

# Initial Environmental Examination

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April 2017

## VIE: Basic Infrastructure for Inclusive Growth in the Northeastern Provinces Sector Project-Construction of Water Supply System in Boc Bo Commune, Pac Nam District, Bac Kan Province

Prepared by Planning and Investment Department of Bac Kan province for the Asian Development Bank.

## CURRENCY EQUIVALENTS

(as of 27 April 2017)

Currency unit	–	Viet Nam Dong (D)
D1.00	=	\$0.000044
\$1.00	=	Đ 22,730

## ABBREVIATIONS

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

The PPTA	–	The Project Preparatory Technical Assistant Consultants
The Project	–	Basic Infrastructure for Inclusive Growth in the Northeastern Provinces Sector Project
The Subproject	–	Construction of a Water Supply System for Boc Bo Commune, Pac Nam District, Bac Kan Province
UXO	–	Unexploded ordnance

#### **WEIGHTS AND MEASURES**

Km <sup>2</sup> (square kilometer)	–	unit of length
m <sup>3</sup> (cubic meter)	–	A measure of volume

#### **Note:**

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

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## I. EXECUTIVE SUMMARY

1. The proposed Basic Infrastructure for Inclusive Growth in the Northeastern Provinces Sector Project (BIIG 1) will invest in the recently completed Four Northeastern Provinces (FNEP) Overall Development Plan (2015). The development plan responds to the Government of Vietnam's strategy of targeting the investment into poorer provinces and regions. The use of a sub-regional approach seeks to build the interrelationship between provinces as one of the foundations for accelerating growth in the more remote regions. As such the plan targets investment into outputs that build areas of comparative advantage in a manner that increases the competitiveness of economic activity in the sub-region. The expected impact is to improve socio-economic wellbeing of local communities through the improved financial returns and through lower costs of accessing public health services, education, water supply and markets.

2. The project has four outputs being (i) FNEP road network connectivity improved, (ii) rural water supply improved, (iii) ARVCs in Lang Son improved, and (iv) decentralized public asset management processes implemented.

### A. Subproject Summary

3. The subproject is entitled "Construction of a Water Supply System for Boc Bo Commune, Pac Nam District, Bac Kan Province" and is a representative subproject for Output 2 of BIIG 1: Improved Rural Water Supply. The subproject has a design target of 1300m<sup>3</sup>/day to supply 1,081 households, government institutions and business. In all a total of 4,791 residents (beneficiaries) in Boc Bo commune, Pac Nam district center will be served by 2030. Its objectives are to improve public hygiene, improve the landscape and appearance of the rural area, and to improve the health status and living conditions of people living in the commune.

4. The proposed representative subproject is the water supply for Boc Bo commune, through the delivery of water taken from west tributary of Nang River. Of the fifteen villages in Boc Bo commune (2010 statistic) six are located in lowland and nine in highland. For the nine highland villages, the Subproject can only supply five being: Phieng Lung, Na Phan, Khau Dang, Khuoi Be, and Na Lay village due to terrain and distance constraints. The proposed subproject, including a Water Treatment Plant (WTP), will be constructed with the following design information:

**Table 1 - Water Supply System Boc Bo Commune, Pac Nam District**

Representative Subproject	Vinh Quang Town Hoang Su Pi
Project Daily Water Capacity (m <sup>3</sup> per day)	1,300
Number of households supplied	1,081
Total Population supplied	4,791
Dam Height (m)	Utilize existing Vang My Weir
Supply Area	Boc Bo commune
Number of admin units	1
Name of Operating unit	Market Management Board (MMB)
Total Investment (USD mill)	\$1,191,000
Invest \$/hh	\$1,102

5. The project, classified as Environment Category B, is judged to have limited potential adverse environmental impacts, particularly in relation to pipeline construction, access road construction activities and, to a lesser degree, the disposal of sludge from the water treatment plant (WTP). The unavoidable construction impacts are temporary and can be mitigated, whereas adverse impacts related to incorporating grey water in the design of the WTP has minimized the discharge.

6. This Initial Environmental Assessment complies with the laws, decrees and circulars, the national technical standards and national technical standards of Vietnam and the Asian Development Bank (ADB) policy.

## **B. Environment impacts and mitigation**

7. The project has very limited impacts on the natural environment, ecological resources and cultural assets. Most of the likely impacts are common for construction activities such as dust, noise, traffic disruptions, and waste can be prevented or minimized by standard mitigation measures.

8. During operation of the WTP, it is necessary to ensure that the management of chemical treatment process and new sludge tanks under the design meet the GOV discharge standards and water source protection management, hygiene condition of the WTP in accordance to Circular No.50/2015/TT-BYT<sup>1</sup>

9. In some proposed areas, the project may increase the volume of grey water that needs to be treated and released safely to the environment. It is recommended that before installing the new water connection in each subproject area, construction supervision consultants, PMU, and representatives of local sewerage unit make a general inspection to confirm that there is a combination of drainage system and grey water in the central area of Pac Nam district, Boc Bo commune to be able to handle the increased wastewater load. On the other hand, they will identify additional works to be carried out by the drainage system and / or the local community before the new connection is made.

10. The EMP for the subproject includes mitigation measures and monitoring processes to manage and assess the expected and unexpected impacts of this project. The EMP also specifies responsibilities for implementation, and capacity development and training requirements of Market Management Board (MMB) - response for subproject management in the operation phase and the appointed PMU to monitor the implementation of the EMP. The implementation of the EMP will require assistance from an environmental specialist (ESS), and a construction supervision consultant (CSC) to take part in the audit work of the EMP.

## **C. Information Disclosure, Public Consultation, and Grievance Redress**

11. According to Vietnamese law, for a water supply facility with a capacity less than 50,000 m<sup>3</sup>/day, it is not necessary to prepare an Environmental Impact Assessment Report (EIA) including public consultation but in accordance with the ADB Safeguard Policy Statement, for category B subprojects, it is necessary to conduct public consultation. As such, consultation on option of construction of WTP, technology processes, water supply alternatives, etc. is essential as a part of actual survey in project preparation. Public information and consultation activities

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<sup>1</sup> Circular No.50/2015/TT-BYT dated 11 December 2015 of the Ministry of Health, providing for the inspection of drinking water and domestic water's sanitation and quality

were carried out as part of a baseline survey of local environmental conditions along the projects sites. Meeting with local authorities took place on 12 September 2016. Public meeting was held in Boc Bo CPC on 14 September 2016.

12. During the consultation on environmental matters, local leaders and members of some households were given an introduction to the project, anticipated environmental impacts and mitigation measurements, the project implementation schedule and relevant environmental issues. Overall, there was no opposition raised with respect to the proposed subproject.

13. A three-step grievance redress mechanism will be established for the subproject, common to social as well as environmental safeguards to handle environmental impacts and land occupation. As a guideline, any complaints about any subproject's activity will be solved through negotiation to get agreement. Complaints will be submitted toward 3 levels of entities: First through CPC, then the DPC and finally through PPC. If an agreement was not reach, then they will be law court as the final method. MMB will bear all administrative and legal cost arising in such complaint solving processes in the operation phase.

#### **D. Institutional arrangement**

14. Bac Kan DPI will establish an Official Development Assistance (ODA) Project Management Unit (PMU) and assigned relevant staff to support the preparation of the subproject in the PPTA period. One member of the PMU has been assigned as the Environmental Safeguards Officer (ESO). The assigned ESO, has been participating in a training course on "Fundamental Safeguard and Gender Safeguard Policy Statement (SPS) of ADB" under TA8902-Vie Capacity Building for Project Management Unit Professionalization - organized by ADB in August 2016. Environmental specialist (ESS) for subproject implementation will organize a formal training course and on-the-job training for relevant PMU staff, Construction Supervision (CSC), communities, contractors; and support for establishment and operation of the subproject environment management system in construction phase. The ESS will also support PMU's capacity building by reviewing and evaluating the capacity for environmental protection of the PMU and MMB – subproject management organization in the operation phase.

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

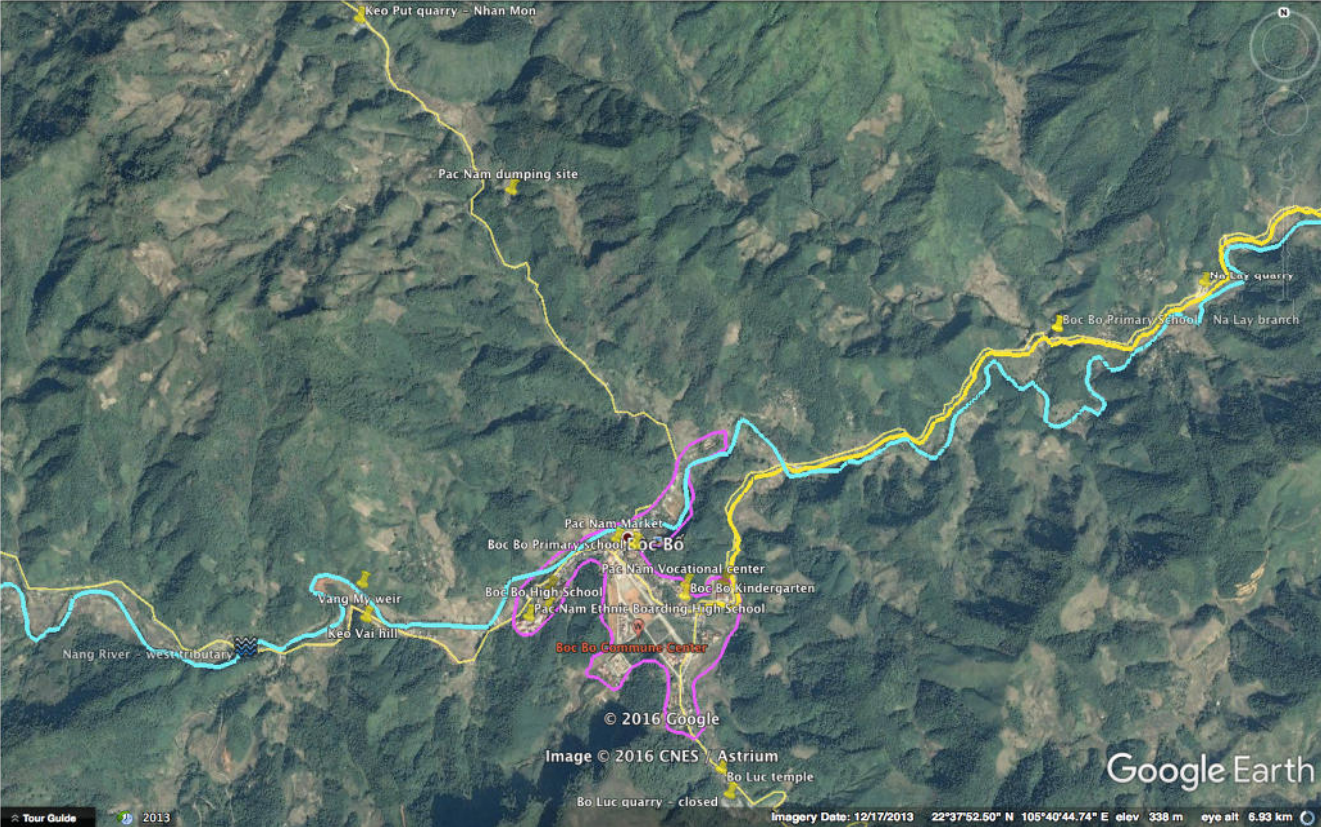
#### **E. Conclusion**

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



is not required. In case of any change in the subproject design, the ESS will update EMP before detail design finalization.

Figure 1 – General Map of Pac Nam District Center and Subproject Area



## II. BACKGROUND

### A. Objectives of the Subproject

#### 1. The Basic Infrastructure for Inclusive Growth in the Northeastern Provinces Sector Project

17. The subproject objectives will be achieved through construction of the water supply system, providing greater access to clean water, especially for people in the mountainous areas, including poor households. Specifically, including Water supply system for Boc Bo commune, Pac Nam district.

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

### III. POLICY AND LEGAL FRAMEWORK

19. The subproject shall comply with requirements of ADB SPS 2009 and the GOV's Guidelines on Implementation of the 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 subprojects such as quarry operations, extraction of gravel, etc., will also require permission from the relevant provincial level authorities.

#### A. ADB SPS Requirements

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

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

21. For environmental safeguards, the subproject is initially categorized as 'B'. A subproject which would be classified as category A on environmental safeguards would be ineligible as a BIIG 1 subproject.

#### B. Legal and Administrative Framework for Environmental Protection in Vietnam

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

##### 1. Laws

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

##### 2. Decrees and Regulations

- Decree No. 18/2015/ND-CP dated February 14, 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans.

- Circular No. 27/2015/TT-BTNMT dated May 29, 2015 on strategic environmental assessment, environmental impact assessment and environmental protection plans.
- Circular No.50/2015/TT-BYT dated 11 December 2015 of the Ministry of Health, providing for the inspection of drinking water and domestic water's sanitation and quality
- 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 legislation applicable to the subproject are the following**

- Decision No. 3733/2002/QĐ-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. PROJECT DESCRIPTION

### A. The need for subproject

23. The proposed water supply scheme is the water supply system for Boc Bo commune to deliver 1,300m<sup>3</sup>/day to supply 1081 households<sup>2</sup>. The scheme will construct a new water supply system with the distribution network.

24. Boc Bo town is partially served by a piped network supplied by a single pumping station located at the entrance to Bo La cave, Na Coc village with the capacity of approximately 55 m<sup>3</sup>/day. This only supplies 88 households and 16 government agencies located in the centre of Boc Bo commune. Constructed in 2001, the system has failed to deliver sufficient quantities of water and supply can be intermittent. There is no filtration and untreated water is delivered to households and there are complaints from local people relating to hard water. The scheme was constructed in 2003 and water losses are estimated at 40%. A survey of the existing water source concludes there is a complicated geological labyrinth with a catchment area of 5 km<sup>2</sup>. The existing scheme was operated by the DPC until 2010, when it transferred to the Marketing Management Board (MMB). The existing groundwater source has low turbidity however it is not able to supply the projected increase in demand. The expansion of the scheme will necessitate the use of surface water, which will have higher levels of contaminants and suspended solids and will necessitate the installation of a water treatment plant.

25. The existing water supply network is composed of high-density poly-ethylene (HPDE) pipe of total length 3,037, with diameters ranging from 75 mm to 34 mm. The scheme O&M is undertaken by the MMB and water charges are levied against individually metered household connections. Within the service area are a number of small household operated schemes using springs feeding tanks that suffice during rainy season but dry up or become polluted in the dry season.

