

Initial Environmental Examination

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MFF 0054-VIE: Water Sector Investment Program – Tranche 2

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Supplementary Appendix 19-b

Initial Environmental Examination Construction of Water Supply System in Northern Part of Cam River

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Abbreviations

ADB	Asian Development Bank
AP	Affected Person
BPS	Booster Pumping Station
CEMP	Contractor's Environmental Management Plan
CEMR	Contractor's Environmental Management Report
CPC	Commune People's Committee
DARD	Department of Agriculture and Rural Development
DNREO	District Natural Resources and Environment Office
DOC	Department of Construction
DOH	Department of Health
DONRE	Department of Natural Resources and Environment
DPC	District People's Committee
EERT	External Emergency Response Team
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
EPC	Environmental Protection Commitment
ERC	Emergency Response Coordinator
GPP	Grievance Point Person
GOV	Government of Vietnam
HPWSCo	Hai Phong Water Supply Company
IEC	Information, Education and Communication
IEE	Initial Environmental Examination
M&R	Maintenance and Repair
NREO	(District) Natural Resources and Environment Office
OE	Operating Enterprise
O&M	Operation and Maintenance
O/M&R	Operation, Maintenance and Repair
PIA	Project Implementation Assistance
PMU	Project Management Unit
ROW	Right-of-Way
SERT	Subproject Emergency Response Team
USD	United States Dollar
VND	Vietnamese Dong
W/CPC	Ward/Commune People's Committee
WTP	Water Treatment Plant

Weights and Measures

C	-	Celsius/centigrade
dBa	-	decibel audible
ha	-	hectare/s
km	-	kilometer/s
km ²	-	square kilometer/s
kph	-	kilometer/s per hour
m	-	meter/s
m ³	-	cubic meter/s
mg/l	-	milligram/s per liter
mm	-	millimeter/s

Currency Equivalent

As of March 2011

Currency Unit	-	Vietnamese Dong
USD 1	=	VND 20,800

I. EXECUTIVE SUMMARY

A. Purpose of the Report

1. This report gives an account of the initial environmental examination (IEE) of the proposed Construction of Water Supply System in Northern Part of Cam River Subproject of the Rehabilitating and Upgrading Project of Hai Phong Water Supply System – Stage II. The IEE was conducted as part of the subproject preparation to identify and assess potential impacts of the proposed Subproject on the environment, and to recommend measures to mitigate the potential adverse impacts arising from its implementation. The IEE was carried out following the Environmental Assessment Guidelines (2003) and Safeguard Policy Statement (June 2009) of the Asian Development Bank (ADB), and with reference to the Law on Environmental Protection and its implementation guidelines (Decree No. 80/2006/ND-CP of 9 August 2006 and Decree 21/ND-CP of 28 February 2008) of the Government of Viet Nam (GOV).

B. Rehabilitating & Upgrading Project of Hai Phong Water Supply System-Stage II

2. The Rehabilitating and Upgrading Project of Hai Phong Water Supply System - Stage II (or, the “Project”) is the second phase of an overall effort to rehabilitate the Hai Phong Water Supply System. The first phase, implemented between the 90’s and 2009, rehabilitated and improved the water supply system in the urban center. It was funded by the Government of Finland, World Bank and Hai Phong Water Supply Company (HPWSCo) itself. This second phase was conceptualized to enhance the system’s production capacity and expand the service area to sustainably meet the increasing demand for safe potable water in the old urban center, in recent urban area expansion to the southeast, in future urban expansion south of the urban center and in peri-urban areas of the City. It has five core subprojects that focus on 7 districts:

- (i) Construction of Water Supply System in Northern Part of Cam River, which shall extend services to the peri-urban area north of the City’s urban center;
- (ii) Upgrading of An Duong Water Treatment Plant (WTP) from 100,000 m³ to 200,000 m³/day, which shall enhance the water production of the existing An Duong WTP for an increased water supply in the serviced urban areas and to extend services to future urban expansion area south of the urban center;
- (iii) Rehabilitation of Do Son Water Supply System and Adjacent Areas, which shall convert an existing WTP into a booster pumping station for an improved water supply in the serviced area of Do Son District, and extend services to currently un-serviced urban areas of Do Son and Duong Kinh Districts¹;
- (iv) Construction of Kim Son Water Supply System, which shall extend services to the peri-urban area west and northwest of the City’s urban center; and
- (v) Construction of Hung Dao Water Treatment Plant, which shall provide water to the Do Son BPS and shall also extend services to the new urban areas in Hai An and Kien Thuy District, including the Nui Doi Town and adjacent areas.

