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

Support to Border Areas Development Project (48189-002)

Initial Environmental Examination (IEE)

PR-686 & PR-681 Dak Nong Subproject

Prepared for
THE ASIAN DEVELOPMENT BANK

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CURRENCY EQUIVALENT
(As of 15th July 2016)

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

WEIGHTS AND MEASURES
km^2 – square kilometer
m^3 cubic meter

NOTE
In this report "$" refers to US Dollars

Consultants Quality Assurance Protocol

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Place	**Buon Ma Thuot, Vietnam**	*Date*	**15-07-2016**
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ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
CLV-DTA	Cambodia – Lao PDR – Vietnam Development Triangle Area
CPC	Commune People's Committee
CSC	Construction Supervision Consultant
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
ESP	Environment Safeguard Specialist
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
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
MPI	Ministry of Planning and Investment
PPU	Project Preparation Unit
PPC	Provincial People's Committee
PPE	Personal Protective Equipment
PMU	Project Management Unit
PPTA	Project Preparatory Technical Assistant
ROW	Right of Way
SPS	Safeguard Policy Statement
ESO	Environmental Safeguards Staff
SST	Subproject Support Teams
The PPTA	The Project Preparatory Technical Assistant Consultants
The Project	Support to Border Areas Development Project
The Subproject	PR-686 & PR-681 Dak Nong Subproject

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 soils 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 radically changed global coffee supply chains since 1990, increasing from less than 3% to more than 17% of global production[1]. 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.

3. The Support to Border Areas Development Project (Project) will help the five participating provinces (the Provinces) of Kon Tum, Binh Phuoc, Dak Lak, Dak Nong, and Gia Lai 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

4. 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

5. "PR-686 & PR-681 Dak Nong" subproject was the short-listed subproject in Dak Nong province. The subproject will upgrade two sections with asphalt concrete with detail information as follow:

(i) Section 1 – 14km from Km17+00 of Provincial Road No.686 to Km3+00 at the entrance of Dak Buk So town, Tuy Duc district centre. This section locates in Nam N'Jang and Dak N'Drung communes, Dak Song district.

(ii) Section 2 – about 23 km, starts from Km31+550.67 – Km35+409.15 of Provincial Road No.681 and Km139+00 – Km157+736.65 of old National Road No.14C. It locates in Dak Buk So and Quang Truc communes, Tuy Duc district. The end point of the Section 2 is Dak Huyt Bridge, 6 km away from Bu Prang Border Gate.

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

6. Section 1 of the subproject goes through centre of Dak N'Drung commune with residential area and cultivation area of pepper and coffee. Section 2 goes through coffee and pepper cultivation area of Quang Truc and Dak Buk So communes, Tuy Duc district. Section 2 has about 6 km running in the same alignment with border patrol road of which 2 km goes through watershed protection forest under the management of Border Protection Forest Management Board. Some kind of pine forest is also located along this 6 km section.

7. Section 1 will be upgraded to Vietnamese Standard Road Grade IV – Mountain with the surface width of 5.5 m, foundation width of 7.5 m while Section 2 will be upgraded to Vietnamese Standard Road Grade III – Mountain with the surface width 6 m, foundation width of 9 m. Both sections will have roadside width of 2x1 m and road surface material is asphalt concrete.

8. Currently, there are 3 bridges located in Section 1 of the subproject. General information and the peak water above Mean Sea Level (MSL) based on the investigation of PPTA Design Consultant have been listed in Table 1 below. Bridge over stream No.1 and No.2 will be upgraded and constructed as 2 two culverts. Bridge over Ba stream will be reconstructed with the total length of 34.1 m and width of 8 m.

Table 1 – Number of bridges and designed elevation based on 2005 peak water level

No.	Location	Name (river/ stream)	Section	Current Length (m)	Peak water level 2005 above MSL (m)
1	Km6+750	Ba stream	1	21	303.54
2	Km10+850	Stream No.2	1	6.5	288.10
3	Km12+100	Stream No.1	1	5	N/A

B. Environment impacts and mitigations

9. 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 on Border Watershed Protection Forest. The completion of the road will provide access to the forest; potentially creating favourable condition for wood logging and forestry product exploitation.

10. 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.

11. In the design, 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 start to ensure that all affected households have received compensation adequately in accordance with the current provincial market and ADB safeguard Policy be implemented.

12. The potential negative impact in the construction phase has been identified as (i) forest encroachment in the 2 km section goes through Border Watershed Protection Forest. To

minimize the impact, a closed collaboration between Dak Nong Project Management Unit (PMU), Environment Safeguard Specialist (ESP); Dak Nong Border Forest Management Board, relevant Divisions of Tuy Duc 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 along old NR14C, 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 starts.

13. (ii) Careless construction and poor materials control can cause blockage to Ba stream. Runoff water during its rain could bring waste and soil into the nearby water bodies like Ba stream or Dak N'Drung and Dak Buk So lakes that could lead to siltation and reduce the water quality. Ba stream could be affected by the construction activities, as a bridge will be constructed to replace the current 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 near Ba stream and Dak N'Drung, Dak Buk So Lake with high potential of runoff, erosion and sedimentation.

14. (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 accident and traffic accident especially in the sensitive area such as commune administration centres, medical centres, schools, kindergartens. Dust, noise and vibration from construction machines such as concrete mixing plants or trucks could disturb local people, damage their houses, increase risk of respiratory and skin diseases. To minimize the impact, the contractor will cooperate 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 construction activities, the contractor should compensate them adequately at their own expense.

15. In the operation phase, the potential negative impact has been identified as relating to increase chance of access to Border Protection Forest; dust and noise arising from increasing of traffic density and higher risk of traffic accidents as a result of better driving conditions. To minimize the negative impacts, Dak Nong Department of Transportation (DOT), the responsible agency for subproject management in the operation phase will cooperate with Border Protection Forest Management Board, Tuy Duc DPC and Dak Buk So CPC in forest management, will periodically maintain the road, and will install speed limit, warning signs or road humps (if applicable) at sensitive areas along the road such as schools, kindergartens, medical centres etc.

16. 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) drainage issue along the subproject road, domestic and construction waste accumulate along the roadside and high road elevation in compares with house along roadside. (ii) Deputy Chairman of Dak N'Drung CPC and some people in Dak N'Drung commune have expressed their concerns on the drainage issues as current road elevation is higher than local people's houses. When it rains, runoff water usually flows from the road to

their house, create temporary floods, and make difficulties for their daily activities. All of these concerns are addressed in the EMP (See Table 11 – 12 for more details).

17. 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

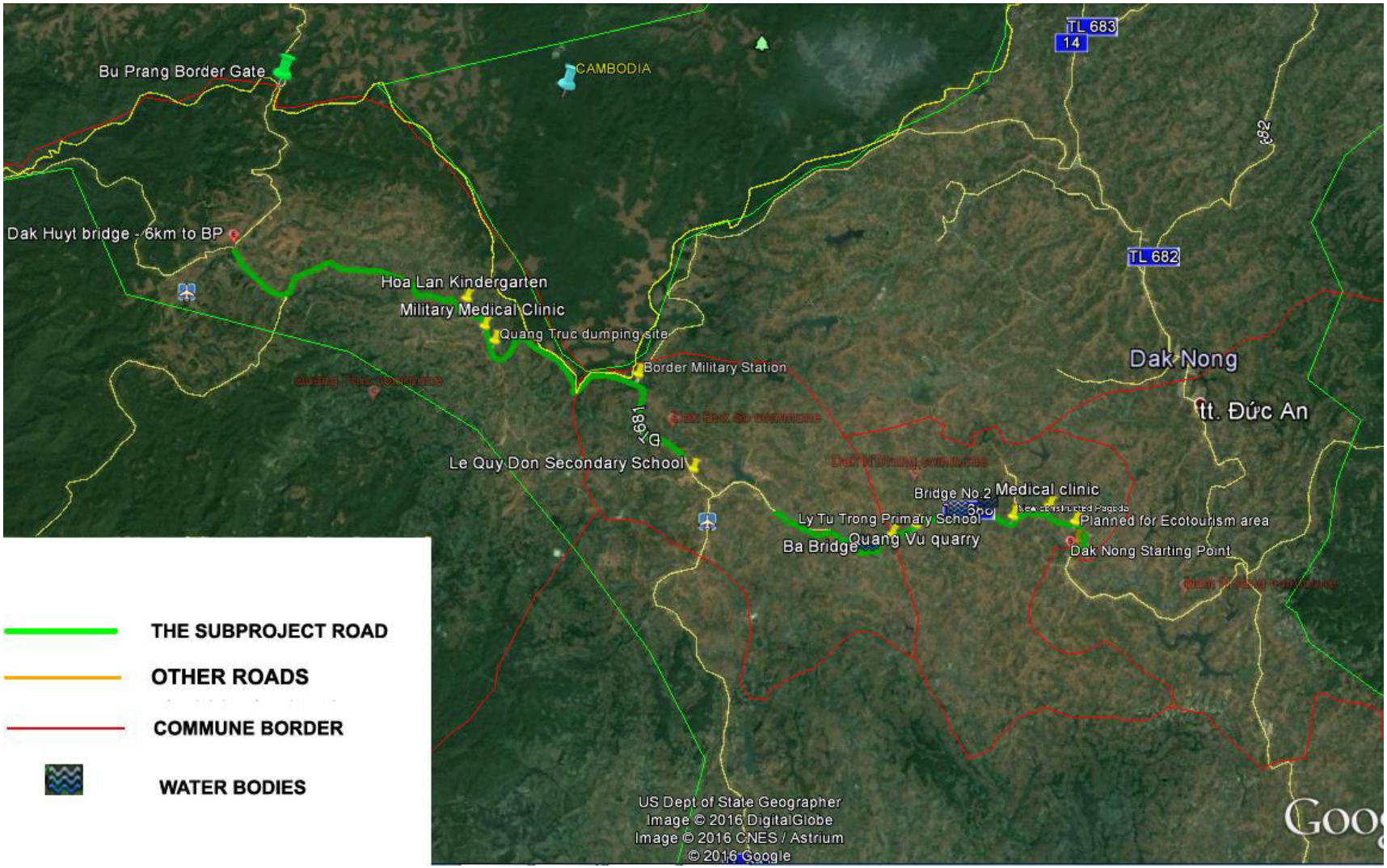
18. Dak Nong Provincial People Committee (CPC) has established a Project Preparation Unit (PPU) under Dak Nong Department of Planning and Investment (DPI) to support the preparation of the subproject in the PPTA period. One staff of the DPI has been assigned as Environmental Safeguards Officer (ESO) of PPU. Ideally, the ESO will become ESO of Dak Nong 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 Dak Nong Department of Transportation (DOT) – subproject management organization in the operation phase.

19. 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 biding 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

20. 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 Dak Nong and Subproject Area



II. BACKGROUND

21. The Support to Border Areas Development Project (Project) will help the five participating provinces (the Provinces) of Kon Tum, Binh Phuoc, Dak Lak, Dak Nong, and Gia Lai to better realize their growth potential and become more closely integrated into subregional frameworks including the Greater Mekong Subregion (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 subregional initiative. The Project will be implemented in 5 provinces in the CLV-DTA of Vietnam including Kon Tum, Binh Phuoc, Dak Lak, Dak Nong and Gia Lai.

22. 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.

23. In order to reached 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.

24. The Government of Vietnam has assigned Ministry of Planning and Investment (MPI) 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.

25. 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

26. 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

27. 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

28. **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.