26. Investment in construction of water supply systems is now an urgent need, in order to solve the shortage of clean water for people living in remote communes as well as local agencies, offices and schools; to ensure all-year-round water for households in the town center and neighboring communes; to solve drinking water shortages that lasted for years; to improve sanitation and health by providing clean water for households, offices, schools and health clinics in Pac Nam district center. The subproject will invest in construction of water supply systems and WTP in Pac Nam district.

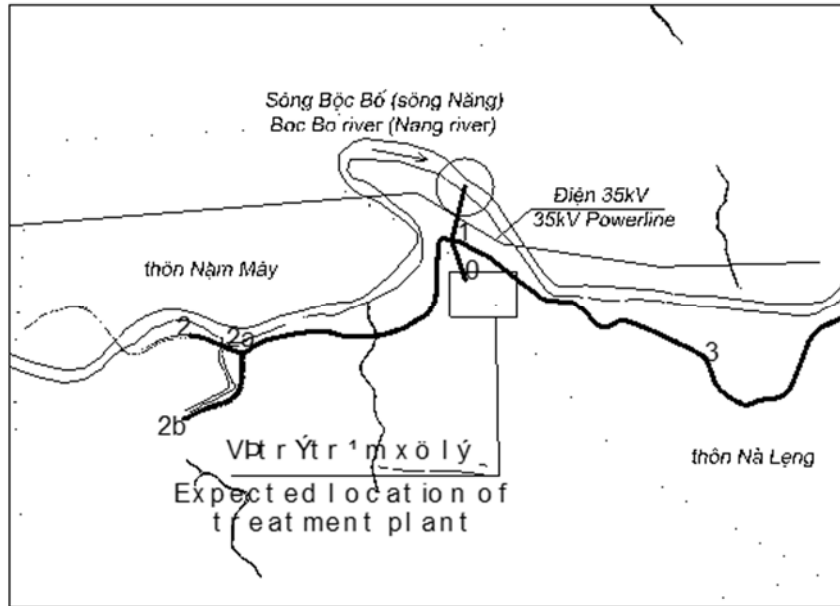
**The proposed subproject: Construction of a Water supply system for Boc Bo commune, Pac Nam district. Upon completion, the system will provide water for about 4,791 local people and staff in offices, schools, and health centers, even in dry seasons. The general location of the proposed Water Treatment Plant (WTP) is shown in**

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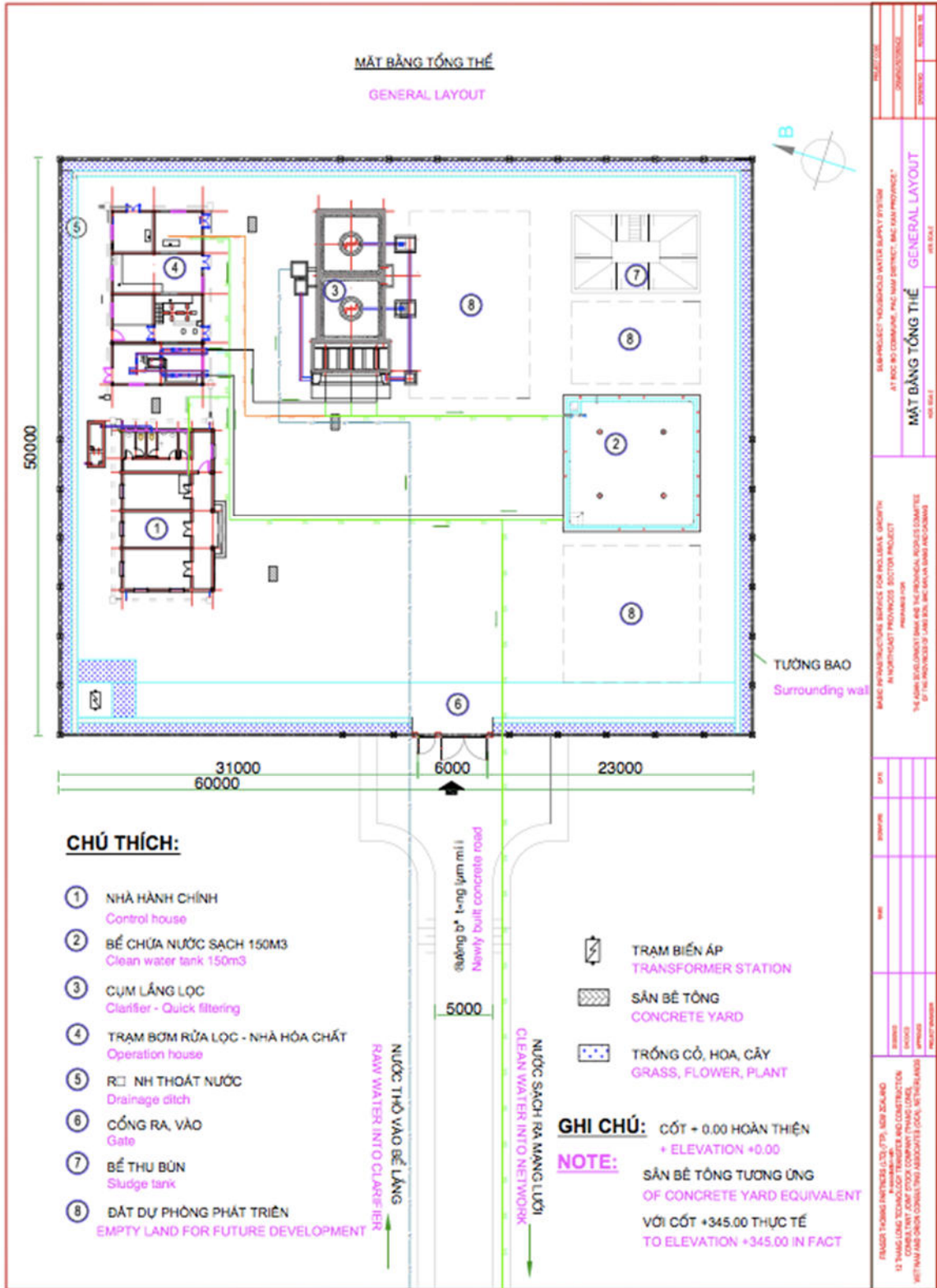
<sup>2</sup> Subproject Feasibility Study Main Report

27. Figure 2.

Figure 2 - Proposed layout plan







## **B. Location and scope**

28. The design and construction of new infrastructure works to address this challenge forms the basis of the Subproject. The existing pumping station is beyond rehabilitation and will be disbanded while the existing distribution pipelines shall amalgamated into the new water supply system. A layout plan of the proposed works, including the WTP is illustrated in Figure 2 above.

29. The new water supply scheme will be served from the Boc Bo river from a site selected just upstream of an existing 12.2 m wide reinforced concrete spillway (Vang My) in Nam May hamlet. A pumping station and intake structure will be constructed immediately upstream of the weir to take advantage of the heightened river level. The riverbank is stable and rock is close to the surface allowing the structure to be located on a sound foundation. It will extract and pump water via a rising main to a new water treatment plant (WTP), which is proposed to construct on top of Keo Vai hill, on the other side of PR 258B. This will involve construction of an access road which will follow an existing forestry track on a steep alignment (See Figure 5 below for more information). Raw water pipes are made of black steel with diameter of 250mm, length of about 200m. The velocity in the pipe is estimated to be 0.334m / s.

30. The treatment plant is to include vertical sedimentation tank, rapid filtration capacity of 1300m<sup>3</sup> / day, a clean water tank of 250m<sup>3</sup> capacity, a single story operation house, a single story management house, sludge tank and other auxiliary works such as landscaping, a gate, surrounding wall. See Table 2 below for specific parameters:

31. After treatment, water from the clean water tank will be distributed by 2km gravity main alongside PR 258B to Boc Bo commune. The pipe network is about 25,000 m, including the main and service pipelines to service the six villages at Boc Bo town, Boc Bo commune.

32. Other engineering construction issues include testing and confirmation of material sources identified during the field investigations, and sites for dumping waste material including excavated soil and waste e.g., concrete detritus from road crossings.

33. Water distribution pipelines will run alongside existing roads to minimize disruption and avoid costly compensation. They will transition down from large to small diameters and ultimately provide a metered house connection to each household. Valves and controls along the pipeline will control flows, quantify losses, and allow sections of the network to be isolated when a breakage or essential maintenance work is required. Where the pipeline crosses bridges or similar structures the pipeline will be in galvanized steel. Other than in situations where pipeline safety is threatened the pipe material will be HDPE<sup>3</sup>.

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<sup>3</sup> The subproject Feasibility Report

**Table 2 - Summary of Technical Information**

<b>Items</b>	<b>Technical Solution</b>
Location of water collector system	Boc Bo river in Nam May village, Boc Bo commune, Pac Nam district, Bac Kan province
Location of treatment plant	Nam May village, Boc Bo commune, Pac Nam district, Bac Kan province, on Keo Vai hill, on the other side of PR 258B from the water source
Water supply process summary	Water source → Intake → Coagulants (alum) → Mixing Equipment → Clarifier combined with reaction dividing wall → Sand filter → Chlorine disinfection → Clean water tank → Transmission and distribution network → Consumption.
Water collector	Water is collected through two DN250 pipes to the water collecting chamber of the raw water station, then pumped to the WTP
Clarifier	One unit consisting of two reactors combined with two vertical clarifiers, reinforced concrete structure, of dimensions 5.34x5.34x7.35m. 3 Quick filter reinforced concrete tanks of dimensions 2.3x2.0x5.67m. Filter capacity 1300m <sup>3</sup> /day.
Clean water tank	Tank capacity W = 250m <sup>3</sup> , by reinforced concrete with dimensions of 11x11x2.00m.
Operation house	Size: (15x7.8) m mortar (75) and brick structure with reinforced concrete roof (M200) 10cm thick, painted walls with one white layer and two yellow layers Washing filter pump: Q = 300m <sup>3</sup> /h, H = 15m, N = 20KW
Management house	Single storey brickwork building, 13.8m x 7.8m with reinforced concrete roof and foundation,
Sludge tank	Stone masonry (M100), 2m deep tank fitted with a sewage pump to pump sludge to tanker vehicles. Pump specification: Q= 20m <sup>3</sup> /h, H=7÷10 m, P= 1KW
Additional items	Items such as drains, perimeter walls, gate, landscaping, fully designed in compliance with current standards.
Transmission and distribution pipeline network	Pipe for distribution network is HDPE-PN10 with diameter from DN200 to DN63
Service pipeline network	HDPE-PN10 pipe with diameters D32-D40-D50 for service network.
Household meter connections	673 households

### **C. Cost estimate**

34. A construction cost estimate has been prepared based on the feasibility study outline designs and a bill of quantities (BOQ). The unit costs are the current rates published by the province. Detail information is listed in Table 2 below.

**Table 3 – Subproject cost estimate**

<b>Summary of Boc Bo Subproject Costs ex Tax</b>			
<b>No</b>		<b>VND mil</b>	<b>\$'000</b>
<b>1</b>	<b>Construction costs</b>		
	Materials	10076	451
	Labor	4548	203
	Equipment	2282	102
	<b>Subtotal</b>	<b>16907</b>	<b>756</b>
2	Equipment costs	326	15
3	Management costs	328	15
4	Consultancy	1848	83
5a	General costs and training	674	30
5b	Contract Management	174	8
6	Peripheral electricity costs	909	41
7	Land compensation	88	4
8	Contingency cost	2208	99
	Tax (10%)	2425	109
	<b>Total</b>	<b>26620</b>	<b>1191</b>

35. For the civil engineering, treatment plant, and distribution works the composition of the bill items, taking-off of quantities, and setting of the unit rates are in line with provincial procedures. The determination of bill items 5, which cover construction management and other costs, are expressed in accordance with standard procedures as a percentage of the civil engineering construction works. A contingency sum of 9% has been included.

## V. DESCRIPTION OF THE ENVIRONMENT

### A. Natural Conditions

#### 1. Topography, Geology, and Soils

36. Bac Kan has a complex topography with large altitudinal variation and different topography types including valleys, high hills, low mountains and lime stone mountains. The topography of Bac Kan could be divided into 4 main areas: the high mountain area; low mountain area; limestone mountain area; and valley.

37. The subproject is location, in Pac Nam district towards the northwest of the province is in the high mountain area with mountain ranges lying in a Northwest - Southeast direction.