3. The Project will also provide institutional development and capacity building of the HPWSCo in water supply infrastructure development, environmental management, and policy reforms to ensure effective implementation of the Project and sustainable operation and maintenance of the entire water supply system.

4. The HPWSCo is the executing agency for the Project. A Project Leading Group (PLG) provides overall guidance and support to Project preparation and implementation. A

¹ In early 2008, the urban area of Hai Phong was extended to the southeast to include the Do Son and Duong Kinh Districts.

Project Management Unit (PMU) manages the day-to-day activities of the Project. The Project will be implemented for a period of about six years, commencing with the preparation of the detailed designs and bidding documents of all subprojects from the 1st Quarter of 2012 to the 1st Quarter of 2013 and followed by phased procurement for, and execution of, subproject civil works, as follows:

- Package 1, Construction of Water Supply System in Northern Part of Cam River, will start its procurement process in the 2nd Quarter of 2012 and construction in the 2nd Quarter of 2013.
- Package 2, Upgrading of An Duong WTP from 100,000 m³ to 200,000 m³/day and Rehabilitation of Do Son Water Supply System and Adjacent Areas, will start its procurement process in the 4th Quarter of 2013, and construction in the 4th Quarter of 2014.
- Package 3, Construction of Kim Son Water Supply System, will start its procurement process in the 2nd Quarter of 2015; and construction in the 2nd Quarter of 2016.
- Package 4, Construction of Hung Dao Water Treatment Plant, will start its procurement process in the 4th Quarter of 2013; and construction in the 2nd Quarter of 2015.

5. Subprojects may start operation even before their respective defects liability periods are over. Package 1 may start operation, at the earliest, by the 1st Quarter of 2015; Packages 2 and 4, by the 4th Quarter of 2016; and Package 3, by the 1st Quarter of 2018.

C. Construction of Water Supply System in Northern Part of Cam River

6. The proposed Construction of Water Supply System in Northern Part of Cam River (or, the “Subproject”) will develop a new water supply system to the north of the City center to serve the peri-urban area in Hai Phong City’s northernmost district, Thuy Nguyen. It is intended to meet total water supply requirements of 90% of the population, and those of industries, commercial establishments and institutions in Thuy Nguyen, including that of the VSIP Hai Phong Township and Industrial Park, by 2025. The Subproject will: i) draw water from the Gia River, an artificial water storage reservoir; ii) subject the drawn water to a treatment process that HPWScO is basically familiar with but employing some improved technologies; iii) supply treated water to the nine communes along National Road 10 from Gia River in the north to Cam River in the south; and iv) connect to the existing water supply network in the City Center. The Subproject components are as follows:

- (i) A new water treatment plant (WTP) in Northern Cam River, of 25,000 m³/day initial capacity, but can be expanded to an ultimate capacity of 200,000 m³/day; and associated access road, approximately 1 km long;
- (ii) A new booster pumping station (BPS) in Tan Duong Commune; and
- (iii) New transmission mains for treated water, nearly 18 km long in total length of various sizes ranging from D250 to D600.

7. Some 28,000 new service connections will be served by the new system. These new connections, however, will be installed under a separate project to be funded by HPWScO’s internal funds; although installations will be carried out timely with the Subproject.

8. The Subproject will be implemented in the urbanized and urbanizing communes of Thuy Nguyen District. The WTP will be situated in an 8-ha site, presently cultivated rice fields, in Trung Son Village of Northern Cam River Commune. The site is about 1 km north of the National Road 10 and is partly right at the south bank of the Gia River. In the north, it is bordered partly by the Gia River and partly by rice fields; in the east, by an earth dike road, about 5-6 m wide and lined with a row of trees on one side; in the south, by a grave site and cultivated rice fields; and in the west, by cultivated rice fields. It is currently accessed from the National Road 10 through a combination of a commune road (partially

concrete, and partially dirt, road) and an agricultural dike road. The same access will be used for the WTP, but will be improved under the Subproject. The access road traverses through rice fields and medium-intensity residential development. A grave site (different from the one bordering the WTP site) can be found within 30-40 m east of the access road alignment.