29. The Project is initially categorized as 'B' for environmental safeguards. 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

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

1. Laws:

- Law No. 55/2014/QH13 of 23 June 2014 by the National Assembly on environment protection
- Law No. 17/2012/QH13 of 21 June 2012 by the National Assembly on water resources
- Law No. 20/2008/QH12 of 13 November 2008 by the National Assembly on biodiversity
- 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.
- Circular No. 36/2015/TT-BTNMT of 30 June 2015 by the Ministry of Natural Resources and Environment stipulating hazardous waste management
- Decision 07/2012/QD-TTg dated February 08, 2012 of the Prime Minister promulgating some regulations on intensified enforcement of forest protection
- Decision 186/2006/QD-TTg dated August 14, 2006 of the Prime Minister promulgating the Regulation on forest management
- Decree 09/2006/ND-CP dated 16th January, 2006 of the Government on forest fire prevention and control
- National Technical Regulations on air and noise quality
    - QCVN 05: 2013/BTNMT on ambient air quality
    - QCVN 26: 2010/BTNMT on noise
    - QCVN 27: 2010/BTNMT on vibration
- National Technical Regulations on water quality

- QCVN 01: 2009/BYT on drinking water quality
- QCVN 02: 2009/BYT on domestic water quality
- QCVN 08: 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/QD-BYT of 10 October 2002 by the Ministry of Health promulgating 21 labor hygiene standards, 5 principles and 7 labor hygiene measurements
- Law No. 50/2014/QH13 of 18 June 2014 by the National Assembly on construction
- Circular No. 22/2010/TT-BXD of 03 December 2010 by the Ministry of Construction on labor safety in work construction
- Law No. 10/2012/QH13 of 18 June 2012 by the National Assembly on labor code

IV. DESCRIPTION OF THE SUBPROJECT

A. The need for subproject

31. Dak Nong is located in the South West of Central Highlands area of Vietnam. It has 130km border line with Muldukirri province of Cambodia. Dak Nong located in a strategy position for socio-economical development and plays a connection role between Central Highlands and Southern Economical Zones as well as Central Coastal provinces and North East provinces of Cambodia. Dak Nong has potential and advantages for agricultural and ecotourism development.

32. There are two main legal documents related to the development of the subproject. The first one is Socio-economical Development Plan of Dak Nong has been approved by the Prime Minister at the Decision No. 1942/QD-TTg dated October 22, 2013 and the second is Transportation Development Plan 2020, up to 2030 approved by the Provincial People Committee at the Decision No. 255/QD-UBND dated February 19, 2013. These documents have stated that in 2016-2020 periods, the Province will focus on upgrade and expand road system to Bu Prang Border Gate in order to enhance cultural and economical exchange as well as bring more benefit on trade and economy for the people of two countries in the border areas.

33. The subproject road has been invested before the establishment of Dak Nong province. Currently, the road surface width is only 3-4m and has been damaged. It made many difficulties for the movement of people as well as goods transportation. Thus, the road need to be upgraded and expanded to improve transportation condition between two countries, connects with National Road No. 76 of Cambodia through Bu Prang Border Gate, support goods exchange between Dak Nong and Modukirri provinces. The upgraded subproject road will contribute to the general socio-economical development plan of Dak Nong until 2020 as approved by the Prime Minister and support to improve living standards of ethnic minority people in the subproject area. On the other hand, the completion of the subproject will also support the development of ecotourism in the province. There is a plan for an ecotourism in Dak N'Drung lake area near the starting point of the subproject.

B. Location and scope

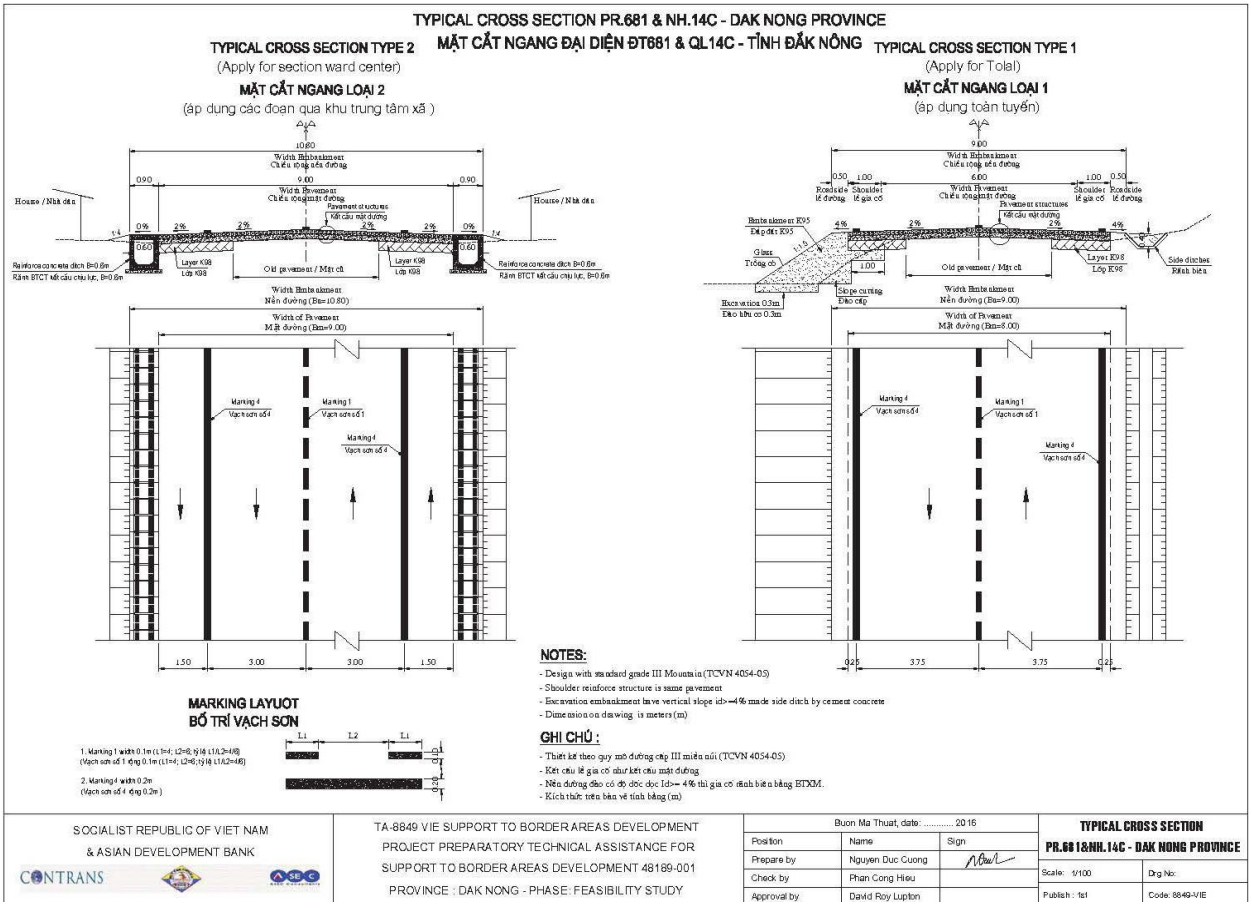
34. The subproject goes through fourth communes of Dak Song district and Tuy Duc district namely Nam N'Jang, Dak N'Drung, Dak Buk So and Quang Truc with total length of 37.3 km. These are poor communes of two districts with many ethnic minority groups living there and specializing in the growing of coffee, rubber, pepper, cashew and cassava in large area. The road after improvement will connect the border with connectivity of road network in these districts and further contribute to achieve the objectives of the project. The subproject will facilitate for transport, commercial connectivity, promote socio--economic development for the areas along the road and create conditions for formation of Bu Prang border gate economic zone, as well as ensuring the security and defence of Dak Nong province and the Central Highlands.

35. The subproject route has the total length of 37.3 km with the starting point at Km17+00 of Provincial Road No.686 in Nam N'jang commune and end point at Km157+761 of National Road No.14C in Quang Truc commune. As the subproject route will not upgrade roads in Tuy Duc district center, it will divide into two sections:

- Section 1 – 14km from Km17+00 to Km3+00 of Provincial Road No.686. It located mainly in Dak N'Drung commune; the section length in Nam N'jang commune is only 100m, will be designed in mountainous Grade IV (width: 7.5m, carriage way: 5.5m).
- Section 2 – about 23 km, start from Tuy Duc district center and ends at Dak Huyt Bridge, 6 km to Bu Prang Border Gate. The 6km from Dak Huyt Bridge to Bu Prang Border Gate has been constructed by Provincial budget by two lane of asphalt concrete follow Mountainous Grade III (width: 9m; carriage way: 6m).

36. The three bridges are all located in Section 1 of the subproject road with the information is listed in Table 1 above.

Figure 2 – Typical Cross Section of PR-686 and PR-681



37. As the subproject road goes through high density population area of Dak N'Drung commune and residential area of Quang Truc commune, worker camps and large material stockpiles will be located at least 100 m away from these areas. Moreover, no worker camps and large material stockpiles will be located in the 2 km section goes through Border Protection Forest. The contractor will also avoid locating worker camps close to the end point of Section 1 and the start point of Section 2 (100 m away) as they are near the Dak Buk so town, Tuy Duc centre.

38. The stone source could be used for construction activities in the subproject area is come from a quarry of Quang Vu Trade and Service Company, located next to the Section 1 of the subproject (200m from the road) in Dak Tien hamlet, Dak N'Drung commune. The stone capacity of the quarry is about 1500000 m^3 and the exploitation time is 30 years and could be serving for the construction of the subproject, as the estimated stone volume for the subproject construction is about 11000 m^3. The estimated volume of excavated soil is 351904.61 m^3, of which 134450.09 m^3 is organic, unstable soil that could not be reused. Estimated volume of filling soil is 312531.46 m^3. About 120000 m excavated soil could be reused as filling soil for road embankment. There is no sand mine on the subproject area. The sand and filling soil sources are located near Serepok Bridge (Bridge No.14) – about 100km from the subproject area. Sand and filling soil could be purchased from the 3 main construction material shops along the subproject road in Dak N'Drung commune, Dak Song district and Quang Truc commune, Tuy Duc district. The detail information could be found in the Detail Design Report.

39. There are two temporary dumping sites existed in the two districts. The District Co-operative is responsible for waste collection in the district area. In the subproject area, there is a temporary dumping site located near the market in Quang Truc commune center, Tuy Duc district. The Contractor should discuss with CPCs and relevant authorities to find out suitable location for waste soil as well as domestic waste from worker before the construction start.

40. Land acquisition and resettlement: As the subproject will upgrade the road surface base on the existing foundation, there is no house will be relocated and no household will be major affected. The construction of the subproject will affect agricultural area, fruit trees and pepper, fence or gate of the local people; mainly concentrate in Dak N'Drung commune, Dak Song district. There are 32 household will be affected with 24 households in Dak Song district and the other 8 households in Tuy Duc district. The largest permanent affected land area of one household is 550 m^2 over 1648 m^2 in total of Dak Song district while only 182 m^2 in total of Tuy Duc district. The detail information could be finding out in the land acquisition and resettlement report.

41. In the plan, the subproject will be constructed in 24 months with the estimated budget in Table 2 below

Table 2 – Estimated budget of the subproject

No	ITEMS COST	METHOLD	SUB COST PA1	USD	Notes
	Investment Cost		**514 479 977 465**	**23 070 851**	
I	**Construction cost**		**358 564 006 000**	**16 079 103**	**22 300**
	Route		**352 923 652 963**	**15 826 173**	**536 627 200 000**
1	Embankment		54 703 782 966	2 453 084	
2	Pavement		233 740 305 306	10 481 628	
3	Drainage; culverts		7 433 427 430	333 338	
4	Long drainage		37 192 320 651	1 667 817	
5	Embankment protection works		6 804 358 717	305 128	

6	Traffic safety		12 582 005 934	564 216	
7	Temporary works		467 451 958	20 962	
	Bridge		**5 640 353 466**	252 931	
	Bridge Km6+798,51		5 640 353 466	252 931	
II	**SITE CLEARANCE COST**	Separated	**248 243 465**	**11 132**	
III	**MANAGEMENT COST**	1.217% *CPXDTT	**3 965 580 000**	**177 829**	
IV	**INVESTMENT ADVICE COST**		**18 474 970 000**	**828 474**	-
1	Report investment cost (*1,2 design improvement)	0.176% *CPXD*1,2	755 242 502	33 867	Decided 957/QD-BXD dated 29/9/2009
2	Survey cost (calculation temporary 100mil vnd /km)	Temporary	3 730 000 000	167 265	
3	Verification cost	0.024%*CPXD	87 422 207	3 920	Decided 957/QD-BXD dated 29/9/2009
4	Shop drawing cost (*1,2 design improvement)	0.857%* CPXD*1,2	3 687 542 635	165 361	Decided 957/QD-BXD dated 29/9/2009
5	Survey cost for shop drawing (Calculation temporary 120mil vnd /km)	Temporary	4 476 000 000	200 717	
6	Establish bidding document; Evaluation bidding document cost	0.2%*GGT	200 000 000	8 969	Decree 63/2014/ND-CP dated 26/6/2014
7	Supervision cost	0.95%*CPXD	3 407 089 904	152 784	Decided 957/QD-BXD dated 29/9/2009
8	Verification shop drawing cost	0.05%*CPXD	174 052 053	7 805	Decided 957/QD-BXD dated 29/9/2009
9	Verification estimates cost	0.05%*CPXD	164 800 710	7 390	Decided 957/QD-BXD dated 29/9/2009
10	Others cost for consultant (temporary)	0.50%*CPXD	1 792 820 030	80 396	
V	**OTHERS**		**30 380 831 000**	**1 362 369**	-
1	Clearance mine cost (calculation temporary: 5000đ/m^2)		**3 276 753 800**	**146 940**	
2	General cost		**20 521 020 330**	**920 225**	
2.1	Temporary housing cost	2.0%*CPXD	7 171 280 120	321 582	
2.2	Others undefined cost (2%)	2.0%*CPXD	7 171 280 120	321 582	
2.3	Mobilization and remobilization cost (calculation temporary)	0.5%*CPXD	1 792 820 030	80 396	
2.4	Ensuring transport cost (Calculation temporary)	1.0%*CPXD	3 585 640 060	160 791	