38. The total land area of Bac Kan is 485,941 ha. In general, soils in Bac Kan are fertile with a thick topsoil layer. The main soil types in Bac Kan are: alluvial soils; soil on slopes and ferrosols. The subproject location near the west tributary of the Nang River is on alluvial soil, rich in nutrients and suitable for agriculture.<sup>4</sup>

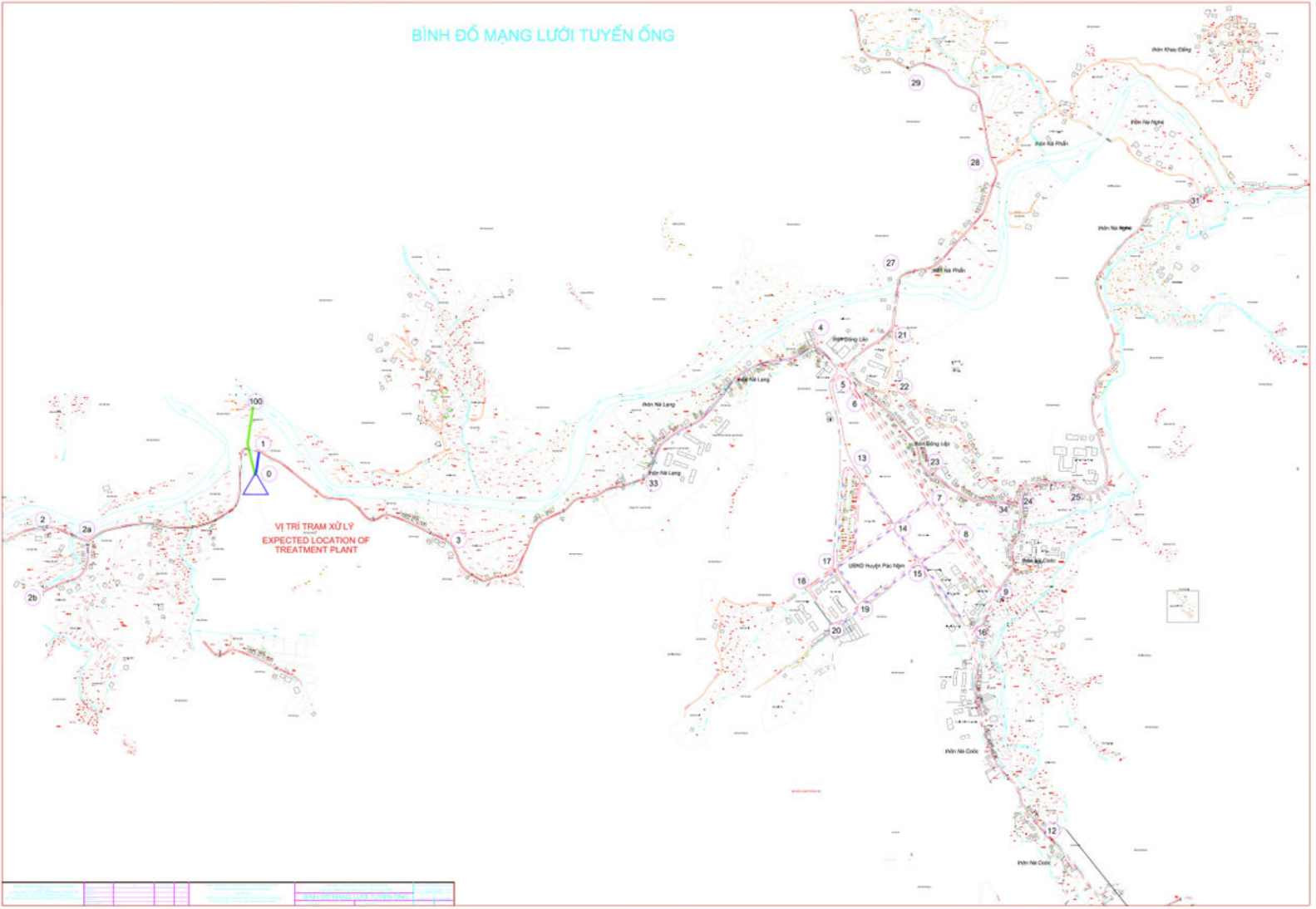
39. The subproject area includes Pac Nam district center and Boc Bo commune, Pac Nam district, shown in Figure 1Figure 3 below. The location is described as follows:

- (iv) Bordering with Nhan Mon, Bang Thanh communes, Pac Nam district to the North
- (v) Nguyen Binh district, Cao Bang province to the East
- (vi) An Thang, Xuan La, Co Linh communes, Pac Nam district to the South
- (vii) Cong Bang, Giao Hieu communes, Pac Nam district to the West

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<sup>4</sup> Status of Environment report (SOE) of Bac Kan province 2015 prepared by Environmental Protection Agency under Bac Kan DONRE

Figure 3 - Subproject Location



## 2. Weather, natural disaster and climate change

40. Bac Kan has a tropical monsoon climate with rainy summers and cold winters and relatively little rain. The climate varies with elevation and the direction of the mountain ranges. Affected by an arch shaped mountain range, the climate in Bac Kan is divided into 3 main areas:

- (i) The central area: the low area located between the Song Gam mountain range to the west and Ngan Son mountain range to the.
- (ii) The East and Northeast area: the mountainous area of the Ngan Son mountain range in a North - South direction with an open valley top the Northeast.
- (iii) The West and Southwest area, where the subproject is located. This includes the mountain ridges of Cho Moi, Pac Nam and Ba Be districts and has typically cold winter with less rain and rainy hot summers.

41. The average annual temperature varies from 20°C - 22°C. The hottest months of the year are May, June, July and August while the coolest months are December and January. The average temperature of Bac Kan has a rising trend in recent years as shown in Table 2 below.

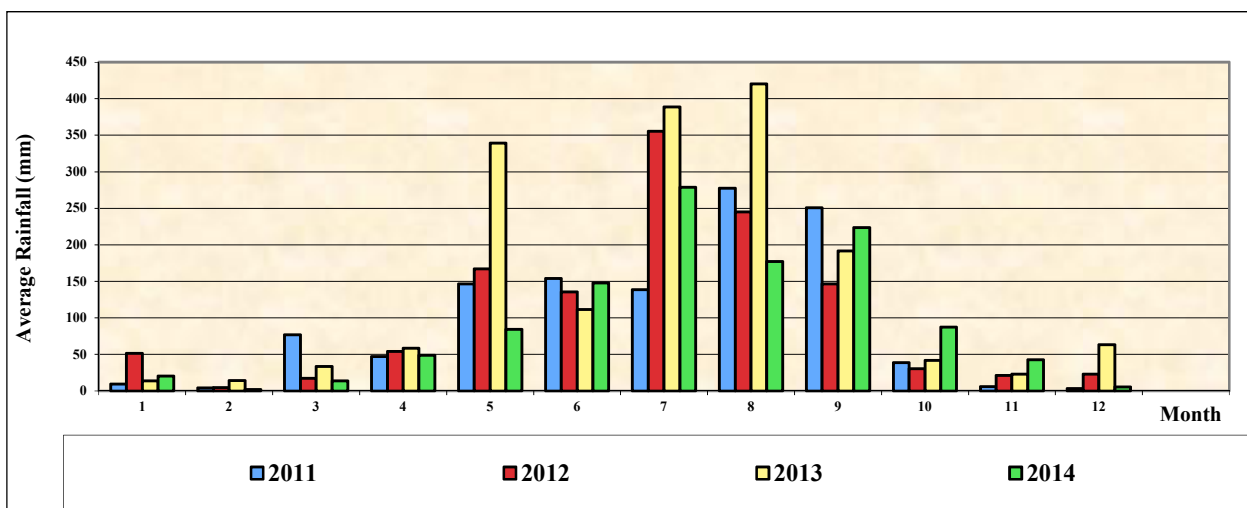
**Table 4 – Average annual temperature in 2011-2014 period**

Month \ Year	2011	2012	2013	2014
1	11.4	14.1	14.30	14.9
2	19.8	15.6	18.9	16.1
3	21	19.9	23.1	19.6
4	22.7	25.6	24	24.3
5	27.4	28	27.1	27.7
6	28.3	28.3	28.1	28.3
7	28.4	27.8	27.3	28.1
8	27.2	27.9	27.4	27.6
9	27.1	26	25.8	27.3
10	23.6	24.4	22.9	24.4
11	19.2	21.3	21	21
12	17.2	17	13.5	15.3
<b>Average annual temperature</b>	<b>21.98</b>	<b>22.99</b>	<b>22.78</b>	<b>22.9</b>

42. The annual average rainfall is about 1,756mm, distributed according to the topography and the seasons. The rainfall reduces from the West to the East of the province and from high to lower areas. The area with the highest rainfall area of the province is Cho Don district with an average annual rainfall of 1800mm - 2000mm. Rain falling between April to October makes up 85% - 90% of the total rainfall of the year. The rainfall of the province in the 2011-2014 periods is shown in Figure 4.<sup>5</sup>

<sup>5</sup> Status of Environment report (SOE) of Bac Kan province 2015.

**Figure 4 – Average rainfall variation of Bac Kan in 2011-2014 period**



### 3. Hydrology

43. As a mountainous province, Bac Kan is the source of many rivers and streams forming a dense network with different directions of flow. There are 5 main river networks in Bac Kan including: Cau River, Nang River (branch of Gam River), Pho Day River, Bac Giang River and Na Ri River. The total surface water deposited is about 3.7 billion cubic meters<sup>6</sup>. Some information on the main rivers in Bac Kan is displayed in the Table below.

**Table 5 – Main rivers of Bac Kan with some brief information**

No.	Name of the river	Total length (km)	Catchment (km <sup>2</sup> )	Average flow, (m <sup>3</sup> /s)	Flow module (l/skm <sup>2</sup> )
1	Cau River	100	1424.9	965	18.6
2	Nang River	70	1600.5	42.1	25.6
3	Pho Day River	36	296	9.7	-
4	Bac Giang River	28.6	898	9.6	-
5	Na Ri River	55.5		24.2	-

44. The Nang River is a branch of the Gam River, which is near famous tourism sites such as Ba Be lake, Puong cave and Dau Dang waterfall. The total length of Nang River is 70 km in Bac Kan and the water catchment is 1,600.5 km<sup>2</sup> in extent.

45. The main sources of water considered as a supply for the Subproject are as follows:

- (i) Bo Luc stream: Originates from the Gia Ve waterfall and flows from south to north with a minimum discharge of 4 to 6 l/s. At the commune center the stream has an average width of about 2 m, and a depth of 0.2m, as measured in September 2016 during the field investigations;
- (ii) Choc Mac, Khuoi De, and Bo Luc streams: These join the Thom Moong stream in the southeast of the commune and flow to the Boc Bo River just downstream of Na Nghe bridge; and,

<sup>6</sup> Status of Environment report (SOE) of Bac Kan province 2015



- (iii) Boc Bo River: One branch of the Nang river and fed by the Nan Sai and Ta Cap streams in Cong Bang commune. In the dry season near Na Nghe bridge the river is 8 to 10 m wide and the water level is 0.5 m, as measured in September 2016 during the field investigations.<sup>7</sup>

#### 4. Seismicity

46. Vietnam has been classified as a low seismicity region although earthquakes of up to degree VI on the Modified Mercalli Scale have occurred in much of the northern mountain region, including Bac Kan province<sup>8</sup>. Ninety percent of the earthquakes that have occurred in Vietnam have taken place in the Northwestern Provinces. However, there is no remarkable earthquakes has been recognized in Bac Kan province.

#### B. Ecological Environment

38. Irrigated rice fields and dense shrub vegetation line the banks of Nang river, where the proposed pumping station for water intake will be located, while vegetation on the hill where the water treatment plant (WTP) is located is dense growth of shrubs and young trees, generally re-growth following previous clearance of the original tree cover of the area for cultivation. The dense, uncultivated vegetation by the stream (left bank) and on the Keo Vai hill comprises species that have regenerated naturally, including shrubs and some emergent trees. These species are well represented in wooded areas, strips of riparian vegetation and forests in the area and as such do not present a unique habitat. The right bank of the river bears mainly cultivated vegetation and grassed areas, which are grazed. No patches of tall or undisturbed forest occur in the immediate project area where the facilities will be built.

**Figure 5 – Location of proposed pumping station and WTP**



Location of proposed pumping station-Vang My weir



Proposed WTP location - top of Keo Vai hill

#### C. Social - Economic Context

##### 1. Administration areas and population

47. The 2010 population of Boc Bo commune was 3,616 with 799 households. The average population density was 67.76 persons/km<sup>2</sup>. By 2016 the population was 3,846 people with 943 households and a growth rate of 1.3% per annum comprising 1.1% natural and 0.2% from in-

<sup>7</sup> Subproject Feasibility Report

<sup>8</sup> UN Office of the Coordination of Humanitarian Affairs (OCHA) Viet Nam: Natural Hazard Risks issued March 2011. [http://www.preventionweb.net/files/23469\\_ochavnmhazardv3110606.pdf](http://www.preventionweb.net/files/23469_ochavnmhazardv3110606.pdf)

migration. For subproject design a 20% demand factor is included to cater for population increases up until 2030 (15 years).

48. The commune includes fifteen villages; the largest, Na Cooc village, is the commune center. Na Hoi village is the smallest and has only seventeen households. On average each household has 4.53 persons. The inhabitants of the Subproject area belong to six distinct ethnic groups being the Kinh, Tay, Nung, Dao, San Chi, and H'Mong groups. The Tay group accounts for the majority of people.

**Table 6 – Population and ethnicity in the subproject area**

	<b>Whole commune</b>	<b>Beneficiary area</b>
Number of villages	15	7
Population	3846	2158
Number of households	943	560
<i>By ethnicity</i>		
Kinh	76	56
Tay	430	348
Nung	32	32
Dao	104	25
H'Mong	110	2
San Chi	191	97
Female headed household	89	62
Number of poor HH	180	49

Data

Source:

*collection from target communes, 2016*

## 2. Economic development and income

49. Land use: Although agricultural land occupies range 7.6% the total land area in Boc Bo commune (See Table 6), agriculture production is still the dominant income source in the commune. Main crops are paddy, maize, cassava, and soybean. Livestock is considered as one of main income sources of the target commune. Forestry occupies over from 85% of total land area in the commune and is still of minor importance economically because (i) almost area is protection forest; (ii) there are some area of forest which can be cut down but because of poor road condition, it could be not sold. Participants in FGDs reported that the price per cubic meter of acacia timber in Boc Bo commune center can be at VND 900,000- 1,000,000/ m<sup>3</sup>, but it reduces to VND 280,000- 300,000 per cubic meter at farm gate far from commune center 8 km. According to annual report 2015, the plantation forest area was 17.35 hectares s in Boc Bo commune. Table 6 illustrates major agricultural products in target commune in 2015

**Table 7 – Land Use in Subproject Area, 2015 (Hectare)**

Type of Land	Boc Bo
Natural land area	5336.53
Agricultural land (excluded forestry land)	406.84
Irrigated land	174.57

Planted Paddy land	174.57
Planted maize land	110.74
Planted cassava land	62
Land for other crops	26.34
Land for aquaculture	6.59
Forestry Land	4671.03

*Source: Data collection from Boc Bo commune, 2016*

50. The focus group discussions indicated farming is major livelihoods of local people. Most agriculture (80%) is for subsistence, with paddy and maize as the main crops. There is no opportunity for off-farm jobs in this area. It is reported that the average annual income per capita was VND 16.2 million in Boc Bo and commune in 2015. However there is a significant disparity among ethnic groups, it was reported that while annual average income per capita of Kinh people is VND 30 million; VND 20 million for Tay ethnic minorities, San Chi people only earned about VND 6.0 million on average per person annually.

### **3. Social services**

51. The commune has a healthcare station without doctor. There are 6 nurses and midwives in Boc Bo commune health station respectively. Because Boc Bo commune located in district center therefore almost people go directly district hospital instead of commune health station. The head of commune health stations reported that in 2015 about 18% of pregnant women had given birth at home, especially remote villages in Boc Bo commune because of poor road condition. According to commune annual report, in 2015, the rate of immunized children under one year of age was 99.1% in the commune.

52. The commune has one kindergarten, one primary school and one secondary school. The subproject commune is connected to the national grid, two remote villages where is located 9 km far from commune center, only 33.5 and 85% households access grid.

