

Initial Environmental Examination

July 2016

VIE: Support to Border Areas Development Project

Prepared by CONTRANS AB, SWEDEN

In joint venture with Transport Engineering Consultant Joint Stock Company No.2 (TECCO2) (Vietnam) and

In association with ASEAN Development and Management Consulting Ltd (ASEC) (Vietnam) for the Asian Development Bank

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Support to Border Areas Development Project (48189-002)

Initial Environmental Examination (IEE)

**UPGRADE PROVINCIAL ROAD No.665 IA BANG-IA
MOR, CHU PRONG DISTRICT, GIA LAI PROVINCE**

**Prepared for
THE ASIAN DEVELOPMENT BANK**

July 2016

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CURRENCY EQUIVALENT
(As of 15th July 2016)

Currency unit: Viet Nam Dong (VND)
USD1 = VND 22300

WEIGHTS AND MEASURES
km² – square kilometre
m³ cubic meter

NOTE
In this report “\$” refers to US Dollars

Consultants Quality Assurance Protocol

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ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
CLV-DTA	Cambodia – Lao PDR – Vietnam Development Triangle Area
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
ESP	Environmental Safeguard Specialist
ESO	Environmental Safeguards Staff
GMS	Greater Mekong Sub-region
IEE	Initial Environmental Examination
IPM	Integrated Pest Management
LEP	Law on Environmental Protection
MONRE	Ministry of Natural Resources and Environment
MMP	Materials Management Plan
PPB	Project Preparation Board
PPC	Provincial People's Committee
PPE	Personal Protective Equipment
PMU	Provincial Project Management Unit
PPTA	Project Preparatory Technical Assistant
SPS	Safeguard Policy Statement
The PPTA	The Project Preparatory Technical Assistant Consultants
The Project	Support to Border Areas Development Project
The Subproject	Upgrade Provincial Road No.665 Ia Bang-Ia Mor, Chu Prong District, Gia Lai Province
TTF	Trade and Transport Facilitation
UXO	Unexploded ordnance
WMSDP	Waste Management and Spoil Disposal Plan

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I. EXECUTIVE SUMMARY

1. The Central Highland of Vietnam has many natural resources with more than 2 million hectares of rich basalt soil; make up 60% of the basalt soil of Vietnam. The soil is suitable for a variety of commercial crops including coffee, cocoa, pepper, and tea. The coffee production area has reached more than 290000 ha, about 80% of the total coffee area of the country. On the global scale, Vietnam has also radically changed global coffee supply chains since 1990, increasing from less than 3% to more than 17% of global production¹. The Central Highlands is also the second largest rubber plantation area in Vietnam, mainly in Dak Lak province.

2. Despite of these advantages, socio-economical development of the Central Highland, especially four border provinces of Kon Tum, Gia Lai, Dak Lak and Dak Nong are still facing many difficulties, with less developed infrastructure and low living standards with many different ethnic groups. Their poverty rate is the second highest in the country, standing at 20.3% compared to 12.6% for the whole country in 2011.

1. The Support to Border Areas Development Project (Project) will help the five participating provinces (the Provinces) of Kon Tum, Gia Lai, Dak Lak, Dak Nong, and Binh Phuoc to better realize their growth potential and become more closely integrated into sub-regional frameworks including the Greater Mekong Sub-region (GMS). The project will include three main outputs and activities: i) Output 1: Road infrastructure in five VDTA provinces rehabilitated; ii) Output 2: VDTA plans and facilities for transport and trade facilitation (TTF) with a focus on inclusive growth developed and iii) Output 3: Institutional capacity for VDTA investment planning, project design and implementation, and resource management strengthened

2. Following extensive data collection, a multi-criteria analysis was used to make the final selection of the roads to be included in the shortlist. Measures were used that reflected the likely impact of the roads including eight themes: (i) agricultural productivity; (ii) population served; (iii) rural population; (iv) traffic count; (v) poor households; (vi) ethnic minority population; (vii) safeguards compliance (environment and social safeguards); and (viii) access to National Road No.14.

A. Subproject Summary

3. The provincial road No.665 in Chu Prong district, Gia Lai province has a total length of 65.87 km, connects NR14 with NR14C and ends at the junction with border patrol road in Ia Mor Border Area with Cambodia. It connects the residential in Chu Prong district centre to the border communes in the West, spreads over 6 communes of Ia Bang, Ia Tor, Ia Pia, Ia Me, Ia Ga and Ia Mor. Along the road from the start point at Phu My T-junction in Ia Bang commune to Km32.6 at Khoi village, Ia Ga commune is dense residential areas and some scattered areas of rubber, coffee and pepper cultivation. 100m corridors on both roadsides of the next section from Khoi village to the cross section with NR14C (Km57.9) is Ia Mor Protection Forest and out of this 100m corridor is vast rubber plantation area. Ia Mor Irrigation Project, locate roadside at Km48+200 is under construction. The proposed irrigation area of this project is 12,000 ha of Ia Mor and Ea Soup cultivation area of Dak Lak. Along the last 8km from cross section with NR14C to Border Patrol road is natural forest of Ia Mor Protection Forest. The whole route has been established before 1975 with the initial scale of 5m widths. Due to the economical

¹ Coffee in the 21st Century – Timothy J Killeen, PhD & Grady Harper

Initial Environmental Examination of Upgrade Provincial Road No.665 Ia Bang – Ia Mor, Chu Prong District, Gia Lai Subproject

development demand, the road has been repaired and upgraded section by section. Some sections are already paved with asphalt concrete or bitumen to reach level IV – Mountainous from Government budget. Some other sections (mainly in Ia Mor and Ia Ga communes) are earth road with 6-7m foundation width.

4. The Subproject: Upgrade Provincial Road No.665 Ia Bang – Ia Mor, Chu Prong District, Gia Lai Province (the Subproject) was the short-listed subproject in Gia Lai province. The Subproject will upgrade 65.87km of provincial road No.665 to Vietnamese Standard Road Grade IV – Mountainous with the surface width of 5.5 m and base width of 7.5 m. The road surface material is asphalt concrete and the design speed is 40 km/h. The slope angle of the road cross-section for straight section is 2%. Roadside width: 2x1m, slope angle of the roadside cross-section are 4%. Road slope filling 1/1.5, road slope excavating 1/1.

5. There are total about 50 culverts along the subproject road. Some of them will be upgraded or reconstructed. There are five streams cross the subproject road with five bridges. Information relating to the existing bridges and planned bridge construction is listed below.

Table 1 – Number of bridges and designed elevation based on 2014 peak water level

N o	Name	Location	Current condition	Beam/ L (m)/ B (m)	Notes
1	Suoi My bridge	Km39+189.38	Concrete slab	L33 / 43.1/ 8	New design, replacing the existing bridge
2	Ia Mor bridge	Km50+200.00	Suspension bridge	5/33/ 142.25/ 8	New design, replacing the existing bridge
3	Jo Stream bridge	Km56+550.56	Concrete slab	L33 / 43.1/ 8	New design, replacing the existing bridge
4	Pa stream bridge	Km60+742.75	Integration of low water crossing and culvert 2D750	L33 / 45.1/ 8	New design, replacing the existing drift
5	No. 5	Km61+331.83	Integration of low water crossing and culvert 2H1000	L24 / 35.1/ 8	New design, replacing the existing drift

B. Environment impacts and mitigations

6. The Project has been ranked 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 concern is the potential negative impact of the subproject implementation to Ia Mor Protection Forest. The completion of the road will provide access to the forest; potentially creating favourable condition for wood logging and forestry product exploitation.

7. This IEE has been prepared to screen impacts and formulate mitigation measures in three phases of subproject implementation including design; pre-construction; construction and operation phases and institutional arrangement to ensure that subproject Environment Management Plan (EMP) will be implemented.

8. In the preconstruction phase, the potential impacts have been identified relating to land acquisition and resettlement. To minimize the impact on income and disturbance of local people's lives, PMU will check and review the Land acquisition and resettlement process before the construction starts to ensure that all affected households have received compensation adequately in accordance with the current provincial market and ADB safeguard Policy be implemented.

9. The potential negative impacts in the construction phase have been identified as (i) forest encroachment in the section goes through Ia Mor Protection Forest. To minimize the impact, a closed collaboration between Gia Lai Project Management Unit (PMU), Environment Safeguard Specialist (ESP); Ia Mor Protection Forest Management Board (IPMB), relevant Divisions of Chu Prong district, Forest Ranger, Military Border Soldier, Construction Supervision Consultant (CSC) and Contractors will be established to identify, manage and control the construction activities along the road section from Khoi village, Ia Ga commune (Km32.6) to the end point of the road, especially for tree cutting and vegetation clearance activities and to ensure construction activities will be done properly on the existing road foundation. Workers should be informed and prohibited from cutting trees for firewood and for use in the subproject activities before construction start.

10. (ii) Careless construction and poor materials control can cause blockage to streams at five crossing locations. Runoff water during its rain could bring waste and soil into the nearby water bodies. That could lead to siltation and reduce the water quality. The five crossing streams, especially Ia Mor stream could be affected by the construction activities, as a bridge will be constructed to replace the existing suspension bridge. The proposed mitigation measures are store lubricants, oils and other construction material stockpiles on impervious ground with covers or roof and at least 100m away from water bodies; install sediment ditches, silt fences at the area with high potential of runoff, erosion and sedimentation.

11. (iii) The operation of construction machines and material transportation could damage local facilities such as low-voltage electricity lines, communication cables, existing drainage system and other roads in the subproject area. They will also impact on local traffic; increase the risk of work accidents and traffic accidents especially in the sensitive areas such as commune administration centres, medical centres, schools, kindergartens. Dust, noise and vibration from construction machines such as concrete mixing plants or transportation truck could disturb local people, damage their houses, increase risk of respiratory and skin diseases. To minimize the impact, the contractor will collaborate with relevant authorities to set up detail plan for machines and workers mobilization as well as material transportation plan; inform in advance that plan to local authorities and local people; in accordance to that plan, PMU, CSC and relevant authorities will monitor the compliance of the contractor in applying designated mitigation measures. If any buildings, structures in the subproject area are damaged by the construction activities, the contractor should compensate adequately with their own expense. (iv) Potential cumulative impact from the construction activities of the Sub-project and Ia Mor Irrigation Project. Large flux of construction workers, machines of two projects, especially for Ia Mor commune, will put a heavy burden to local infrastructure and service system. To avoid or minimize the impact, Gia Lai PMU, ESP, Contractor will work with Ia Mor CPC, Chu Prong DPC and contractor Ia Mor Irrigation Project to find out the suitable worker and machine mobilization schedules of the two projects, avoid concentration of machines and workers at the same time. The contractor will inform construction schedule and scope to local authorities in advance as well as investigate the capacity of mines, quarries and temporary dumping sites to see whether they are suitable for both projects.

12. In the operation phase, the potential negative impacts have been identified relating to increase chance of access to Ia Mor Protection Forest; dust and noise arising from increasing of traffic density and higher risk of traffic accident as better driving conditions. To minimize the negative impacts, Gia Lai Department of Transportation (DOT), the responsible agency for subproject management in the operation phase will cooperate with IMPB, Ia Mor CPC in forest management, periodically maintain the road, install speed limit, warning sign or road hump (if applicable) at the sensitive areas along the road such as schools, kindergartens, markets, medical centres etc.

13. The PPTA Consultant has also identified key stakeholders and conducted public consultations from provincial to commune level with a focus on the affected people views. The main concerns are (i) the road safety during construction time as various large construction machines are operated at the same time and falling material will create slippery condition and increase traffic accident risk. (ii) Village Head of Not village, Ia Me commune has expressed his concern on the drainage issue as the runoff water from PR.665 has created a deep ditch, divided Not village into two parts, make difficulties for the movement of the village people. (iii) The representative of Ia Mor Protection Forest Management Board has expressed his concern on potential negative impacts to the forest. All of these concerns are addressed in the EMP (See Table 11 – 12 for more details).

14. 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 arrangement

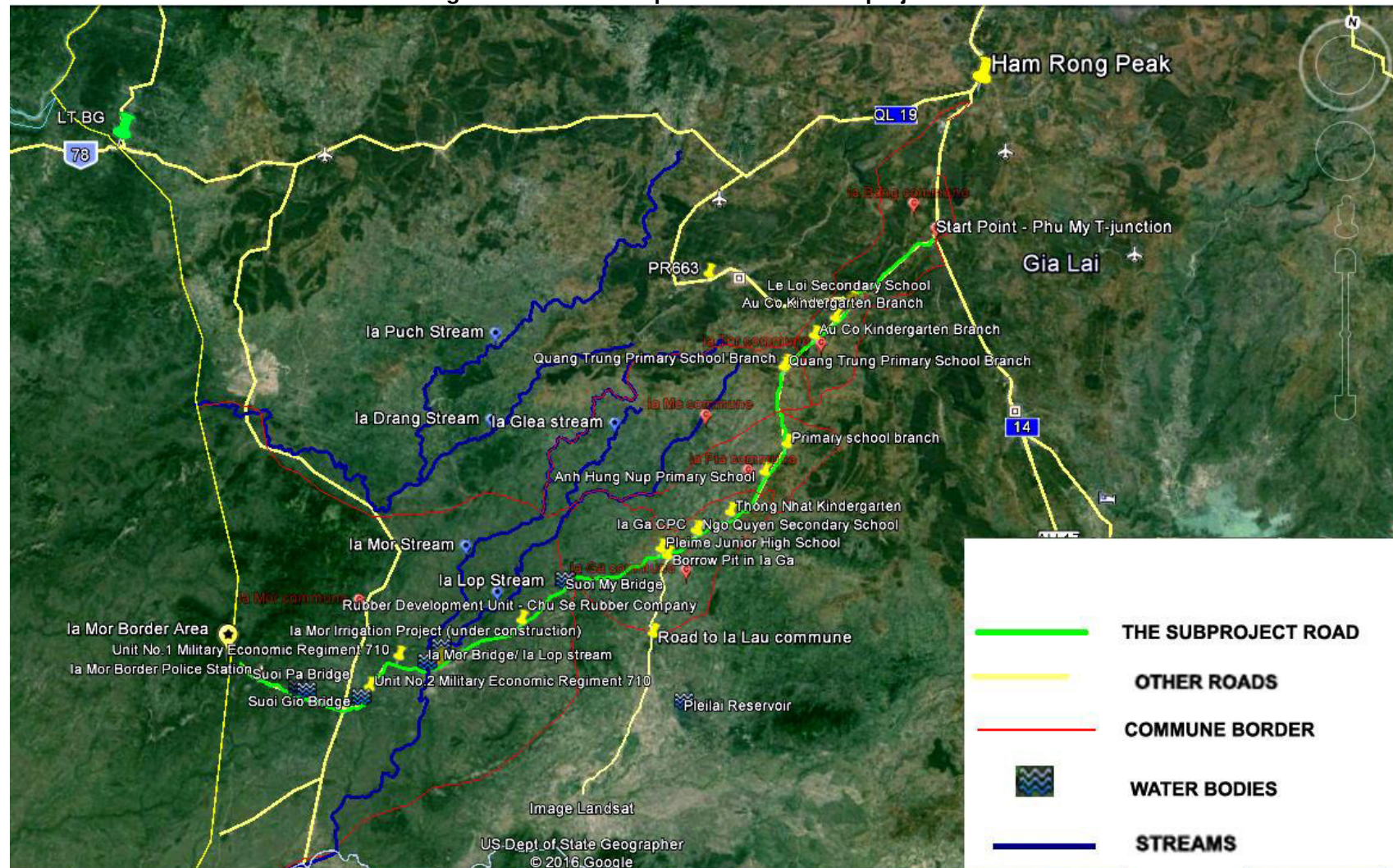
15. Gia Lai Provincial People Committee (CPC) has established a Project Preparation Unit (PPU) to support the preparation of the subproject in the PPTA period. One safeguard staff from other ODA Project has been assigned as Environmental Safeguards Officer (ESO) of PPU. Ideally, the ESO will become ESO of Gia Lai PMU in the construction phase. ESP will organize a formal training course 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. ESP will also support PMU's capacity building by reviewing and evaluating the capacity for environmental protection of the PMU and Gia Lai Department of Transportation (DOT) – subproject management organization in the operation phase.

16. To fully reflect the environmental protection cost of the civil works and engage the environmental responsibilities of civil contractors, environmental requirements will be included in bidding documents and civil work 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 document 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

17. 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 determined, further detailed environmental impact assessment (EIA) is not required. The ESP, before finalization of the detail design, will update the EMP.

Figure 1 – General Map of Gia Lai and Subproject Area



II. BACKGROUND

18. The Support to Border Areas Development Project (Project) will help the five participating provinces (the Provinces) of Kon Tum, Gia Lai, Dak Lak, Dak Nong, and Binh Phuoc to better realize their growth potential and become more closely integrated into sub-regional frameworks including the Greater Mekong Sub-region (GMS), the Cambodia – Lao PDR – Viet Nam Development Triangle Area (CLV-DTA), and the ASEAN Economic Community. It will improve the project area's connectivity by developing critical transport infrastructure, leading to increased movement of people, agricultural produce, and other goods. Moreover, it will facilitate logistics and trade, and help develop the Provinces' capacity for investment planning from a regional integration perspective. As the Provinces are at the joint borders of the CLV-DTA, the Project will enable them to serve as an engine and gateway to wider markets for this sub-regional initiative. The Project will be implemented in 5 provinces in the CLV-DTA of Vietnam including Kon Tum, Gia Lai, Dak Lak, Dak Nong and Binh Phuoc.

19. The proposed Project will include 3 outputs and activities:

- **Output 1: Road infrastructure in five VDTA provinces rehabilitated.** The Project will improve transport infrastructure of the DTA area, including selected sections of provincial roads and roads that are important for filling the missing links for accessing national and international wider markets, tourism, healthcare facilities, and heritage and conservation areas. The project will provide the critical road infrastructure in service of selected value chains to ensure the smooth flow of products along the value chain to the market.
- **Output 2: VDTA plans and facilities for transport and trade facilitation (TTF) with a focus on inclusive growth developed.** This output will stimulate inclusive economic activity by (i) improving TTF within the VDTA leading to easier movement of goods and people across the borders, which in turn will stimulate the formation of strong value chains to support trade and tourism; and (ii) expanding the tourism industry which will involve the local population, with a special emphasis on the inclusion of ethnic minorities. Moreover, tourism also leads to demand for high quality local agricultural produce and rural products such as traditional handicrafts.
- **Output 3: Institutional capacity for VDTA investment planning, project design and implementation, and resource management strengthened.** This output will consolidate the long-term development program for the VDTA. The indicators for achieving this output are: (i) VDTA master plan updated and implementation action plan prepared with ecosystem services, gender and EM considerations; and (ii) Officials nominated by the PPC trained to implement the updated master and action plans.