2.5	Setup Asphalt plant station	Temporary	800 000 000	35 874	
3	Insurance works cost (Temporary)				Decided 33/2004/QĐ-BTC dated 12/4/2004
	Insurance for Route cost (Temporary)	0.42%*CPXD	1 482 279 342	66 470	
	Insurance for Bridge cost (Temporary)	0.60%*CPXD	33 842 121	1 518	
4	Expertise fees (*TMDT)	0.007%*TMDT	38 101 536	1 709	Circulars 176/2011/TT-BTC dated 06/12/2011
5	Verification fees for design document	0.01%*CPXD	37 943 658	1 702	Circulars 75/2014/TT-BTC dated 12/6/2014
6	Verification fees for estimate document	0.01%*CPXD	35 987 854	1 614	Circulars 75/2014/TT-BTC dated 12/6/2014
7	Expertise fees for Bidding document and result bidding	0.1%*GGT	200 000 000	8 969	Decree 63/2014/NĐ-CP dated 26/6/2014
8	Approval settlement report fees	0.22%*TMĐT	1 144 246 500	51 312	Circulars 09/2016/TT-BTC dated 18/01/2016
9	Audit cost (*TMDT)	0.322%* TMDT*1,1vat	1 817 836 020	81 517	Circulars 09/2016/TT-BTC dated 18/01/2016
10	Others (Temporary)	0.5%	1 792 820 030	80 396	
VI	**CONTIGENCY**		**102 846 347 000**	**4 611 944**	-
	Variation works cost	10%	41 138 538 700	1 844 778	
	Inflation cost	15%	61 707 808 050	2 767 166	Indicator construction

V. DESCRIPTION OF THE ENVIRONMENT

A. Physical environment

1. Topography, Geology, and Soil

42. Dak Nong is located in the South West of Central Highlands, at the end of Truong Son range with the geographical coordination from $11^0$45' to $12^0$50' latitude and $107^0$13' to $108^0$10' longitude. Dak Nong borders with Dak Lak province in the North and North East, Lam Dong province in the East and South East, Binh Phuoc province in the South and South West and Cambodia in the West. Dak Nong is one of the provinces in the CLV-DTA.

43. Dak Nong located in a highland area with the average elevation of 500m above Mean Sea Level. The topography of the province is quite flat with grasslands stretch to the East. The topography is lower to the West, toward Cambodia and the low lands are located in the South of the Province with different kind of lakes.

44. The hilly topography is typical for area of Dak Glong, Gia Nghia town, Dak Mil, Dak Song, Dak Rlap and Tuy Duc. The average height above Mean Sea Level is 800m with the slope angle over 30%, suitable for the development of perennial plants, industrial trees and cattle breeding.

45. The result of geological investigation has showed that the geology along the subproject route is quite homogenous with clayey basalt mixed with brownish red hard gravel. The whole route has a stable foundation. At some sections, the wall slope on both sides reached 2-7m with Grade IV Soil top roof. The top roof has been covered with vegetation so they are quite stable except section from Km34+700 – Km34+800 with a steep slope wall up to 7m heights, without vegetation cover and some evidences of landslide. However, it happened in separated positions and the volume is not large enough to block the road and affect the transportation activities.

2. Hydrology and Climate

46. Dak Nong is typical with tropical moisture highland climate and it also affected by hot and dry South West wind. The rainy season starts in April to the end of October with 90% precipitation of the year and the dry season start from November to April next year. The average temperature rank from 23 – 23.7^0C with the temperature peak in March to May and the lowest point in December.

47. The average precipitation is 1800-2600 mm. The highest precipitation is 3000 mm and concentrate in August and September. The driest months are January and February. The average humidity is 81-84%. In the rainy season, the main wind direction is South West and the main wind direction in the dry season is North East. Dak Nong rarely be affected by storm and it is suitable for the development of perennial tropical trees.

48. Dak Nong has a quite dense river and stream network distribute all over the province. National Road No.14 work as a watershed line, divide the province into two parts. Water accumulate to make flow in a short time with steep slope will flood residential area in the downstream. There are 3 main river systems including Serepok, Krong No and upstream of Dong Nai Rivers. In the subproject area, the main flow is Dak N'Drung tributary of Dong Nai Rivers. Dak N'Drung stream originated from the elevation of 800 m, including many streams and

streamlets in the area of Dak Mil, Dak Song, Tuy Duc, Dak R'Lap, Gia Nghia. The total water catchment is 912 km^2 and the average slope is 15-20%.

49. Information related to natural disaster in the subproject area could be found in Table 3 below

Table 3 - Type of natural disaster in the recent year

Year of occurrence	Type of disaster	Affected area		Number of affected people
		Name of district	Name of commune	(HH)
2015	Drought	Tuy Duc	Dak Buk So	01
2015	Drought	Dak Song	Dak N'Dung; Dak Mol; Dak Hoa	Several communes
2015	Drought	Dak Song	Nam Binh	02

3. Surface and ground water

50. Environment Monitoring Centre of Dak Nong has implemented the water-monitoring program for 2011-2015. In 2015, the monitoring program has been implemented in April with the samples from large water bodies of the province.

Surface water resources

51. The monitoring parameters are pH, COD, BOD5, DO, NH4+, NO3-, phosphate, chlorine, iron, copper, zinc, lead, cyanide, arsenic coliform, oil. The closest monitoring points are Dak Nong Bridge (Gia Nghia town) and Ho Tay (Dak Mil town) – 21 km and 26 km to the subproject area respectively. The monitoring has showed that surface water has been polluted by organic substance (BOD, COD); The average COD in Dak Nong bridge is 35 mg/l, 2.2 times over the allowed level (15 mg/l) and the average COD in Ho Tay is 1.5 times over the allowed level (QCVN 08:2008/BTNMT).

Underground water resources

52. Underground water is distributed in the entire province with large deposit from 40-90 m depth. Underground water deposit of the province is decreasing rapidly in the recent year as it has been used for irrigation purpose, mainly coffee in the dry season. The result from 37 sampling points has showed that, in general, the quality of underground water is still under the allowed level of A2 column, QCVN 09:2008/BTNMT. Only COD parameter at some points are higher than allowed level, especially in Hamlet No.2, Tuy Duc district (located in the middle of two subproject road sections) is 1 time higher than the allowed level.

4. Air quality and noise

53. According to Status of Environment report (SOE) of Dak Nong province 2011 - 2015, the level of CO, NO2, SO2 and TSP dust at subproject area is in the allowable limit of QCVN 05-2013/BTNMT. At only some monitoring points closed to the temporary dumping sites of the district or some processing factory, some parameters are higher than the allowed level. In the subproject area, the temporary dumping site in Quang Tam commune, Tuy Duc district has been listed as the environmental pollution point under the Report on 2014 Environmental Protection Program of Dak Nong DONRE.

B. Biological environment

54. The main ecosystem along the subproject route is coffee cultivation and rubber plantation area. Pepper and coffee cultivation is dominated along the Section 1 of the subproject road while rubber; coffee and pine plantation area is mainly located along Section 2. There is about 2 km closed to the border line with Cambodia is protection forest.

1. Agriculture

55. The main cultivation area of Tuy Duc and Dak Song are coffee and rubber. Coffee is the main agricultural production in the subproject area and contributes the large part for the economical development of the province. However, the natural disaster, especially drought has impact seriously on the development of the coffee growth. Groundwater has been used rapidly for irrigation purpose, mainly for coffee as it has high water demand. At some area, ground water level has going down deeper than 90m. Lack of water will be the main challenge for the development of coffee growth. Detail information related to agricultural sectors in 2014-2015 of the district is listed in Table 4 below.

Table 4 - Main agricultural production type of the district (2014-2015)

Production type	Unit	Tuy Duc district	Dak Buk So com.	Quang Truc com.	Dak Song district	Nam N'Jang com.	Dak N'Drung com.
1. Main crops							
a. Coffee							
Area	Ha	18,500	2,666	119.9	25,533		2,631
Productivity	Ton/ha		0.18	10.52	2.605		
Output	Ton/year	36,450	9,102	225.9	60,994	6,921	
b. Rubber							
Area	ha	8,010	824	100	1,469		15
Productivity	Ton/ha		0.12		1.65		
Output	Ton/year	1,920	240		880		
c. Pepper							
Area	ha	1,340	488	225.9	6,802		1,282
Productivity	Ton/ha		0.27	9.2	2.7		
Output	Ton/year	990	634.5	177.4	9,755	4,077	
d. Rice							
Area	ha	440	11.5	115	489		45

Productivity	Ton/ha		0.42	2.63	5.5		
Output	Ton/year	1,700	48.3	303.3	2,666		
e. Cassava							
Area	ha			517	810	191	
Productivity	Ton/ha			9.44	18.5		
Output	Ton/year			82.9	15.024		
f. Corn							
Area	ha			74.5	4,565	310	670
Productivity	Ton/ha			4.26	7.1		
Output	Ton/year			318	32.579		
f. Main livestock							
Buffalo	head	931	82	183	155	15	71
Cow	head	1862	165	1,037	2,382	122	287
Pigs	head	5,720	1,675	1,036	33,822	3,885	1,237
Poultry	head	128,590	35,000	6,817	295,160	32,960	29,389

2. Forestry

56. The total production forest of Tuy Duc district is 10,066 ha in 2014. The forest area is mainly located in Bu Gia Map National Park – South West of the district. The distance from the buffer zone of the National Park to the subproject route is about 5 km. A bunch of protection forest located 2 km along section 2 of the subproject – closed to the borderline with Cambodia. This is a separated forest with total natural area of 2 km^2, part of zone 1457 and located in Dak Buk So commune, Tuy Duc district. In accordance to Resolution No.31/NQ-HDND dated December 10, 2015 of Dak Nong People Council, this area has been planned to change to transportation land for road expand to Bu Prang border gate.

3. Faunna and Flora

57. Dak Nong has a diversified fauna and flora system with 1489 plant species and 273 animal species. The dominant families of plant species are Leguminosea; Magnoliaceae; Lauraceae; Fagaceae; Euphorbiaceae; Moraceae; Lythraceae; Dipterocarpaceae and Pinophyta. There is not so many specific plant species; only Da Lat Pinus (Pinus dalatensis) is specific for Central Area.

58. There are several specific animal species exist in Dak Nong province including blackleg langur (Pygathrix nigripes); golden cheek ribbon (Nomascus gabriellae); Truong Son Deer (Muntiacus truongsonensis)... Wild animal hunting and deforestation are still happen in the province. In two years of 2014 and 2015, Dak Nong Forest Protection Police has recorded 24 cases of forest protection violation. The forest coverage is still decreasing by 40000 ha per year and poses a great thread to the biodiversity conservation of the province.

59. However, these specific and precious species are now mainly concentrated in two nature reserves: Nam Nung and Ta Dung and some part of Bu Gia Map National Park in Dak Nong's area. The nearest biodiversity conservation area to the subproject road is Nam Nung nature reserve, which is more than 14 km away from the start point of section 1 of the subproject.