### **4. Historical, cultural and religious presence**

53. There are several archaeological sites that have been discovered in the subproject area, along Nang River showed the trace of ancient people like in Tham Hau place, Dai Khao village, Cao Tri commune, Ba Be district. Other locations have also been found in this area. In accordance to the specialists of Vietnam Historical Museum, the area of Cao Tri commune, Ba Be district was the living area of ancient people in Old Stone Age - about 20,000 to 10,000 before Christ<sup>9</sup>. Ba Be National Park is also a famous tourist attraction site and it is located about 18 km to the south of the subproject area in Boc Bo commune.

### **5. Unexploded Ordnance**

54. There has been no armed conflict in the site in recent decades. Nonetheless, nearly 40 years after Vietnamese - Chinese border war ended, unexploded ordnance (UXO) remains from aircraft, booby traps and land mines, all of which are indiscriminate and all of which result in concealment of the ordinance and information on the extent and location of UXO is sparse. In some locations, such as the sites of former combat bases or military supply routes, the scale of the risk is high. For most of the rest of the country, the level of risk for any one site is largely

<sup>9</sup> <http://www.vista.net.vn/bao-tang-diem-den-khac/bao-tang-tinh-bac-kan.html>

unknown. Prior to earthworks and especially for the pipeline excavation corridors, survey for the presence UXOs has to be conducted by an authorized bomb and mine Clearance Company.

#### **D. Surface Water Resources**

55. The new water supply scheme will be served from the Boc Bo river from a site selected just upstream of an existing 12.2 m wide reinforced concrete weir in Nam May hamlet. No stream gauging data is available but a recent study by the Ministry of Rural Development (MARD) measured flows across the weir. The district Division of Agriculture and Rural Development measured actual flow across the weir and assessed the minimum water level in the dry season was 26 mm with lowest velocity being 0.2 m/s. With a spillway width of 12.2 m, the minimum flow rate is 63.4 l/s or 5,477 m<sup>3</sup>/day – exceeding the daily demand of 1,300 m<sup>3</sup> The river, and in particular the water retained by the weir, is adjacent to land used for grazing and the water is subject to a degree of contamination from animals and birds..

56. Downstream of the proposed intake site - see Figure 3) is a 16 ha irrigation command area fed by an ungated concrete lined supply canal leading off from the left hand side of the spillway. The spillway has been constructed to supply this canal and in the dry season, when the water depth across the spillway is at its lowest (0.2 m) and the demand is high, sufficient water will still be available for irrigation and water supply needs.

57. Using an irrigation demand of 1 l/sec/ha for the irrigated area this amounts to a hypothetical abstraction of about 0.016 m<sup>3</sup> per day or 1,382 m<sup>3</sup>. When added to the daily water supply demand (1,300 m<sup>3</sup>) this amount to 49% of the measured minimum daily flow (5,477 m<sup>3</sup>) leaving a surplus of 2,795 m<sup>3</sup>.

58. Including the expected impact of climate change, flows in the Boc Bo river would reduce by a further 33 m<sup>3</sup> which is inconsequential. Further downstream of the proposed extraction point community and agricultural demand is supported by inflow from tributaries, and no competition for water is currently known.

59. The selected site was assessed for its engineering suitability. With a minimum water depth of 0.2 m across the weir and a minimum depth of 0.5 m immediately upstream. The water level in the screened wet well could be set to ensure pump inlets are submerged. Field interviews found the Boc Bo River has not dried up and that flow passes to the right hand side bank onto surrounding fields and dissipate quickly reducing the risk to the stream alignment which might threaten the intake works. The site would benefit from a fence lining the right hand bank to reduce the level of contamination from animal waste.<sup>10</sup>

#### **E. Water Quality**

60. The quality of the source water at the Boc Bo River, west tributary of Nang River is good, not polluted by cultivation activities. West tributary of Nang River meets the water needs for Boc Bo commune and Pac Nam district as the input for clean water demand at present and long term.

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<sup>10</sup> The PPTA Consultants strongly recommend that ADB seek assurance from Bac Kan PMU that the subproject establish water gauging stations at the proposed water source prior to Fact Finding and that where the gauge data differs by more than 10% from current reported data a detailed hydrological assessment be undertaken prior to subproject approval. Concurrently monthly water quality tests should be undertaken

61. Based on the survey results, the quality of water in Nang River met the requirement as raw water for Water supply system for domestic use as stated in QCVN 08:2015-MT/BTNMT<sup>11</sup>.

**Table 8 - Test result of Nang River's raw water source<sup>12</sup>**

No	Properties	Unit	Result	QCVN 08:2015-MT/BTNMT	Testing method
1	pH	-	7.36	6 – 8.5	APHA 4500-pH
2	Turbidity	NTU	16	-	APHA 2130- Turbidity
3	Color	Pt – Co	10	-	A PHA 2120
4	Alkalinity	mg CaCO <sub>3</sub> /l	200		APHA 2320-Alkalinity
5	Hardness	mg CaCO <sub>3</sub> /l	110	-	APHA 2340-Hardness
6	Oxidization	mg O <sub>2</sub> /l	4.5	>4	APHA 4500-KMnO <sub>4</sub>
7	Total Suspended Solid (TSS)	mg/l	25	50	APHA 2540
8	COD	mg O <sub>2</sub> /l	23	30	APHA 5220-COD
9	Ammonium (NH <sub>4</sub> <sup>+</sup> - N)	mg/l	0.041	0.3	APHA 4500-NH <sub>3</sub> TCVN 5988-1995
10	Nitrite (NO <sub>2</sub> - N)	mg/l	0	0,05	APHA 4500 TCVN 6180-1996
11	Nitrate (NO <sub>3</sub> - N)	mg/l	1.78	2	APHA 4500 TCVN 6178-1996
12	Arsenic (As)	mg/l	< 0.01	0.01	APHA 3500 - As
13	Zinc (Zn)	mg/l	0.04	1.5	SMEWW/311B:2012
14	Total Iron (Fe)	mg/l	0.13	0.5	APHA 3500-Fe
15	Iron (II)	mg/l	< 0.01	0.5	APHA 3500-Fe
16	Copper (Cu)	mg/l	0.015	1	TCVN 5070:1995
17	Potassium (PO <sub>4</sub> <sup>3-</sup> )	mg/l	0.029	0.3	TCVN 6202:2008
18	Chromium Cr (VI)	mg/l	-	0.04	TCVN 7939:2008

## VI. IMPACT, ALTERNATIVES AND MITIGATION MEASURES

### A. Area of influence of the subproject

62. The area of influence of the subproject includes the water intake area the WTP area, the area served by the pipe distribution network and the area along the raw water transmission pipe. It includes several villages of Boc Bo commune, Pac Nam district.

<sup>11</sup> QCVN 08-MT:2015/BTNMT National Technical Regulation on Surface Water Quality Column A1: Water quality for domestic water supply and other purposes

<sup>12</sup> Water sampled at the west tributary of Nang River afer flow through Boc Bo commune by Center of natural resources and environment monitoring under Bac Kan DONRE on June 24, 2016.

## **B. The expected benefits**

63. Many households in the region resently seek water sources by themselves for the purposes of catering and drinking. Commonly, groups of about 3-5 households invest together in a tank system and water pipeline directly from small stream heads to their house for catering. The capacity of these supplies is inadequate and also reportedly declining so households use dual systems of mountain water for consumption and stream for washing. The supply water quality is not well controlled to follow Vietnamese supply water quality regulations.

64. The benefits of the subproject are improved public health by ensuring full time reliable access to clean water for most of the local people in Boc Bo commune. The water will be safe for drinking and cooking, reducing the incidence of water related disease, which in turn improves the quality of life for beneficiaries, reducing the need to purchase safe water, and reduces productive time lost to illness.

## **C. Alternative; Design and Location Consideration**

65. Surface water sources in Boc Bo district consist of rivers, streams, and rainwater retained in lakes and small ponds. Of these, the main sources of water considered as a raw water supply for the Subproject are as follows:

- (iv) Bo Luc stream: Originates from the Gia Ve waterfall and flows from south to north with a minimum discharge of 4 to 6 l/s. At the commune center the stream has an average width of about 2 m, and a depth of 0.2m, as measured in September 2016 during the field investigations;
- (v) Choc Mac, Khuoi De, and Bo Luc streams: These join the Thom Moong stream in the southeast of the commune and flow to the Boc Bo River just downstream of Na Nghe bridge; and,
- (vi) Boc Bo River: One branch of the Nang river (west tributary) and fed by the Nan Sai and Ta Cap streams in Cong Bang commune. In the dry season near Na Nghe bridge the river is 8 to 10 m wide and the water level is 0.5 m, as measured in September 2016 during the field investigations.

66. The subproject area has several watercourses, the three largest being the Nang river, the Cong Bang river, and the Nghien river. The Nang River is the largest with an average rainy the flow of 942 m<sup>3</sup>/s reducing to a dry season flow of 19.5 m<sup>3</sup>/s.

67. Based on a review of existing data, a site on the Boc Bo river in Nam May has been selected as the site for the proposed intake and pumping station. The selected site is about 2 km upstream of the confluence of the Boc Bo and Bo Luc river. The site is located in Nam Mây hamlet. Two other sites were assessed as providing increased supply security being (i) above the confluence of the Boc Bo river and Bo Luc stream, and (ii) just below the confluence of Boc Bo river and Bo Luc stream. Both were discounted due to a proposal to build a new wastewater treatment plant upstream. The effluent water from this plant would discharge into the Boc Bo river and threaten water quality<sup>13</sup>.

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<sup>13</sup> The subproject Feasibility Study

## **D. Pre-construction Activities**

68. The preconstruction activities under the subproject area are site clearance along the raw water pipeline, WTP and distribution networks. The rice field area where the proposed 200m raw water pipelines will be placed will be acquired for the construction activities. A Resettlement and Ethnic Development Plan (REMDP) has been prepared to cover compensation and assistance based on ADB SPS.

69. **Slope stability.** The access road to the WTP will follow an existing track but will involve widening to form the road bench. This will involve some cutting into the hillside, and will also alter the existing water flows on the hillside. Risks are to be mitigated by design measures to protect the slopes and manage drainage. This will include (i) careful design of the access road, minimizing the amount of cutting necessary to form the road, (ii) providing for retention on the downslope side (iii) a geotechnical assessment of slopes to be cut should be made, and suitable retention or revetment structures included in the design as necessary (iv) a hydrological assessment and design of road drains and culverts, including cascades to direct runoff water as necessary (v) provision for cut slopes to be re-vegetated with grass and shrub species.

70. **Protection of the water source.** Provision will be made in the detailed design to include a perimeter fence around the water sources to exclude animal traffic and reduce contamination from animal waste.

## **E. Potential Impacts and Mitigation Measures in the Construction Phase**

### **1. Loss of trees and impact to fauna**

71. **Impacts:** Construction work will involve some removal of trees along 600m access road and WTP proposed position itself. The trees on Keo Vai hill are mainly production young trees of less than 15cm diameter, and comprise species that have regenerated naturally. These species are well represented in nearby wooded areas and strips of riparian vegetation and forests in the area and as such the vegetation on Keo Vai hill does not present a unique habitat. The number of trees that will be cut down as part of the works will be very few, so the impact is not significant.

72. **Mitigation measures:** Trees owned by local residents that will be removed, will be compensated under the provisions of the REMDP. To reduce the impact on further trees and vegetation, the DARD office of Pac Nam district will be counted the number of trees to be cut down, construction time and schedule. The contractor will not use or permit the use of fuel wood for construction activities or for cooking and water heating in worker's camps. The contractor will prohibit staff from collecting fuel wood from nearby forests and will not buy or use wood from illegal sources. The PMU assisted by the ESS and CSC will strictly supervise and monitor the protection of trees and other vegetation.

### **2. Generation of surplus soil**

73. **Impacts:** Soil from excavation activities to construct the access road and leveling ground for construction of water treatment plant, which could not be reused as piled fill soil will release silt and cause possible soil erosion on slopes if discarded in situ.

74. **Mitigation measures:** A small amount of excavated soil will be reused as filling soil to cover the pipe system. The remaining surplus will be reused to the extent possible as a base material for the WTP site and for access road construction if suited for the purpose, or provided

to local people for use on public or private land, as they desire. Not much of surplus soil will be transferred to a disposal site, to be agreed with the CSC and local authorities.

### **3. Generation of construction waste**

75. **Impacts:** Solid waste that will be generated from construction mainly includes waste from workers' camps, debris, and packaging of materials and equipment cement cover, oil containers, crates and cardboard. Some may be contaminated with hazardous or semi hazardous substances. Domestic waste from workers camps may include organic waste, as well as plastic and other packaging and semi toxic items such as used batteries. Other waste will be generated at workshops, storage sites, refueling sites and depots. This is a minor impact, as the main construction site is such of the WTP and small access road.

76. **Mitigation measures:** Contractors will be required to (i) reuse construction waste such as cement bag cover, metal tools where possible and (ii) install rubbish bins at work sites and in worker's camps to allow efficient collection of waste and transport the solid waste to a disposal site approved by the CSC.

### **4. Impact from noise, dust and vibration generated by the construction activities**

77. **Impacts:** Earthworks and rock crushing activities will be the main sources of dust. Construction machines and vehicles will generate gaseous emissions (NO<sub>x</sub> SO<sub>x</sub>, CO, CO<sub>2</sub>, etc.) when they are in operation. These gaseous emissions and dust could cause health problems for residents who live near the construction site and along the transportation route and along the distribution pipeline network. The impact is considered as minor as the WTP and access road will be constructed at Keo Vai hill, about 1 km far from Boc Bo town. The installation of distribution network inside dense population will be done mainly by manual work.

78. **Mitigation measures:** The contractors will not locate any large or noisy construction machines near residential area of Boc Bo and will work with Boc Bo CPC, with the representative of ESS and PMU, to identify suitable materials transportation route. During the dry period, the sites and patches near residential areas, especially the sensitive receivers like Pac Nam Ethnic Boarding High School; Boc Bo High School; Boc Bo Secondary School; Boc Bo Primary School; Pac Nam Market; Pac Nam Vocational Center; Boc Bo Kindergarten should be sprayed with water regularly to suppress dust generated PMU and CSC will responsible to monitor these mitigation measures.

### **5. Impact on local traffic**

79. **Impacts:** Distribution pipelines installation is likely to cause hindrance in traffic flow along PR258B and internal roads of Boc Bo town if not mitigated properly especially in the area of Pac Nam ethnic boarding high school, Boc Bo high school, Boc Bo secondary school and Pac Nam market. Pupils will get difficulties on their way to schools and local people will get difficulties on their way to the market. On the other hand, material transportation activities from proposed Keo Put quarry in Nhan Mon commune could also impact on the movement of local people especially at Pac Nam market. The impact duration will be short, during the distribution pipelines installation in 12 months construction phase.