20. In order to reach these above outputs as well as avoid and minimize any possible negative impact of the Project implementation, the Project Preparatory Technical Assistant Consultants (the PPTA) has been recruited. The main tasks of the PPTA are (i) detail a project design that is economically, financially and technically feasible; (ii) provide advance drafts of the complete set of documentation necessary for the ADB to proceed with internal processing of the ensuing Project; (iii) prepare feasibility studies and comprehensive criteria for road sections, logistics and institutional arrangements to be improved under the Project; (iv) define the scope, cost, procedures for identifying subprojects, financing plan, implementation arrangements, procurement strategy, technology issues, capacity development needs and

post-project operation and maintenance arrangements for the project (v) establish measures that will ensure adherence to the safeguard policies of both the ADB and the Government; (vi) provide guidance in actions to maximize the socioeconomic benefits such as impacts on poverty, gender and fair employment practices; (vii) provide project start up support to the government.

21. The Government of Vietnam has assigned Ministry of Planning and Investment as the line agency for the preparation phase of the Project. Department of Planning and Investment (DPI) of the five provinces are responsible for the Project preparation phase in their provinces. DPIs have prepared a long list of the proposed roads in their provinces based on the Provincial Transportation Master Plans and the demand for road upgrade at the moment. The long list subprojects have been detailed feasibility and preliminary designs have been undertaken by the PPTA. A multi-criteria system with weight has been developed to screen and short-listed these subproject roads. The parameters have been listed in the Paragraph 4 above.

22. The Project is initially categorized as 'B' for environmental safeguards, and IEE is required to meet requirement of ADB SPS 2009. The objectives and scope of this IEE are to (i) assess the existing environmental conditions along and 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) carryout 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.

III. POLICY AND LEGAL FRAMEWORK

23. 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 environmental protection 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 SPS requirement

24. ADB safeguard policy statement (SPS) 2009 imposes safeguard requirements for all its funded projects. The SPS 2009 clarifies reason, scope and contents of the environmental assessment. Safeguard policy statement emphasizes on environmental and social sustainability in progress of economic growth and poverty reduction in Asia and the Pacific, therefore the objectives of SPS focus on:

- 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

25. **Environment Categorization:** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

26. For environmental safeguards, the Project is initially categorized as 'B'. Environmental criteria for the long list multi-criteria system has been developed and contributed for the evaluation and short-listed subproject roads. Detail of the environmental criteria could be found in Appendix 02. The subproject has been classified as category A on environmental safeguards will not be short-listed as it will rescale the whole Project to category A on environment

B. Legal and Administrative Framework for Environmental Protection in Vietnam

27. The subproject has to comply with the environmental legal framework of Vietnam that 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
- 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. Others

- 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.
- 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: 2008/BTNMT on surface water quality
- QCVN 09: 2008/BTNMT on underground water quality
- QCVN 14: 2008/BTNMT on domestic wastewater

3. Other legislations applicable to the Project 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/QĐ-BYT of 10 October 2002 by the Ministry of Health promulgating 21 labour hygiene standards, 5 principles and 7 labour 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 labour safety in work construction
- Law No. 10/2012/QH13 of 18 June 2012 by the National Assembly on labour code

IV. DESCRIPTION OF THE SUBPROJECT

A. The need for subproject

28. The natural area of Gia Lai is 15.540 km² with the population in 2015 is approximately 1.377.800 people, including 01 city, 02 towns and 14 districts with 222 communes/ precincts in total. There are 34 ethnic groups living in Gia Lai with two local groups are Bahna and Jrai. The other ethnic people are migrants such as Tay and Thai ethnic people – mainly from the North. Gia Lai located in the GMS economical corridor and it has 90 km borderline with Cambodia. The position of Gia Lai make it works as a gateway to the border for all provinces in DTA area. National Road No. 14 connects Gia Lai to Ho Chi Minh City and other provinces in the Central Highlands. Gia Lai is also linked with the central coastal provinces through National Road No. 19 and 25. Thus, Gia Lai has an important position in national security and defence as well as economical development.

29. With the advantage and potential on agricultural development, up to now, in 2015 GDP contributions of Gia Lai, agriculture – forestry – aquaculture are still make up 40.04%. Industry and construction make up 26.77%; services are 33.19%. Agriculture is mainly long-term industrial plantation such as rubber, pepper, coffee and breeding. However, agricultural production processing is still weak and not met with the agricultural advantages and potential of the province.

30. One of the major reasons for the slow development of the agricultural sector in Gia Lai is the less development of the road network. Gia Lai has a total 10817 km road but mainly aggregated road and earth road. The 4 main roads are National Road No.14; 14C; 19 and 25 with the total length of 505km, make up only 4.67% of the province roads. Gia Lai also has 11 provincial roads with the total length of 537 km; make up 4.96% of the total road length.

31. In the rainy season, muddy condition of the road has blocked the movement of local people and goods transportation; make many difficulties for local people. In the dry season, air pollution by dust and other exhaust fumes could affect the health of local people.

32. In the General Socio-Economical Development Plan of Gia Lai to 2020, part of Chu Prong district will be separated to establish a new district in the area of Ia Ga commune. Thus, road No. 665 will be the main transportation route of the district and contribute to socio-economic in the area.

33. Upon the completion of the proposed road, it will become a bloodline link National Road No.14 to National Road No.14C as well as other roads in the province to make a transportation network and remove the geological barriers between regions, support goods exchanges, enlarge cultivation area of rubber, pepper and coffee.

B. Location and scope

34. ""Upgrade Provincial Road No.665 Ia Bang - Ia Mor" route goes through six communes including Ia Bang, Ia Tor, Ia Me, Ia Pia, Ia Ga and Ia Mor in Chu Prong district. These are poor communes of Chu Prong district with many ethnic minority groups living there and cultivating coffee, rubber, pepper, cashew and cassava in large area. The road improvement will connect National Road No.14 and National Road No.14C to the border with Cambodia; contribute to

social and economic development of such communes of Project. The beneficiaries of the subproject will be: (i) local people in Chu Prong district where the subproject runs through with the estimation of 106,648 people in 26,501 households, of which 11,389 households are ethnic minorities and 3273 poor households; (ii) processing factories, agribusiness enterprises located close to the road.

35. The Subproject will upgrade 65.87km of provincial road No.665 to Vietnamese Standard Road Grade IV – Mountainous with the surface width of 5.5 m and base width of 7.5 m. The road surface material is asphalt concrete or cement concrete and the design speed is 40 km/h. The detail scale of a cross section as below:

- + Road base width: 7.5 m.
- + Road surface width: 5.5 m, slope angle of the road cross-section for straight section is 2%.
- + Roadside width: 2x1m, slope angle of the roadside cross-section are 4%.
- + Road slope filling: 1/1.5; road slope excavating: 1/1.

36. There are total nearly 50 culverts along the subproject route. Some of them will be upgraded or reconstructed. There are also stream cross the route with 5 bridges with Ia Mor stream is the largest, cross the road at Km50+133. All of them will be newly constructed to remove the existing one. Ia Mor Irrigation Project, which is located at Km48+200, is under construction. This is an investment project from Ministry of Agriculture and Rural Development to irrigate for 12000 ha of different crops in Ia Mor and Ea Soup district of Dak Lak province. Pleilai Irrigation Lake in Ia Lau and Ia Pior communes, located about 10km from the subproject road.

37. Suoi My and Suoi Jo bridges are in good condition. However, the distance between spans of both bridges is not enough for water flow in the flood season and it blocks the traffic on the road in the flood season. On the other hand, the narrow width and the loading capacity of these bridge are not suitable to the design scale of the whole route. Ia Mor suspension bridge is serving for transportation of local people with only 2.5 m width. The bridge is degraded and loading capacity is only 2.5 tons. Suoi Pa Bridge and Bridge No.5 at Km61+331.83 are integrated drifts. The connection with Border Military Station No. 729 or border patrol road will be lost when it rains heavily or in the flooding time.

38. Current status of drainage and culvert system

- + Culvert: Some culverts have already been constructed along the road. However, most of them have a small diameter, old and limited in the length make them unsuitable with the new design scale. There are total 50 culverts with total length of 480.87m, the round culvert has diameter from Ø75 to 4Ø150cm, the tube culvert has the dimensions from H75x75cm to H100x100cm, the slab culvert has the dimensions from BxH50x50 to BxH4x3m.

- + Incline culvert: Several incline culverts have already been located along the road to cross ditches in the residential area. All of them are still in good condition.

- + Drainage canal along the road: The drainage canal system has been constructed at some sections along the road especially in the residential areas. The budget has been extracted from annual operation and maintenance budget. These canal sections are still well functioned enough but some parts are already damaged. In accordance with the new design of the whole route, these canal sections must be reconstructed.

39. Utilized all culverts are still in good conditions, ensure water drainage along the road and reconstruct or construct new culverts in case the old one is not function well.

40. The drainage system along the road will be earth canal, designed in trapezium shape with size of $(1.2+0.4) \times 0.4\text{m}$. The section with high slope angle ($i>5\%$) and located outside of the residential area will be constructed by cut stone VXM M100 and 20cm in thickness.

41. Traffic safety system: Signal and sign are adequate at the section from Km0+0,00-:-Km32+6 and at section goes through Ia Mor commune centre. In the other sections, traffic signal and sign must be replace or newly install.

42. Traffic safety setup in the whole route: provide more traffic signals and signs at the road turning sections, high slope, culvert position... in accordance with Road signal QCVN 41: 2012/BGTVT



Bitumen section: 3.5m surface width



Bitumen section: 5.5m surface width – Rubber plantation area



Cement concrete: 5.5m surface width



Earth road section

Support to Border Areas Development Project (48189-002)
Initial Environmental Examination of Upgrade Provincial Road No.665 Ia Bang – Ia Mor, Chu Prong District, Gia Lai Subproject

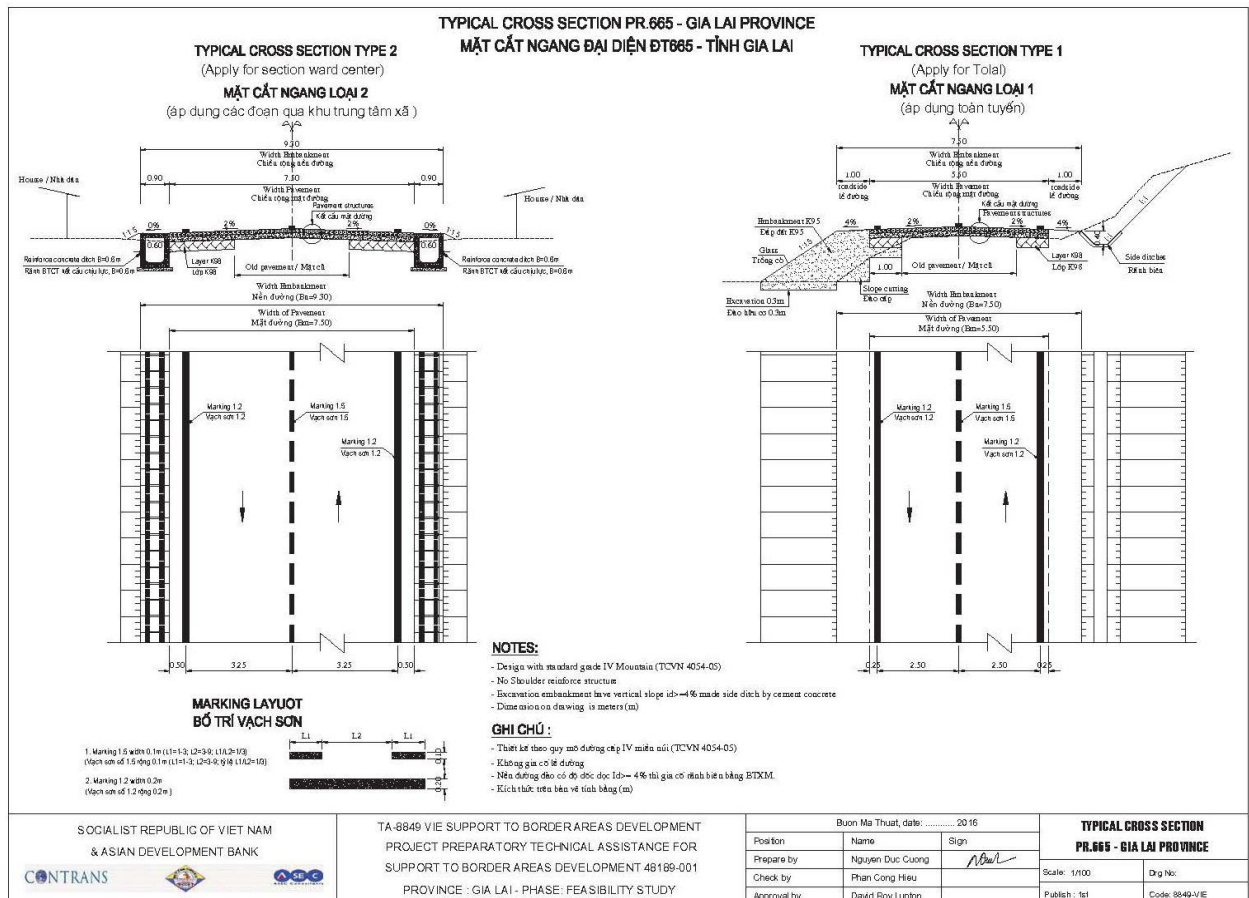


Suoi My bridge: 4.5m width



Ia Mor suspension bridge: 2.5m width

Figure 2 – Typical Cross Section of PR665



43. The last 8km section (from the junction with NR14C to the end point of the route) goes through Ia Mor Protection forest. Although the subproject will only upgrade the road surface base on the existing road foundation and with the same alignment, the contractor will not locate worker camps and large material stockpiles in that section. Moreover, no worker camps and large material stockpiles will be located close (at least 100m away) to the large water bodies

such as 5 stream crossing positions or the sensitive area like schools, kindergarten, medical centre...

44. The estimated volume of excavated soil of the subproject is about 134917.45 m³, of which 96519.27 m³ is unstable organic soil that is not suitable for embankment. Estimated required soil volume for embankment is 452436 m³ and 25697.52 m³ could be utilized from excavated soil. Estimated volume of stone using for the subproject implementation is 145000 m³. The main filling soil and stone sources for the subproject could come from Doc Trang borrow pit in Ia Ga commune, locate roadside to Ia Lau and Ia Piar communes, about 500m from Km31+500 of the subproject route. This borrow pit has been organized to provide filling soil for transportation construction of Gia Lai province and it has the operation license from Gia Lai DONRE. Part of the borrow pit could be used as temporary dumping site for the subproject. This borrow pit is under the management of Ia Ga CPC. There is another borrow pit at Km45 in Ia Mor commune. This borrow pit has been organized to provide filling soil for projects in Chu Prong district and under the management of Ia Mor CPC.

45. Sand, steel, cement and other construction material could be bought in the shops system along the subproject road.

46. Currently, all the communes have set up a temporary place for domestic waste. They have already planned for disposal site and assigned the location in the commune. The contractor should work with CPCs for quarries, mines and dumping site before construction start. ESP will integrate this information in the updated EMP.

47. Land acquisition and resettlement: There is no house will be relocated or major affected household. There are 56 affected households by the subproject construction activities. Only 2 households in Ia Mor is severely affected as they has lost more than 10% of the total natural land holding. The detail information on affected households is show in Table 2 below.

Table 2 – Affected households, enterprises and organizations

No.	District/ Commune	Number of AHs	Number of marginall y AHs ¹	Number of severely affected HHs	Number of vulnerabl e AHs	Number of affected EM househol d	Number of affected organizati ons	Number of affected enterprise s
A	Chu Prong	56	54	2	8	14	9	4
1	Ia Bang	3	3	0	1	0	0	0
2	Ia Tor	20	20	0	2	3	4	0
3	Ia Me	1	1	0	0	1	0	0
4	Ia Pia	20	20	0	2	0	3	3
5	Ia Ga	4	4	0	1	3	1	0
6	Ia Mor	8	6	2	2	7	1	1
Total		56	54	2	8	14	9	4

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Note: Marginally affected household means the household who lose less than 10% of total productive land holding, partial loss of residential land without relocation/rebuilt the house on remaining land.