C. Socio-economical conditional and infrastructure

1. Population and Ethnic

60. The total population of Tuy Duc district is 52,731 people and Dak Song district is 75,907 people in accordance to *Statistics of* population *and ethnic composition of Tuy Duc and Dak Song District People's Committee in 2015.* Ethnic minorities make up nearly 50% of the total population of Tuy Duc district and only 18% of the Dak Song population is ethnic minorities. Detail information could be seen in Table 5.

Table 5 – Ethnic groups of Tuy Duc and Dak Song districts

No		Total of population	Peoples clarification (number of people)							
			Kinh	M'Nong	Thai	Muong	Tay	Nùng	Dao	Others
		Total	Total	Total	Total	Total	Total	Total	Total	Total
1	**Tuy Duc District**	**52,731**	**26,844**	**12,045**	**73**	**302**	**1,213**	**669**	**231**	**11,354**
	Percentage (%)	100	50.9	22.84	0.14	0.57	2.3	1.27	0.44	21.53
2	Dak Buk So commune	10,891	9,084	837	21	48	323	182	128	268
	Percentage (%)	100	83.4	7.68	0.19	0.44	2.97	1.67	1.18	2.46
3	Quang Truc commune	7,614	3,940	2,649	51	196	346	185	44	203
	Percentage (%)	100	51.8	34.8	0.67	2.57	4.54	2.43	0.58	2.67
4	**Dak Song District**	**75,907**	**62,427**	**7,164**	**335**	**208**	**1,412**	**799**	**1,602**	**1,960**
	Percentage (%)	100	82.24	9.44	0.46	0.27	1.86	1.05	2.11	2.58
5	Nam N'Jang commune	10,525	7,796	0	52	23	199	232	0	2,223
	Percentage (%)	100	74.07	0	0.49	0.21	1.89	2.2	0	21.12
6	Dak N'Drung commune	10,990	6,876	2,122	15	45	457	128	86	1,261
	Percentage (%)	100	62.56	19.3	0.13	0.4	4.15	1.16	0.78	11.48

2. Living Standards and housing

61. The numbers of poor households in Tuy Duc district is 6611 and in Dak Song district is 2806, make up more than 50% of the district total household. There are also 1154 households in Tuy Duc and 1391 households in Dak Song are close to the poverty line. The main reasons for this high number of poor household are mainly lack of budget for investment and lack of cultivation land. Detail information could be found in Table 6 below.

Table 6 – Number of poor households in the subproject area (2014-2015)

	Household		Poor Household					
	Total of HHs	Total of EM HHs	Lack of production facilities	Lack of landing production	Lack of production fund	Lack of production knowlege	Many childre n	Other s
Tuy Duc District	**12,871**	**4,823**	**847**	**1,590**	**5,511**	**574**	**412**	**1,019**
Dak Buk So Commune	2,900	2,479	347	248	751	306	222	770
Quang Truc Commune	1,962	922	277	111	542	83	61	138
Dak Song District	**2,806**	**941**	**412**	**1,291**	**2,139**	**90**	**221**	**723**
Nam N'Jang Commune	148	22	27	40	141	15	44	99
Dak N'Drung Commune	492	215	0	317	492	0	2	8

3. Employment and income

62. From the investigation result of the Consultants, local people in the subproject are mainly working in agriculture.

Table 7 – Production value of the district and three communes (2014-2015)

Types of Land	Unit	Tuy Duc District	Dak Buk So Commune	Quang Truc Commune	Dak Song District	Nam N'Jang Commune	Dak N'Drung commune
Natural land used areas	*ha*	111,924.94	8,348.94	55,908.96	80,646.24	16,478.67	6,757.38
Agriculture Land	*ha*	104,907.77	7,411.16	52,737.94	75,418.4	15,351.69	6,157.34
I. Agricultural production land	*ha*	57,167.63	7,079.98	12,512.32	52,608.34	7,062.22	6,083.99
1. Land for planting anual crops	*ha*	16,967.41	1,113.67	6,395.69	12,312.89	1,861.53	1,157.53
- Rice	*ha*	585.71	38.03	46.76	349.06	1.49	48.14
- Other	*ha*	16,381.70	1,075.64	6,348.93	11,963.82	1,860.04	1,109.19
2. Land for perennial trees (timber, industrial trees)	*ha*	40,200.22	5,966.31	6,116.63	40,295.47	5,200.69	4,926.66
- Rubber	*ha*	8010	824	100	1469	0	15

- Other	*ha*	32,190.22	5,142.31	6,016.63	38,826.47	5,200.69	4,911.66
1. Land for forest	*ha*	47,565.39	202.43	40,315.42	22,238.81	8,261.81	23.64
2. Land for aquatic	*ha*	174.75	128.75	10.2	570.57	27.66	49.7
3. Land for other agriculture	*ha*	0	0	0	0.65	0	0
II. Non-agriculture land	*ha*	4,714.61	918.67	900.14	4,938.76	974.63	599.34
1. Land for housing (rural and urban)	*ha*	335.60	86.22	31.67	825.57	213.62	74.42
2. Land for trading and services	*ha*						
3. Specialised land	*ha*	1,660.48	475.93	395.25	2,232.52	357.92	234.02
III. Non-used land	*ha*	2,302.56	19.11	2,170.88	289.08	152.35	0.71

4. Education and Public Health

63. Each commune has a clinic to serve local people in the commune with some simple treatment. There are few HIV infected cases happen in the subproject area in accordance to statistic number of 2015. The information related to medical system of the district is showed in Table 8 below.

Table 8 – Medical care in the subproject area 2015

	Unit	**Tuy Duc District**	Dak Buk So Com.	Quang Truc Com.	**Dak Song District**	Nam N'Jang Com.	Dak N'Drung Com.
1. Hospital/ heathcare center	piece	**1**	1	1	**1/9**	1	1
2. Staff						8	7
- Doctor	persons	**3**	1		**27**	1	1
- Nurse, pharmacists	persons		2			2	5
- Elderlies	persons					5	1
In which: female staffs	persons	**14**	4	4		8	
3. Number of examed patients	persons	**11,265**	3,502	3,050	**92,118**	6,444	3,438
In which: female patients	persons		1,648	582			
4. Number of drug users in the commune	persons					15	24

In which: female	persons					0	0
5. Number of HIV infected people	persons	**36**	7	11	**87**	1	5
In which: female	persons	**15**	3	3		1	1
6. Number of malnourished children	persons	**1,498**	138	318	**20,9**	18.5	0
In which: female	persons	**734**	68	155			0

64. There are four kindergarten/ schools located in the subproject area of Dak Song district. Huong Duong Kindergarten located near the starting point of subproject section 1 in Nam N'Jang commune. Le Van Tam Primary School and Ly Thuong Kiet Secondary School located near Dak N'Drung CPC – about 100m from the subproject road. Ly Tu Trong Primary School for Dak Buk So commune is located at the roadside of the subproject road. There is only Hoa Lan kindergarten located at the road side of the subproject road in section 2 in Quang Truc commune. Detail information related to education and training is listed in Table 9 below.

Table 9 – Education and training in 2015

	Unit	**Tuy Duc District**	Dak Buk So Com.	Quang Truc Com.	**Dak Song District**	Nam N'Jang Com.	Dak N'Drung Com.
1. Number of class							
Kindergarten	Class	125	23	25	126	16	19
Primary School	Class	245	50	31	307	43	37
Secondary School	Class	75	23	8	134	15	17
High school	Class	1			1		
2. Number of students go to school							
a. Kindergarten	Student	3,433	709	500	3,988	583	556
b. Primary school	Student	6,476	1,353	714	8,650	1,145	1,072
c. Secondary School	Student	2,697	894	240	4,825	505	627
d. High school	Student						
3. Percentage of dropout (%) in	%	1,23	0	1	0.001	0.7	0
4. Percentage of student finishing primary school	%	100	100	95.4	99.92	100	99.36
5. Percentage of student finishing secondary school	%	100	100	100	98.7	99.17	99.27
6. Percentage of	%						

student finishing high school							
7. Percentage of illiterates	%				3.75	0	1.42

5. Water supply and electricity cover

65. Nearly all the households in the subproject areas using electricity from national electricity network. The percentage of households using clean water is also high, up to 100% in Dak Buk So and Quang Truc communes of Tuy Duc district. In Dak Song district, the percentage for Nam N'Jang and Dak N'Drung communes are 96% and 90% respectively.

6. HIV and human trafficking

66. There are total 24 HIV infected cases have been recognized in the 4 communes of the subproject. 18 infected cases have been recognized in 2 communes of Tuy Duc district. No human trafficking case has been recorded in the subproject area.

7. Infrastructure

67. ***Transportation***: The road network in Dak Nong has a total length of 3412km including 1501km of bitumen road, make up 44%, and 1911 km of earth and aggregate road make up 56% of the total road length. The backbones of the province are three national roads with the total length of 310 km. 6 provincial routes with the total length of 310 km; 125 km of town internal road; 798 km district road; 657 km communal road; 1172 km hamlet road and 40 km road of special purpose.

68. The road density of Dak Nong in km/km^2 area and km/1000 people is still low in comparison with average density of the Central Highlands and the whole country. The density in km/km^2 area of Dak Nong is 0.344 in comparison with 0.433 of Central Highlands and 0.799 of the whole country. In another term, Dak Nong has only 0.344 km/ 1000 people while this number of the Central Highlands is 4.624.

69. Tuy Duc district has total 187.73 km of asphalt/ concrete roads while Dak Song district has total 98.8 km. The subproject road is part of the road network connect to Bu Prang Border Gate with Cambodia. It play a backbone role, connects the agricultural areas in Central Highlands to the Border Gates through National Road No.14. Section 1 is already paved with asphalt while some parts of section 2 is still earth road. The road has been constructed before the establishment of Dak Nong province (separate from Dak Lak in 2004) and it has been damaged severely after more than 10 year in operation.

70. ***Industrial activities***: The processing industry is still contributing the largest part in the industrial sector of Dak Nong. According to statistic data of 2012, processing industry make up 91.68% of the industrial sector. The exploitation industry make up 1.59% and other sectors such as manufacturer, electricity and water supply make up only 6.72%. Dak Nong has a high industrial growth rate in comparison with other provinces in the Central Highlands. However industrial productivity is still low due to the slow development progress of some projects like Aluminium Processing Factory, high quality rubber production factory...

71. Industrial activities are not developed in the subproject area. The percentage of industry and construction sector in Dak Buk So and Quang Truc communes of Tuy Duc district is 0 while

this percentage in Nam N'Jang and Dak N'Drung communes of Dak Song district is only 12 and 1.6% respectively.

72. ***Other public facilities***: Detail information related to infrastructure system could be found in Table 10 below.

Table 10 – Infrastructure system in the subproject area

	Unit	Tuy Duc District	Dak Buk So Com.	Quang Truc Com.	Dak Song District	Nam N'Jang Com.	Dak N'Drung Com.
1. Roads	Km						
- Earth road	km	603.8	55	65	97.55	25	17
- Concrete / asphalt roads	km	187.73	39	56	98.8	46	19
2. Number of car	unit						
3. Number of motorbike	unit				4126	528	517
4. Market in commune	unit	1	1	1	*a.* *1*	1	1
- Distance for the centre of commune	km	1	0.5	0.5	0.5	0.5	0.05
5. Market outside commune	unit	2			5	1	1
- Distance to the centre of commune	km	15	25		15-23	15	15
6. Percentage of HHs using national electricity	%	90.64	94.33	95.51	96.95	98	85
7. Percentage of HHs using clean water	%	100	100	100	90	96	90
8. Percentage of concrete HHs with floors	%	6.1	11	4	5	2	10
9. Percentage of HHs with brick / wood, roof, 1 floor	%	93.5	89	95	92	97	80
10. Percentage of HHs with cottages, tent	%	0.4	0	1	3	1	10
11. Percentage of HHs using telephone and cell phone	%	100	100	100	100	100	100
12. Percentage of HHs having toilet	%	100	100	100	90	85	100

D. Archaeological, Historical and Cultural Treasures

73. There are several archaeological sites have been discovered in Dak Nong in the recent years. The objects are mainly come from Stone Age, New Stone Age and the Pre-Iron Age. In 2013, there are 35 sites have been discovered mainly concentrated in Cu Jut, Dak R'Lap and Dak Mil district. There are no archaeological or cultural sites in the subproject area. There is only a mark of Ho Chi Minh trail through Tuy Duc district area and provincial historical site of Henri

Maitre - a French official from the Colony period. These two marks are located at roadside in Dak Buk So commune, Tuy Duc district.