80. **Mitigation measures:** To minimize the disturbance to local people, the contractor will inform Boc Bo CPC the construction schedule for distribution pipelines in advance and will also coordinate with local traffic authorities to implement appropriate traffic diversion schemes (if needed) to avoid inconvenience due to pipelines installation, setup clear traffic signal boards and traffic advisory signs at the market and school areas.

## **6. Safety of construction workers**

81. **Impacts:** Workers are at risk of accidents associated with construction, particularly power connect to the nearby transmission line for the electricity substation of the WTP.

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

## **F. Potential Impacts and Mitigation Measures in the Operation Phase**

### **1. Risk of water pollution and pipe breakages**

83. **Impacts:** The water source of Boc Bo River could be polluted by the cultivation activities and animal waste along the river upstream; increasing the turbidity and contamination level for the raw water pumped to the WTP. Treated water could also be polluted due to the failure of the treatment system or inappropriate operation procedures such as incorrect chemical dosage. The water pipe could be broken, leading to waste of water and contamination.

84. **Mitigation measures:** MMB will install fences surround the water intake location to avoid cattle trespassing and install warning boards at the intake location as well as some main points along the distribution pipeline system. MMB will also inspect the water intake, pipeline system regularly and fix any system failure in time to ensure adequate water supply and quality. MMB, in collaboration with the DARD office of Pac Nam district, will take awareness raising measures such as signs and information displays and arrange appropriate propoganda to raise the awareness of local people on the importance of water source protection.

### **2. Risk of accident during WTP operation process**

85. **Impacts:** Chemicals using in the WTP, like chlorine, especially in powder form, could be leaked and impact on the health of operation workers. Electric shock could be happen with worker working at the electricity substation. Other work accident could happen if the worker not to be trained properly and follow the safe working procedures.

**Mitigation measures:** The WTP must be equipped with a fire control system and protective gear for workers. Workers should be trained in the principles of safe working, emergency steps and proper handling and storage of chemicals. Among the chemicals, chlorine is the most toxic and therefore requires safe storage and handling. The operating procedures of the plant should include an inspection and maintenance schedule for all chemical storage and treatment

equipment. Chlorine containers must be kept in a dry place and stored separately from non-hazardous materials.

## **VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION**

### **A. The purpose of information disclosure, consultation and participation**

86. Public Consultation and Disclosure. Public consultation shall include discussions with members of project beneficiary groups, affected persons and commune officials, as a part of IEE preparation, in order to ascertain any concerns that may need to be addressed. In accordance to Circular No. 27/2015/TT-BTNMT, preparation of an EIA, entailing including public consultation is not required as the capacity of the subproject is only 2,200 m<sup>3</sup>/day in comparison with the threshold for the EIA requirement being 50,000 m<sup>3</sup>/day. As per ADB's SPS (2009), for category B subprojects however, it is necessary to conduct public consultation, including the following aspects:

- (i) A summary of the proposed works under the subproject;
- (ii) A summary of subproject objectives and likely positive and negative environmental impacts, covering the impacts in design, construction and operation phases for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders;
- (iii) Invitation for feedback in respect of any areas of concern that the public may have, and suggested means of implementation; Summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and Indigenous Peoples;
- (iv) Acceptability of the proposed works to the public; and
- (v) Request for information on the known occurrence of unexploded ordinance in the area where the scheme components will be built and facilitating participation of affected people during project implementation.

### **B. Method of consultation and participation**

87. The method of information dissemination and consultation and participation includes the rapid assessment methodology and stakeholders participation and consultation using the following techniques:

- An in-depth interview (live-interview): organizing dialogues, meetings and discussions with local authorities, including interview via phone for additional information. At the commune level, the participants are usually deputy chairman and land administrative staff of the CPC.
- Obtaining information on the questionnaire (integrated with the social survey)
- Public consultation meeting at the CPC with the participant of affected households; representatives of commune, district and provincial level.

### **C. Consultation process**

88. The PPTA in collaboration with the local authorities held consultations with local stakeholders. These were conducted as part of the baseline survey on local environmental conditions along the pipeline corridor and the location of the WTP.

89. The main content of the consultation meeting was to provide information on the Water Supply System for Boc Bo commune, Pac Nam district; the adverse environment impacts, and proposed mitigation measures to be applied during the construction phase and operation phase. The participants also expressed their views as well as other opinions related to the Subproject and other issues.

### **D. The result of information disclosure and public consultation**

90. In general, there is no opposition from the public to the proposed subproject. All the local people have shown support for the subproject and are looking forward to the commencement of construction as soon as possible.

91. The public consultation meeting was carried out as part of a baseline survey of local environmental conditions along the projects sites. Meeting with local authorities took place on 12 September 2016. Public meetings were held in Boc Bo CPC on 14 September 2016.

92. The IEE, including the Environmental Management Plan (EMP) will be translated in Vietnamese and will be made available at the office of the People's Committees of Boc Bo commune.

## VIII. GRIEVANCE REDRESS MECHANISM

### A. Purpose of the mechanism

During the preparation of the subproject, information is disseminated to local people on the scope of the subproject; environmental, social impacts and the grievance redress mechanism. Negative impacts of an environmental or social nature, or resettlement impacts, may occur during the construction and operational phases. Any comments/ suggestions of local people will be solved quickly, transparently in accordance with protected the law, particularly for people affected by the subproject. This grievance redress mechanism is classified by level and responsibilities of involved parties. . The GRM will be disclosed with the IEE and other safeguard documents to ensure that potentially affected persons are aware of it and their entitlement to raise complaints. During construction, the Contractor will appoint a member of his staff to act as the focal point, who will liaise with the Community Supervision Board and, if appropriate, the complainant(s) to address and seek solutions to any grievance that relates to the Contractor's actions.

### B. Grievance redress process

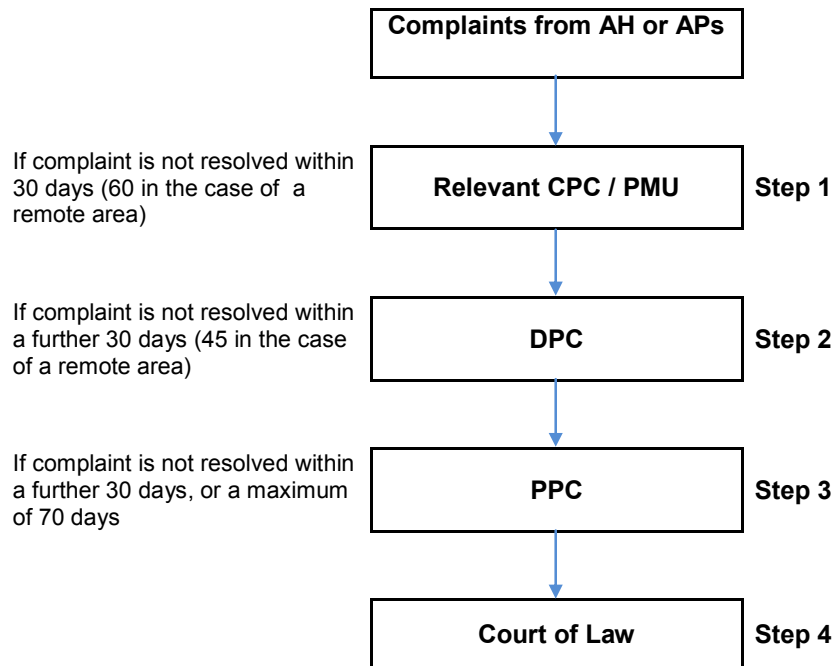
93. There are three steps to address complaints received from stakeholders:

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

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

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

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



## IX. ENVIRONMENTAL MANAGEMENT PLAN

### A. Implementation Arrangements

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

95. 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 9 – Responsibilities for EMP implementation**

Agency	Responsibilities
Bac Kan Project Management Unit under DPI (PMU)	<ul style="list-style-type: none"> <li>- Ensure that EMP provisions are strictly implemented during various subproject phases (design/pre-construction, construction and operation) to mitigate environmental impacts to acceptable levels.</li> <li>- Undertake monitoring of the implementation of the EMP (mitigation and monitoring measures) with assistance from CSC and ESS.</li> <li>- Ensure that Subproject implementation complies with ADB's environmental policy and safeguards policy statement (SPS 2009) principles and requirements</li> <li>- For subproject duration, commit and retain a dedicated staff within PMU as environment and safeguards staff to oversee EMP implementation</li> <li>- Ensure that environmental protection and mitigation measures in the EMP are incorporated in the detailed design.</li> <li>- With the support from ESS, updated EMP to suitable with any changing in</li> </ul>

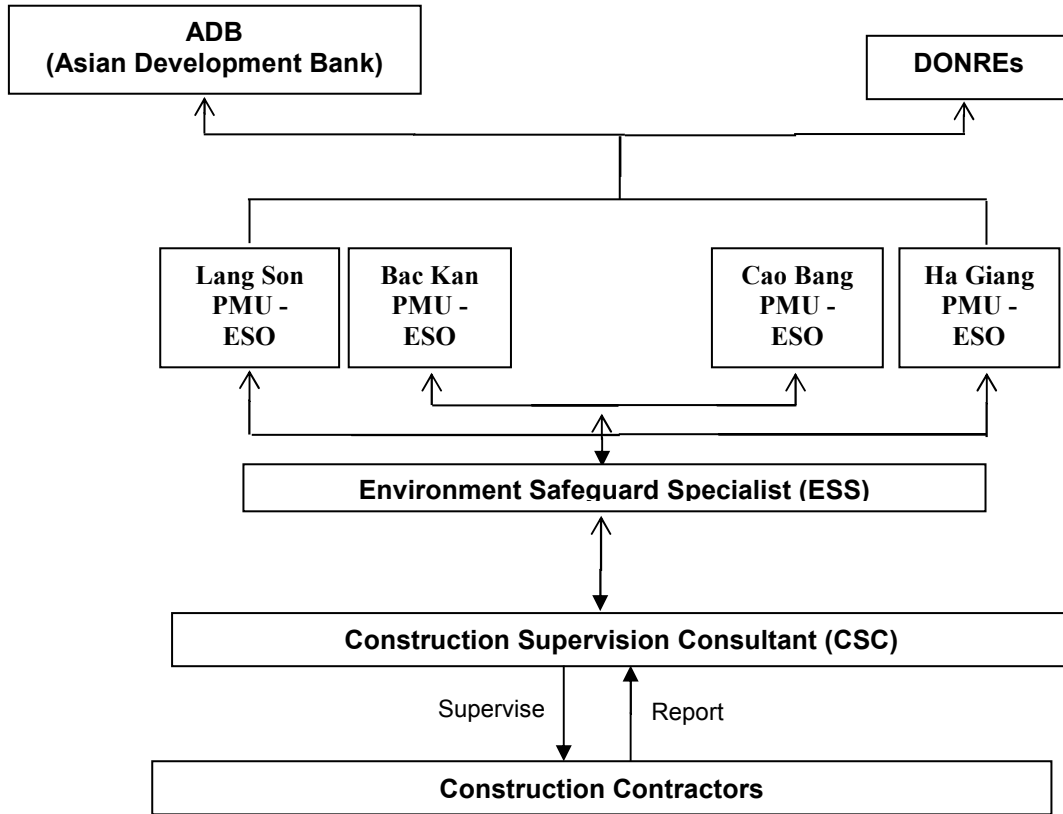
	<p>subproject scope or any unanticipated impact rise.</p> <ul style="list-style-type: none"> <li>- Obtain necessary environmental approval(s) from DONRE prior to award of civil works contracts</li> <li>- Include the Subproject updated EMP in the bid and contract documents for civil works</li> <li>- Establish 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</li> <li>- With assistance from ESS, prepare semi-annual environmental monitoring reports for submission to ADB</li> <li>- Based on the results of EMP monitoring, identify environmental corrective actions and prepare a corrective action plan, as necessary, for submission to ADB.</li> </ul>
Environmental Safeguards Staff (ESO)	<ul style="list-style-type: none"> <li>- PMU staff support for EMP implementation</li> <li>- Work closely with ESS to daily supervise of EMP implementation and preparation of EMP monitoring report</li> </ul>
Environment Safeguard Specialist (ESS)	<ul style="list-style-type: none"> <li>- Update EMP to make it suitable with the current condition or whenever subproject scope change or any unanticipated impact rise.</li> <li>- Ensure that the environmental protection and mitigation measures identified in the EMP for the design stage has been incorporated in the detail design;</li> <li>- Assist PMU to ensure that all environmental requirements and mitigation measures from the IEE and EMP are incorporated in the bidding documents and contracts.</li> <li>- During detailed design phase carry out baseline data collection on air quality, noise and surface water quality (as specified in the EMP)</li> <li>- Implement all mitigation and monitoring measures for various subproject phases specified as ESS's tasks in the EMP</li> <li>- 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.)</li> <li>- Undertake environmental management capacity building activities for PMU as described in the IEE and EMP.</li> <li>- Engage international and national environment specialists to ensure proper implementation of EMP provisions. Through these specialists, the ESS shall: (i) ensure proper and timely implementation of ESS'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.</li> </ul>
Construction Supervision Consultant (CSC)	<ul style="list-style-type: none"> <li>- Provide the ESS relevant information as well as full access to the subproject site and all project-related facilities (such as construction yards, workers' camps, borrow and quarry areas, crushing plants, concrete mixing plants, etc.) to monitor contractors' implementation of the subproject EMP, assess environmental impacts resulting from on-going site works and operation related facilities, undertake environmental effects monitoring and orientation of workers on EMP implementation.</li> <li>- Undertake day-to-day subproject supervision to ensure that contractors properly implement the EMP.</li> <li>- Orient workers on EMP implementation, and health and safety procedures</li> <li>- Document and report to PMU on occupational accidents, diseases and incidents</li> <li>- As part of regular progress report submission to PMU, prepare reports on the</li> </ul>

	<p>status of the contractors' implementation of the EMP and health and safety issues</p> <ul style="list-style-type: none"> <li>- Engage an environmental staff to ensure proper implementation of the above tasks.</li> </ul>
Contractors	<ul style="list-style-type: none"> <li>- Recruit qualified environmental officer to ensure compliance with environmental statutory and contractual obligations and proper implementation of the Subproject EMP.</li> <li>- During detailed design phase, prepare method statement (including a Waste Management and Spoil Disposal Plan) described in the IEE/EMP.</li> <li>- Ensure full understanding of the EMP and resources require for its implementation when preparing the bid for the work.</li> <li>- Implement additional environmental mitigation measures, as necessary</li> </ul>
Market Management Board (MMB)	<ul style="list-style-type: none"> <li>- Responsible for operation and maintenance of subproject.</li> <li>- Implement EMP monitoring during operation</li> </ul>
Bac Kan Department of Natural Resources and Environment (DONRE)	<p>Review and approve environmental assessment reports required by the Government.</p> <ul style="list-style-type: none"> <li>- Undertake monitoring of the subproject's environmental performance based on their mandate</li> </ul>



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

**Figure 6 – EMP Implementation Organization Chart**



**B. Environment Impact Mitigation**

96. The anticipated environmental impacts and mitigation measures discussed in the previous section is presented in Table 10. The table also shows responsibilities and timeframe/schedule for implementation of mitigation measures and monitoring.