Source of data: IOL data provided by PMU of Gia Lai DPI

48. In the plan, the subproject will be constructed in 24 months with the estimated budget of 20,270,751 USD in equivalent with 452,037,736,494 VND). Detail are listed in Table 3 below

Table 3 – Estimated budget of the subproject

No	ITEMS COST	METHOD	Subtotal (Select) (VND)	USD	Notes
	Invesment Cost	I+II+...+VI	<u>452 037 736 494</u>	<u>20 270 751</u>	
I	Construction cost	1+2	<u>329 412 699 000</u>	<u>14 771 870</u>	22 300
	Route		270 754 555 969	12 141 460	
1	Embankment		40 706 826 892	1 825 418	
2	Pavement		196 572 012 272	8 814 888	
3	Drainage; culverts		8 688 786 135	389 632	
4	Long drainage		17 746 516 453	795 808	
5	Embankment protection works		2 112 934 346	94 750	
6	Traffic safety		4 121 485 380	184 820	
7	Temporary works		805 994 492	36 143	
	Bridge		58 658 142 612	2 630 410	
	Suoi My bridge Km39+189,38		6 619 392 840	296 834	
	Ia Mor Bridge Km50+209,69		32 351 081 673	1 450 721	
	Suoi Jo Bridge Km56+550,56		6 637 557 445	297 648	
	Suoi Pa Bridge Km60+742,45		7 199 764 166	322 859	
	Bridge Km61+331,83		5 850 346 489	262 347	
II	SITE CLEARANCE COST	Separated	<u>782 966 494</u>	35 111	
III	MANAGEMENT COST	1.192% *CPXDTT	<u>3 686 298 000</u>	165 305	
IV	INVESTMENT ADVICE COST		<u>23 792 890 000</u>	1 066 946	-
1	Report investment cost (*1,2 design improvement)	0.169%*CPXD*1,2	709 205 671	31 803	Decided 957/QD-BXD dated 29/9/2009
2	Survey cost (calculation temporary 100mil vnd /km)	Temporary	6 500 000 000	291 480	
3	Verification cost	0.023%*CPXD	83 515 705	3 745	Decided 957/QD-BXD dated 29/9/2009
4	Shop drawing cost (*1,2 design improvement)	0.834%*CPXD*1,2	3 440 123 838	154 266	Decided 957/QD-BXD

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					dated 29/9/2009
5	Survey cost for shop drawing (Calculation temporary 120mil VND/km)	Temporary	7 800 000 000	349 776	
6	Establish bidding document; Evaluation bidding document cost	0.2%*GGT	100 000 000	4 484	Decree 63/2014/ND- CP dated 26/6/2014
7	Supervision cost	0.92%*CPXD	3 194 402 721	143 247	Decided 957/QD-BXD dated 29/9/2009
8	Verification shop drawing cost	0.05%*CPXD	163 684 520	7 340	
9	Verification estimates cost	0.04%*CPXD	154 894 319	6 946	
10	Others cost for consultant (temporary)	0.50%*CPXD	1 647 063 495	73 859	
V	OTHERS		<u>28 795 951 000</u>	1 291 298	
1	Clearance mine cost (calculation temporary: 5000vnd/m ²)		3 557 211 650	159 516	ESP will check with Provincial Military Command whether UXO clearance needed
2	General cost		18 417 698 445	825 906	
2.1	Temporary housing cost	2.0%*CPXD	6 588 253 980	295 437	
2.2	Others undefined cost (2%)	2.0%*CPXD	6 588 253 980	295 437	
2.3	Mobilization and remobilization cost (calculation temporary)	0.5%*CPXD	1 647 063 495	73 859	
2.4	Ensuring transport cost (Calculation temporary)	1.0%*CPXD	3 294 126 990	147 719	
2.5	Setup Asphalt plant station	Temporary	300 000 000	13 453	
3	Insurance works cost (Temporary)				Decided 33/2004/QD- BTC dated 12/4/2004
	Insurance for Route cost (Temporary)	0.42%*CPXD	1 137 169 135	50 994	
	Insurance for Bridge cost (Temporary)	0.60%*CPXD	351 948 856	15 782	
4	Expertise fees (*TMDT)	0.007%*TMDT	44 037 344	1 975	Circulars 176/2011/TT- BTC dated 06/12/2011
5	Verification fees for design document	0.01%*CPXD	35 652 454	1 599	Circulars 75/2014/TT- BTC dated

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					12/6/2014
6	Verification fees for estimate document	0.01%*CPXD	33 855 657	1 518	Circulars 75/2014/TT-BTC dated 12/6/2014
7	Expertise fees for Bidding document and result bidding	0.1%*GGT	100 000 000	4 484	Decree 63/2014/ND-CP dated 26/6/2014
8	Approval settlement report fees	0.20%*TMDT	1 342 536 000	60 203	Circulars 09/2016/TT-BTC dated 18/01/2016
9	Audit cost (*TMDT)	0.286%*TMDT*1.1vat	2 128 778 080	95 461	Circulars 09/2016/TT-BTC dated 18/01/2016
10	Others (Temporary)	0.5%	1 647 063 495	73 859	
VI	CONTIGENCY		<u>65 566 932 000</u>	2 940 221	-
	Variation works cost	10%	38 568 783 800	1 729 542	
	Inflation cost	15%	26 998 148 660	1 210 679	Indicator construction

V. DESCRIPTION OF THE ENVIRONMENT

A. Physical environment

1. Topography, Geology, and Soils

49. The topography of Gia Lai is in the central highland, divided into 4 regions: (i) high mountains and hills; (ii) highland area; (iii) midland region and plain (iv) low land. The peak of Gia Lai is 2023 m; and the lowest point is 200 m, the average level is 500 m to the mean sea level.

50. High mountain and hill occupy about 2/5 of the total area of the province, separated in sections with the total area of 6909 km², mainly concentrate in the North – East, East and South – East area of the province with some high peaks over 500m and higher than 15° angle. The highest peak is Kon Ka Kinh, over 1700m. Especially, the Mang Yan mountain range lay from Kon Ka Kinh peak to Krong Pa district, divide Gia Lai into 2 separated climate regions are East Truong Son and West Truong Son.

51. The highland region make up about 1/3 total natural area of the province (5800 km²) with two red basaltic highland soil is Pleiku and Kon Ha Nung, suitable for industrial tree development. The area of Pleiku highland is 4550 km² with homogenous red basaltic soil in asymmetric qua-quaversal form, the average level is 750-800m, and the average slope is 3°-5°, light waving terrain. The main ridge between Mekong catchment and Ba river system at the city crossing section that lie North-South direction. It is nearly mix with national road No. 14. The terrain is quite suitable for building construction. Kon Ha Nung highland has the area of 1250 km², old basaltic soil with main type of soil is brown red ferralitic soil, average level is 800 – 900m, and the average slope is 10°-18°.

52. Midland and plain terrain make up 1/5 total natural land area of the province. The lowland terrain distributes along the river and stream, quite flat and is not separated. It is usually cover by a rich nutrition alluvial and suitable for industrial tree development. There are 2 main valleys are An Khe valley with about 1312 km² and Ayunpa – Krongpa, about 1474 km² natural area. The average level is from 200-300m.

53. Follow the Land investigation result of Institute of Agricultural Design and Planning – Central Region on the map scale 1/100000 of Gia Lai 2005; there are 6 soil groups with 16 soil types in Chu Prong district. The yellowish red soil makes up 44.17% of the total area and the grey soil make up 33.7% of the total area. The subproject area of Ia Mor, Ia Lau and Ia Pior are dominated with the yellowish red soil on acid magma and metamorphic rock. This type of soil has medium nutrient but the pH is low so it is suitable for bean, cereal crops or some kind of perennial tree such as rubber and cashews if the soil layer is over 70 cm in thickness.

2. Hydrology and Climate

54. Gia Lai is in the highland tropical monsoon climate with a dry and not so cold winter, wet and cool summer, the temperature variation between seasons in a year is from 9-10°C. Gia Lai is a rich moisture area, high precipitation with higher rainfall in a year with high active frequency of storm and tropical depression. Gia Lai has two clear seasons are rainy season which start from May and end in October, the dry season start from November and end in April next year.

The average precipitation of West Truong Son region is 2200 to 2500 mm, and East Truong Son region is 1200 to 1750 mm. The average air temperature varied from 22°C to 27°C. The climate condition of Gia Lai is suitable for industrial tree development, forestry and agricultural as well as cattle breeding.

55. In Chu Prong district, the precipitation of the rainy season make up 80% of the year with the main wind direction is South - West why North – East is the main wind direction in the dry season. The average temperature is 23.5°C and the average humidity of 81%.

56. The density of river and stream network in Chu Prong district is not so high but uniform distribute in the district from the North to South and from the East to West. The main streams are Ia Hlop stream, Ia Drang, Ia Mor, Ia Puch and Ia Glea. The water level is quite stable, suitable for the development of irrigation reservoir to serve for the cultivation of local people.

57. The Plateau at the South and West of Ham Rong Mountain is the sources of two main streams under Serepok River valley: Ia Drang and Ia Lop – the two main streams of Chu Prong district.

58. Ia Drang Stream, including two main branches: Ia Puch and Ia Drang. They originated from hilly area in Ham Rong Mountain, flow South West through the West area of the district, flow around the base of Chu Prong Mountain to Cambodia.

59. Ia Lop Stream including 3 main branches: Ia Lop, Ia Glae and Ia Mor. Ia Glae and Ia Mor start from the South of Ham Rong Mountain, flow through South West of the district to Ia Pior and South of Ia Mor commune then join Ia Lop, called Ia Mor cross the subproject road at Km50+133, then flow to Cambodia.

3. Surface and ground water

Surface water resources and quality

60. Total surface water deposit of Gia Lai is approximately 23 billion cubic meter, distribute in the main river systems are Ba river, Se San river system and the branch of Serepok river network.

61. Abundant of river and stream with their characteristics of short and high slope angle so Gia Lai has a great potential of hydropower. Se San River is one of the three rivers in Vietnam with highest hydropower potential, make up 11.3% hydropower potential of the country (stay behind 44% of Da river and Dong Nai river with 16,4%). Ba River and Serepok River also have a great potential for hydropower of 4.7 billion KWh, make up 6,64% ratio of the country.

62. The river/ stream system of Chu Prong district originated from South West of Pleiku Plateau, located in the high precipitation area of Gia Lai (>2000mm), so they have a quite abundant water resources. The annual flow module is about 30-40 l/s/km².

63. The area with high precipitation from 2000 – 2400mm per year as in Bien Ho Lake or Chu Prong... the minimum monthly flow rate reached to 8-10 l/s/km².

64. According to the result of surface water monitoring of Gia Lai in 2015, some areas of Gia Lai are already polluted with NH₄⁺, NO₂⁻, PO₄³⁻ and other organic pollution like BOD₅, COD

or micro-organism pollution with E.coli and coliform. The water quality in some areas is not suitable for drinking water or irrigation water. However, the water quality in Chu Prong district and the subproject area is still under the QCVN 08:2008/BTNMT. Table 4 below show the result of surface water quality monitoring in Chu Prong district in 2012.

Table 4 - Surface water quality in the subproject area

Water sampling in rainy season (09/2012)						
Sample name	pH	BOD ₅	TSS	COD	DO	Herbicide partition
	-	mg/l	mg/l	mg/l	mg/l	µg/l
NM3	6.28	19	24	32	1.92	0.16
NM4	6.49	15	19	24	3.05	KPH
NM5	6.57	12	20	17	3.76	0.05
QCVN 08:2008/BTNMT (Column B1)	5.5 – 9	15	50	30	≥ 4	0.4
QCVN 08:2008/BTNMT (Column B2)	5.5 – 9	25	100	50	≥ 2	0.5

Water sampling in dry season (12/2012)						
Sample name	pH	BOD ₅	TSS	COD	DO	Herbicide partition
	-	mg/l	mg/l	mg/l	mg/l	µg/l
NM3	6.35	21	26	39	3.2	0.14
NM4	6.73	12	16	21	4.7	KPH
NM5	6.62	10	14	18	5.3	KPH
QCVN 08:2008/BTNMT (Column B1)	5.5 – 9	15	50	30	≥ 4	0.4
QCVN 08:2008/BTNMT (Column B2)	5.5 – 9	25	100	50	≥ 2	0.5

NM3: Ia Bang stream - located in Ia Bang commune, Chu Prong district - at the wastewater point of Chu Se Rubber Factory.

NM4: Ia Lop stream - located in Yen Hung hamlet, Ia Pior commune, Chu Prong district.

NM5: Mo stream – located in Ia To commune, Chu Prong district.

Underground water resources and quality

65. According to an investigation of Southern Hydrological Geology Federation, underground water resources in the aquiferous complex are: Basalt igneous aquiferous complex Pliocene – Pleistocene with large distribution area, thick water holding layer. This is the most important water holding layer of Ia Mor – Ia Lop valley, could provide water for medium and large scale. The sustainable exploitation capacity is 1191675 m³/day.

66. The quality of basalt igneous aquiferous complex is usually low mineral content, varied from 0.15 – 0.45 g/l. The main mineral agent are sodium bicarbonate-sodium chloride; calcium with low ion content. All the contamination parameters are under the allowed level of QCVN 09:2008/BTNMT – on underground water quality.

4. Natural Disaster

67. There is no hydrological monitoring station in the district area. However, based on an investigation with the local people, from August to October every year, especially year with a lot of tropical pressure and storm, the down stream area of Ia Lop and Ia Mor is usually flooded 2-3 days.

5. Air quality and noise

68. In accordance to air quality monitoring program of Gia Lai Department of Natural Resources and Environment (DONRE) in 2015, the ambient air quality in Gia Lai province is still not polluted. All monitoring parameters are under QCVN 05:2013/BTNMT on ambient air quality. Noise has also been measured and at all sampling location, it is still under QCVN 26:2010/BTNMT on noise. The nearest monitoring point for air quality and noise is in Chu Prong district centre – about 6 km from the subproject road. The monitoring program of Division of Natural Resources and Environment of Chu Prong district in 2012 has also showed no trace of air pollution in the district.

B. Biological environment**1. Agriculture**

69. From the starting point at Phu My T-junction to the junction to Ia Lau and Ia Pior communes are the production areas of coffee, pepper and rubber. Local people grow these productions in their paddy fields. The latter part of the road in Ia Ga and Ia Mor communes is mainly production forest with the domination of rubber plantation. The protection forest is only existed on 100 m corridor from each side of the proposed road. In Ia Lau and Ia Pior commune is a large production area of cassava and sweet potato. The crop ratio of the district could be seen in Table 5 below

Table 5 - Area and production of the main crop of Chu Prong district in 2010

Name of the crop	Area (ha)	Production (ton)
Total Cultivation Area	57,831.6	
I. Annual crop	18,245.8	
1 – Food crop	9,218	36,643
a) Rice	3,718	11,453
b) Corn	5,500	25,190
2 – Other starch plant	4,400	
3 – Vegetables	4,104	
4 – Annual industrial plantation	576	
- Peanuts	200	184
- Cotton	300	480
II. Perennial plants	39,585.8	
1 – Industrial plants	39,303	
- Coffee	13,704	33,232
- Rubber	21,970	10,322
- Cashew	1,800	2,374
- Tea	529	1005
- Fruit plants	250	

Sources: Chu Prong Environment Report 2013

2. Forestry

70. Chu Prong has a rich forestry resources and it could become an advantage for economical development if the forest were well managed and well protected. The main forest type in the district is light forest with broad leaves. The dominant family is Dipterocarpaceae. This type of forest makes up 87.70% of the total forest area in the district. Evergreen broad leaves forest and plantation forest makes up only 12.30%. Currently, the name of Chu Prong does not listed in any plan for special forest system of Viet Nam. In 2000, Bird Life International and Forest Planning Institute of Vietnam have implemented an investigation in the Southwest area of the district and proposed plan to establish a Conservation area with total natural area of 50,104 ha in Ia Mor and Ia Lau communes. However, in accordance to Decision No. 53/2008/QĐ-UBND of Gia Lai PPC and the most recent forest investigation result in 2015, the forest subzones along the subproject road in Ia Ga and Ia Mor communes are mainly rubber plantation forest. The protection “forest” is only 100 m corridor from each side of the road and in some places; this corridor has also been occupied for living area of rubber plantation workers.

3. Fauna and Flora

71. The natural forest in Gia Lai makes up 78.3% of the total forest area. There is several kind of precious timber tree such as merawan, Burma padauk, aglaia. The main family of the plantation cover in Gia Lai is Dipterocarpaceae, Fabaceae, Meliaceae, Fagaceae, Myrtaceae, Urticaceae and Chrysopogon. This kind of forest has been cleared in a large area due to changing in production method to industrial tree plantation.

72. In general, Gia Lai province has a rich forest resources, high terrestrial biodiversity with many rare plant and animal species. However, due to deforestation, along with indiscriminate hunting activities... has made this rich natural resources are at risk of depletion.

73. In accordance to a survey of Animal Resources Institute, there are 375 bird species under 42 families in Gia Lai; 107 mammal species in 30 families; 94 reptile species under 16 families; 48 amphibian species in 6 families; 96 fish species and other species. In particular there are rare species such as the rhinoceros, gaur, tiger, leopard, bear, civet flying, flying squirrel, red wolves, pygmy loris, gibbon, spotted bat, birds such as white-collar cranes, peacock, reptiles such as geckos, worm lizard, spotted python. However, they are mainly concentrated in Kon Ka Kinh National Park, more than 55 km away from the start point of the subproject route in Phu My T-junction and there is no endangered or specific animal and plant species have been recognized in the subproject area in the recent years.

C. Socio-economical condition and infrastructure

1. Population and Ethnic

74. Up to December 2015, total population of Chu Prong district is 116,867 people with 61245 Kinh people; make up 52.4% of the total district population. Among ethnic minorities, Jrai people have the largest population with 38634, double of all other ethnic groups' population. The other ethnic groups are mainly people migrated from the Northern part of the countries including Muong, Nung, Dao, Tay, Thai...

75. The communes in the North of the district - including Ia Bang, Ia Tor, Ia Me and Ia Pia of the subproject – have a high population density of 104.2 – 415.8 people/km². The low

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population density communes are in the South and South West of the district, especially Ia Puch and Ia Mor - two border communes. Ia Mor has the lowest population density of the district, only 3.6-people/ km².²

Table 6 – Population and ethnic groups in the subproject area

No		Total of population	Peoples clarification (number of people)							
			Kinh	Jrai	Thai	Muong	Tay	Nung	Dao	Others
		Total	Total	Total	Total	Total	Total	Total	Total	Total
1	Chu Prong District	116,867	61,245	38,634	724	4,441	2,255	4,695	3,251	1,613
2	Ia Tor commune	4,419	2,284	2,089	14	12	4	14		2
3	Ia Me commune	5,819	2,310	3,469			12	28		
4	Ia Pia commune	5,770	2,827	2,852		25		59		7
5	Ia Ga commune	4,212	1,627	1,173	12		202	809	374	15
6	Ia Mor commune	1,959	395	1,485	16	55	5	3		
7	Ia Bang commune	6,192	4,100	2,092						

Data sources: Summary of data of households, poor population, marginal households under the people's components in 2015 of Chu prong District

2. Living Standards

76. The poverty rate of the whole district is still more than 10% in 2014. Of which, Ia Bang commune has the lowest poverty rate of nearly 2.4% while Ia Mor has the highest rate of 22%. Follow the new poverty standards 2015, the poverty rate in the district even higher with more than 40% for Ia Mor commune. See Table 7 below for detail of poverty in the subproject area.