9. The transmission mains will be installed within road carriageways of the access road, National Road 10, and main road through Tan Duong Commune. The National Road 10, along which a large section of the transmission main will be laid, is, on both sides, predominantly built up with mixed residential and commercial development. The road through Thuy Duong Commune from Nui Deo to the BPS site is largely lined with agricultural lands. The BPS will be built in a site that is partly freshwater marsh and partly rice field in Tan Duong Commune near the Binh Bridge. It is close to the site of the proposed VSIP Township and Industrial Park.

10. The Subproject sites are not served by any of the Hai Phong water supply systems, have access to power supply, are about 15 to 30 km away from three of the City's four disposal sites and 6 to 20 km away from three big quarry sites in Hai Phong. The 1,600-ha site of the VSIP Township and Industrial Park, east of the Tan Duong BPS, requires major filling and could make good use of the excess filling materials from the Subproject.

11. The Subproject will be implemented over a period of about 35 months, commencing in the 1st Quarter of 2012 with the preparation of the detailed design and bidding documents. Procurement for civil works will take about 12 months starting in the 2nd Quarter of 2012; and construction, about 20 months starting in the 2nd Quarter of 2013. Operation is estimated to start by the 1st Quarter of 2015, even before defects liability period is over.

D. Summary of Impacts and Mitigation Measures

12. The IEE identified and screened a range of likely issues/concerns/impacts arising from Subproject execution. The issues/concerns/impacts that assessed as potentially significant are summarized as follows. The salient concerns relative to siting are: i) a third of the northern perimeter of the WTP site is along the southern bank of the Gia River; ii) a grave site borders the WTP site at its south; iii) more urbanized and densely populated sections of the transmission main alignment; iv) the losses and displacements associated with land and right-of-way acquisition; and v) the vulnerability of the WTP site to flooding during heavy rains. From inadequate design, the more crucial concerns are the delivery of unsafe water and the inadequate resurfacing of the road sections, affected by the transmission main installations, to their previous standards. During construction, the likely significant impacts are dust, noise, deterioration of Gia River water quality and its impact on aquatic life, solid waste, sediments, traffic, access blocking, disruption of socio-economic activities, hazards to community and workers' health and safety, and damage to the grave site adjacent to the WTP site. During operation, the potential salient concerns are: i) delivery of unsafe water; ii) unsustained operations due to the deteriorating quality and quantity of raw water and/or inefficient operation, maintenance and repair. The provision of a reliable system of safe potable water supply will have the following positive impacts or benefits: i) improved quality of life; ii) induced socio-economic growth; and iii) improved local economy. These developments, however, will lead to accelerated land use changes (conversions and intensifications) and rising demand for basic infrastructures/services. Of utmost concern is that water demand will increase, and will increasingly put pressure on the system. More water consumption will result in the generation of more wastewater. Without parallel efforts in managing sewage and wastewater (critically, industrial wastewaters), the quality of life in the service area will eventually deteriorate. City authorities will be confronted with pressures to meet rising demand for other basic infrastructure services as well, e.g., drainage, solid waste management and power supply, among others. These anticipated crosscutting effects

of having a more reliable water supply will require comprehensive planning for sustainable development, coordination of infrastructure provisions and appropriate development guide and controls.

13. The recommended environmental mitigation measures consist of actions, activities, plans and documents (including certification of registered Environmental Protection Commitment, water use agreement, building permit and permit to operate) that need to be conducted, observed, fulfilled or obtained to prevent, mitigate or compensate for the adverse impacts of the Subproject on the environment. Specific measures are presented in the EMP. Some of the broad measures are as follows:

- (i) Inputting environmental considerations in detailed design and O&M Manual.
- (ii) Specifying environmentally preferred construction practices, materials and technologies, where possible, in the detailed design and/or bidding documents.
- (iii) Prompt compensation of affected households and replacement of displaced community infrastructures according to the approved Resettlement Plan.
- (iv) Ensuring the engagement of an environment-responsible Contractor by incorporating the ADB-cleared Subproject EMP into the bidding documents for use as basis in the preparation of Contractor's EMP (CEMP), addressing as minimum the Subproject EMP requirements. CEMPs to be quantitatively and qualitatively evaluated against the Subproject EMP. CEMP of winning bidder to be cleared by ADB prior to awarding of Contract. The Contract to stipulate the tie-up of progress payment and collection of performance bond with the performance in CEMP/Subproject EMP implementation.
- v) Good and environment-friendly engineering practices that avoid first, and (if unavoidable) mitigate, adverse impacts; and full implementation of the CEMP/Subproject EMP.
- (vi) Quality construction supervision and environmental monitoring by the PMU.
- (vii) Environment-friendly O&M Manual, incorporating the EMP.
- (viii) Sufficient funds for sustained quality of operation and maintenance.
- (ix) Observance of the grievance redress mechanism and prompt resolution of lodged grievances.