E. Key Environmental Features

74. ***Physical environmental features:*** The first half of section 1 of the subproject goes through residential area of Nam N'Jang (300 m) and Dak N'Drung communes. The second half of this section goes through cultivation area of Dak N'Drung commune – Dak Song district and Dak Buk So commune – Tuy Duc district. This is the cultivation area of coffee, pepper and rice with good irrigation system of Dak Buk So Lake. The 3 bridges of the subproject route are all located in this part of section 1.

75. The first 3.5 km of the section 2 – from Tuy Duc district centre to the junction with old National Road No.14c – goes through coffee cultivation area of Dak Buk So commune. The next 2 km from the junction with Road No.14c goes through the area of protection forest along the borderline with Cambodia. This is planned to change to transportation land for the expanding of the subproject road. The second half of section 2 goes through Quang Truc commune centre and the cultivation area with mainly coffee and rubber. The end point is in a T-junction at Dak Huyt Bridge, 6 km to Bu Prang Border Gate and 25 km to the Gate of Bu Gia Map National Park in Binh Phuoc province.

76. The largest water body in the subproject area is Dak Buk So Lake, located in Tuy Duc district centre, about 1.2 km from the end point of section 1. Dak N'Drung Lake located at the roadside of the start point of section 1. Dak Nong province has planned for an eco-tourism site in the future.

77. ***Social environmental features:*** There are 3 schools and 1 kindergarten located along the section 1 of the subproject. Dak N'Drung CPC and medical centre is also located roadside at the centre of the commune. Le Quy Don Secondary School is located in Tuy Duc district centre, about 1 km from the start point of section 2. Section 2 goes through Quang Truc commune centre with Hoa Lan kindergarten and Quang Truc CPC. There is also one military medical centre of Military Unit No. 726 located about 50m from the subproject road.

VI. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

78. 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. Border Watershed Protection Forest located along 2 km of the subproject road in Section 2 could be adversely affected due to subproject implementation.

79. 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. 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.

80. The constructions activities during the construction phase will be mainly upgrade the existing road. The main physical issues relate to impacts such as vegetation clearance, earthworks, erosion control, obtaining rock based construction materials, noise, dust, spoil disposal, disposal of other waste, and water quality. The construction for the civil works will create dust; noise and vibration that could be affect local people during the construction side.

81. 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

82. ***Impacts:*** 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 Border 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 live along the subproject in Dak N'Drung commune – on the lower roadside as runoff water could flow to their house and create temporary inundation, make difficulties for their daily activities.

83. ***Mitigation Measures:*** The road surface of the Section 1 will be upgraded to asphalt concrete with the surface width of 5.5 m based on the existing road foundation width of 7.5 m. The roadsides will be improved 2x0.5m with the same road surface structure. To ensure the quality of the subproject road, 2-layer road surface of asphalt concrete (Eyc ≥ 130Mpa) has been considered in the subproject design. Culverts and small bridges (Bridge No.1 and No.2) have been designed to withstand a 25 year return and the medium bridge – Ba Bridge – has been designed to withstand a 100 year return. Contractor will work with Dak N'Drung CPC to support local people on levelling up their living area, using part of excavation soil. 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

84. **Impacts**: As the subproject will upgrade the road surface base on the existing foundation, there will be neither house relocated nor major affected household (lost more than 10% their land). The construction of the subproject will affect agricultural area, fruit trees and pepper, fence or gate of the local people; mainly concentrate in Dak N'Drung commune, Dak Song district. Households that lost their agricultural land will reduce the agricultural productivity and reduce their income. Households with area of yards and fence affected must repair their yards and fence.

85. **Mitigation measures:** Before the construction start, PMU will review the Land Acquisition and Resettlement report and check at the field to ensure that all 32 affected households have received compensation adequately in accordance with the current provincial market price.

3. Public relocation

86. **Description:** The implementation of the subproject road could involve in the relocation of some public infrastructure such as electricity poles or drainage system. It could lead to the interruption of the public services and impact on the local people. However, the road mainly upgrading the surface based on the existing foundation and the construction will not relocate any public infrastructure or buildings.

4. Disturbance of unexploded mine and bomb (UXO)

87. **Impacts:** Along the two sections of the subproject road, UXO can be left in some areas that have not been used for construction. Mine detector in subproject area may obstruct moving or agricultural works of local people. However, to help in securing safety for people UXO clearance team will be hire from professional UXO detector team. The clearance process could impact on local people living and cultivated activities, especially when the subproject route mainly goes through residential and cultivation area. However, the impact is minor due to most of the route will be constructed on the existing road base. This affect will be temporary and can be controlled by hiring mine detector team.

88. **Mitigation measures:** PMU will work with the Provincial Military Commands to check whether the area along the subproject route has been UXO cleared in the first phase or not. If it is not, Provincial Military Commands will be engaged in UXO clearing along the subproject road. The impact is only temporary in the pre-construction phase.

B. Potential impacts and mitigation measures in the construction phase

1. Loss of trees and impact to fauna

89. **Impacts:** The implementation of the subproject will involve in cut down some fruit trees and pepper in Dak Buk So communes. The construction activities will create noise, vibration that disturbs wild animals living in the forest area next to the road. Workers could hunt wild animals and cut down trees in the forest for fuel wood in cooking, water heating. Vegetation cover along the route could also get fires resulting from execution of the works. Invasive plant species could be introduced during roadside tree plantation or replant vegetation cover for high slope. The impact will be happened along the subproject route, worker camps area especially 2 km protection forest closed to the T-junction with National Road No.14C. This is a minor impact as there is small number of fruit trees and pepper will be cut down and the 2 km of protection forest along the borderline with Cambodia is only a separated forest and it also planned to change to transportation land for the expanding of the subproject.

90. **Mitigation measures:** CSC and PMU safeguards staff will supervise closely the tree cut down process to ensure no tree out of the cut-down list will be affected. The Border Watershed Management Board – the management unit of the protection forest area - will be informed about the construction time and schedule, scope of works as well as location of worker camps and material storage sites. On the other hand, no construction camps, concrete mixing plants, material storage sites are to be located in the forest areas. Avoid locate construction camps, concrete mixing plants or any machines that could create loud noise and vibration in the section of natural forest at the first half of section 2. 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. The contractors should not buy or use wood from illegal sources. 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

91. **Impacts:** Local water supplies, electrical power supply, and telecommunications must be maintained during the works. It will affect local people in their daily activities. Subproject construction could impact local facilities in the residential areas of Nam N'Jang; Dak N'Drung; Dak Buk So; Quang Truc communes and Tuy Duc district centre. 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.

92. **Mitigation measures:** to minimize the negative impact, the contractors will inform in advance the construction schedule, the affected electric and telecommunication cable system, irrigations system to CPCs of the four 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 CSC 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

93. **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. 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 quarries; borrow pits and temporary material storage along the subproject road. It will affect local people living in the subproject area and near the quarries, borrow pits. The impact is minor as the main work at is upgrading the road surface based on the existing road base so the required amount of construction material is not large. On the other hand, the terrain of the subproject area is quite flat and not required large volume of filling soil.

94. **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 Dak Nong to ensure material exploitation at the mines will not cause any uncontrolled negative environmental impacts.

4. Generation of excess spoil

95. **Impacts:** The soil from cutting activities, which could not be reused as filling soil, could have significant impacts and environmental degradation due to the improper disposal of these materials. 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 land resources along the road are still available for temporary dumping area of spoil. In the positive side: local people could use the spoil for their cultivation land, especially people in Dak N'Drung commune could use excavated soil to level up their living area, avoid inundation and temporary flood when its rain. The impact is minor due to the small quantity of spoil.

96. **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. The spoil could be stored at locations agreed with CPCs; Dak Buk So and Quang Truc communes so local people could take soil to fertilize their land or level up their living area as in Dak N'Drung commune.

5. Generation of construction waste and domestic waste from workers

97. **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 area along the subproject area. This is a minor impact as the construction sites will scattered along 34 km of the subproject road and there are two temporary dumping sites in Tuy Duc and Dak Song district.

98. **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 2 DPCs of Tuy Duc and Dak Song districts 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.

6. Impact from hazardous materials and hazadous waste disposal

99. **Impacts:** Use of hazardous substances such as oils and lubricants can cause significant impacts at the construction sites along the subproject road if uncontrolled or if waste is not disposed correctly. It will affect surrounding environment and local residential area. However, this impact could be considered as insignificant because the main construction activity of the subproject road is upgrading road surface based on the existing foundation and the construction machines are not large.

100. **Mitigation measures:** Dak Nong 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.

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

101. **Impacts:** Earthworks and the operation of concrete mixing plant will be the main sources of dust. Concrete mixing plant will be located at the quarry in Dak Tien village, Dak N'Drung commune. (20 m from roadside in the end of Section 1). Construction machines will generate gaseous emissions (NOx SOx, CO, CO_2, 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 in the four communes. Wild animal in the protection forest area along the road could also be affected from noise, vibration and dust from construction activities. This is an average impact due to the subproject route goes through dense population area with several schools/ kindergartens and medical centres.

102. **Mitigation measures:** similar to the mitigation measure for impact from rock crushing and concrete mixing plant, the contractors should not located any noisy machines near the environmental sensitive areas such as the protection forest, schools/ kindergartens and medical centres. The large storage sites should be located at least 100m away from these sensitive points. The contractors will work with CPCs of Nam N'Jang; Dak N'Drung; Dak Buk So and Quang Truc 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

103. **Impacts:** Roadside erosion and runoff could happen when its rain, especially at the roadside unlevelled section and the borrow areas. Erosion and runoff could impact on the cultivation areas of local people. Landslide could happen in the section with high slope side, for instance the area from Km34+700 to Km34+800 in Section 2 with steep slope along side and there is no vegetation cover. Landslide will damage the road and block movement. The impact could be considered as minor as based on the survey result of the PPTA, the scope of the landslide is not large and the amount of landslide will not block the road and impact on local transportation.

104. **Mitigation measures:** To minimize the negative impacts during 24-month of construction time, the contractors should limit to store material near the area of stream crossing points. The main construction activities such as bridges/ culverts construction should be implemented in dry season. The contractors will also update weather forecast daily during construction time to avoid heavy rain day. Work with relevant authorities for vegetation clearance in the area of stream crossing and Km34+700 to Km34+800. PMU and CSC will responsible to monitor these mitigation measures.

9. Impact on crossing streams or bridge construction locations

105. **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 3 crossing streams, especially Ba stream and Dak Buk So lake, Dak N'Drung lake could be affected by the construction activities and it will lead to reduce water quality of waterbodies of the streams/ lakes.

106. **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 DPCs to monitor the implantation of these mitigation measures.

10. Impact on water resources and quality

107. ***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 Ba stream crossing point. As Ba stream from Dak N'Drung Irrigation Lake, provide irrigation water for cultivation area of Dak N'Drung and Nam N'Jang communes, the subproject construction in 24 months could impact on the irrigation water resources for downstream users of these two communes.

108. ***Mitigation measures***: In order to minimize this negative impact, the contractors will work with Agricultural and Irrigation Staff of Dak Song district to set up a suitable construction schedule, avoid impact on the irrigation activities for Dak N'Drung and Nam N'Jang 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

109. ***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 4 communes along the subproject road. This is an average impact due to high density of population in the subproject area, especially in Dak N'Drung and Quang Truc communes.

110. ***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 4 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

111. **Impacts:** Dust, exhaust gas and noise generating from earthworks, transporting of material, construction activities and operation of machines, etc. These factors have 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 34km of the subproject, in the residential areas of 4 communes of Tuy Duc and Dak Song district.

112. **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 Nam N'Jang; Dak N'Drung; Dak Buk So and Tuy Duc CPCs 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

113. **Impacts:** Construction activities on the Subproject road are likely to cause hindrance in traffic flow if not mitigated properly especially in centre area of Quang Truc, Dak Buk So, Dak N'Drung communes and Tuy Duc district. 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 through the town internal road networks.

114. **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 Nam N'Jang; Dak N'Drung; Dak Buk So and Tuy Duc. The contractor will also construct temporary road and minimizing interference with traffic flows past the works site.

14. Environmental impacts due to inappropriate environmental recovery responsibility

115. **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.