Table 7 – Number of poor households and the reason in 2014

	Poor Household		Poverty reasons					
	Total of poor HHs	Number of Poor people	Lack of production fund	Lack of production land	Lack of production facilities	Lack of labour	Unemployment	Others
Chu Prong District	3,273	13,656	55.30	14.7	12.56	4.83	2.29	10.32
Ia Tor Commune	187	867	69.52	24.6	6.95	0.04	0.05	24.06

² Sources: Chu Prong Environment Report 2013

	Poor Household		Poverty reasons					
	Total of poor HHs	Number of Poor people	Lack of production fund	Lack of production land	Lack of production facilities	Lack of labour	Unemployment	Others
Ia Me Commune	141	514	60.99	3.55	9.93	0	0	25.53
Ia Ga Commune	144	645	90.28	0	2.08	0	0	7.64
Ia Pia Commune	165	616	95.15	1.21	00	0	0	3.64
Ia Mor Commune	97	432	31.96	0	0	0.21	0	67.83
Ia Bang Commune	37	147	37.84	29.7	0	0.05	0	32.41

Sources: Results of census of poor households, marginal poor households in 2014 of the People's Committee of Chu Prong district

3. Employment and income

77. From the investigation result of the PPTA Consultant, in total 27421 households of the district, there are 25109 households working in agriculture, forestry and fisheries sectors. The number for industrial and construction is 345 households while 1967 households working in the business and trade. Table 8 below shows the production value of the district in 2015

Table 8 – Production of Chu Prong district 2015

	Unit	Chu Prong District
I. Total of production value (million dong)	Mill. dong	7,766.85
1. Agriculture, forestry, fisheries	Mill. dong	4,858.2
- Agriculture	Mill. dong	4,843.6
+ Crop	Mill. dong	4,496.7
+ livestock	Mill. dong	334.1
- Fisheries	Mill. dong	9.62
- Forestry	Mill. dong	4.98
2. Industry- construction	Mill. dong	1,305.2
3. Business and services	Mill. dong	1,603.5
II. Production structure under sector (%)	%	
1. Agriculture, forestry, fisheries	%	63.8
2. Industry- construction	%	16.4
3. Business and services	%	19.8

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III. Total food production (ton)		40,441
- Average food production per person	Ton	0.357
IV. Average income	Million dong	28.2

4. Education and Public Health

78. The medical network of the district is including 01 District Medical Centre, 21 commune medical centres, 01 central medical in Ia Lau commune. The total medical staffs of the district are 211 people with 38 medical doctors. The status of medical system is summarized in Table 09 below.

Table 9 – Health care in the subproject area 2015

	Unit	Chu Prong District	Ia Tor Commune	Ia Me Commune	Ia Pia Commune	Ia Ga Commune	Ia Mor Commune	Ia Bang Commune
1. Hospital / healthcare centre	Piece	23	1	1	1	1	1	1
2. Staff		211	6	05		5		
- Doctor	Persons	38	0	1		1		
- Nurse, pharmacists	Persons	138	5	2	5	3		
- Orderlies	Persons	35	1	2	1	1		
In which: female staffs	Persons	161	3	5	3	1		
3. Number of examined patients	Persons	62,767	1,899	1,662	951	1,955		2,996
In which: female patients	persons		711	815		731		
4. Number of drug users in the commune	persons		0	10		1		
In which: female	persons					0		
5. Number of HIV infected people	persons	25	0	1	1	3		
In which:	persons	8		1		2		

female								
6. Number of malnourished children	persons	1,936	29	31		87	85	
In which: female	persons		11	17		42		

79. The Primary school and Secondary school system has been well developed and allocated all over the district area. Many branches of the Primary school have also opened to ensure all the children at the school age will go to school. Along the subproject road, there are 5 kindergartens/ branches; 10 primary schools/ branches; 4 secondary schools and 1 junior high school.

5. Water supply and electricity cover

80. Nearly all the households in the subproject areas using electricity from national electricity network. The lowest rate is 98% in Ia Tor and Ia Mor communes. The percentage of households using clean water is also high; all communes have a ratio higher than 90% except Ia Pia with 74.6% of the households have using clean water.³

6. HIV and human trafficking

81. There is no human trafficking case has been recorded in the subproject communes. For HIV infection, over 25 infectious cases in 2015, there are 3 cases in Ia Ga commune and Ia Pia, Ia Me have 1 case for each commune.⁴

7. Infrastructure

82. **Transportation:** The transportation system of the district has developed in the recent years. The road distributed in a large network but many of them have already downgraded. There are 3 National Roads running through the district including: (i) NR19 connects Pleiku city with Le Thanh – Duc Co Border Gate through 3 communes of Bau Can, Thang Hung and Binh Giao – total 20km of bitumen in good condition; (ii) NR14 from Ham Rong T-junction goes through Ia Bang commune with total 10km in the district area, crosses the subproject road at Phu My T-junction – start point of the subproject; (iii) NR14C goes through 2 border communes of Ia Puch and Ia Mor with total 38km, mainly earth road with some sections are upgraded to cement concrete.

83. There are two provincial roads in the district. The first one is the subproject road – PR665 and the second one is PR663 starts from the junction with NR19, goes through Bau Can, Ia Phin, Chu Prong town, Ia Boong, Ia Puch communes then connects to NR14C with total 48km.

84. There are also 11 district roads with total over 200km and other commune roads, inner town roads... with total over 200 km.

³ Data sources: *Department of Planning and Finance of Chu Prong district*

⁴ Data sources: *Report of the medical work in 2015 orientations and tasks of DPC 2016 Chu Prong*

85. ***Industrial activities:*** The construction industry of the district has a high development ratio. Industry-construction and business-trade have the ratio of one fifth over agriculture/ forestry/ fisheries in term of labour distribution but made up one third in term of production value for the year 2015. (See Table 8 above for more details).

86. ***Other public facilities:*** With the development of the infrastructure system, local people in the subproject area could easily access to the market. There is no market located in the subproject communes and the farthest distance from the market to one commune centre is quite far, almost 70km in cases of Ia Mor commune. The detail information of the infrastructure system could be found in the table below.

Table 10 – Infrastructure system in the subproject area

	Unit	Chu Prong District	Ia Tor Commune	Ia Me Commune	Ia Pia Commune	Ia Ga Commune	Ia Mor Commune	Ia Bang Commune
1. Roads	Km							
- Soil road	km	757	45	2	19.08	6,9		
- Concrete / asphalt roads	km	263	15	4	14.72	29.07		
2. Number of car	piece		68	7				
3. Number of motorbike	piece	21,106	1,120	1500				
4. Market in commune	market	02						
- Distance for the centre of commune	km	0.3						
5. Market outside commune	market	1	1	1	1	1	1	1
- Distance for the centre of commune	km	4	8	10	30	50	70	5
6. Percentage of HHs using national electricity	%	100	98	100	99.9	100	98	100
7. Percentage of HHs using clean water	%	92	95	89.9	74.6	98	92	98
8. Percentage of concrete HHs with floors	%	5	13	20	9.3			
9. Percentage of HHs with brick / wood, roof, 1 floor	%	90	58	70				
10. Percentage of HHs with cottages, tent	%	5	15	10				
11. Percentage of HHs using telephone and cell phone	%	100	99	96	82	100	100	100
12. Percentage of HHs having toilet	%	90	82	70	72.3			

Data sources:

1. Department of Planning and finance of Chu Prong district
2. Office of people's committee of Ia Me commune
3. Office of people's committee of Ia Ga commune

D. Archaeological, Historical and Cultural Treasures

87. There are several archaeological sites have been discovered in Gia Lai province. The new discovered archaeological site in An Khe town (about 80km from the subproject) has been highly evaluated by the Institute of Archaeology of Viet Nam. There are no archaeological, cultural sites in the subproject area.

E. Key Environmental Features

88. **Physical environmental features:** The subproject area is quite flat and has a trend of going downward gradually from the start point to the end point in the border area with Cambodia in North East – South West direction. Along the first 30km goes through Ia Bang, Ia Tor, Ia Piar, Ia Me is mainly residential area with coffee cultivation of local people. There is no forest located in this section of the subproject area. The later part in Ia Ga and Ia Mor communes (mainly Ia Mor commune) is the forest area but mainly production forest of rubber plantation companies (Chu Se Rubber Company, Military Economic Regiment 710). There are 3 subzones (989, 991, 993) of Ia Mor Protection Forest located along the road. The 3 subzones have already changed to production forest with rubber plantation and only 100 m corridor from both sides of the road is remain protection forest with few trees under Dipterocarpaceae family – the local tree type.

89. Over 5 stream crossing points, Ia Mor is the largest stream, cross the road at Km 50+133. Pleilai Irrigation Lake in Ia Lau and Ia Piar communes, located about 10km from the subproject road. Ministry of Agriculture and Rural Development has invested Ia Mor irrigation system to irrigate for 12000 ha of different crops in Gia Lai and Dak Lak provinces. This system will also provide drinking water for 50000 people living in the border communes of Chu Prong district. This project is now under construction and locate at KM48+200 of the subproject route

90. **Social environmental features:** The first 32 km of the subproject goes through dense population area. There are 5 kindergartens/ branches; 10 primary schools/ branches; 4 secondary schools and 1 junior high school located at along the subproject road. Each commune has one medical clinic and there are two small churches located roadside of the subproject. Ia Mor residential area is also partly located along the road in Ia Mor commune. There is also An Phu Farm – Chu Se Rubber Company and Ia Mor Military Border Station located along the road at this section.

VI. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

91. 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. Ia Mor Protection Forest located along the subproject road from KM32+6 to the end of the road could be adversely affected due to subproject implementation.

92. The constructions activities during the construction phase will be mainly upgrade the existing road. The main physical impacts are relating to vegetation clearance for the site preparation, the operation of construction machines and material transportation truck, construction material exploitation at quarry, borrow pit and temporary stockpile. The activities will create dust, noise and vibration that disturb local people and increase risk of respiratory and skin disease.

93. The subproject construction will also impact on local traffic making difficulties for people to access their properties, especially the ones who live along the subproject road. There are several CPCs, medical clinics, schools, and kindergartens located along the road. There is also Rubber Development Unit of Chu Se Rubber Company; Unit No.1 and No.2 of Military Economic Regiment 710 and Ia Mor Border Military Station locate along the road in Ia Mor commune. These impacts to social infrastructure will be in short duration of construction phase only and these have been subject to detailed assessment in the Resettlement Plan.

94. The potential environmental impacts as well as the mitigation measures in the pre-construction, construction and operational phases are assessed below. The criteria for assessment are in line with ADBs SPS as specified in ADB Safeguard Policy Statement 2009 and the GOV standards based on Environmental Protection Law 2014. Where GOV standards or guidelines have some kind of conflict with ADB SPS, 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 impacts and mitigation measures in the pre-construction phase

1. Improper subproject location and design

95. **Description:** If environmental and climate change considerations are not included in the subproject detail, the construction of the subproject road could pose severely negative impact to the sensitive receivers along the subproject road. The quality and longevity of the road could also be impacted from the unwilling weather conditions, which will lead to increase maintenance time consuming, and budget. Intensity of impact to Ia Mor Protection Forest will also change with different road surface material and construction technology. The construction of bitumen road will create a higher forest fire risk due to bitumen heating. Improper drainage design could impact on local people as the case in Not village, Ia Me commune. Runoff water has created a deep ditch, divided Not village into two parts, make many difficulties for the movement of village people.

96. **Mitigation Measures:** The detail design of the road and culverts/ bridges will consider the flood situation of the Ia Mor area, especially the bridges area over crossing streams and A2 scenario - the highest scenario for precipitation of Tay Nguyen area until 2100⁵ with the precipitation will increase 1.9% in compare with the precipitation of 1980-1999 period (1721.5mm). Culverts have been designed to withstand a 25-year return and bridges have been designed to withstand a 100-year return. Asphalt concrete has been selected as road surface material for the whole route. A culvert or a drift will be constructed to support the movement between residential clusters in Not village, Ia Me commune. In line with ADB policy on environmentally responsible procurement, a new environmental assessment report will be undertaken for submission to ADB if there are any changes to subproject design that would result to environmental impacts or risks that are not within the scope of the current IEE.

2. Land acquisition and resettlement

97. **Impacts:** The subproject will upgrade the road surface based on the existing foundation and construct/ reconstruct 5 bridges in total. 56 households is affected by the implementation of the subproject of which 2 households in Ia Mor is severely affected as they has lost more than 10% of the total natural land holding. If the compensation will not be paid correctly, it could impact on the incomes of the affected people, especially in Ia Mor communes, the poorest commune of the district.

98. **Mitigation measures:** Before the construction start, PMU will review the Land Acquisition and Resettlement report and check at the field to ensure that all affected households have received compensation adequately in accordance with the current provincial market price. ESP wills response for quarterly monitoring and record any complaints from these affected households and local people before submit to PMU for resolution. A grievance redress mechanism will be established and inform to relevant stakeholders before construction start.

3. Public facilities affected and relocation

99. **Impacts:** Some public facilities such as electricity cables, drainage system, and telecommunication system could be affected or relocated for the implementation of the road. This will impact on the daily living of local people who using these facilities.

⁵ Climate Change Adaptation Plan for Gia Lai in 2010-2020 period with view to 2030.

100. However, the subproject road will mainly upgrade road surface without changing direction or the road foundation. The Right of Ways (ROW) of the road has been defined 15 m from each side of the road so it will not make relocation of the electricity cable system along the road. The drainage system along the subproject road is also severely damaged so it will be upgraded and repaired. No other public facilities will be affected or relocated due to the implementation of the subproject.

4. Disturbance of unexploded mine and bomb (UXO)

101. **Impacts:** The subproject will be upgraded based on the existing foundation. There is no risk of UXO during the implementation of the subproject.

B. Potential impacts and mitigation measures in the construction phase

1. Loss of trees and impact to fauna

102. **Impacts:** 100 m corridor on both roadside from Suoi My Bridge to the junction with NR14C are 3 subzones – 989, 991 and 993 of Ia Mor Protection Forest under the management of Ia Mor Protection Forest Management Board. There are also 4 subzones of 995, 996, 999 and 1000 of Ia Mor Protection Forest locate along the subproject road from the junction with NR14C to the end point at the junction with border patrol road. These four subzones are under the management of Ia Mor CPC and Border Defence Soldier of Border Defence Post No. 729. The construction activities could have severely negative impact to the forest as trees could be cut down for construction activities and for using as fuel woods for bitumen or water heating. Forest fire could also be happened due to careless construction activities. Some kind of wild animals will be affected from the noise and vibration of construction activities or being hunted by the construction workers. However, as nearly all the area of subzones 989, 991, 993 – Ia Mor Protection Forest has now been changed to rubber plantation and the “real” protection forest are only 100 m corridors from each side of the road and the road will be constructed base on the existing alignment, the negative impacts could be minimized through suitable mitigation measures. The subproject will only cut down 249 rubber trees of Chu Prong Rubber Company and Border Station No. 729; 25 cashew trees of 02 households in Ia Mor commune, 14 fruit trees of 03 households in Ia Ga commune.

103. **Mitigation measures:** Ia Mor Protection Forest Management Board, Ia Mor Border Defence Post, Ia Mor and Ia Ga CPCs will be informed in advance for construction plan and scope, especially for tree cutting and vegetation clearance activities. ESP and PMU safeguards staff will supervise closely the tree cutting process to ensure no tree out of the cut-down list will be affected. Workers should be informed and prohibited from cutting trees for firewood and for use in the subproject activities before construction start. The contractors will also not use wood as fuel to heating bitumen or any other activities. They also will not by fuel wood from illegal sources. On the other hand, no construction camps, concrete mixing plants, large material storage sites are to be located in the forest area. The contractors will not use or permit the use of woods as fuel for construction activities or use for cooking and water heating in worker camp. Hunting is prohibited in all subproject area. PMU, ESP and CSC will strictly supervise and monitor the construction activities to ensure they will be done properly on the existing road foundation.

2. Impact on local facilities

104. **Impacts:** As the first 32.6 km of the subproject road goes through several residential areas, the water supplies, electrical power supply, and telecommunications, drainage systems of these areas could be maintained during the works. It will affect local people in their daily activities. It is minor impact as the road will be upgraded based on the existing foundation and no current public infrastructures will be relocated. The impact will be happened in 24-month of construction and stop upon the construction complete.

105. **Mitigation measures:** to minimize the negative impact, the contractors will inform in advance the construction schedule, the affected electricity and telecommunication cable system, irrigations system to CPCs of the 6 subproject communes in advance. Construction schedule will be published at the CPC so local people could easy access these information. If any facilities are accidentally damaged during construction period, it should be reported to ESP and PMU as well as the owner to the facilities before repaired at the contractor's expenses.

3. Impact by material exploitation activities at the quarry, borrow pits and temporary storage areas

106. **Impacts:** In the work of excavating and material exploitation for the subproject construction activities if excavated soil is not collected then siltation will be occurred, especially at 5 stream crossing areas in Ia Ga and Ia Mor commune. It will be able to cause stuck in water flow closed to the mines and quarry area, create filling situation that affects cultivation areas of residents. Earthwork activities will also change soil structure and raise the amount of unconsolidated sediments at the borrow pits. When it rains, runoff of rainwater will take away them into the surrounding water bodies causing sedimentation and erosion also. Runoff water could also take construction material such as sand, soil from material storage sites into the surrounding water bodies if material stored for a long duration at the construction site. This impact will happen in the area of the two proposed borrow pits in Doc Trang, 500 m from subproject road and roadside at Km45, Ia Mor commune. The estimated volume for embankment soil is 452,436 m³ and about 28,500 m³ could be utilized from excavated soil. It will affect local people living in the subproject, quarry, and borrow pit areas. The temporary storage areas could also have some negative impacts on the surrounding environment such as soil runoff when its rain of dust arising in the dry conditions.

107. **Mitigation measures:** To minimize the impact, in the detail design period, ESP will provide a MMP for implementation by contractors. The MMP will support to balance the excavation soil and the filling soil to utilize most of the excavation soil for filling purpose. MMP will also list the suitable quarry and mines for construction materials. These mines should own operation licenses from MONRE of Gia Lai to ensure material exploitation at the mines would not cause any uncontrolled negative environmental impacts. The temporary storage areas must be covered with canvas and fenced with signboard to avoid passing people. Replant tree and vegetation cover of any vegetation clearance area in the quarries and borrow pits.

4. Generation of excavated spoil

108. **Impacts:** The excavated soil subproject construction activities that could not be reuse as filling soil may have significant impacts and environmental degradation due to the improper disposal of these materials. According to the survey result of the PPTA Design Consultant, the estimated volume of excavated soil is 134,917.45 m³, of which 96,519.66 m³ is organic soil,

unsuitable for reuse as filling soil for road embankment. This amount of organic soil will be transferred to the temporary dumping site. People in the residential areas along the subproject road and near the temporary dumping sites could be affected by soil erosion from these temporary dumping areas. This is a minor impact as in the negative side, the subproject road will be upgraded base on the existing foundation so the levelling work is minimized and the volumes of spoil will be not much. On the other hand the flat terrain along the subproject route is also minimizing the filling soil volume. The vacant land areas along the road are still available for temporary dumping area of spoil. In the positive side: local people could use the spoil for their garden or house foundation.