97. Table 10 shows that most mitigation activities during pre-construction are to be implemented by the ESS while during construction, measures shall be primarily implemented by the contractors. During operation stage, DARD 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 10 - Detailed Environmental Mitigation Plan**

Environmental Concern	Objective	Proposed Mitigation Measures	Locations	Timing	Responsible to implement	Budget
<b>Preconstruction Detailed Designs Phase</b>						
1. Land acquisition and resettlement	Control the impact of land acquisition and resettlement	1. Affected persons well informed ahead of project implementation 2. Monitor the compensation process to ensure it is suitable with the Land Acquisition and Resettlement Report	N/A	Before subproject starts	PMU	Included in the operation cost of PMU
2. Slope stability	Minimize the impact on the stability of the slope by access road construction activities	1. Minimize the amount of cutting necessary to form the road in the design 2. Design for retention on the downslope side. 3. Conduct geotechnical assessment and include suitable retention or revetment structures in the design. 4. Conduct hydrological assessment and design of road drains and culverts. 5. Design the re-vegetated with grass and shrub species for cut slopes.	In all subproject area	Before subproject starts	Design consultants	Included in the contract with the consultant
3. Protection of water source	Avoid water source pollution	1. Include a perimeter fence around the water sources in the detailed design	At the water intake area	Before construction start	Design consultants	Included in the contract with the consultant
<b>Construction Phase</b>						
4. Loss of trees and impact to fauna	Avoid and minimize impact to flora and fauna in the subproject area	1. Minimize vegetation covers clearances. 2. All replanting works to utilize locally available non-invasive species. 3. The contractors will not use or permit the use of wood, as fuel for the execution of any part of the works and to the extent practicable will ensure that fuels other than wood are used for cooking, and water heating in all camps and living accommodations. 4. Contractors will not buy or use wood from the illegal sources (that come from the illegal logging)	At the WTP construction area, along the proposed access road to the WTP	Through out the construction phase	CPC, Contractors	Included in the contract with the contractors
5. Generation of surplus soil	Control surplus soils	1. Reuse excavated soil as filling soil to cover the pipe system. 2. Surplus soil will be reused to the extent possible as a base material for the WTP site 3. Further surplus soil will be transferred to a disposal site as agreed with the CSC and local authorities	Through out construction site	Through out construction phase	Contractors	Included in the contract with the contractors
6. Generation of construction waste and domestic waste from workers	Control waste disposal	1. Reuse construction waste such as cement bag cover, metal tools where possible. 2. Install rubbish bins at work sites and in worker's camps. 3. Transport the solid waste to a disposal site approved by the CSC.	Through out construction site and worker camps area	Through out construction phase	Contractors	Included in the contract with the contractors

7. Dust, noise and vibration	To minimize negative impacts from dust, noise and vibration during construction period	<ol style="list-style-type: none"> <li>1. Large or noisy machines will not be located near residential area of Boc Bo.</li> <li>2. Work with Boc Bo CPC, ESP and PMU to identify suitable materials transportation route.</li> <li>3. Spray water regularly to suppress dust generated at the sites and patches near residential area during the dry period</li> </ol>	Along the pipe installation line, WTP and access road construction site, material transportation road	Through out construction phase	Contractors	Included in the contract with the contractors
8. Traffic management	Minimize disturbance of traffic	<ol style="list-style-type: none"> <li>1. Inform Boc Bo CPC in advance the construction schedule for distribution pipelines.</li> <li>2. Coordinate with traffic police of Pac Nam district to implement appropriate traffic diversion schemes (if needed)</li> <li>3. Setup clear traffic signal boards and traffic advisory signs at the market and school areas.</li> </ol>	Along the distribution pipelines and materials transportation route, especially area near Pac Nam market.	Through out construction phase	Contractors	Included in the contract with the contractors
9. Safety precautions for workers and public safety	Ensure worker and local people safety	<ol style="list-style-type: none"> <li>1. Conduct training for workers on safety, including roles and responsibilities, safe site practices and environmental hygiene</li> <li>2. Institute site and camp rules like wearing protective tools properly.</li> <li>3. Ensure all excavation sites are fenced and sign boards, perimeter markers installed</li> <li>4. Liaison with the power company to ensure that qualified technicians are on site to ensure that safety procedures are followed</li> <li>5. Assign responsibility to supervisor staff to ensure that all safety rules are followed</li> </ol>	Through out the construction site	Through out the construction phase	Contractors	Included in the contract with the contractors
<b>Operation phase</b>						
10. Water pollution and pipe breakages	Ensure the quality of the water supply	<ol style="list-style-type: none"> <li>1. Install fences surround the water intake location to avoid cattle trespassing</li> <li>2. Install warning boards at the intake locations and some main points along the pipeline.</li> <li>3. Inspect the water intake, pipeline system regularly and fix any system failure in time.</li> <li>4. Collaborate with DARD office of Pac Nam district to conduct propagandas to raise awareness of local people for water quality protection</li> </ol>	Water intake area, along the pipeline	Continuously	Market Management Board (MMB)	Included in the operation budget of MMB

## **C. Environment Monitoring**

### **Environment Compliance Monitoring**

98. Table 11 below shows the program for monitoring the compliance on various provisions of the EMP during construction and operation phases. ESS needs to implement a number of measures during detailed design phase (e.g., incorporation of environmental design measures into the detailed design, update EMP, etc.) and this will be confirmed by PMU to ADB. During construction, most of the mitigation the contractors shall implement measures and CSC and ESS shall monitor their environmental performance, in terms of implementation of such measures. The timing or frequency of monitoring is also specified in Table 11. During operation EMP implementation shall be the responsibility MMB.

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

### **Environmental Effects Monitoring**

100. ESS 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, ESS shall undertake quarterly monitoring of surface water quality and air quality and noise in the same locations sampled during pre-construction. Additional sampling occasions shall be carried out and additional parameters shall be analyzed (as necessary) to validate complaints and/or investigate pollution events caused by the subproject. MMB will responsible for treated water quality monitoring in the first year of the operation phase

**Table 11 - Environmental Compliance Monitoring**

Environmental Concern	Parameter to monitor	Location	Frequency & verification	Responsible to monitor	Estimated Cost
<b>Design and Pre-construction Phase</b>					
1. Land acquisition and resettlement	Compensation documents	N/A	Once, before construction start	Bac Kan DPI, DONRE and PMU	Included in the operation budget of Bac Kan PMU
2. Slope stability	Design documents	N/A	Once, before construction start	Bac Kan PMU	Included in the operation budget of Bac Kan PMU
3. Pollution of water source	Perimeter fence in design documents	N/A	Once, before construction start	Bac Kan PMU	Included in the operation budget of Bac Kan PMU
<b>Construction phase</b>					
4. Loss of tree and impact to fauna	Check of implementation	At the WTP construction site, along the access road to the WTP	Before construction commencement and through out construction phase. Part of daily construction supervision	ESS/ PMU CSC	Included in the operation budget of PMU/ ESS/ CSC
5. Waste and surplus soil disposal	Check of implementation	Through out construction site, designated disposal area	Bi-weekly Part of daily construction supervision	ESS/ PMU CSC	Included in the operation budget of PMU/ ESS/ CSC
6. Dust, noise and vibration	Check of implementation	Through out construction site	Bi-weekly and spot checks Part of daily construction supervision	ESS/ PMU CSC	Included in the operation budget of PMU/ ESS/ CSC

7. Traffic management	Check of implementation	Through out construction site, along material transportation route, near Pac Nam market	Bi-weekly Part of daily construction supervision	ESS/ PMU CSC	Included in the operation budget of PMU/ ESS/ CSC
8. 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 site	Bi-weekly Part of daily construction supervision	ESS/ PMU CSC	Included in the operation budget of PMU/ ESS/ CSC
<b>Operation of WTPs &amp; Pipeline Network</b>					
9. Water pollution and pipe breakages	Public complaints of operation of WTPs, drinking water availability & quality, and malfunctions with pipelines (e.g., leaks).	On property of WTP, pipelines, and pump stations, water intake location	Continuously	MMB	Included in the operation budget of MMB

**Table 12 - Environmental Effects Monitoring**

Environmental Concern	Parameter to monitor	Location	Frequency & verification	Responsible to monitor	Estimated Cost
<b>Design and Pre-construction Phase</b>					
1. Air quality (dust, CO, NOx, SOx, noise, wind, and vibration levels) to supplement baseline air quality data collected during PPTA and reported in IEE Water quality parameters sampled west tributary of Nang River during PPTA & reported in IEE.	Using field and analytical methods described in QCVN and TCVN standards for ambient air and surface water quality sampling & analysis.	Representative sites of heavy civil & earthwork including along truck routes At raw water intake location	One day and one night measurement	ESO	Included in the operation budget of Bac Kan PMU
<b>Construction phase</b>					
A) Air quality: dust, CO, NOx, SOx, noise, wind, and vibration levels B) Surface water quality: TSS, heavy metals (As, Cd, Pb,) oil and grease, total & fecal coliform, pH, DO, COD, BOD <sub>5</sub> , temperature, NH <sub>3</sub> , and other nutrient forms of N & P. C) Public comments and complaints D) Incidence of worker or public accident or injury	A – B: Using field and analytical methods described in QCVN and TCVN standards for ambient air and surface water quality monitoring. Include visual observations of dust and noise from contractor & public reports. C) Information transferred by telephone hotline number D) Regular reporting by contractors/ Bac Kan PMU	A – B): At the intake water area C): Using hotline number placed at construction areas D): At all construction	(A–B): Quarterly during construction periods (1 time for baseline data and 4 times in 1 year construction) C) Continuous public input D) Continuous	Quarterly	A) &B) (60\$ & 500\$) per sample times under cost norm of Ha Giang <sup>14</sup> C) & D) With (no extra cost)
<b>Operation of WTPs &amp; Pipeline Network</b>					
Treated water quality: total & fecal coliform, pH, DO, NH <sub>3</sub> , NO <sub>3</sub> , NO, chlorine, PAC, NaCl, and heavy metals (As, Cd, Pb,).	Using field and analytical methods described in QCVN & TCVN standards for water quality monitoring, and parameters of QCVN 14:2008/BTNMT & TCXDVN 33:2008/BXD. Follow the procedures under Circular No.50/2015/TT-BYT providing for the inspection of drinking water and domestic water's sanitation and quality	At WTP & random user locations along distribution network	Biannually for parameter under B column, or when public complaint arises	MMB	Included in the operation budget of MMB

<sup>14</sup> There is no available cost norm for Bac Kan. Figures have been estimated base on Ha Giang cost norm.



**D. Reporting**

101. PMU will submit the following reports to ADB:

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

**Table 13 – Reporting procedures**

<b>Project Phase</b>	<b>Type Of Report</b>	<b>Frequency</b>	<b>Responsibility</b>	<b>Submitted To Whom</b>
<b>Construction</b>	<b>Environmental Performance Report</b> indicating compliance with EMP and monitoring results at the contractor site	Daily	Construction contractor	CSC
	<b>Subproject EMP Compliance Report</b> indicating compliance with subproject EMP and monitoring results	Quarterly	CSC	PMU
	<b>EMP Compliance Report</b> indicating compliance with subproject EMP and monitoring results	Semi-annually during construction phase	ESS/ PMU	ADB
<b>Operation</b>	<b>EMP Compliance Report: Operation</b> indicating compliance with subproject EMP commitments during operation	Annually in the first year of operation. On-going frequency to be determined based on review after 1 year.	MMB	DONRE Office of Pac Nam DPC

**Table 14 – Estimated cost for EMP Implementation (1-year construction/ 2-year in total)**

Item	Estimated cost (US\$)
<b>Staff Costs</b>	
<b>1. Environment Safeguard Specialist (ESS)</b>	<b>10,720</b>
1 National ESS - 03 man-months (intermittent in 1 year construction) – 2,000 US\$/ man-month	6,000
Per diem for ESS: 48 US\$ x 30 days x 3 months	4,320
Travelling cost for 2 round trips: 200 US\$ x 2 trips	400
<b>EMP Budget</b>	
<b>2. Environmental effects monitoring (implemented by ESS)</b>	<b>800</b>
Ambient air quality: 1 monitoring location x 5 times x 60 US\$/sample <sup>15</sup>	300
Surface water quality: 1 monitoring location x 5 times x 100 US\$/sample <sup>16</sup>	500
<b>3. Training/orientation, local transportation, supplies (by ESS)</b>	<b>1,500</b>
a) Training/orientation: 1 formal training course for PMU, CSC, Contractors, MMB and DARD office of Pac Nam district and other “on the job” training	1,000
b) Local transportation and supplies	500
<b>4. Printing Environmental monitoring report by ESS (8 reports)</b>	<b>300</b>
<b>Subtotal (2+3+4)</b>	<b>2,600</b>
<b>5. Contingency</b>	<b>130</b>
<b>Total (2+3+4+5)</b>	<b>2,730</b>

## E. Capacity Building

102. 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 Bac Kan DPI with one staff has been assigned as ESO.

103. The most significant challenge is the lack of human and financial resources and necessary infrastructure. To address this constraint, Bac Kan DPI/PMU will designate a full time staff as environmental safeguards officer (ESO) to handle the environmental aspects of the subproject during implementation stage. The ESO and other relevant staff of PMU will be trained

<sup>15</sup> Due to there is no cost norm for Bac Kan province, figures have been estimated base on environmental monitoring cost norm of Ha Giang province.

<sup>16</sup> Due to there is no cost norm for Bac Kan province, figures have been estimated base on environmental monitoring cost norm of Ha Giang province.

by the Environment Safeguard Specialist (ESS) during subproject implementation as “on the job” training or by formal training courses.