116. **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 construction phase

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

117. **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 Bu Prang International Border Gate. 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 and medical centres.

118. **Mitigation measures:** Dak Nong 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, especially in the sensitive area.

2. Favourable conditions for transportation of goods and people movement

119. **Description:** The upgraded road will favor the good transportation to Bu Prang Border Gate. Support movement of local people on the road in rainy condition. As it support better transportation of goods, especially agricultural product, the time for transportation will reduce and the profit will increase. The completion of the road will favour people in the 4 communes of Tuy Duc and Dak Song districts and surrounding residential areas as well as people who doing business along the subproject road.

3. Driving conditions and community safety

120. **Description:** 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.

4. Affects on employment or livelihood

121. **Description:** 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 Tuy Duc and Dak Song districts will be benefited from the completion of the road. This is a permanent impact and has significant effects to local people's lives.

5. Impacts on ethnic groups

122. **Description:** 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

123. 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

124. 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 subproject road included representatives from Dak Nong DPI, DONRE, and DARD. Consultation has also been implemented with representatives from 4 CPCs in Tuy Duc and Dak Song districts, representative of Forest Management Board, Bu Prang Border Gate. 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 37 local people have been interviewed with 16 of them are women. Consultations took place in September 2015 and April 2016.

B. Information dissemination during public consultation

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

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

126. 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; and (iv) grievance redress mechanism.

C. Obtained results and use of results from public consultation

127. 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 road has been constructed more than 10 years ago and different parts have been severely damaged, upgrade road surface will support goods transportation from Dak Nong and other surrounding provinces to Bu Prang Border Gate. The main construction work will be upgrade

road surface based on the existing road foundation, 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
Forest protection at 2 km goes through Border Protection Forest.	DARD: This forest area is mainly located in Cambodia. The area managed by Vietnam is not large. DPI: This area has been planned to change to transportation land in accordance to Transportation Development Plan to 2020 of the province.
Soil erosion and drainage system of the subproject road	Dak N'Drung CPC: There is no drainage system along the route. The road level is high in compare with local people house along the route in Dak N'Drung commune. Good drainage system must be constructed to ensure runoff water will not flow over cultivation area of local people
Construction time	Tuy Duc district: The contractors should cooperate with local authorities to inform local people on construction schedule and scope.

Table 12 – Main environmental concerns from public consultation

Concerns expressed	How concerns are addressed in IEE
Forest protection at 2 km goes through Border Protection Forest.	CSC and PMU safeguards staff will supervise closely the tree cut down process to ensure no tree out of the cut-down list will be affected. The Border Watershed Management Board – the management unit of the protection forest area - will be informed about the construction time and schedule, scope of works as well as location of worker camps and material storage sites. No construction camps, large material storage sites are to be located in the forest areas. 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. The contractors should not buy or use wood from illegal sources. PMU, ESP and CSC will strictly supervise and monitor the construction activities to ensure they will be done properly on the existing road foundation.
Suitable compensation	Before construction start, PMU will review the Land Acquisition and Resettlement Report and check at the site to ensure that all the 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.
Soil erosion and drainage system of the subproject road	The design of the road must follow the relevant regulations. Construction methods and schedule will be informed in advance to local people. CPCs in cooperation with PMU and CSC will monitor the compliance during construction phase. Contractor work with Dak N'Drung CPC to support local people using excavation soil to level up their living areas.
Clean waste on the road side	ESP will support PMU prepare WMSDP before the construction start. CSC and PMU will strictly supervise the contractors to ensure suitable mitigations measures will be applied as stated in WMSDP.

128. 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. Dak Nong PMU will responsible for IEE

translation to Vietnamese and disclose at 4 subproject communes of Dak Song and Tuy Duc districts.

VIII. GRIEVANCE REDRESS MECHANISM

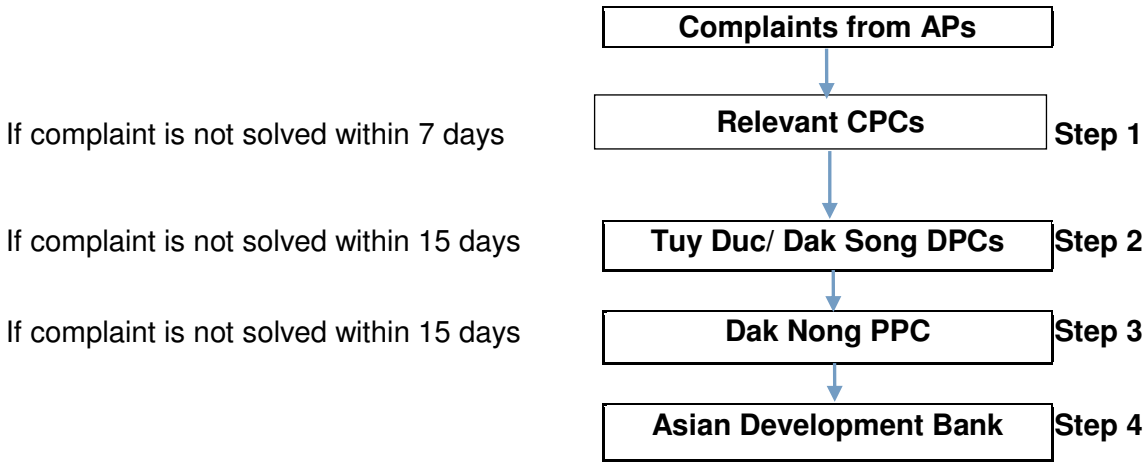
A. Purpose of the mechanism

129. 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

130. 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 Tuy Duc/ Dak Song DPC to resolve the complaint.
- ***Stage 3***: If more than 15 days but no official response from Tuy Duc/ Dak Song DPCs, the complainant may submit a complaint in the written form to the Dak Nong PPC (through Dak Nong DONRE). Dak Nong PPC will require Tuy Duc/ Dak Song DPCs to solve the complaint. In case the complaint is still not resolved, Dak Nong 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

131. Dak Nong PMU will recruit one Environment Safeguard Specialist (ESP) under Loan Implementation Consultants (LIC) to support subproject implementation in Dak Nong. 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.

132. 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

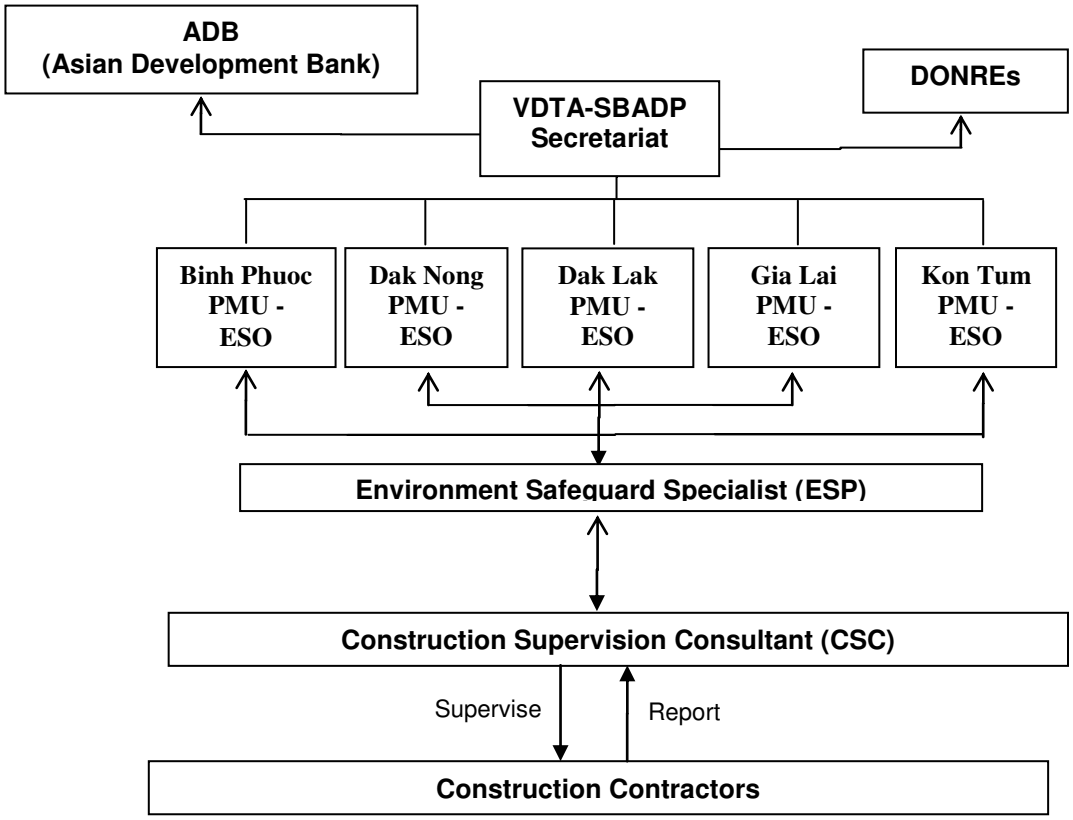
Agency	Responsibilities
Dak Nong Department of Planning and Investment	- Executing agency with overall responsibility for subproject construction and operation - Ensure that sufficient funds are available to properly implement the EMP Ensure that the Subproject, regardless of financing source, complies with the provisions of the EMP and ADB Safeguard Policy Statement 2009 (SPS) - Ensure that Subproject implementation complies with Government environmental policies and regulations - Ensure that tender and contract documents include the Subproject updated EMP - Submit semi-annual monitoring reports on EMP implementation to ADB
Provincial Project Management Unit under DPI (PMU)	- 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 CSC and ESP. - Ensure that Subproject implementation complies with ADB's environmental policy and safeguards policy statement (SPS 2009) principles and requirements - For subproject duration, commit and retain 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)	- 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)	- 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. - 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)	- 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	- 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
Dak Nong Department of Transportation (DOT)	- Responsible for operation and maintenance of Subproject road - Implement EMP monitoring during operation
Dak Nong Department of Natural Resources and Environment (DONRE)	Review and approve environmental assessment reports required by the Government. - Undertake monitoring of the subproject's environmental performance based on their mandate

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

Figure 3 – EMP Implementation Organization Chart



B. EMERGENCY RESPONSE PLAN

133. 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...

134. 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.

135. With the four types of emergency case listed in paragraph 133 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.

136. 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.

137. 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

138. 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.

139. 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, 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 Dak Nong on climate change. Check the plan for using excavation soil for levelling up in Dak N'Drung 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	ESP	Before construction	N/A	Included in the contract with ESP
3. Environmentally responsible procurement	EMP is properly implemented by selected contractors	1. EMP is included in tender documents to ensure that mitigation measures are budgeted and to prepare the contractors for environmental responsibilities. 2. 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. 3. 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
4. Material Management Plan	Manage material storage area to avoid runoff and sedimentation	1. Designs to balance excavation and fill where possible. 2. Prepare an MMP. The plan shall detail 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: (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,	ESP	Before bidding	N/A	Included in the contract with ESP

		(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.				
5. Plan spoil and waste disposal	Minimize waste and pollution	1. Re-use of waste materials & spoil disposal locations included in bid and contract documents. 2. Prepare a 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: 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 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) Programme for disposal of general waste / hazardous waste. viii) Discussion of the ESP, PMU/CSC	ESP	Before bidding	N/A	Included in the contract with ESP

		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.				
6. Unexploded Ordnance	Avoid accidents due to any kind of UXO	1. Coordinate with appropriate agencies at the design stage to identify if UXO is a potential threat to works 2. Based on the findings, engage an authorized UXO clearing contractor (usually from Dak Nong Military Command, as necessary. 3. Ensure that the contractors shall only commence site works after the UXO clearing firm has certified that the subproject areas are already cleared.	ESP	Before bidding	N/A	Included in the contract with ESP
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 impacts to fauna	Avoid and minimize impact to flora and fauna in the subproject area	1. Minimized vegetation covers clearances. 3. Prohibit cutting of trees for firewood and for use in subproject. 4. During replanting 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.	Nam N'Jang; Dak N'Drung; Dak Buk So; Quang Truc CPCs; Contractors	Through out construction phase	Along the subproject road, especially 2 km go through protection forest in Dak Buk So commune;	Included in the contract with contractors