109. **Mitigation measures:** To minimize the negative impacts during 24-month of construction, the contractors should evaluate and grade the spoil and the suitable spoil will be used for filling purpose. This will reduce the need to extract soil for filling. Part of the borrow pit in Doc Trang could be used as temporary dumping site. The areas for disposal should be agreed with CPCs. Dak Lak DONRE will check and ESP/CSC/PMU recorded and monitored for the disposal sites. The disposal site will be located at least 50m from water bodies and be protected from erosion and grassing.

5. Generation of construction waste and domestic waste from workers

110. **Impacts:** Solid waste that will be generated from construction mainly includes domestic waste of workers and scraps of transported soil and stone, debris, mud. Domestic waste is mainly generated from construction workers at campsites. Uncontrolled waste disposal operations can cause significant impacts. It will impact firstly the workers in the campsite and areas surround the construction sites and local residential areas of Ia Bang, Ia Tor, Ia Pia, Ia Me and Ia Mor along the subproject road. Waste could also pollute water bodies of the streams as the 5 crossing points with the subproject road. This will happen in 24 construction months and along 65.87km of the road.

111. **Mitigation measures:** To minimize the impact during 24-month of construction time, ESP will assist PMU to monitor the contractor progress of WMSDP implementation, to ensure the contractors will provide enough trash bins at the worker camps. Contractors need to work with 3 CPCs of 5 subproject CPCs to find out suitable place for construction and domestic waste disposal. CSC and PMU will supervise to ensure waste and unused construction material will be treated properly and transfer to designated location. A regular check must be done by ESP at the sensitive area such as the 5 stream crossing points, schools and medical centres to ensure no waste will be accumulated near the sensitive receivers.

6. Impact from hazardous materials and hazardous waste disposal

112. **Impacts:** Use of hazardous substances such as oils and lubricants, bitumen can cause significant impacts if uncontrolled or if waste is not disposed correctly. However, the affected level is insignificant because the main construction activity in 65.87 km is paving the road surface and the construction machines are not large. The impact areas could be surrounding water bodies, especially Ia Mor stream. Local people in 6 communes along the subproject road could also be affected.

113. **Mitigation measures:** Gia Lai PMU assisted by the ESP and CSC will be responsible to monitor the contractor's progress of implementing the WMSDP to avoid or minimize impacts from use of hazardous substances such as oils and lubricants. The contractors must ensure that

safe storage of fuel; oils... are agreed by PMU/ESP. They must storage in the areas provide with roof, impervious floor and at least 100 m from watercourse.

7. Impact from noise, dust and vibration generated during from the construction activities

114. **Description:** Earthworks and the operation of concrete mixing plant will be the main sources of dust. Concrete mixing plant will be located at Doc Trang quarry (500 m from the junction to Ia Lau commune) in Ia Ga commune. Construction machines will generate gaseous emissions (NO_x, SO_x, CO, CO₂, etc.) when they are in operation. Transportation vehicles could also create dust along the transportation route. These gaseous and dust could cause health problems to the residents who living near the construction site and along the transportation route, especially at the environmental sensitive area such as schools/ kindergartens, medical centres, subproject communes. This is an average impact due to the first 30km of the subproject route goes through dense population area with many schools/ kindergartens, medical centres, in Ia Bang, Ia Pia, Ia Tor and Ia Me communes. The latter part is also passes through Ia Mor commune centre with the possible of cumulative impact in case Ia Mor Irrigation Project and the Subproject is implemented at the same time.

115. **Mitigation measures:** The contractor will not locate any noisy machines near the environmental sensitive areas such as the schools/ kindergartens, medical centre, CPCs. The contractors also will not locate large material storage sites in the residential areas. The large storage sites should be located at least 100m away from these sensitive points. The contractors will work with CPCs of the 6 communes, with the representative of ESP and PMU, to identify areas for large material storage site as well as material transportation plan. PMU and CSC will responsible to monitor these mitigation measures.

8. Landslide, soil erosion and runoff

116. **Impacts:** Roadside erosion and runoff could happen when its rain, especially at the roadside unlevelled section, near the rivers/ streams and the borrow areas. Erosion and runoff could impact on the cultivation areas of local people, impact of the quality of water bodies. Landslide could happen in the section with high slope side, will damage the road and block movement. In general, the impact could be considered as insignificant due to subproject flat area and there is no large water bodies located at the road side but attention must be paid to the crossing point with Ia Mor stream as it is the largest stream of the district and play an important role for the irrigation and even domestic water of Chu Prong district.

117. **Mitigation measures:** The contractors should limit to store material near the area of stream crossing point, especially Ia Mor stream. The construction activities of culverts/ bridges construction will be implemented in dry season. The contractors will also update weather forecast daily during construction time to avoid heavy rain day. PMU and CSC will responsible to monitor these mitigation measures.

9. Impact on crossing streams or bridge construction locations

118. **Impacts:** Careless construction and poor materials control can cause blockage to streams. Runoff water during its rain could bring waste and soil into the nearby water bodies. That could lead to siltation and reduce the water quality. The 5 crossing streams, especially Ia

Mor stream could be affected by the construction activities and it will lead to reduce water quality of water bodies of the streams.

119. **Mitigation measures:** the contractors should disposed soils, spoils and construction waste out of the bridges/ culverts construction immediately. They should also discuss with relevant authorities for MMP and WMSDP implementation. Silt fences and sediment barriers or other devices will be used as appropriate based on the design to prevent migration of silt during excavation and drilling operation within streams. The steep slopes should be covered with vegetation to avoid landslide and siltation in the nearby rivers/ streams. PMU and CSC should work and collaborate closely with relevant authorities such as CPCs and Chu Prong DPC to monitor the implementation of these mitigation measures.

10. Impact on water resources and quality

120. **Impacts:** The drainage system, irrigation and water resources on surrounding lands will be affected by construction activities as follows: a) local water supplies will need to be tapped to meet campsite and construction requirements, so bringing subproject based water use into competition with local use; b) surface and subsurface water resources near the subproject route could be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at construction campsites; (c) natural streams may become silted by borrow material (earth) in the runoff from the construction area, workshops and equipment washing-yards. Construction activities could impact on the quality of the nearby water bodies. Waste and construction material could fall into the water bodies if the waste is not control carefully or material stockpiles area not be covered and well monitored. The impact will mainly on water bodies along the subproject road such as crossing streams and worker camps area, especially at the Ia Mor stream crossing point. As Ia Mor stream provide irrigation water for Ia Mor cultivation area and Ea Soup of Dak Lak, the subproject construction in 24 months could impact on the irrigation water resources for downstream users of Ia Mor and Ea Soup.

121. **Mitigation measures:** In order to minimize this negative impact, the contractors will work with Agricultural and Irrigation Staff of Chu Prong and Ea Soup districts to set up a suitable construction schedule, avoid impact on the irrigation activities for Ia Mor and Ea Soup cultivation areas. The contractors will store lubricants, oils in designated area with roof covered and impervious foundation at least 50m from streams/ lakes. Sediment ditches, silt fences should be installed in suitable location to avoid runoff, erosion and siltation in lakes/ streams. Material storage sites should also be covered carefully with canvas and located at least 50m away from water bodies. PMU and CSC will responsible to monitor these mitigation measures.

11. Impact by the large influx of construction worker

122. **Impacts:** Large influx of construction worker will create a burden on local public services like electric and water supply. Construction workers from other area could bring outside disease to the subproject area. The concentration of workers in the work camps could also create a good environment for diseases such as sore eyes, cholera, flu and respiratory problems. Social aspect: concentration of a number of workers could lead to social problems such as gambling, drug addiction, prostitute, violence, conflict amongst workers, or between workers with local people. The impact will affect directly on workers and indirectly on the community near the construction sites in the residential area of 6 communes along the subproject road. This is an average impact due to high density of population in the subproject area.

123. **Mitigation measures:** Worker camp location and facilities located at least 500m from residential areas as agreed by local communities and approved by ESP and PMU and managed to minimize impacts. All workers should register with local police for temporary residential certificate. The worker camp should be located in the area with sufficient drainage to avoid water logging and formation of breeding sites for mosquitoes and flies. Worker should have health check before start work in the subproject and should be trained for living and working behaviour before joining the sites. On the other hand, Contractors will use local labours for simple works such as smooth the road, moving soil, give priority to poor families, female householders, woman if they need jobs. It aims to raise their income, create more jobs, contribute to poverty reduction for local community and also reduce the number of construction workers from outside. Local people in the residential area of 8 subproject communes will have benefits from the subproject construction. However, this is a small positive impact and it requires the coordination between the contractor and CPCs of subproject communes and nearby communes in recruiting local labours (contractors often prefer to engage their own trained workforces rather than training unskilled labourers). The duration of the impact is also short, only in 24 months construction time.

12. Risk to health and safety to local people or construction workers

124. **Impacts:** Dust, exhaust gas and noise generating from earthworks, transporting of material, construction activities and operation of machines, etc. These factors cause direct affects on health of workers and local residents. Material transport and construction activities on the existing road may create the risk of affects on traffic safety and houses structure on roadsides especially in the environmental sensitive areas. The excavation of the trenches for side drain construction can threaten public safety, particularly of pedestrians and children. Waste and wastewater from construction activities and worker camps could also create a favourable environment for the outbreak of some respiratory diseases of local people as well as workers. Accidents may occur if during the construction if workers are not provided with safety equipment and obey construction regulations. The objects of this impact are local people in the subproject area especially pupil in the subproject area and the workers working at the site. This is an average impact, as the construction sites will stretch along 65.87 km of the subproject, in the residential areas of 6 communes of Chu Prong district.

125. **Mitigation measures:** The contractors with the support from ESP will conduct training for workers on safety and environmental hygiene. The workers will be instructed construction camp rules and site arrangement and all of them will be equipped with appropriate PPE such as safety boots, helmets, protective clothes, gloves and ear protection for the one working with noisy equipment. All areas of excavation greater than 1m deep and insides of temporary works should be fenced with sign boards installed. The contractors in collaboration with ESP and PMU will also work with 6 CPCs of commune along the road for the construction plan and scope. The CSC and PMU will responsible for supervision activities during construction phase and response timely for any raised opinions/ comments from local people and authorities.

13. Impact on the local traffic

126. **Impacts:** Construction activities on the Subproject road are likely to cause hindrance in traffic flow if not mitigated properly especially at the start point (Phu My T-junction), junction with PR663, junction with the road to Ia Lau commune and junction with NR14C along the subproject road. Local people and people from other area who travel on the subproject road will be affected

during 24 months construction period. However, this is a minor impact due to local people could have other options for travel and the subproject only paved the road surface in short construction time.

127. **Mitigation measures:** To minimize the disturbance to local people, the contractor will work with CPCs on construction plan and the construction schedule and scope will be published in all subproject communes and districts. The contractors need to coordinate 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. The contractor will also construct temporary road and minimizing interference with traffic flows past the works site.

14. Cumulative impact from the Subproject and Ia Mor Irrigation Project

128. **Impacts:** Ia Mor Irrigation Project is under construction at Km48+200 of the Subproject road. This project is a huge irrigation project, invested by Ministry of Agricultural and Rural Development to ensure irrigation water for 12,000 ha cultivation area of Ia Mor commune and Ea Soup district, Dak Lak province. The construction activities of the two projects at the same time will create a heavy burden to the local infrastructures and services like water supply, electricity, road network, and waste treatment system... The impact will mainly take place in Ia Mor commune and impact directly to commune's infrastructure and service and local people. However, the impact is not large as the main dam construction is nearly complete at the moment and the reservoir will store water in the middle of 2017.

129. **Mitigation measures:** PMU and EPS will work with Ia Mor CPC and the contractor of Ia Mor Irrigation Project to find out a suitable construction schedule, machine and worker mobilization plan avoid concentrate construction works at the same time. The contractor will inform Ia Mor CPC the construction schedule and scope in advance. The selection of material mines, borrow pit and dumping site for the subproject will also consider the demands from Ia Mor Irrigation Project.

15. Environmental impacts due to inappropriate environmental recovery responsibility

130. **Impacts:** If after construction work has been completed, the sites are not cleaned up, construction and domestic waste will pollute surrounding environment. If site restoration such as replanting trees; grass; filling up construction pit; removing camp site have not been implemented in accordance with environmental regulation then the environmental issues like erosion, sedimentation and accident may occur. Construction waste and waste soil could also impact on the soil quality of the temporary acquired land area.

131. **Mitigation measures:** Site cleaning up must be performed right after the work completion. Pit and excavation areas must be filled up by the contractors when the construction complete. PMU and CSC will strictly monitor the site to ensure all construction sites will be fully recovered upon the construction finish.

C. Potential impacts and mitigation measures in the operation phase

1. Increase access to the forest

132. **Impacts:** The better road condition could increase the chance to access Ia Mor Protection forest and make more convenience for wood logging or other illegal forest exploitation activities

133. **Mitigation measures:** Gia Lai Department of Transportation (DOT) the management organization of the subproject in the operation phase will coordinate with Ia Mor Protection Forest Management Board, Ia Mor CPC and Ia Mor Border Post No.729 to set up suitable control system. Establish checkpoints at the junction with NR14C and the border patrol road. On the other hand, better road condition will also support the management board of the forest in forest patrol and forest fire prevention.

2. Impact from dust and noise arising from increasing of traffic density

134. **Impacts:** Paved road surface condition will reduce the dust concentration but better road condition will also increase traffic density along the subproject road especially the road play an important role for goods transportation from National Road No.14 to NR14C and along the border area. Noise, dust and vibration could have negative impact on the local people living along the subproject road, especially the environmental sensitive areas such as schools/ kindergartens, medical centres in the first 30km of the road.

135. **Mitigation measures:** Gia Lai Department of Transportation (DOT) will responsible for subproject management in the operation phase. Road hump, speed limit sign could be installed at the sensitive areas like schools/ kindergarten, medical centres. The use of air horn should be banned along the subproject road, especial in the sensitive area.

3. Favourable conditions for transportation of goods and people movement

136. **Impacts:** The upgraded road will favor the goods transportation from agricultural production of Chu Prong district to Le Thanh Border Gate via NR14C. Support movement of local people on the road in rainy condition, especially local people in Ia Mor and Ia Ga commune. As it supports better transportation of goods, especially agricultural product, the time for transportation will reduce and the profit will increase. The completion of the road will favor people in the 6 communes of Chu Prong districts and surrounding residential areas as well as people who doing business along the subproject road.

4. Driving conditions and community safety

137. **Impacts:** 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. On the other hand, the condition of the road facilities will be enhanced and driving conditions should improve. The beneficiaries of the subproject are local people in the two districts and people who travel on the subproject road.

5. Affects on employment or livelihood

138. **Impacts:** Increase incomes and living standards for people in the subproject area by means of increasing the profit as save time for transportation and merchant will access production area easier, thus the agricultural production price will be higher. Local people in the subproject area and people who cultivate in the subproject area as well as local people in the 6 subproject communes of Chu Prong district will be benefited from the completion of the road. This is a permanent impact and has significant effects to local people's lives.

6. Impacts on ethnic groups

139. **Impacts:** The completion of the subproject road will support to increase incomes and living standards for ethnic minorities in the subproject area by means of increasing the profit. The completion of the road will support them to save time for travel and increase production prices as merchant could access the production area easier.

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

140. 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 preparation

141. 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 provincial road No.665 included representatives from Gia Lai DPI, DONRE, DARD, DOT, Chu Prong Division of Natural Resources and Environment, Chu Prong Division of Agricultural and Rural Development. Consultation has also been implemented with representatives from 6 CPCs in Chu Prong district, Ia Mor Protection Forest Management Board, Ia Mor Military Border Station. Several local people living along the subproject road have been consulted using questionnaire and concentrated on the inconvenient condition for local people during the construction phase of the subproject. There are 24 local people have been interviewed with 8 of them are women. Consultations took place in March 2016.

B. Information dissemination during public consultation

142. 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 sub-project 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.

143. The information disseminated during public consultation is including: (i) background of the Project and subproject; (ii) basic information related to ADB and the Government requirement for environmental protection; (iii) potential impacts during subproject implementation and mitigation measures.

C. Obtained results and use of results from public consultation

144. The results of the public consultations are recorded in Table 11 and 12 below. In general, all the relevant stakeholders are support the implementation of the subproject. As the subproject

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road foundation has been constructed long time ago, the subproject will mainly upgrade the road surface based on the existing foundation with 15 m ROWs, no house must be relocated and no major land acquisition will be taken, the local people is totally support the subproject implementation.

Table 11 – Main issues and information from local authorities

Main issues	Information from relevant authorities
Impact by runoff water	Lang Not village, Ia Me commune: accumulate water in the heavy rain has created flows, divided the village into two parts. Good drainage system should be consider to avoid it
Impact on Ia Mor protection forest	Ia Mor Protection Forest Management Board: Cooperate with the Management Board in Forest Protection. Inform construction schedule and scale in advance

Table 12 – Main environmental concerns from public consultation

Concerns expressed	How concerns are addressed in IEE
No compensation or inadequate compensation	Before the construction start, PMU will review the Land Acquisition and Resettlement report and check at the field to ensure that all affected households have received compensation adequately
Moderate material transportation speed, cover with canvas to avoid dust and fallen materials	Regulation for material transportation will be put as an appendix in the contract with contractor. CPCs in cooperation with PMU and CSC will monitor the compliance during construction phase.

145. The environmental assessment process under the SPS 2009 requires the disclosure of the IEE to the public during the completion of the IEE to be in strict adherence to the rules. This process will be concluded by displaying the IEE at the PPC Headquarters during the period when the IEE is disclosed on the ADB website. Gia Lai PMU will responsible for IEE translation into suitable language and disclose at all six communes of Chu Prong district.