**Table 15 – Detail capacity building program**

Objective	<ol style="list-style-type: none"> <li>1. Build capacity and procedures in undertaking systematic environmental assessments in accordance with Government regulations and ADB guidelines</li> <li>2. Provide training on international best practice on environmental management, monitoring and reporting.</li> <li>3. Provide guidance on how to effectively incorporate environmental measures into project design and how to incorporate EMP provisions into tender and contract documents.</li> </ol>
Tasks/Scope of Work	<ol style="list-style-type: none"> <li>1. Undertake training needs analyses and review prevailing government regulations and donor guidelines governing the assessment and management of environmental impacts for road development.</li> <li>2. Review the skills of PMU and MMB staff to establish existing capacity on environmental assessments, environmental monitoring and implementation of mitigation measures for road development project.</li> <li>3. Prepare the training plan and relevant training materials.</li> <li>4. Deliver the training, which may be through a combination of hands-on assistance, on-the-job training, and training workshops.</li> <li>5. Evaluate the effectiveness of the training measuring improvements in attitudes and skills achieved.</li> <li>6. Modify the training documents/materials as necessary.</li> <li>7. Hand-over the amended training documents/ material to the project manager for use in the delivery of the training.</li> <li>8. Prepare report on result of training.</li> </ol>
Time frame	Possible within 2 months after construction commencement
Target participant	Staff in PMU and MMB who responsible for environmental management
Staff resources	National environmental specialist with at least 10 years experience on environmental management water supply projects and must possess relevant graduate degrees in civil engineering, environmental management and other relevant courses.

## **X. CONCLUSIONS AND RECOMMENDATIONS**

104. 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.

105. The implementation of the subproject “Construction of a Water Supply System, Boc Bo Commune, Pac Nam District, Bac Kan Province” will improve conditions and enhance water supply services for people especially people in the mountainous areas and the poor people so that they can access the qualified and sanitary water resource for their domestic, production and tourism demand. 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.

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

## XI. APPENDIX

### A. Appendix 1: Photos of the subproject area



Boc Bo River - ahead of Vang My Weir



Waste accumulated near Vang My Weir



Current road condition at the proposed WTP



Public consultation in Boc Bo CPC

**B. Appendix 2: Source of Reference Information**

1. *Bac Kan Status of Environmental Report 2015*
2. *Bac Kan Climate Change Adaptation Plan (2011-2020)*
3. *Report on Water Quality Monitoring Plan in 2015 Bac Kan DONRE*
4. *The PO reports of the PPTA for Bac Kan Province*
5. *Social and Resettlement Report of the PPTA*

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

1. Loss of trees and impact to fauna	<ol style="list-style-type: none"> <li>1. Minimize vegetation covers clearances.</li> <li>2. All replanting works to utilize locally available non-invasive species.</li> <li>3. The contractors will not use or permit the use of wood, as fuel for the execution of any part of the works and to the extent practicable will ensure that fuels other than wood are used for cooking, and water heating in all camps and living accommodations.</li> <li>4. Contractors will not buy or use wood from the illegal sources (that come from the illegal logging)</li> </ol>
2. Generation of surplus soil	<ol style="list-style-type: none"> <li>1. Reuse excavated soil as filling soil to cover the pipe system.</li> <li>2. Surplus soil will be reused to the extent possible as a base material for the WTP site</li> <li>3. Further surplus soil will be transferred to a disposal site as agreed with the CSC and local authorities</li> </ol>
3. Generation of construction waste and domestic waste from workers	<ol style="list-style-type: none"> <li>1. Reuse construction waste such as cement bag cover, metal tools where possible.</li> <li>2. Install rubbish bins at work sites and in worker's camps.</li> <li>3. Transport the solid waste to a disposal site approved by the CSC.</li> </ol>
4. Dust, noise and vibration	<ol style="list-style-type: none"> <li>1. Large or noisy machines will not be located near residential area of Boc Bo.</li> <li>2. Work with Boc Bo CPC, ESP and PMU to identify suitable materials transportation route.</li> <li>3. Spray water regularly to suppress dust generated at the sites and patches near residential area during the dry period</li> </ol>
5. Traffic management	<ol style="list-style-type: none"> <li>1. Inform Boc Bo CPC in advance the construction schedule for distribution pipelines.</li> <li>2. Coordinate with traffic police of Pac Nam district to implement appropriate traffic diversion schemes (if needed)</li> <li>3. Setup clear traffic signal boards and traffic advisory signs at the market and school areas.</li> </ol>
6. Safety precautions for workers and public safety	<ol style="list-style-type: none"> <li>1. Conduct training for workers on safety, including roles and responsibilities, safe site practices and environmental hygiene</li> <li>2. Institute site and camp rules like wearing protective tools properly.</li> <li>3. Ensure all excavation sites are fenced and sign boards, perimeter markers installed</li> <li>4. Liaison with the power company to ensure that qualified technicians are on site to ensure that safety procedures are followed</li> <li>5. Assign responsibility to supervisor staff to ensure that all safety rules are followed</li> </ol>

## D. Appendix 4: 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 <sub>5</sub> (20 <sup>0</sup> C)	mg/l	4	6	15	25
6	Ammonium (NH <sub>4</sub> <sup>+</sup> ) (as N)	mg/l	0,1	0,2	0,5	1
7	Clorua Chloride (Cl <sup>-</sup> )	mg/l	250	400	600	-
8	Florua Fluoride (F <sup>-</sup> )	mg/l	1	1,5	1,5	2
9	Nitrite (NO <sub>2</sub> <sup>-</sup> ) (as N)	mg/l	0,01	0,02	0,04	0,05
10	Nitrate (NO <sub>3</sub> <sup>-</sup> ) (as N)	mg/l	2	5	10	15
11	Phosphate (PO <sub>4</sub> <sup>3-</sup> ) (as P)	mg/l	0,1	0,2	0,3	0,5
12	Xianua Cyanide (CN <sup>-</sup> )	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 <sup>3+</sup> )	mg/l	0,05	0,1	0,5	1
17	Chrom VI (Cr <sup>6+</sup> )	mg/l	0,01	0,02	0,04	0,05



18	Copper (Cu)	mg/l	0,1	0,2	0,5	1
19	Zinc (Zn)	mg/l	0,5	1,0	1,5	2
20	Nickel (Ni)	mg/l	0,1	0,1	0,1	0,1
21	Iron (Fe)	mg/l	0,5	1	1,5	2
22	Mercury (Hg)	mg/l	0,001	0,001	0,001	0,002
23	Surface-active substances	mg/l	0,1	0,2	0,4	0,5
24	Total oil & grease	mg/l	0,01	0,02	0,1	0,3
25	Phenon (Total)	mg/l	0,005	0,005	0,01	0,02
26	Organic chlorine pesticide					
	Aldrin + Dieldrin	µg/l	0,002	0,004	0,008	0,01
	Endrin	µg/l	0,01	0,012	0,014	0,02
	BHC	µg/l	0,05	0,1	0,13	0,015
	DDT	µg/l	0,001	0,002	0,004	0,005
	Endosulfan(Thiodan)	µg/l	0,005	0,01	0,01	0,02
	Lindan	µg/l	0,3	0,35	0,38	0,4
	Chlordane	µg/l	0,01	0,02	0,02	0,03
	Heptachlor	µg/l	0,01	0,02	0,02	0,05
27	Organic phosphorus pesticide					
	Parathion	µg/l	0,1	0,2	0,4	0,5
	Malathion	µg/l	0,1	0,32	0,32	0,4
28	Herbicide					
	2,4D	µg/l	100	200	450	500
	2,4,5T	µg/l	80	100	160	200
	Paraquat	µg/l	900	1200	1800	2000
29	Total radioactivity $\alpha$	Bq/l	0,1	0,1	0,1	0,1
30	Total radioactivity $\beta$	Bq/l	1,0	1,0	1,0	1,0
31	E.coli	MPN/ 100ml	20	50	100	200
32	Coliform	MPN/ 100ml	2500	5000	7500	10000

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

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

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

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

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

### **3. METHOD FOR DETERMINATION**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- TCVN 5991-1995 (ISO 5666-3-1984) - Water quality - Determination of total mercury by flameless atomic absorption spectrometry - Method after digestion with bromine
- TCVN 6002-1995 (ISO 6333-1986) - Water quality - Determination of manganese - Formaldoxime spectrometric method
- TCVN 6053-1995 (ISO 9696-1992) - Water quality - Measurement of gross alpha activity in non-saline water - Thick source method
- TCVN 6177-1996 (ISO 6332-1988) - Water quality - Determination of iron - Spectrometric method using 1,10 - phenanthroline
- TCVN 6193-1996 (ISO 8288-1986) - Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead - Flame atomic absorption spectrometric methods
- TCVN 6197-1996 (ISO 5961-1994) - Water quality - Determination of cadmium by atomic absorption spectrometry
- TCVN 6222-1996 (ISO 9174-1990) - Water quality. Methods for the determination of total chromium by atomic absorption spectrometry
- TCVN 6626-2000 (ISO 11969-1996) - Water quality - Determination of arsenic - Atomic absorption spectrometric method (hydride technique)
- TCVN 6216-1996 (ISO 6439-1990) - Water quality - Determination of phenol index - 4-Aminoantipyrine spectrometric methods after distillation
- TCVN 5070-1995 - Water quality - Weight method for determination of oil and oil products
- TCVN 6053-1995 (ISO 9696-1992) - Water quality - Measurement of gross alpha activity in non-saline water - Thick source method
- TCVN 6219-1995 (ISO 9697-1992) - Water quality - Measurement of gross beta activity.
- TCVN 6187-1-1996 (ISO 9308-1-1990) - Water quality - Detection and enumeration of coliform organisms, thermotolerant coliform organisms and presumptive Escherichia coli - Part 1: Membrane filtration method

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

#### **4. IMPLEMENTATION ORGANIZATION**

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

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

## QCVN 09 : 2008/BTNMT

### NATIONAL TECHNICAL REGULATION

#### ON UNDERGROUND WATER QUALITY

#### Introduction

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

### NATIONAL TECHNICAL REGULATION

#### ON UNDERGROUND WATER QUALITY

#### 1. GENERAL PROVISIONS

##### 1.1. Scope of application

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

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

##### 1.2. Explanation of terms

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

#### 2. TECHNICAL REGULATIONS

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

**Table 1: Limit values of the underground water quality parameters**

No.	Parameters	Unit	Limit values
1	pH	-	5,5 - 8,5
2	Hardness (as CaCO <sub>3</sub> )	mg/l	500
3	Total solids	mg/l	1500
4	COD (KMnO <sub>4</sub> )	mg/l	4
5	Ammonium (as N)	mg/l	0,1
6	Chloride (Cl <sup>-</sup> )	mg/l	250
7	Fluoride (F <sup>-</sup> )	mg/l	1,0
8	Nitrite (NO <sub>2</sub> <sup>-</sup> ) (as N)	mg/l	1,0
9	Nitrate (NO <sub>3</sub> <sup>-</sup> ) (as N)	mg/l	15
10	Sulphate (SO <sub>4</sub> <sup>2-</sup> )	mg/l	400
11	Cyanide (CN <sup>-</sup> )	mg/l	0,01
12	Phenol	mg/l	0,001
13	Arsenic (As)	mg/l	0,05

14	Cadimi (Cd) Cadmium (Cd)	mg/l	0,005
15	Lead (Pb)	mg/l	0,01
16	Chromium VI (Cr6 +)	mg/l	0,05
17	Copper (Cu)	mg/l	1,0
18	Zinc (Zn)	mg/l	3,0
19	Manganese (Mn)	mg/l	0,5
20	Mercury (Hg)	mg/l	0,001
21	Iron (Fe)	mg/l	5
22	Selenium (Se)	mg/l	0,01
23	Total radioactivity $\alpha$	Bq/l	0,1
24	Total radioactivity $\beta$	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 determining 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 sulphate - Gravimetric method using barium chloride
- TCVN 6181-1996 (ISO 6703-1-1984) Water quality - Determination of total cyanide
- TCVN 5988-1995 (ISO 5664-1984) - Water quality - Determination of ammonium -Distillation and titration method
- TCVN 6194-1996 (ISO 9297-1989) Water quality -Determination of chloride - Silver nitrate titration with chromate indicator (Mohr's method)

- TCVN 6195-1996 (ISO 10359-1-1992) - Water quality - Determination of fluoride - Part 1: Electrochemical probe method for potable and lightly polluted water
- TCVN 6216-1996 (ISO 6439-1990) - Water quality - Determination of phenol index -4- Aminoantipyrine spectrometric methods after distillation
- TCVN 6626-2000 (ISO 11969-1996) - Water quality - Determination of arsenic - Atomic absorption spectrometric method (hydride technique)
- TCVN 6193-1996 (ISO 8288-1986) - Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead - Flame atomic absorption spectrometric methods
- TCVN 6197-1996 (ISO 5961-1994) - Water quality - Determination of cadmium by atomic absorption spectrometry
- TCVN 6002-1995 (ISO 6333-1986) - Water quality - Determination of manganese - Formaldoxime spectrometric method
- TCVN 6177-1996 (ISO 6332-1988) - Water quality - Determination of iron - Spectrometric method using 1,10 - phenanthroline
- TCVN 6183-1996 (ISO 9965-1993) -Water quality - Determination of selenium - Atomic absorption spectrometric method (hydride technique)
- TCVN 59910-1995 (ISO 5666-3-1984) Water quality - Determination of total mercury by flameless atomic absorption spectrometry - Method after digestion with bromine
- TCVN 6222-1996 (ISO 9174-1990) - Water quality -Determination of chromium - Atomic absorption spectrometric methods
- TCVN 6187-1-1996 (ISO 9308-1-1990) - Water quality - Detection and enumeration of coliform organisms, thermotolerant coliform organisms and presumptive Escherichia coli - Part 1: Membrane filtration method

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

#### **4. IMPLEMENTATION ORGANIZATION**

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

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

## QCVN 05:2013/BTNMT

### NATIONAL TECHNICAL REGULATIONS ON AMBIENT AIR QUALITY

#### Introduction

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

#### *National Technical Regulation on Ambient Air Quality*

### 1. GENERAL PROVISIONS

#### 1.1. Scope of applications

1.1.1. This Regulation deals with limitations on values of basic factors including sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO), dioxide nitrogen (NO<sub>2</sub>), ozone (O<sub>3</sub>), total suspended particles (TSP), PM<sub>10</sub>, PM<sub>2.5</sub>, 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<sub>10</sub> is total suspended particles with aerodynamic diameter less than or equal to 10 µm.