		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. 6. Contractors shall not buy or use wood from the illegal sources (that come from the illegal logging) 7. No construction camps, concrete mixing plants, material storage sites are to be located in the forest area. 10. 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.			worker camps area	
2. Local facilities	Prevent interruption of services such as electricity and water supply during relocation of the local facilities. Repair damaged access roads.	1. Reconfirm power, water supply, and telecommunications likely to be interrupted by the works. 2. Contact all relevant local authorities for facilities and local people to plan re-provisioning of power, water supply, and telecommunication systems. 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. 4. Affected communities shall be properly informed in advance. 5. Reconnection of facilities shall be done at the shortest practicable time before construction commences. 6. Facilities damaged during construction shall be reported to the CSC, PMU and facility authority and repairs arranged immediately. 7. Access roads, agricultural land and other	Contractors	Before construction start and through out the construction phase	Along the subproject route; at the residential areas	Included in the contract with contractors

		properties damaged during transport of construction materials and other project-related activities shall be reinstated upon completion of construction works at each section				
3. Materials exploitation and management of quarry, borrow pits and temporary storage area	Minimize impacts from materials extraction, transportation and storage.	1. Implement MMP prepared by ESP during detailed design phase. 2. Balance excavation and fill requirements to minimization negative impacts 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. 4. Procure materials only from Dak Nong DONRE authorized quarries and borrow sites. 5. Replant tree and vegetation cover of any vegetation clearance area in quarries and borrow pits 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. 7. Borrow/quarry sites shall not be located in productive land and forested areas. 8. During quarry/borrow site operation, provide adequate drainage to avoid accumulation of stagnant water. 9. 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. 10. 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. 11. 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.	Contractors	Though out construction phase	Subproject site, quarries and borrow pit areas	Included in the contract with contractors
4. Waste and spoil disposal	Control spoils and waste disposal,	1. Implement corresponding provisions of WMSDP prepared by the ESP.	Contractors	Through out construction	Through out construction	Included in the contract

	lubricant and hazardous wastes.	2. Areas for disposal to be agreed with CPCs and Dak Nong 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 disposal 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.		phase	site, material storage areas, machines and vehicles maintenance area	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. 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. 8. Mixing, bitumen heating plants operations will be equipped with dust suppression	Contractors	Through out construction phase	Through out construction site especially at the sensitive areas such as schools/ kindergarten, medical centers…	Included in the contract with contractors

		devices such as water sprays. 9. Clean up road surfaces after work. 10. To protect buildings and structures from vibration, non-vibrating roller shall be used in construction sites near buildings and structures. 11. Structures, which are damaged due to vibration caused by the construction activities, shall be repaired immediately as directed by ESP/PMU. 12. Machinery shall be turned off when not in use. 13. Pile driving during to be schedule for daytime if construction site is near sensitive points or approved by DONRE, CPCs and ESP/PMU. 14. Impose speed limits on construction machines and transportation vehicles to minimize dust emission along areas where sensitive pints are located (houses, schools, clinics, pagodas etc.).				
6. Erosion control/ run off	Protect established facilities	1. Establish vegetation and erosion protection immediately after completion of works in each stretch / sector. 2. Check weather forecasts and minimize work in wet weather. 3. Stockpile topsoil for immediate replanting after cutting. 4. Minimize damage and excavation of surrounding vegetation during slope formation. 5. Protect the cut slope with planted vegetation, bioengineering or conventional civil engineering structures as soon as practicable after excavation. 6. Include and implement appropriate measures for slope protection, i.e. vegetation cover and stone pitching, as required in the detailed construction drawings. 7. Prevent erosion and protect the excavated slope with temporary or permanent drainage as soon as practicable after cutting. 8. If new erosion occurs accidentally, back	Contractors	Through out construction phase	Through out construction site and high risk slope as agreed with ESP/PMU (especially from Km34+700 to Km34+800)	Included in the contract with contractors

		fill immediately to restore original contours. 9. Low embankments will be protected from erosion by seeding and planting indigenous grasses that can flourish under local conditions. 10. 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.				
7. Stream protection and bridge/culvert construction	Protect stream and maintain flows	In sections along and near streams and water bodies: 1. Rocks and stones will be disposed not to block streams. 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. 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.	Contractors	Through out construction phase	3 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	1. Province adequate drainage facilities at construction sites and worker camps to avoid stagnant water. 2. Implement agreed designs for bridges/ culverts sufficient to control flooding as designed. 3. Store lubricants, fuels and wastes in dedicated enclosures at least 50 m from water bodies on high and impervious ground with top cover 4. Solid waste from construction activities and workers camps will not be thrown in streams and other water bodies (drainage, lake, pond, etc.) 5. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off. 6. Stockpiled materials will be covered to	Contractors	Through out construction phase	3 stream/ flow crossing positions, material storage sites, temporary waste disposal area	Included in the contract with contractors

		reduce silted run-off. 7. No stockpiling or borrow sites at least 100m of water body. 8. Work in streams at bridge repair sites will be scheduled during dry season and work duration shall be as short as possible. 9. Washing of machinery and vehicles in surface waters shall be prohibited.				
9. Large influx of construction workers	Construction camps and worker camps not to cause any negative impact to surrounding environment (forest area, water bodies, wild animal)	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. 2. Hire and train as many local workers as possible. 3. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas. 4. Mobile toilets (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and prevented by cleaning lavatories daily and by keeping toilets clean at all times. 5. Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers. 6. Borrow pits and natural depressions with pre-laid impervious liners will be used to dispose of scarified/scraped asphalt, and then covered with soil. This will check potential groundwater contamination. 7. As much as possible, food shall be provided from farms nearby and bush meat supplies will be banned to discourage poaching. 8. Camp site will be cleaned up to the satisfaction of and local community after use. 9. Solid and liquid waste will be managed in line with WMSDP. 10. All waste materials shall be removed and disposed to disposal sites approved by local authorities 11. Land used for campsites shall be	Contractors	Through out construction phase	Through out construction sites and worker camps	Included in the contract with contractors

		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.				
10. Safety precautions for workers	Ensure worker safety	1. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers. 2. Scheduling of regular (e.g., weekly tool box talks) to orient the workers on health and safety issues related to their activities as well as on proper use of personal protective equipment (PPE). 3. Fencing on all excavation, borrow pits and sides of temporary bridges. 4. Workers shall be provided with appropriate PPE such as safety boots, helmets, safety glasses, earplugs, gloves, etc. at no cost to the employee. 5. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles. 6. Workers shall be provided with reliable supply of potable water. 7. Construction camps shall be provided with adequate drainage to avoid accumulation of stagnant water. 8. Construction camps shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained to allow effective operation. 9. Ensure reversing signals are installed on all construction vehicles.	Contractors	Through out construction phase	Through out construction sites	Included in the contract with contractors
11. Traffic Management	Minimize disturbance of traffic	1. Communicate to the public through local officials regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions. 2. In coordination with local traffic authorities, implement appropriate traffic diversion schemes to avoid inconvenience	Contractors	Through out construction phase	Through out construction sites; at start and end points of Section 1; junctions with National Road No.14c.	Included in the contract with contractors

		due to subproject operations to road users, ensure smooth traffic flow and avoid or minimize accidents, traffic hold ups and congestion 3. In coordination with local traffic officials, schedule transport of materials to avoid congestion, set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up. 4. Provide safe vehicle and pedestrian access around construction areas. 5. Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous conditions. 6. Provide sufficient lighting at night within and in the vicinity of construction sites. 7. Designate traffic officers in construction sites.				
12. 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. 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.	Dak Nong Department of Transportation (DOT)	Through out operation phase	At the start and end point of two sections. At the sensitive areas closed to schools/ kindergarten, medical centres	Included in operation and maintenance cost
2. Traffic and road safety	Minimize road accident	1. Undertake road safety awareness 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).	Dak Nong DOT	Through out operation phase	Along two sections subproject road	Included in operation and maintenance cost

D. Environmental monitoring

1. Compliance Monitoring

140. 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 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 Dak Nong DOT.

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

142. 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.

143. 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 mixing (if required) in line with all environmental regulations and permit conditions from provincial authorities.

144. At construction phase, the Contractors need to implement environmental monitoring in a monthly basis in all their construction sites. 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.

145. Dak Nong Department of Transportation will be in charge of EMP implementation in the operation phase. The tasks are including monitoring of dust, noise and natural calamity mitigation measures... They also monitor the accidents along the subproject road as basis for implementation of mitigation measures to improve road safety.

2. Environmental Effects Monitoring

146. 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 ground water quality; 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. Dak Nong DOT will responsible for ambient air quality monitoring in the first two years of the operation phase.

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 commencement	Dak Nong DPI/ DONRE; PMU	Included in the operation budget of PMU
3. 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
4. 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
5. 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
6. Unexploded Ordnance	Checking documents/ certificates	N/A	Once, before construction start	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 impacts to fauna	Check of implementation	Along the subproject road, especially 2 km go through protection forest in Dak Buk So; 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 management of	Check of implementation	Subproject site, quarries and	Bi-weekly	ESP/ PMU	Included in the operation budget

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, PM2.5, PB, NO_2, SO_2…); Noise level (average noise level, maximum noise level, vehicles frequency…)	11 monitoring points: at start and end points of 2 sections. T-Junction with the road to NR14; Near Dak N'Drung centre; near Quang Vu quarry; near Ba Bridge; T-junction with NR14C; in the protection forest area; near Quang Truc centre.	1 time before construction start and semi-annually during 2 years construction time	ESP	3,300 USD[2]
6. Land slide, erosion control/ run off	Check of implementation	Through out construction site and high risk slope as agreed with ESP/PMU (especially in Km34)	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	3 streams/ rivers crossing point	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC

[2] Figures has been estimated base on environmental monitoring cost norm of Dak Nong – Decision No. 17/2015/QD-UBND.

8. Water resources and quality	Check of implementation	Through out construction sites; 3 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 in total. 3 sampling points at 20m downstream of the crossing stream. 1 sampling point Dak N'Drung lake; 1 sampling point in Dak Huyt bridge area	1 time before construction start and every quarter during 2 years construction time	ESP	4,050 USD
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 Labor Code of Vietnam and other relevant Decision, Decree and Circular under Government requirements	Through out construction sites	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
11. Traffic Management	Check of implementation	Through out construction sites; at junctions with road to NR14; start and end points of 2 sections; T-junction with NR14c.	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
12. Environmental recovery	Confirmed implementation of required enhancements	Through out construction sites	Before construction and bi-weekly check	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/

			Part of daily construction supervision		CSC
Operation Phase					
1. 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 two sections. At the sensitive areas (schools/ kindergarten, medical centres/ area of protection forest	Semi-annual in the first two years	Dak Nong DOT	Included in operation and maintenance cost
2. Road safety	Check of implementation	Along two sections of the subproject road	Semi-annual	Dak Nong DOT	Included in the operation budget of DOT

E. Reporting

147. 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	ESP
	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.	Dak Nong DOT	Dak Nong DONRE

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

Item	Estimated cost (US$)
1. Environment Safeguard Specialist of ESP	***76,910***
1 National ESP - 14 man-months (intermittent in the first 2 years; 6 – 4 – 4) – 4000 US$/ 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)	***7,350***
Ambient air quality: 11 monitoring locations x 5 times x 60 US$/sample[3]	3,300
Surface water quality: 5 monitoring locations x 9 times x 90 US$/sample[4]	4,050
3. Training/orientation, local transportation, supplies (by ESP)	***21,500***
a) Training/orientation: 1 formal training course for PMU, CSC, Contractors and Dak Nong 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)	**113,760**
5. Contingency	**11,240**
Total (1+2+3+4+5)	**125,000**

F. Capacity building

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

149. The most significant challenge is the lack of human and financial resources and necessary infrastructure. To address this constraint, Dak Nong 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 Unit (PPU) will be come ESO of the subproject PMU also. The ESO and other relevant staff of PMU will be trained by the environment specialists of the ESP during subproject implementation as "on the job" training or by formal training courses.

[3] Due to there is no cost norm for Dak Lak province, figures has been estimated base on environmental monitoring cost norm of Dak Nong – Decision No. 17/2015/QD-UBND.
[4] Due to there is no cost norm for Dak Lak province, figures has been estimated base on environmental monitoring cost norm of Dak Nong – Decision No. 17/2015/QD-UBND.