VIII. GRIEVANCE REDRESS MECHANISM

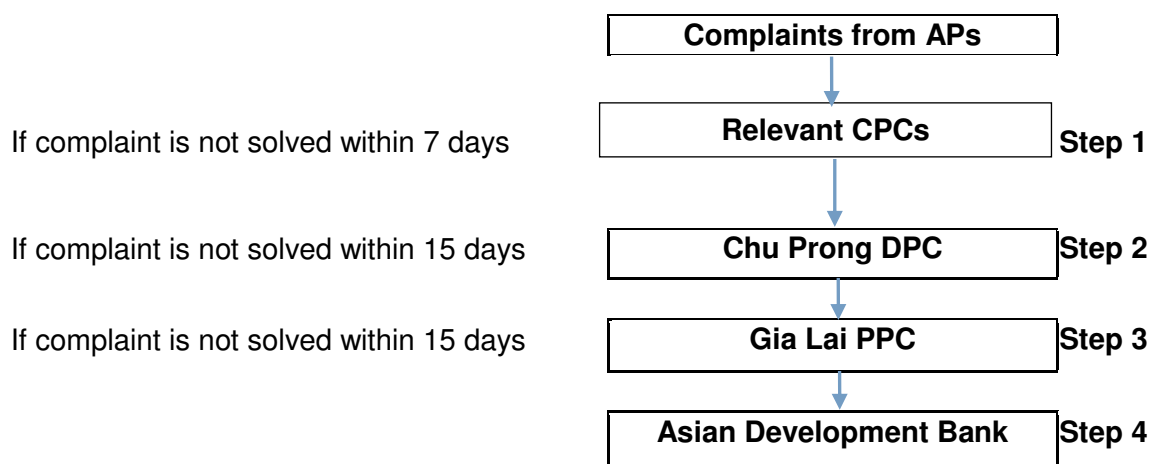
A. Purpose of the mechanism

146. During the deployment of the subproject, local people are disseminated environmental protection activities such as EMP. Negative impacts on the environment may occur during the construction and operational phases. Any comments/ suggestions of local people will be solved quickly, transparently and protected by law, particularly for affected people by the subproject. Complaint handling mechanism was classified by level and responsibilities of involved parties.

B. Grievance redress mechanism

147. Per the environmental management frame, there are 03 steps to redress complaint as below:

- **Stage 1:** If a household has any complaint he/she can submit a complaint in written or verbal to the representative of CPC-community monitoring board (usually the Deputy Chairman of the commune). CPC will work with ESP and CSC to solve complaints and representative of the CPCs will response in written form to the complainant.
- **Stage 2:** If the complaint is not resolved within 7 days, the complainant will submit an application to the Chu Prong DPC to resolve the complaint.
- **Stage 3:** If more than 15 days but no official response from the DPCs, the complainant may submit a complaint in the written form to the Gia Lai PPC (through Gia Lai DONRE). Gia Lai PPC will require Chu Prong DPC to solve the complaint. In case the complaint is still not resolved, Gia Lai PPC will require environmental police to investigate and requested stakeholders to resolve the complaint.
- If efforts to resolve disputes using the grievance procedures remain unresolved or unsatisfactory, APs have the right to directly discuss their concerns or problems with the ADB Southeast Asia Department through the ADB Viet Nam Resident Mission (VRM). If APs are still not satisfied with the responses of VRM, they can directly contact the ADB Office of the Special Project Facilitator (OSPF).



IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Implementation arrangements

148. Gia Lai PMU will recruit one Environment Safeguard Specialist (ESP) under Loan Implementation Consultants (LIC) to support subproject implementation in Gia Lai. ESP will support PMU updated EMP and as well as monitor the compliance of the contractors during construction phase. ESP will also responsible for training and capacity building on the implementation of EMP.

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

Table 13 – Responsibilities for EMP implementation

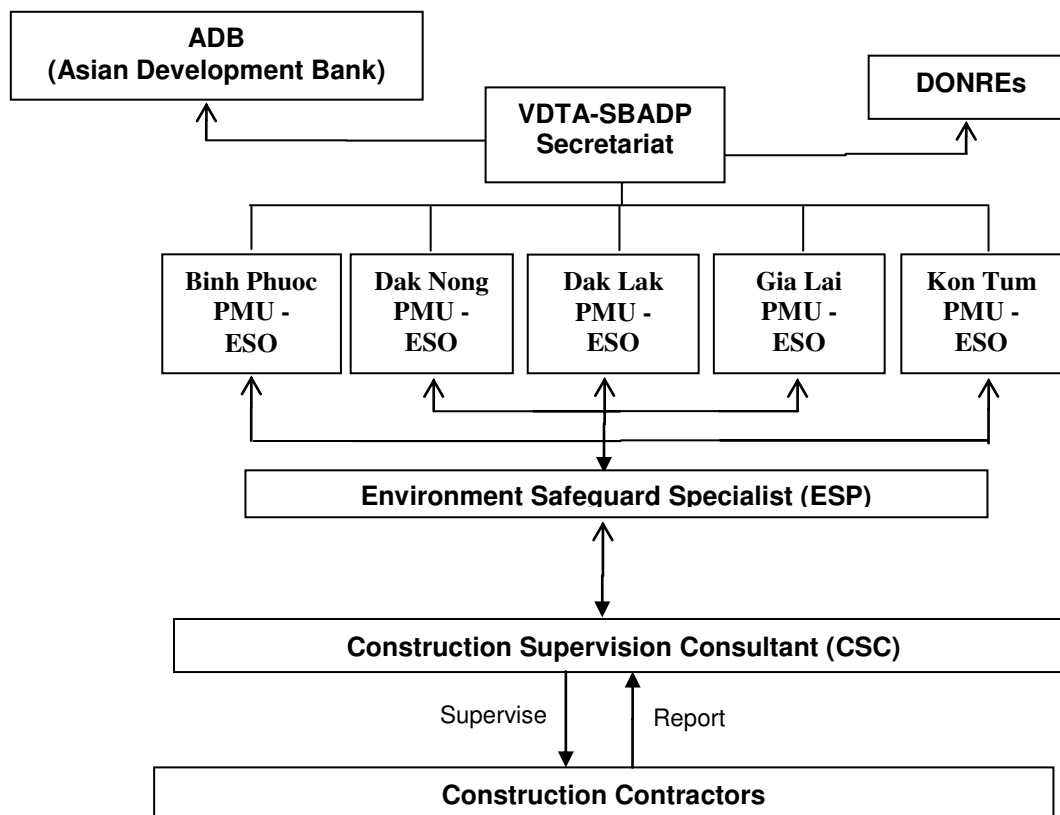
Agency	Responsibilities
Gia Lai Project Management Unit under DPI (PMU)	<ul style="list-style-type: none"> - Ensure that EMP provisions are strictly implemented during various subproject phases (design/pre-construction, construction and operation) to mitigate environmental impacts to acceptable levels. - Undertake monitoring of the implementation of the EMP (mitigation and monitoring measures) with assistance from ESP and CSC. - 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 a 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)	<ul style="list-style-type: none"> - PMU staff support for EMP implementation - Work closely with ESP of LIC to daily supervise of EMP implementation and preparation of EMP monitoring report
Environment Safeguard Specialist (ESP)	<ul style="list-style-type: none"> - Update EMP to make it suitable with the current condition or whenever subproject scope change or any unanticipated impact rise. - Ensure that the environmental protection and mitigation measures identified in the EMP for the design stage has been incorporated in the detail design; - Assist PMU to ensure that all environmental requirements and mitigation measures from the IEE and EMP are incorporated in the bidding documents and contracts.

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	<ul style="list-style-type: none"> - During detailed design phase carry out baseline data collection on air quality, noise and surface water quality (as specified in the EMP) - During detailed design phase, prepare method statement (Waste Management and Spoils Disposal Plan) described in the IEE/EMP. - Implement all mitigation and monitoring measures for various subproject phases specified as ESP's tasks in the EMP - Work with 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 change in alignment that will result to adverse environmental impacts that are not within the scope of the IEE prepared during loan processing, etc.) - 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 ESP 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)	<ul style="list-style-type: none"> - Provide the ESP 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	<ul style="list-style-type: none"> - Recruit qualified environmental officer to ensure compliance with environmental statutory and contractual obligations and proper implementation of the Subproject EMP - Provide sufficient funding and human resources for proper and timely implementation of required mitigation measures in the EMP - Implement additional environmental mitigation measures, as necessary
Gia Lai Department of Transportation (DOT)	<ul style="list-style-type: none"> - Responsible for operation and maintenance of Subproject road - Implement EMP monitoring during operation
Gia Lai Department of Natural Resources and Environment (DONRE)	<ul style="list-style-type: none"> - 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 3 – EMP Implementation Organization Chart



B. EMERGENCY RESPONSE PLAN

150. The main type of emergency cases covered by the subproject are (i) spills: transportation accident of vehicles; spills during material handling operations or transport; overflow of contaminated water; spilling contents of infectious solid wastes... (ii) fire and explosion: machines, property or waste container; (iii) personal injury: traffic accident, work accident (heart attack, serious fall, severe injury...) or contact with chemical; (iv) natural disaster: flash flood, landslide, tropical storms...

151. Emergency Control Team (ECT): In construction phase, the Contractor will establish an ECT from the worker at site. The Team will have the responsibility of providing first response actions in an emergency case. The tasks of the Team including organizing the necessary resources, communications, and evacuation of people and implement corrective actions that may be necessary to return the emergency case back to normal. All member of the team should be trained to implement suitable actions for certain emergency case. Team member should also be physically capable; have certain leadership qualities and command authorities; have clear diction; good decision making skills; and be able to remaining calm under pressure.

152. With the four types of emergency case listed in paragraph 150 above, ECT will have to control and response as follow:

- In major emergency case, the role of the ECT is to ensure that the damage or danger caused by the emergency is controlled or minimized until external professional aid arrives. The Team leader will assign team member for appropriate case.
- Rescue and first aid: One member of the Team will have main response for this action called First Aid Officer. The task is render assistance in removing any injured person from the accident location and to provide effective management of injuries until the Ambulance arrives on-site.
- Communications: The task of Communication Officer is monitor communication and facilitates the effective information exchange between construction site and the suitable State Organizations (Polices, Ambulance, Fire workers...). The communication methods could be air horn or alarm gong (warning system), internal phone system (walkie-talkie...) and mobile phone.

153. The ECT Leader is response for exchange information with external sources (people in surrounding communes, media...)

- Traffic Control: The Traffic Control Officer will be responsible for ensuring the free flow of traffic at the site and adjacent area. He/she may be involved in remove block vehicle/object.
- Fire detection: Smoke detectors are fitted in the construction and worker camps. Smoke detectors are connected as part of an early warning system. People would raise a Site alarm whenever recognized fire. Members of ECT should be trained in the use of advanced fire fighting techniques and equipment including the use of fire hydrants, water cannons, fire extinguishers and hose reels.

- Site evacuation: The Team Leader will determine and control the evacuation of the site. When emergency grow over the manageable level, the Team leader will direct team member to evacuate people from the site. The Team Leader should have the on-site people checklist to mark names and ensure all people have been safely evacuated.

154. When an emergency case has been identified, the Site Leader/ Contractor Director shall immediately be informed. For certain case, the State services shall be contacted by calling 113 (Police), 114 (Fire worker) or 115 (Ambulance). An information checklist of the ECT and external emergency services is required to present throughout the construction site.

C. Environmental mitigation

155. The anticipated environmental impacts and mitigation measures discussed in the previous section is presented in Table 14. The table also shows responsibilities and timeframe/schedule for implementation of mitigation measures and monitoring.

156. Table 14 shows that most mitigation activities during pre-construction are to be implemented by the ESP while during construction, measures shall be primarily implemented by the contractors. During operation stage, Gia Lai 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 14 - 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. Environment and climate change in detail designs	Incorporation of environmental and climate change adaptation design measures into the detailed design	Check the detail design on the incorporation of environment and climate change adaptation, update base on the different scenarios of Gia Lai on climate change. Check the plan for drift construction in Not village, Ia Me commune	ESP	Before construction	N/A	Included in the contract with ESP
2. 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.	PMU; ESP	Before construction	N/A	Included in the contract with ESP and PMU operation budget
3. Impact on Public facilities	Minimize impact from the interruption of services such as electricity and water supply during relocation of the local facilities.	1. Review detail designs to identify potential affected public facilities 2. Working with the owner of the affected public facilities to minimize “service interruption” duration and suitable mitigation measures	CPCs, PMU, ESP	Before construction	Through out the subproject sites	Included in the contract with ESP and CPCs, PMU operation budget
4. Environmentally responsible procurement	EMP is properly implemented by selected contractors	1. Update EMP 2. EMP is included in tender documents to ensure that mitigation measures are budgeted and to prepare the contractors for environmental responsibilities. 3. Specify in bid document 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. 4. Contractors recruit qualified staff to oversee implementation of environmental and safety measures specified in EMP.	ESP; PMU	Before bidding and before construction commencement	N/A	Included in the contract with ESP and PMU operation budget
5. Material Management Plan	Manage material storage area to avoid runoff and	1. Designs to balance excavation and fill where possible. 2. Prepare the MMP. The plan shall detail	ESP	Before bidding	N/A	Included in the contract with ESP

	sedimentation	<p>the arrangements to be made to facilitate the timely production and supply of construction materials to avoid impacts due to unnecessary stockpiling outside the Subproject site. MMP shall consider the following:</p> <ul style="list-style-type: none"> (i) Required materials, potential sources and estimated quantities available, (ii) Impacts to identified sources and availability (iii) Excavated slope material for reuse and recycling methods to be employed, (iv) Required endorsements from DONRE and local groups for use of sources. (v) Methods of transportation to minimize interference with normal traffic. (vi) Constraints of regular delivery schedule to reduce stockpiling on site. vii) Measures to be employed to mitigate nuisances to local residents. (viii) Program for reuse of slope excavated material for reuse (ix) Program for delivery of quarry and borrow materials. (x) Discussion of the CSC, PMU/ ESP inspection/monitoring role. (xi) Agreement on publicity/public consultation requirements. 				
6. Plan spoil and waste disposal	Minimize waste and pollution	<ol style="list-style-type: none"> 1. Re-use of waste materials & spoil disposal locations included in bid and contract documents. 2. Prepare the WMSDP. The plan shall cover handling, storage, treatment, transport and disposal of solid and liquid wastes, hazardous materials, hazardous wastes and excavation spoils. 3. WMSDP will include consideration of all matters related to solid, liquid waste and spoil disposal including the following: <ul style="list-style-type: none"> i) Expected types of waste and quantities of waste arising. ii) Waste reduction, reuse and recycling methods to be employed iii) Agreed reuse and recycling options and 	ESP	Before bidding	N/A	Included in the contract with ESP

		locations for disposal / endorsement from DONRE and local groups. iv) Methods for treatment and disposal of all solid and liquid wastes. v) Methods of transportation to minimize interference with normal traffic. vi) Establishment of regular disposal schedule and constraints for hazardous waste. vii) Program for disposal of general waste / hazardous waste. viii) Discussion of the ESP, PMU/CSC inspection/ monitoring role. ix) Establishment of complaints management system for duration of the works x) Agreement on publicity/ public consultation requirements. 4. The WMSDP shall include a section on Hazardous Materials and Waste section. This will detail the mitigation measures, organizational arrangements, resources, facilities, etc. to avoid environmental as well as health and safety impacts due to use and disposal of hazardous materials/substances.				
7. Environmental Capacity Development	Develop environmental management capacity of PMU to ensure proper EMP implementation and promote environmental awareness among workers.	1. PMU to commit and retain dedicated staff for subproject duration to oversee EMP implementation. 2. ESP to train PMU to build their capacity on EMP implementation, monitoring and reporting using workshops and on-the-job training techniques and case studies. 3. Conduct workers' orientation on EMP provisions. The ESP shall periodically conduct such orientation as every new contractor is engaged.	PMU; ESP	Through out the pre-construction and construction phase	N/A	Included in the contract with ESP and PMU operation budget
Construction Phase						
1. Loss of trees and impact to fauna	Avoid and minimize impact to the plant and wild animal in the subproject area	1. Inform construction schedule and scope to Ia Mor Protection Forest Management Board, Ia Mor Border Defence Post, Ia Mor CPC in advance Minimized vegetation covers clearances. 2. Prohibit workers from using guns or any other kind of hunting tools at the subproject area.	6 CPCs; Contractors	Through out construction phase	Along the subproject road; worker camps area	Included in the contract with contractors and CPCs operation budget

		<p>3. Prohibit cutting of trees for firewood and for use in subproject.</p> <p>4. During replanting/ vegetation recover 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.</p> <p>5. 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.</p> <p>6. No construction camps, large material storage site, heavy construction machine, concrete mixing plant is to be in the forest area.</p> <p>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.</p>				
2. Local facilities	Prevent interruption of services such as electricity and water supply during relocation of the local facilities. Repair damaged access roads.	<p>1. Reconfirm power, water supply, and telecommunications likely to be interrupted by the works.</p> <p>2. Contact all relevant local authorities for facilities and local people to plan re-provisioning of power, water supply, and telecommunication systems.</p> <p>3. Facilities shall be relocated and reconnected well ahead of commencement of construction works and contractors shall coordinate with facility company for relocation and reconnection well before works commence.</p> <p>4. Affected communities shall be properly informed in advance.</p> <p>5. Reconnection of facilities shall be done at the shortest practicable time before</p>	Contractors	Before construction start and through out the construction phase	Along the subproject route; at the residential areas	Included in the contract with contractors

		<p>construction commences.</p> <p>6. Facilities damaged during construction shall be reported to the CSC, PMU and facility authority and repairs arranged immediately.</p> <p>7. Access roads, agricultural land and other properties damaged during transport of construction materials and other project-related activities shall be reinstated upon completion of construction works at each section</p>				
3. Materials exploitation and management of quarry, borrow pits and temporary storage area	Minimize impacts from materials extraction, transportation and storage.	<p>1. Implement MMP prepared by ESP during detailed design phase.</p> <p>2. Balance excavation and fill requirements to minimization negative impacts</p> <p>3. Prioritize use of existing quarry sites with suitable materials and update the list of quarries and borrow pits monthly in MMP and report to PMU and minimize impacts on other local resources.</p> <p>4. Procure materials only from Gia Lai DONRE authorized quarries and borrow sites.</p> <p>5. Replant tree and vegetation cover of any vegetation clearance area in quarries and borrow pits</p> <p>6. Stockpile topsoil for later use and fence and re-contour borrows pits after use. Topsoil, overburden, and low-quality materials shall be properly removed, stockpiled near the site, and preserved for rehabilitation.</p> <p>7. Do not use quarries in areas of natural woodland or near rivers, which provide food and shelters for birds and other animals.</p> <p>8. Borrow/quarry sites shall not be located in productive land and forested areas.</p> <p>9. During quarry/borrow site operation; provide adequate drainage to avoid accumulation of stagnant water.</p> <p>10. Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favourable for mosquito breeding.</p> <p>11. Upon completion of extraction activities,</p>	Contractors	Though out construction phase	Subproject site, quarries and borrow pit areas	Included in the contract with contractors

		quarry and borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks. 12. To avoid drowning when pits become water filled, measures such as fencing, providing flotation devices such as a buoy tied to a rope, etc. shall be implemented.				
4. Waste and spoil disposal	Control spoils and waste disposal, lubricant and hazardous wastes.	1. Implement corresponding provisions of WMSDP prepared by the ESP. (including hazardous wastes) 2. Areas for disposal to be agreed with CPCs and Gia Lai DONRE checked and recorded by the CSC, ESP/PMU and monitored 3. Spoil and waste will not be disposed of in streams or other surrounding water bodies. 4. Spoils and waste shall only be disposed to areas approved by local authorities. 5. Spoil disposals shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas. 6. Under no circumstances will spoils be dumped into watercourses (rivers, streams, drainage, irrigation canals, etc.) 7. The spoils disposal site shall be located at least 50 m from surface watercourses and shall be protected from erosion by avoiding formation of steep slopes and grassing.	Contractors	Through out construction phase	Through out construction site, material storage areas, machines and vehicles maintenance area	Included in the contract with contractors
5. 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 sensitive area. 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.	Contractors	Through out construction phase	Through out construction site especially at the sensitive areas such as schools/ kindergarten, medical centres, pagodas and church	Included in the contract with contractors