1.2.3. Particle PM<sub>2.5</sub> is total suspended particles with aerodynamic diameter less than or equal to 2,5 µm.

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

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

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

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

### 2. Technical Reputation

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

**Table 1: Maximum value of basic parameters of ambient aire**Unit: Micro gram over cubic meter ( $\mu\text{g}/\text{m}^3$ )

No.	Paramater	Average 1 hour	Average 8 hours	Average 24 hours	Annual average
1	SO <sub>2</sub>	350	-	125	50
2	CO	30.000	10.000	-	-
3	NO <sub>2</sub>	200	-	100	40
4	O <sub>3</sub>	200	120	-	-
5	Total Suspended Particle (TSP)	300	-	200	100
6	Dust PM <sub>10</sub>	-	-	150	50
7	Dust PM <sub>2,5</sub>	-	-	50	25
8	Pb	-	-	1,5	0,5

Note: ( - ) unspecified



### E. Appendix 5: Stakeholder Communication Strategy

Objective	Key Challenges	Risks	Stakeholder Group	Messages	Means of Communication	Timeline	Responsibility	Resources
Disseminate information on project design, key impacts anticipated as well as any mitigation measures, to project Aps and beneficiaries	Language/Culture Literacy Managing expectations, including that of free water delivery and compliance with Viet Nam law (full cost recovery) Reach of information, especially in isolated or remote settlements in peri-urban areas and communes Lack of confidence in local authorities		Subproject Aps Community members (men & women in urban/peri-urban/rural communes) Women headed HH Poor HH	Subproject design, key benefits (including those of treated water supply), implementation arrangements and schedule of civil works opportunities for temporary employment as construction workers, community mobilizers or IEC campaign facilitators Main impacts of subproject (positive and negative) through disclosure Planned mitigation measures, especially for female APs (including compensation rates, entitlements, grievance redress mechanism) View water as a commercial good and stress the importance of user cost recovery, including for poor HHs Targeted subsidies, including free connections and lifeline tariffs	Public information meetings Resettlement committee meetings in affected areas Printed information in local language(s) posted in accessible public areas Gender-sensitive IEC campaign, including community-level training and public media campaign Meetings, consultations and other interactions between PMUs/WSCs and CSBs in the subproject area's service zones	Ongoing prior to implementation of activities Early in each phase of subproject preparation Subproject detailed design Ongoing during civil works Post evaluation after project completion	Primary: PMUs WSCs Contractors/ subcontractors for civil works Local authorities at commune-, ward-, city- and district-level (CPCs, WPCs, CPCs and DPCs) VWU Community Health Centers (CHCs)  Secondary: PPCs DPI DOLISA	Costs will be covered in part by the RPs, GAPs as well as basic project implementation budgets under PMU Incremental Cost and Construction Supervision Contract Resettlement Specialist WSC/PMU Social Development & Safeguards Specialists Compensation and Resettlement Committees (CRCs) Community Supervision Boards (CSBs) Community health workers (under respective DOHs)

Objective	Key Challenges	Risks	Stakeholder Group	Messages	Means of Communication	Timeline	Responsibility	Resources
				included in tariff by law to poor and women-headed households.				
Deliver information on labor opportunities and good labor practices	Language/Culture Literacy and low levels of awareness		Community members as well as outsiders hired as semi-skilled and skilled construction workers, community mobilizers and IEC campaign facilitators in subproject areas Contractors/ subcontractors for civil works	Opportunities for appropriate skills training/upgrading during period of hire, with quotas reserved for women (GAP) Core labor standards, including no forced labor and child labor Gender parity in work related compensation, i.e., equal pay for equal work, for women and men, and the right to separate living & toilet facilities at work sites Schedule of civil works Labor safety regulations Risks and prevention of HIV/AIDS transmission and Human Trafficking	Public information meetings Printed information in local language(s) and language(s) of migrant workers (on pamphlets and billboards), posted in accessible public areas, especially at or near construction sites IEC campaign for HIV/AIDs and Human Trafficking, including community-level training and public media campaign	Early in each phase of sub project preparation Ongoing during civil works and conduct of IEC campaigns	Primary: PMUs WSCs Local authorities at commune-, ward-, city- and district-level VWU CHCs Secondary: PPCs DOLISA	Costs will be covered in part by the GAPs as well as basic project implementation budgets under PMU Incremental Cost and Construction Supervision Contract PMU Social Development & Safeguards Specialists CSBs Community health workers Health NGOs
Highlight responsibility of provincial government agencies in enabling access of disadvantaged groups to	Lack of political willingness to implement decrees and decisions Provincial budget constraints		PPCs DOLISA PCs at other administrative levels in provinces, i.e., local authorities	Basic project design, anticipated impacts and any planned mitigation and grievance redress measures as they apply	WSC meetings with relevant local authorities and government agencies authorities, attended by VWU officials at the appropriate level	From outset of the project	MPI (as CA) WSCs VWUs at all levels	Costs will be covered by the GAP and basic project implementation budgets under PMU Incremental Cost and

Objective	Key Challenges	Risks	Stakeholder Group	Messages	Means of Communication	Timeline	Responsibility	Resources
municipal water supply				to APs, beneficiary groups and workers in the province State support for water related subsidies to poor and women headed HHs, and other vulnerable groups (including EMs, disabled, etc.), in accordance with Decrees 117 & 124				Construction Supervision Contract WSC management PMU Director PMU Social Development & Safeguards Specialists
Inform Provincial VWUs about project design and entry points for their participation – community mobilization, IEC, and ensuring women's access to all project benefits	Lack of sectoral capacity Relative lack of resources and decision making authority compared to other departments and agencies, including WSCs		Vietnam Women's Union (VWU)	Basic project design and anticipated impacts, as they matter to women Disseminate information on improved HH water management, sanitation and hygiene to communities in collaboration with Community Health Centers.	Public information meetings IEC campaign (including materials) to raise awareness on links between gender and WASH issues Training materials integrating gender	From outset of the project	VWU WSCs Local authorities at commune-, ward-, city- and district-level CHCs	Costs will be covered by the GAP budget □PMU Director PMU Social Development & Safeguards Specialists CSBs Community health workers
Inform network of Community Health Centers in project areas about project design and	Relative lack of resources and decision making authority compared to other departments and agencies, including WSCs		Community Health Centers (and community health workers), Department of Health	Disseminate information on health benefits of improved water supply, sanitation and hygiene to communities in collaboration with	Public information meetings, IEC sanitation and hygiene awareness materials, including community based training and public media campaign HIV/AIDS training module	Early in each phase of sub project preparation Ongoing during civil works and conduct of IEC campaigns	□VWU PMUs WSCs Local authorities at commune-, ward-, city- and district-level CHCs	Costs will be covered by the project implementation budget (social development) □PMU Social Development &

Objective	Key Challenges	Risks	Stakeholder Group	Messages	Means of Communication	Timeline	Responsibility	Resources
the role they are expected to play in disseminating information on improved WASH as well as HIV/AIDS causes & prevention				VWC Design and propagate training module about HIV/AIDS				Safeguards Specialists CSBs Community health workers
Promote community involvement in resettlement and project monitoring	Identifying valid community representatives Newly formed, slow to build up capacity required Functions vaguely defined		Community Supervision Boards (CSBs) Compensation and Resettlement Committees (CRCs)	Information on resettlement areas, affected households, resettlement plan and compensation policies Core labor standards integrating gender concerns and labor safety regulations Special consideration of community members from poor and/or women-headed HHs in all aspects of the project Risks and prevention of HIV/AIDS transmission and Human Trafficking	Meetings between WSCs/PMUs and CSBs and CRCs Public information meetings presided over by CSBs or CRCs Direct interactions between affected HHs and CSBs or CRCs Printed information in local language(s) posted in accessible public areas Gender-sensitive IEC campaign, including community-level training and public media campaign	Early in each phase of sub project preparation Ongoing during civil works and conduct of IEC campaigns	VWU PMUs WSCs Local authorities at commune-, ward-, city- and district-level	Costs will be covered by the GAPs and basic project implementation (social development component) budgets PMU Social Development & Safeguards Specialists CSBs Community health workers

Objective	Key Challenges	Risks	Stakeholder Group	Messages	Means of Communication	Timeline	Responsibility	Resources
Ensure understanding of HIV/AIDS transmission and Human Trafficking risks, and prevention measures for both	Language/Culture Literacy and low levels of awareness		Communities in or near project area construction sites Workers on construction site	Key risks and mitigation measures of HIV/AIDS transmission and Human Trafficking	Public information meetings Printed information in local language(s) and language(s) of migrant workers (on pamphlets and billboards), posted in accessible public areas, especially at or near construction sites IEC campaign for HIV/AIDS and Human Trafficking, including community-level training and public media campaign	Prior to commencement of civil works and throughout civil works	PMUs VWU CHCs Civil works contractors/subcontractors	Costs will be covered in part by the GAPs as well as basic project implementation budgets PMU Social Development & Safeguards Specialists CSBs Community health workers Local NGOs with a health focus
Strengthen business processes and institutions, integrating gender issues	Inertia to change; tendency to maintain institutional and socioeconomic status quo		All WSC and PMU staff, especially women in executive and non-executive positions VWU members at all levels within the province	Reasons why profit generation, user cost recovery and tariff roadmap are core principles of business viability Negotiate sharing of capital costs and underwriting of any subsidies to consumers with state agencies (PCs and DOLISA) Opportunities for training, exposure visits, with quotas reserved for female staff and VWU members to learn more	Resettlement committee meetings and/or meetings with affected households, Printed information in local language posted in accessible public areas Training workshops and exposure visits to raise awareness about benefits of community participation in all aspects of project planning, implementation, and M&E Financial and technical training workshops Training materials to promote gender sensitivity Routine consultation with VWUs on gender-related matters relevant to project outputs Routine consultations between WSC management and women	From outset of each subproject Ongoing prior to implementation of activities Early in each phase of subproject preparation At project detailed design Ongoing during civil works	Water Supply Companies (WSCs) as independent commercial & legal entities MPI PPCs PMUs VWUs	Costs will be covered in part by the GAPs and project implementation budgets PMU Director PMU Social Development & Safeguards Specialists Staff welfare committees of WSCs

Objective	Key Challenges	Risks	Stakeholder Group	Messages	Means of Communication	Timeline	Responsibility	Resources
				about the sector Gender parity in work related compensation, i.e., equal pay for equal work, for women and men in WSCs	employees, in executive and non-executive positions, about professional issues that matter to them			

Key: ADB - Asian Development Bank; PMU –Projects Management Board; APs – Affected Persons; CSB – Community Supervision Board; CPC – Commune Peoples Committee; CWU – Commune Women’s Union; DARD – Department of Agriculture & Rural Development; DOC – Department of Construction; DONRE – Department of Natural Resources & Environment; DOT – Department of Transport; DPI – Department of Plan and Investment DRCs – District Resettlement Committees; GAP – Gender Action Plan; IAs – Implementing Agencies; IPP – Indigenous Peoples Plan; PP – Project Proposal; O & M – Operation & Maintenance; PPC – Provincial peoples Committee; of RIs –Rural Infrastructure; RP – Resettlement Plan; VWU – Vietnam Women’s Union;

F. Appendix 6: Meeting minute and list of attendance - Public consultation

Dự án Hạ tầng Cơ bản Phát triển Toàn diện các tỉnh Đông Bắc - PPTA 8957

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM  
Độc lập - Tự do - Hạnh phúc

PHIẾU ĐIỀU TRA KHẢO SÁT MÔI TRƯỜNG

Ngày 13 tháng 9 năm 2016  
Tại xã Bắc Thành, Bắc Bộ huyện Bắc Ninh tỉnh Bắc Ninh

Đại diện nhóm khảo sát điều tra môi trường - Dự án Hạ tầng Cơ bản Phát triển Toàn diện các tỉnh Đông Bắc  
1/ Ông Nguyễn Thanh Dương - Trưởng nhóm  
2/ Ông Nguyễn Huy - Cán bộ hỗ trợ

Đã làm việc với:  
Đại diện chính quyền xã (có danh sách kèm theo)

Nội dung trao đổi làm việc:

- UBND xã Bắc Thành:
  - + Bà con không ủng hộ, mong mọi việc đều thuận lợi, hòa đồng.
  - + Trong tình hình công tác hạ tầng, công tác phải được báo cáo tham khảo, tham khảo để có địa điểm đặt trạm.
  - + Công việc kiểm tra giám sát hay không? Phải giám sát chặt chẽ.
- UBND xã Bắc Bộ:
  - + Vấn đề tiền nước: Cần công tác tham khảo liên quan đến tiền sử dụng nước sinh hoạt trên địa bàn.
  - + Quy mô xây dựng phải rõ ràng để người dân đặc biệt.
  - + Cần phải cử lý do và do đó sẽ có nhiều địa điểm.
  - + Khẳng định nguồn nước sông Năng đảm bảo, nhiều khu vực bị ngập lụt ven sông.

**DANH SÁCH CÁC ĐẠI BIỂU THAM VẤN NHẬN TIỀN HỖ TRỢ  
DỰ ÁN HỖ TRỢ KỸ THUẬT CHUẨN BỊ DỰ ÁN HẠ TẦNG CƠ BẢN PHÁT  
TRIỂN TOÀN DIỆN CÁC TỈNH ĐỒNG BẮC (PPTA – 8957)**

Bắc Kạn..., ngày...14... tháng 9 năm 2016

Nhóm Tư vấn môi trường thực hiện khảo sát tại

Xã...Bắc Khê.....huyện...Pác Nặm.....tỉnh...Bắc Kạn.....

**I. Danh sách các đại biểu nhận tiền hỗ trợ**

No.	Họ tên	Ký nhận
1	Đuan Thị Hối	Hối
2	Leông Thị Vinh	Vinh
3	Mai Thị Liên	Liên
4	Dương Thị Cao	Cao
5	Hương Minh Bội	Bội
6	Đặng Văn Bội	Bội
7	Công Văn Huân	Huân
8	Dương Hồng Xuân	Xuân
9	Đặng Thị Mân	Mân
10	Ngô Thị Đào	Đào
11	Ngô Thị Thuông	Thuông
12	Nguyễn Thị Thiên	Thiên
13	Hương Thị Tình	Tình
14	Lê Thị Mân	Mân
15	Thị Thị Nga	Nga
16	Đặng Văn Mai	Mai
17	Công Ngọc Lép	Lép
18		