Table 18 – Detail capacity building program

Objective	1. Build capacity and procedures in undertaking systematic environmental assessments in accordance with Government regulations and ADB guidelines 2. Provide training on international best practice on environmental management, monitoring and reporting. 3. Provide guidance on how to effectively incorporate environmental measures into project design and how to incorporate EMP provisions into tender and contract documents.
Tasks/Scope of Work	1. Undertake training needs analyses and review prevailing government regulations and donor guidelines governing the assessment and management of environmental impacts for road development. 2. Review the skills of PMU and Dak Nong 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 Dak Nong 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

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

151. The implementation of the subproject "Upgrade Road from NR No.14 to Bu Prang Border Gate (Section Km3-Km17 of PR No.686 and Section From Tuy Duc District Centre to Dak Huyt Bridge) – Dak Nong Province" will steadily improve the road quality; make it convenient for goods transportation to Bu Prang 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. 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.

152. 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 develop follow-monitoring plan as specified in the EMP. With these measures in place, environmental impacts of the subproject should be manageable and will not result in any residual impacts, which are above accepted environmental standards.

Appendix 1: Photos of the subproject road and the vicinity

S1 - Starting point in Nam N'Jang commune

Quang Vu quarry at the road side of the subproject

Low roadside in Dak N'Drung commune

Dumping site in Quang Truc commune

Area goes through 2 km of protection forest

High slope at Km34 of the road

Military Base of Unit No.726 is under construction

Endpoint at Dak Huyt Bridge

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 resevoirs	(-15) Some steep slopes on the road	(-15) 7 bridegs/ 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) Widing road with high moutains	(-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.
Daklak	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
Daknong	Dak Buk So – Bu Prang	(-20) Border protection forest. Bu Gia Map National Park (in Binh Phuoc province)	(-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
	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. *Dak Nong Statistic Report 2014*
2. *Tuy Duc and Dak Song Statistic Report 2014*
3. *Statistics of poor households and marginal poor households of Dak Song and Tuy Duc District People's Committee in 2015*
4. *Statistics of poor households of Labour Invalids and Social Affairs of Dak Song and Tuy Duc District People's Committee in 2015*
5. *Statistics Division of Dak Song and Tuy Duc District people's committee in 2015*
6. *Statistic Division of area by administrative unit of Dak Song and Tuy Duc district in 2015*
7. *Healthcare Centre of Dak Song and Tuy Duc Districts people's committee in 2015*

Appendix 4: Environmental Mitigation Measures to Include into Bidding Documents

1. Loss of trees and impacts to fauna	1. Minimized vegetation covers clearances. 3. Prohibit cutting of trees for firewood and for use in subproject. 4. During replanting 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. 5. 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. 6. Shall not buy or use wood from the illegal sources (that come from the illegal logging) 7. No construction camps, concrete mixing plants, material storage sites are to be located in the forest area. 10. 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.
2. Local facilities	1. Reconfirm power, water supply, and telecommunications likely to be interrupted by the works. 2. Contact all relevant local authorities for facilities and local people to plan reprovisoning of power, water supply, and telecommunication systems. 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. 4. Affected communities shall be properly informed in advance. 5. Reconnection of facilities shall be done at the shortest practicable time before construction commences. 6. Facilities damaged during construction shall be reported to the CSC, PMU and facility authority and repairs arranged immediately. 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
3. Materials exploitation and management of quarry, borrow pits and temporary storage area	1. Implement MMP prepared by ESP during detailed design phase. 2. Balance excavation and fill requirements to minimization negative impacts 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. 4. Procure materials only from Dak Nong DONRE authorized quarries and borrow sites. 5. Replant tree and vegetation cover of any vegetation clearance area in quarries and borrow pits 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. 7. Borrow/quarry sites shall not be located in productive land and forested areas. 8. During quarry/borrow site operation, provide adequate drainage to avoid accumulation of stagnant water. 9. 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. 10. 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. 11. 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	1. Implement corresponding provisions of WMSDP prepared by the ESP. 2. Areas for disposal to be agreed with CPCs and Dak Nong 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.
5. Noise, dust and vibration	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. 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. 8. Mixing, bitumen heating plants operations will be equipped with dust suppression devices such as water sprays. 9. Clean up road surfaces after work. 10. To protect buildings and structures from vibration, non-vibrating roller shall be used in construction sites near buildings and structures. 11. Structures, which are damaged due to vibration caused by the construction activities, shall be repaired immediately as directed by ESP/PMU. 12. Machinery shall be turned off when not in use. 13. Pile driving during to be schedule for daytime if construction site is near sensitive points or approved by DONRE, CPCs and ESP/PMU. 14. Impose speed limits on construction machines and transportation vehicles to minimize dust emission along areas where sensitive pints are located (houses, schools, clinics, pagodas etc.).
6. Erosion control/ run off	1. Establish vegetation and erosion protection immediately after completion of works in each stretch / sector. 2. Check weather forecasts and minimize work in wet weather. 3. Stockpile topsoil for immediate replanting after cutting. 4. Minimize damage and excavation of surrounding vegetation during slope formation. 5. Protect the cut slope with planted vegetation, bioengineering or conventional civil engineering structures as soon as practicable after excavation. 6. Include and implement appropriate measures for slope protection, i.e. vegetation cover and stone pitching, as required in the detailed construction drawings. 7. Prevent erosion and protect the excavated slope with temporary or permanent drainage as soon as practicable after cutting. 8. If new erosion occurs accidentally, back fill immediately to restore original contours. 9. Low embankments will be protected from erosion by seeding and planting indigenous grasses that can flourish under local conditions. 10. 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.
7. Stream protection and bridge/culvert construction	In sections along and near streams and water bodies: 1. Rocks and stones will be disposed not to block streams. 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. 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.
8. Impact on water resources and quality	1. Province adequate drainage facilities at construction sites and worker camps to avoid stagnant water. 2. Implement agreed designs for bridges/ culverts sufficient to control flooding as designed. 3. Store lubricants, fuels and wastes in dedicated enclosures at least 50 m from water bodies on high and impervious ground with top cover 4. Solid waste from construction activities and workers camps will not be thrown in streams and other water bodies (drainage, lake, pond, etc.) 5. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off. 6. Stockpiled materials will be covered to reduce silted run-off. 7. No stockpiling or borrow sites at least 100m of water body. 8. Work in streams at bridge repair sites will be scheduled during dry season and work duration shall be as short as possible. 9. Washing of machinery and vehicles in surface waters shall be prohibited.
9. Large influx of construction workers	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. 2. Hire and train as many local workers as possible. 3. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas. 4. Mobile toilets (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and prevented by cleaning lavatories daily and by keeping toilets clean at all times. 5. Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers. 6. As much as possible, food shall be provided from farms nearby and bush meat supplies will be banned to discourage poaching. 7. Camp site will be cleaned up to the satisfaction of and local community after use. 8. Solid and liquid waste will be managed in line with WMSDP. 9. All waste materials shall be removed and disposed to disposal sites approved by local authorities 10. 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.
10. Safety precautions for workers	1. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers. 2. Scheduling of regular (e.g., weekly tool box talks) to orient the workers on health and safety issues related to their activities as well as on proper use of personal protective equipment (PPE). 3. Fencing on all excavation, borrow pits and sides of temporary bridges. 4. Workers shall be provided with appropriate PPE such as safety boots, helmets, safety glasses, earplugs, gloves, etc. at no cost to the employee. 5. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles. 6. Workers shall be provided with reliable supply of potable water. 7. Construction camps shall be provided with adequate drainage to avoid accumulation of stagnant water. 8. Construction camps shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained to allow effective operation. 9. Ensure reversing signals are installed on all construction vehicles.
11. Traffic Management	1. Communicate to the public through local officials regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions. 2. In coordination with local traffic authorities, implement appropriate traffic diversion

	schemes to avoid inconvenience due to subproject operations to road users, ensure smooth traffic flow and avoid or minimize accidents, traffic hold ups and congestion 3. In coordination with local traffic officials, schedule transport of materials to avoid congestion, set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up. 4. Provide safe vehicle and pedestrian access around construction areas. 5. Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous conditions. 6. Provide sufficient lighting at night within and in the vicinity of construction sites. 7. Designate traffic officers in construction sites.
12. Environmental recovery	Reconfirm and implement recovery (e.g., landscaping, tree replanting) identified at the detailed design stage

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 solidss (TSS)	mg/l	20	30	50	100
4	COD	mg/l	10	15	30	50
5	BOD_5 (20^0C)	mg/l	4	6	15	25
6	Ammonium (NH^+_4) (as N)	mg/l	0,1	0,2	0,5	1
7	Clorua Chloride (Cl^-)	mg/l	250	400	600	-
8	Florua 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
	Endosunfan(Thiodan)	µg/l	0,005	0,01	0,01	0,02
	Lindan	µg/l	0,3	0,35	0,38	0,4
	Chlordane	µg/l	0,01	0,02	0,02	0,03
	Heptachlor	µg/l	0,01	0,02	0,02	0,05
27	Organic phosphorus pesticide					
	Parathion	µg/l	0,1	0,2	0,4	0,5
	Malathion	µg/l	0,1	0,32	0,32	0,4
28	Herbicide					
	2,4D	µg/l	100	200	450	500
	2,4,5T	µg/l	80	100	160	200
	Paraquat	µg/l	900	1200	1800	2000
29	Total radioactivity α	Bq/l	0,1	0,1	0,1	0,1
30	Total radioactivity β	Bq/l	1,0	1,0	1,0	1,0
31	E.coli	MPN/ 100ml	20	50	100	200
32	Coliform	MPN/ 100ml	2500	5000	7500	10000

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

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

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

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

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

3. METHOD FOR DETERMINATION

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

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

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

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

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

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

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

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

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

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

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

- TCVN 6494-1999 - Water quality - Determination of ions of fluoride, chloride, nitrite, Orthophotphat, 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/QD-BKHCNMT dated June 25, 2002 of the Minister of Science, Technology and Environment.

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

QCVN 09 : 2008/BTNMT

NATIONAL TECHNICAL REGULATION

ON UNDERGROUND WATER QUALITY

Introduction

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

NATIONAL TECHNICAL REGULATION

ON 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 CaCO3)	mg/l	500
3	Total solids	mg/l	1500
4	COD ($KMnO_4$)	mg/l	4
5	Ammonium (as N)	mg/l	0,1
6	Chloride (Cl-)	mg/l	250
7	Fluoride (F-)	mg/l	1,0
8	Nitrite (NO^-_2) (as N)	mg/l	1,0
9	Nitrate (NO^-_3) (as N)	mg/l	15
10	Sulgreasee (SO_4^{2-})	mg/l	400
11	Cyanide (CN-)	mg/l	0,01
12	Phenol	mg/l	0,001
13	Asenic (As)	mg/l	0,05

14	Cadimi (Cd) Cadmium (Cd)	mg/l	0,005
15	Lead (Pb)	mg/l	0,01
16	Chromium VI (Cr6 +)	mg/l	0,05
17	Copper (Cu)	mg/l	1,0
18	Zinc (Zn)	mg/l	3,0
19	Manganese (Mn)	mg/l	0,5
20	Mercury (Hg)	mg/l	0,001
21	Iron (Fe)	mg/l	5
22	Selenium (Se)	mg/l	0,01
23	Total radioactivity α	Bq/l	0,1
24	Total radioactivity β	Bq/l	1,0
25	E.Coli	MPN/100ml	Not found
26	Coliform	MPN/100ml	3

3. METHOD FOR DETERMINATION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4. IMPLEMENTATION ORGANIZATION

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

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

QCVN 05:2013/BTNMT

NATIONAL TECHNICAL REGULATIONS ON AMBIENT AIR QUALITY

Introduction

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

National Technical Regulation on Ambient Air Quality

1. GENERAL PROVISIONS

1.1. Scope of applications

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

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

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

1.2. Interpretation of terms

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

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

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

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

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

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

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

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

2. Technical Reputation

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

Table 1: Maximum value of basic parameters of ambient aire

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

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

2	CO	30.000	10.000	-	-
3	NO_2	200	-	100	40
4	O_3	200	120	-	-
5	Total Suspended Particle (TSP)	300	-	200	100
6	Dust PM_{10}	-	-	150	50
7	Dust $PM_{2,5}$	-	-	50	25
8	Pb	-	-	1,5	0,5
Note: (-) unspecified					