		<p>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 and other sensitive points such as schools, clinics... are located nearby. If works are within 15m of any sensitive points, the contractors shall install dust barrier between the works at the road edge and the sensitive points (e.g. 2.5 m high temporary walls, etc.)</p> <p>8. Mixing, bitumen heating and crushing plants operations will be equipped with dust suppression devices such as water sprays.</p> <p>9. Clean up road surfaces after work.</p> <p>10. To protect buildings and structures from vibration, non-vibrating roller shall be used in construction sites near buildings and structures.</p> <p>11. Structures, which are damaged due to vibration caused by the construction activities, shall be repaired immediately as directed by ESP/PMU.</p> <p>12. Machinery shall be turned off when not in use.</p> <p>13. Pile driving during to be schedule for daytime if construction site is near sensitive points or approved by DONRE, CPCs and ESP/PMU.</p> <p>14. Impose speed limits on construction machines and transportation vehicles to minimize dust emission along areas where sensitive points are located (houses, schools, medical centres etc.).</p>				
6. Erosion control/ run off	Protect established facilities	<p>1. Establish vegetation and erosion protection immediately after completion of works in each stretch / sector.</p> <p>2. Check weather forecasts and minimize work in wet weather.</p> <p>3. Stockpile topsoil for immediate replanting after cutting.</p> <p>4. Minimize damage and excavation of surrounding vegetation during slope formation.</p>	Contractors	Through out construction phase	Through out construction site	Included in the contract with contractors

		<p>5. Include and implement appropriate measures for slope protection, i.e. vegetation cover and stone pitching, as required in the detailed construction drawings.</p> <p>6. Prevent erosion and protect the excavated slope with temporary or permanent drainage as soon as practicable after cutting.</p> <p>7. If new erosion occurs accidentally, back fill immediately to restore original contours.</p> <p>8. Low embankments will be protected from erosion by seeding and planting indigenous grasses that can flourish under local conditions.</p> <p>9. Payments will be linked to the completion of the works as indicated by the installation of erosion control measures to protect the works to the satisfaction of ESP/PMU.</p>				
7. Stream protection and bridge/culvert construction	Protect stream and maintain flows especially 5 stream crossing positions	<p>In sections along and near streams and water bodies:</p> <p>1. Rocks and stones will be disposed not to block streams.</p> <p>2. 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.</p> <p>3. 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.</p>	Contractors	Through out construction phase	5 streams/ flows crossing point	Included in the contract with contractors
8. Impact on water resources and quality	To minimize impact from wastewater drainage and prevent potential impact on water quality due to subproject activities	<p>1. Provide adequate drainage facilities at construction sites and worker camps to avoid stagnant water.</p> <p>2. Implement agreed designs for bridges/ culverts sufficient to control flooding as designed.</p> <p>3. Store lubricants, fuels and wastes in dedicated enclosures at least 50 m from</p>	Contractors	Through out construction phase	5 stream/ flow crossing positions, material storage sites, temporary waste disposal area	Included in the contract with contractors

		<p>water bodies on high and impervious ground with top cover</p> <p>4. Solid waste from construction activities and workers camps will not be thrown in streams and other water bodies (drainage, lake, pond, etc.)</p> <p>5. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off.</p> <p>6. Stockpiled materials will be covered to reduce silted run-off.</p> <p>7. No stockpiling or borrow sites at least 100m of water body.</p> <p>8. Work in streams at bridge repair sites will be scheduled during dry season and work duration shall be as short as possible.</p> <p>9. Washing of machinery and vehicles in surface waters shall be prohibited.</p>				
9. Large influx of construction workers	Construction camps and worker camps not to cause any negative impact to surrounding environment (forest area, water bodies); Control of infectious diseases	<p>1. Construction and worker camp location and facilities located at least 500m from settlements and agreed with local communities and facilities approved by ESP and managed to minimize impacts.</p> <p>2. Hire and train as many local workers as possible.</p> <p>3. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas.</p> <p>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.</p> <p>5. Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers..</p> <p>6. Camp site will be cleaned up to the satisfaction of and local community after use.</p> <p>7. Solid and liquid waste will be managed in line with WMSDP.</p> <p>8. All waste materials shall be removed and disposed to disposal sites approved by local authorities</p> <p>9. Land used for campsites shall be restored</p>	Contractors	Through out construction phase	Through out construction sites and worker camps	Included in the contract with contractors

		<p>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.</p> <p>10. Standing water will not be allowed to accumulate in the temporary drainage facilities or along the roadside to prevent proliferation of mosquitoes.</p> <p>11. Temporary and permanent drainage facilities will be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.</p> <p>12. Malaria controls (e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid formation of stagnant water, etc.) and HIV-AIDS education will be implemented in line with social plans for the subproject.</p> <p>13. HIV/AIDS awareness and prevention program shall be implemented in line with social plans under the subproject.</p>				
10. Safety precautions for workers and public safety	Ensure worker safety; Prevent accident with local people	<p>1. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers.</p> <p>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).</p> <p>3. Fencing on all excavation, borrow pits and sides of temporary bridges.</p> <p>4. Workers shall be provided with appropriate PPE such as safety boots, helmets, safety glasses, earplugs, gloves, etc. at no cost to the employee.</p> <p>5. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles.</p> <p>6. Workers shall be provided with reliable supply of potable water.</p> <p>7. Construction camps shall be provided with adequate drainage to avoid</p>	Contractors	Through out construction phase	Through out construction sites, quarries and borrow areas, material transportation roads, especially near schools/ kindergartens, medical centres, church.	Included in the contract with contractors

		<p>accumulation of stagnant water.</p> <p>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.</p> <p>9. Ensure reversing signals are installed on all construction vehicles.</p> <p>10. Install barriers (e.g., temporary fence) at construction areas to deter pedestrian access to the roadway except at designated crossing points.</p> <p>11. The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation and such sites have a watchman to keep public out.</p> <p>12. Speed restrictions shall be imposed on subproject vehicles and equipment when traveling through residential areas, especially through the sensitive points such as schools, local clinics, pagodas...</p> <p>13. Upon completion of construction works, borrow areas will be backfilled (if suitable materials are available, e.g., excavation spoils) or fenced.</p>				
11. Traffic Management	Minimize disturbance of traffic	<p>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.</p> <p>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</p> <p>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</p>	Contractors	Through out construction phase	Through out construction sites; at Phu My T-junction and junction with PR663, junction to Ia Lau commune; junction with NR 14C.	Included in the contract with contractors

		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.				
12. Cumulative impact	Minimize the intensify impacts of two subproject construction at the same time	1. Inform construction schedule and scope to Ia Mor CPC in advance 2. Work with the contractor of Ia Mor Irrigation Project to find out suitable construction, material transportation time. 3. Consider the capacity of material mines, borrow pits and disposal sites for both project.	Contractors	Through out construction phase	Through out construction sites	Included in the contract with contractors
13. Environmental recovery	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. Increase forest access	To minimize illegal wood logging and forest production gathering in Ia Mor Protection Forest	1. Cooperate with Ia Mor Protection Forest Management Boards and Ia Mor CPCs to setup a suitable O&M plan 2. Participate in the Forest Protection Campaign if applicable 3. Install sign board, propaganda board on forest protection along the section goes through Ia Mor Protection Forest	Gia Lai Department of Transportation (DOT)	Through out operation phase	At the section goes through Ia Mor Protection Forest	Included in operation and maintenance cost
2. Generate dust, noise, vibration	To minimize dust, noise and vibration	1. Install sign board, speed limit/ loading limit to prevent dust, noise and vibration from over speed vehicles 2. Install road humps at the residential area to reduce the impact from noise, dust and vibration.	Gia Lai Department of Transportation (DOT)	Through out operation phase	At the start and end point and 3 main junctions along the subproject route. At the sensitive areas closed to schools/ kindergarten, medical centres, church	Included in operation and maintenance cost
3. Traffic and	Minimize road	1. Undertake road safety awareness	Gia Lai DOT	Through out	Along two	Included in

road safety	accident	campaigns for local residents and other road users of the subproject 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).		operation phase	sections subproject road	operation and maintenance cost
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D. Environmental monitoring

1. Compliance Monitoring

157. Table 15 below shows the program for monitoring the compliance on various provisions of the EMP during pre-construction, construction and operation phases. ESP 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 ESP 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 Gia Lai DOT.

158. 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 by PMU with assistance from ESP and this, along with implementation of EMP provisions, shall be audited by ADB as part of the loan conditions.

159. Prior to implementation of the subproject the IEE and EMP will be updated and amended, as necessary, by ESP 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.

160. At pre-construction phase, PMU with the support from ESP will prepare all environmental protection compliance certificates under Vietnam's regulations as guided through LEP 2014. CSC and ESP will also need to confirm that Contractors and their suppliers have complied with all statutory requirements for permits from DONRE and provincial authorities. CSC and ESP will check that Contractors have all the necessary valid licenses and permits for use of powered mechanical equipment if necessary and the use of local water supplies (and to construct or operate plant such as for cement batching or asphalt/bitumen (if required) in line with all environmental regulations and permit conditions from provincial authorities.

161. At construction phase, the ESP will undertake regular monitoring of the contractor's implementation of mitigation measures specified in the Subproject EMP if applicable. On the other hand, CSC will also monitor the construction activities on daily basis. They will ensure that the contractors comply with all environmental regulations as specify in subproject EMP if applicable.

162. Gia Lai Department of Transportation will be in charge of EMP implementation in the operation phase. The tasks are including monitoring of dust, noise and water quality... They also monitor the accidents along the subproject road as basis for implementation of mitigation measures to improve road safety.

2. Environmental Effects Monitoring

163. ESP undertakes baseline environmental monitoring for air quality, noise and surface water quality. Sampling will be conducted prior to start of site works at the specified locations. During construction, ESP shall undertake quarterly monitoring of surface water quality and semi-

annual monitoring of air quality and noise in the same locations sampled during pre-construction. Additional sampling occasions shall be carried out and additional parameters shall be analysed (as necessary) to validate complaints and/or investigate pollution events caused by the subproject.

Table 15 - 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. Environment and climate change	Detail designs with environment and climate change cooperated	N/A	Only one time before the construction commence	PMU	Included in the operation budget of PMU
2. Land acquisition and resettlement	Compensation documents	N/A	Only one time before the construction commence	Gia Lai DPI/ DONRE; PMU	Included in the operation budget of PMU
3. Public facilities	Checking documents	N/A	Only one time before the construction commence	PMU	Included in the operation budget of PMU
4. Environmentally responsible procurement	Include in bidding documents. Check compliance	N/A	Bidding preparation period. Before start site works	PMU	Included in the operation budget of PMU
5. Material Management Plan	Require in contract with ESP. Check at Detailed Design.	N/A	Only one time in detailed design phase	PMU	Included in the operation budget of PMU
6. Plan spoil and waste disposal	Require in contract with ESP. Check at Detailed Design.	N/A	Only one time in detailed design phase	PMU	Included in the operation budget of PMU
7. Environmental Capacity Development	Require in contract with ESP. Check at Detailed Design. Complete training and check before and during the construction works.	N/A	Before construction commencement and at the beginning period of the construction phase	PMU	Included in the operation budget of PMU
Construction Phase					
1. Loss of trees and impact to fauna	Check of implementation	Along the subproject road, especially area goes through Ia Mor Protection Forest; 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. Local facilities	Check of implementation	Along the subproject road	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
3. Materials exploitation and	Check of implementation	Subproject site, quarries and	Bi-weekly	ESP/ PMU	Included in the operation budget

management of quarry and borrow pits		borrow pit areas	Part of daily construction supervision	CSC	of PMU/ ESP/ CSC
4. Waste and spoil disposal	Check of implementation	Through out construction site, material storage areas, machines and vehicles maintenance area	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
5. 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
	Ambient air quality (temperature, moisture, wind direction and speed, PM10, NO ₂ , SO ₂ ...); Noise level (average noise level, maximum noise level, vehicles frequency...)	9 monitoring points: 2 point at start and end points the road. 4 point at junctions: with PR663; Road to Ia Me commune; Road to Ia Lau commune; with NR14C. 3 points in front of Ia Pia; Ia Ga and Ia Mor CPCs.	1 time before construction start and semi-annually during 2 years construction time (5 times in total)	ESP	2,700 USD ⁶
6. Land slide, erosion control/ run off	Check of implementation	Through out construction site	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
7. Stream protection and bridge/culvert construction	Check of implementation	5 streams/ rivers crossing point	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC

⁶ Since there is no cost norm for Gia Lai province, figures has been estimated base on cost norm of Chu Prong Environmental Monitoring 2013 for ambient air quality by Chu Prong Division of Natural Resources and Environment. (1 USD = 22255 VND)

8. Water resources and quality	Check of implementation	Through out construction sites; 5 stream crossing positions, 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
	Surface water quality	5 sampling points at 20m downstream of the crossing streams.	1 time before construction start and every quarter during 2 years construction time (9 times in total)	ESP	4,050 USD ⁷
9. 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
10. Safety precautions for workers and public safety	Check of implementation. Check compliance to Labour Code of Vietnam and other relevant Decision, Decree and Circular under Government requirements	Through out construction sites, Subproject roads, quarries and borrow areas, transportation road	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
11. Traffic Management	Check of implementation	Through out construction sites; at junction with PR663; Road to Ia Me commune; Road to Ia Lau	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC

⁷ Due to there is no cost norm for Gia Lai province, figures has been estimated base on cost norm of Chu Prong Environmental Monitoring 2013 for surface water quality by Chu Prong Division of Natural Resources and Environment. (1 USD = 22255 VND)

		commune; with NR14C			
12. Collaborate with Ia Mor Irrigation Project	Check of implementation, checking documents	Construction sites in Ia Mor commune; material transportation road, borrow pit, mines and dumping site	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
13. Environmental recovery	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. Increase access to forest	Check of implementation	At the section passing Ia Mor Protection Forest	Semi-annual in the first two years	Gia Lai PPC	Included in operation budget of Gia Lai PPC
2. Dust, noise, vibration	Check of implementation; Ambient air environment, noise level at the road and in the areas which are adjacent to road	At the start and end point of the road. At the sensitive areas (schools/ kindergarten, medical centres, churches.	Semi-annual in the first two years	Gia Lai PPC	Included in operation and maintenance cost
2. Road safety	Check of implementation	Along the subproject road	Semi-annual	Gia Lai PPC	Included in the operation budget of PPC

E. Reporting

164. PMU will submit the following reports to ADB:

- *Monitoring report for baseline environment:* this report shows the result of baseline environment as implemented by ESP 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 16 – 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	Monthly	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.	Gia Lai DOT	Gia Lai DONRE

Table 17 - Estimated cost for EMP Monitoring (2-year construction/ 4-year in total)

Item	Estimated cost (US\$)
1. Environment Safeguard Specialist (ESP)	76,910
1 National ESP - 14 man-months (intermittent in the first 2 years; 6 – 4 – 4) – 4000 US\$/ man-month	56,000
Per diem for ESP: 48 US\$ x 30 days x 14 months	20,160
Air fare + taxi (to and from airports) for 3 round trips: 250 US\$ x 3 trips	750
2. Environmental effects monitoring (implemented by ESP)	6,750
Ambient air quality: 9 monitoring locations x 5 times x 60 US\$/sample ⁸	2,700
Surface water quality: 5 monitoring locations x 9 times x 90 US\$/sample ⁹	4,050
3. Training/orientation, local transportation, supplies (by ESP)	21,500
a) Training/orientation: 1 formal training course for PMU, CSC, Contractors and Gia Lai DOT and other “on the job” training	1,500
b) Local transportation and supplies	20,000
4. Printing Environmental monitoring report by ESP (8 reports)	8,000
Subtotal (1+2+3+4)	113,160
5. Contingency	11,840
Total (1+2+3+4+5)	125,000

F. Capacity building

165. 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 capacity building will be implemented more to have sufficient EMP implementation. 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, PPU has been established under Gia Lai DPI with one staff has been assigned as ESO.

166. The most significant challenge is the lack of human and financial resources and necessary infrastructure. To address this constraint, Gia Lai DPI/PMU will designate a full time staff as environmental safeguards officer (ESO) to handle the environmental aspects of the subproject during implementation stage. Ideally, ESO of the Project Preparation Board (PPB) will be come ESO of the subproject PMU also. The ESO and other relevant staff of PMU will be trained

⁸ Due to there is no cost norm for Gia Lai province, figures has been estimated base on cost norm of Chu Prong Environmental Monitoring 2013 for ambient air quality by Chu Prong Division of Natural Resources and Environment. (1 USD = 22255 VND)

⁹ Due to there is no cost norm for Gia Lai province, figures has been estimated base on cost norm of Chu Prong Environmental Monitoring 2013 for surface water quality by Chu Prong Division of Natural Resources and Environment. (1 USD = 22255 VND)

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by the environment specialists of the ESP during subproject implementation as “on the job” training or by formal training courses.

Table 18 – Detail capacity building program

Objective	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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 Gia Lai 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 and Gia Lai DOT who responsible for environmental management
Staff resources	International and national environmental specialist with at least 15 years experience on environmental management of road projects and must possess relevant post-graduate degree in civil engineering, environmental management and other relevant courses. With working knowledge of safety issues and at least 3 years experience in conducting environmental management training.

X. CONCLUSIONS AND RECOMMENDATIONS

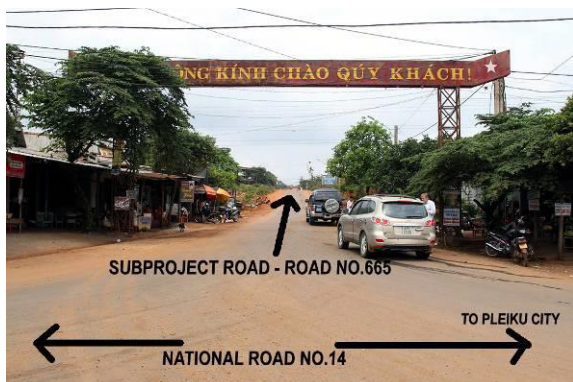
167. This IEE study was carried out in the Technical Assistant for Project Preparation (PTTA) phase. Primary and secondary data were used to assess potential environmental impacts in a comprehensive manner and public consultation and route reconnaissance were carried out in order complete the environmental 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.

168. The implementation of the subproject “Upgrade Provincial Road No.665 Ia Bang-Ia Mor, Chu Prong District, Gia Lai Province” will steadily improve the road quality; make it favourable for transportation in both dry and rainy season, support stable goods transportation from agricultural production area of Chu Prong to National Road 14C and Le Thanh Border Gate. 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. The cumulative impact to Ia Mor commune from Ia Mor Irrigation Project and the subproject implementation is negligible as the main construction works for Ia Mor Irrigation Project are nearly complete and this Project will start operate in the beginning of 2017. 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.

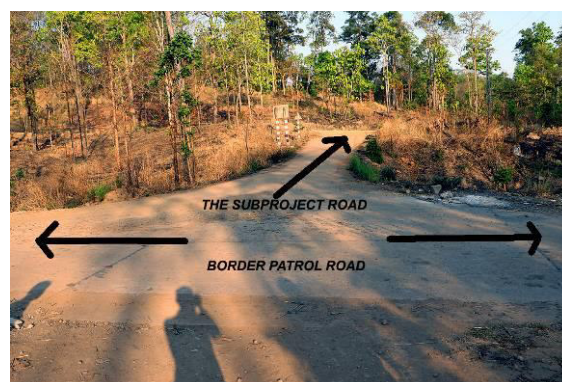
169. No further or additional impact assessment is considered necessary at this stage. At the implementation stage, PMU through ESP will develop detail EMP to monitor the schedules of mitigation measures and conduct of environmental effects monitoring activities. EMP must be updated to ensure effective environmental monitoring and should be developed 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

Appendix 1: Photos of the subproject road and the vicinity



Subproject road: Starting point



Subproject road: End point



At junction to Ia Lau and Ia Pior communes



Protection and production forest (the one between dash lines is rubber plantation after 100m corridor of protection forest)



Road section in Ia Mor – rainy season



Road section in Ia Mor – dry season



Ia Mor stream at the crossing point



Main dam of Ia Mor Irrigation Project



Borrow pit at Km45 – Ia Mor commune



Doc Trang borrow pit – on the way to Ia Lau and Ia Pior communes (500 m from junction)



Ditch created by runoff water from drainage system of subproject road in Not hamlet, Ia Me commune

Appendix 2: Environmental criteria for subproject selection

Province	Road	Environmental Criteria (100 points)				(Points remaining over 100 points) Environmental grading and remarks
		(Deduction/40) National Park, Nature Reserve, Historical Site, Forest	(Deduction/20) Flood prone, water bodies	(Deduction/20) Land slide, soil erosion	(Deduction/20) Alteration of surface water bodies	
Kon Tum	No. 675A	(-35) Some type of forest along the road	(-15) Sesan river, several large reservoirs	(-15) Some steep slopes on the road	(-15) 7 bridges/ total 237 m of length	Rank 1 – 10 points Category B. Pay attention to land slide, soil erosion and flood. Wood logging activities still happen.
	No. 673A	(-40) Ngoc Linh Nature Reserve	N/A	(-10) Winding road with high mountains	(-5) 4/24	Rank 3 – 30 points Category A. The first 9km go through Ngoc Linh Nature Reserve. Pay attention to land slide also.
Gia Lai	No. 665	N/A	(-5) Some streams and river	N/A	(-20) 3/231	Rank 4 – 40 points Category B. Pay attention to flooding
	ChuTy– Ia Nan	N/A	N/A	N/A	(-5) 1/33	Rank 5 – 50 points Category B
	No. 670	N/A	(-10) Some rivers and streams	(-10) Some steep slopes on the road	(-5) 3/30	Rank 4 – 40 points Category B. Pay attention to land slide, soil erosion.
Dak Lak	No. 29	(-20) York Don National Park	N/A	N/A	N/A	Rank 5 – 50 points Category B. The part connect to Dak Rue Border Gate go near the buffer zone of York Don National Park.
	Cu Ne – Ea Sup	N/A	(-10) Ea Sup Lakes and some small streams and lakes	N/A	(-5) 2/20	Rank 5 – 50 points Category B. Pay attention to flooding
Dak Nong	Dak Buk So – Bu Prang	(-20) Border protection forest. Bu Gia Map National Park (in Binh Phuoc	(-5) Dak Buk So; Dak Blung lakes. Some small irrigation system	(-15) Some slopes along the route, hilly parts of the road	N/A	Rank 3 – 30 points Category B. Pay attention to forest protection and land slide

		province)				
	No. 685	(-20) Cat Tien South Protection Forest	(-5) Some lakes and river	(-10) Mountainous area	N/A	Rank 4 – 40 points Category B. Cat tien South Protection Forest is 7 km away from the road. Pay attention to forest protection and land slide
	Pr.Rd No. 6	N/A	(-5) Dak Buk So lake and other small lakes	(-15) Some land slide point	N/A	Rank 4 – 40 points Category B. Pay attention to land slide
	Gia Nghia Rd	N/A	N/A	N/A	N/A	Rank 5 – 50 points Category B
Binh Phuoc	Pr.Rd No.756	N/A	(-5) Some small lakes and streams	N/A	N/A	Rank 5 – 50 points Category B
	No. 754; 754A	(-30) Ta Thiet Protection Forest; Historical Site	(-5) Some small rivers and lakes	N/A	N/A	Rank 4 – 40 points Category B. The road goes along Ta Thiet Protection Forest for around 3.5 km. Historical Site of Southern Army General Staff is far from the road. Pay attention to forest protection.
	756B	N/A	(-5) Some small streams and lakes	N/A	(-5) 1/10	Rank 5 – 50 points Category B
	756C	N/A	N/A	N/A	N/A	Rank 5 – 50 points Category B

Appendix 3: Sources of reference information

1. *Gia Lai Environmental Monitoring Report 2015*
2. *Chu Prong Environmental Statistic Report 2013*
3. *Statistics of poor households and marginal poor households of Chu Prong District People's Committee in 2015*
4. *Statistics of poor households of Labour Invalids and Social Affairs of Chu Prong District People's Committee in 2015*
5. *Statistics Division of Chu Prong District people's committee in 2015*
6. *Statistic Division of area by administrative unit of Chu Prong district in 2015*
7. *Healthcare Centre of Chu Prong Districts people's committee in 2015*

Appendix 4: Environmental Mitigation Measures to Include into Bidding Documents

1. Loss of trees and impact to fauna	<p>1. Inform construction schedule and scope to Ia Mor Protection Forest Management Board, Ia Mor Border Defence Post, Ia Mor CPC in advance</p> <p>Minimized vegetation covers clearances.</p> <p>2. Prohibit workers from using guns or any other kind of hunting tools at the subproject area.</p> <p>3. Prohibit cutting of trees for firewood and for use in subproject.</p> <p>4. During replanting/ vegetation recover 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.</p> <p>5. 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.</p> <p>6. No construction camps, large material storage site, heavy construction machine, concrete mixing plant is to be in the forest area.</p> <p>7. Take all precautions necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works. Immediately suppress the fire, if it occurs, and shall undertake replanting to replace damaged vegetation.</p>
2. Local facilities	<p>1. Reconfirm power, water supply, and telecommunications likely to be interrupted by the works.</p> <p>2. Contact all relevant local authorities for facilities and local people to plan re-provisioning of power, water supply, and telecommunication systems.</p> <p>3. Facilities shall be relocated and reconnected well ahead of commencement of construction works and contractors shall coordinate with facility company for relocation and reconnection well before works commence.</p> <p>4. Affected communities shall be properly informed in advance.</p> <p>5. Reconnection of facilities shall be done at the shortest practicable time before construction commences.</p> <p>6. Facilities damaged during construction shall be reported to the CSC, PMU and facility authority and repairs arranged immediately.</p> <p>7. Access roads, agricultural land and other properties damaged during transport of construction materials and other project-related activities shall be reinstated upon completion of construction works at each section</p>
3. Materials exploitation and management of quarry, borrow pits and temporary storage area	<p>1. Implement MMP prepared by ESP during detailed design phase.</p> <p>2. Balance excavation and fill requirements to minimization negative impacts</p> <p>3. Prioritize use of existing quarry sites with suitable materials and update the list of quarries and borrow pits monthly in MMP and report to PMU and minimize impacts on other local resources.</p> <p>4. Procure materials only from Gia Lai DONRE authorized quarries and borrow sites.</p> <p>5. Replant tree and vegetation cover of any vegetation clearance area in quarries and borrow pits</p> <p>6. Stockpile topsoil for later use and fence and re-contour borrows pits after use. Topsoil, overburden, and low-quality materials shall be properly removed, stockpiled near the site, and preserved for rehabilitation.</p> <p>7. Do not use quarries in areas of natural woodland or near rivers, which provide food and shelters for birds and other animals.</p> <p>8. Borrow/quarry sites shall not be located in productive land and forested areas.</p> <p>9. During quarry/borrow site operation; provide adequate drainage to avoid accumulation of stagnant water.</p> <p>10. Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favourable for mosquito breeding.</p> <p>11. Upon completion of extraction activities, quarry and borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks.</p> <p>12. To avoid drowning when pits become water filled, measures such as fencing, providing flotation devices such as a buoy tied to a rope, etc. shall be implemented.</p>
4. Waste and spoil	<p>1. Implement corresponding provisions of</p>

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disposal	<p>WMSDP prepared by the ESP. (including hazardous wastes)</p> <p>2. Areas for disposal to be agreed with CPCs and Gia Lai DONRE checked and recorded by the CSC, ESP/PMU and monitored</p> <p>3. Spoil and waste will not be disposed of in streams or other surrounding water bodies.</p> <p>4. Spoils and waste shall only be disposed to areas approved by local authorities.</p> <p>5. Spoil disposals shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas.</p> <p>6. Under no circumstances will spoils be dumped into watercourses (rivers, streams, drainage, irrigation canals, etc.)</p> <p>7. The spoils disposal site shall be located at least 50 m from surface watercourses and shall be protected from erosion by avoiding formation of steep slopes and grassing.</p>
5. Noise, dust and vibration	<p>1. Restrict works to daylight hours within 500 m of sensitive area.</p> <p>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.</p> <p>4. Monitor and investigate complaints; propose alternative mitigation measures.</p> <p>5. Keep material storage site moist</p> <p>6. Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid or minimize spills and dust emission.</p> <p>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 and other sensitive points such as schools, clinics... are located nearby. If works are within 15m of any sensitive points, the contractors shall install dust barrier between the works at the road edge and the sensitive points (e.g. 2.5 m high temporary walls, etc.)</p> <p>8. Mixing, bitumen heating and crushing plants operations will be equipped with dust suppression devices such as water sprays.</p> <p>9. Clean up road surfaces after work.</p> <p>10. To protect buildings and structures from vibration, non-vibrating roller shall be used in construction sites near buildings and structures.</p> <p>11. Structures, which are damaged due to vibration caused by the construction activities, shall be repaired immediately as directed by ESP/PMU.</p> <p>12. Machinery shall be turned off when not in use.</p> <p>13. Pile driving for Ia Mor Bridge to be schedule for daytime or approved by DONRE, CPCs and ESP/PMU.</p> <p>14. Impose speed limits on construction machines and transportation vehicles to minimize dust emission along areas where sensitive points are located (houses, schools, medical centres etc.).</p>
6. Erosion control/ run off	<p>1. Establish vegetation and erosion protection immediately after completion of works in each stretch / sector.</p> <p>2. Check weather forecasts and minimize work in wet weather.</p> <p>3. Stockpile topsoil for immediate replanting after cutting.</p> <p>4. Minimize damage and excavation of surrounding vegetation during slope formation.</p> <p>5. Include and implement appropriate measures for slope protection, i.e. vegetation cover and stone pitching, as required in the detailed construction drawings.</p> <p>6. Prevent erosion and protect the excavated slope with temporary or permanent drainage as soon as practicable after cutting.</p> <p>7. If new erosion occurs accidentally, back fill immediately to restore original contours.</p> <p>8. Low embankments will be protected from erosion by seeding and planting indigenous grasses that can flourish under local conditions.</p> <p>9. Payments will be linked to the completion of the works as indicated by the installation of erosion control measures to protect the works to the satisfaction of ESP/PMU.</p>
7. Stream protection and bridge/culvert construction	<p>In sections along and near streams and water bodies:</p> <p>1. Rocks and stones will be disposed not to block streams.</p> <p>2. 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.</p> <p>3. 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.</p>
8. Impact on water	<p>1. Provide adequate drainage facilities at construction sites and worker camps to avoid</p>

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resources and quality	<p>stagnant water.</p> <p>2. Implement agreed designs for bridges/ culverts sufficient to control flooding as designed.</p> <p>3. Store lubricants, fuels and wastes in dedicated enclosures at least 50 m from water bodies on high and impervious ground with top cover</p> <p>4. Solid waste from construction activities and workers camps will not be thrown in streams and other water bodies (drainage, lake, pond, etc.)</p> <p>5. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off.</p> <p>6. Stockpiled materials will be covered to reduce silted run-off.</p> <p>7. No stockpiling or borrow sites at least 100m of water body.</p> <p>8. Work in streams at bridge repair sites will be scheduled during dry season and work duration shall be as short as possible.</p> <p>9. Washing of machinery and vehicles in surface waters shall be prohibited.</p>
9. Large influx of construction workers	<p>1. Construction and worker camp location and facilities located at least 500m from settlements and/ or agreed with local communities and facilities approved by ESP and managed to minimize impacts.</p> <p>2. Hire and train as many local workers as possible.</p> <p>3. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas.</p> <p>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.</p> <p>5. Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers.</p> <p>6. Camp site will be cleaned up to the satisfaction of and local community after use.</p> <p>7. Solid and liquid waste will be managed in line with WMSDP.</p> <p>8. All waste materials shall be removed and disposed to disposal sites approved by local authorities</p> <p>9. 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.</p> <p>10. Standing water will not be allowed to accumulate in the temporary drainage facilities or along the roadside to prevent proliferation of mosquitoes.</p> <p>11. Temporary and permanent drainage facilities will be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.</p> <p>12. Malaria controls (e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid formation of stagnant water, etc.) and HIV-AIDS education will be implemented in line with social plans for the subproject.</p> <p>13. HIV/AIDS awareness and prevention program shall be implemented in line with social plans under the subproject.</p>
10. Safety precautions for workers and public safety	<p>1. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers.</p> <p>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).</p> <p>3. Fencing on all excavation, borrow pits and sides of temporary bridges.</p> <p>4. Workers shall be provided with appropriate PPE such as safety boots, helmets, safety glasses, earplugs, gloves, etc. at no cost to the employee.</p> <p>5. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles.</p> <p>6. Workers shall be provided with reliable supply of potable water.</p> <p>7. Construction camps shall be provided with adequate drainage to avoid accumulation of stagnant water.</p> <p>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.</p> <p>9. Ensure reversing signals are installed on all construction vehicles.</p> <p>10. Install barriers (e.g., temporary fence) at construction areas to deter pedestrian</p>

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	<p>access to the roadway except at designated crossing points.</p> <p>11. The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation and such sites have a watchman to keep public out.</p> <p>12. Speed restrictions shall be imposed on subproject vehicles and equipment when traveling through residential areas, especially through the sensitive points such as schools, local clinics, pagodas...</p> <p>13. Upon completion of construction works, borrow areas will be backfilled (if suitable materials are available, e.g., excavation spoils) or fenced.</p>
11. Traffic Management	<p>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.</p> <p>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</p> <p>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.</p> <p>4. Provide safe vehicle and pedestrian access around construction areas.</p> <p>5. Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous conditions.</p> <p>6. Provide sufficient lighting at night within and in the vicinity of construction sites.</p> <p>7. Designate traffic officers in construction sites.</p>
12. Cumulative impact	<p>1. Inform construction schedule and scope to Ia Mor CPC in advance</p> <p>2. Work with the contractor of Ia Mor Irrigation Project to find out suitable construction, material transportation time.</p> <p>3. Consider the capacity of material mines, borrow pits and disposal sites for both project.</p>
13. Environmental recovery	<p>Contractors to reconfirm and implement recovery (e.g., landscaping, tree replanting) identified at the detailed design stage</p>

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 ⁰ C)	mg/l	4	6	15	25
6	Ammonium (NH ₄ ⁺) (as N)	mg/l	0,1	0,2	0,5	1
7	Chlorua Chloride (Cl ⁻)	mg/l	250	400	600	-
8	Fluorua 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	Xianua Cyanide (CN ⁻)	mg/l	0,005	0,01	0,02	0,02
13	Asen (As)	mg/l	0,01	0,02	0,05	0,1
14	Cadimi (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	Phenon (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
	Endosulfan(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, Orthophosphat, bromide, nitrate and soluble sulphate 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/QĐ-BKHCMNT 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/QĐ-BTNMT dated December 31, 2008 of the Minister of Natural resources and Environment.

**NATIONAL TECHNICAL REGULATION
ON UNDERGROUND 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 underground water quality parameters

No.	Parameters	Unit	Limit values
1	pH	-	5,5 - 8,5
2	Hardness (as CaCO ₃)	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	Sulphate (SO ₄ ²⁻)	mg/l	400
11	Cyanide (CN ⁻)	mg/l	0,01
12	Phenol	mg/l	0,001
13	Arsenic (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/QĐ-BKHCMNT 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, PM_{2.5}, 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 PM₁₀ 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 (µg/m³)

No.	Paramater	Average 1 hour	Average 8 hours	Average 24 hours	Annual average
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Initial Environmental Examination of Upgrade Provincial Road No.665 Ia Bang – Ia Mor, Chu Prong District, Gia Lai Subproject

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					