E. Information Disclosure, Consultation and Participation

14. Public consultation and participation during subproject preparation were conducted in the form of on-site informal discussions during field visits, key informant interviews, socio-economic survey and focus group discussions. Information disclosed to date include: i) Subproject description and components; ii) location; iii) expected period of implementation; iv) extent of land to be acquired/withdrawn; v) potential affected farmlands and households; and vi) expected adverse impacts during construction (discussed during random interviews with affected residents). This IEE & its EMP will undergo finalization during the detailed design stage. To incorporate further opinions of, and inputs from, stakeholders into the final IEE & EMP, it would be valuable to subject the findings of this IEE and its EMP to a multi-stakeholder consultation in the first quarter of the detailed design stage.

F. Grievance Redress Mechanism

15. Informally, a complainant can approach or call the PMU, the Contractor or the Operator to raise his/her complaints/concerns. If complaint is not acted on promptly, or if complainant is not satisfied with the resolution undertaken, he/she can call or approach the HPWSCo's Customer Relations Office.

16. The formal grievance redress mechanism will involve the following steps:

- Step 1 The Affected Person (AP) lodges complaint. The complaint will be documented and registered by the PMU Grievance Point Person (GPP), during construction, and by the Operating Enterprise, during operation.
- Step 3 The AP will be informed immediately if the grievance is within, or outside, the purview of the mechanism. If within, the complaint will be immediately (or, not later than the next day) reviewed, investigated and discussed; if outside, AP shall be directed to the proper institution and/or proper mechanism for the complaint.
- Step 4 If impact/issue is minor, the Contractor/OE shall act immediately. If impact/issue will need thorough review and investigation, more work to be done, and/or supplies/parts to be procured, to resolve, the Contractor/OE shall immediately provide the most suitable interim measure to reduce impact; and shall start work on the final measure not later than 5 days from the day discussion meeting is held.
- Step 5 If, according to the AP, the impact has been resolved satisfactorily, the GPP/OE shall obtain a written confirmation of satisfaction from the AP. In the event the AP is not satisfied, or the issue persists, he/she can lodge an appeal to his/her CPC. The CPC shall immediately record the appeal and together with the GPP, Contractor or OE, review the history of the grievance and discuss the appeal and quick resolution of the issue. If the agreed on action/measure has not started within 5 days from the time of formal lodging of the appeal, or if the AP is still not satisfied with the resolution, AP can seek assistance from CPC to raise the grievance to the most relevant institution, i.e., District or City Court.

G. Environmental Management Plan

17. The EMP will be the framework for environmental impact mitigation and effects monitoring during Subproject implementation. The draft EMP is featured as **Annex H**. It will be finalized by the PMU based on the detailed design, with technical assistance from the Environmental Specialist of the Project Implementation Assistance (PIA) Team. The final EMP, cleared by the ADB, shall form part of the bidding documents to draw more environment-responsible contractors to bid for the civil works. Bidders shall prepare a Contractor's EMP (CEMP) that will address as minimum the requirements/recommendations of the Subproject EMP. CEMPs shall be quantitatively and qualitatively evaluated against the Subproject EMP. The Contract for civil works shall explicitly stipulate the obligations of parties involved to institute the mitigation measures properly and carry out environmental monitoring according to the ADB-cleared CEMP and Subproject EMP, both to be appended in the Contract. The Contract for civil works shall stipulate the tie-up of progress payment and collection of performance bond with the performance in CEMP/Subproject EMP implementation. The Subproject EMP shall be incorporated into the O&M Manual for implementation during operation.

18. The marginal costs for implementing the EMP are initially estimated to include:
- (i) VND 778 Million (USD 37,400) of fixed cost to cover:
 - confirming raw water quality for use as basis in detailed design, and environmental monitoring to establish baseline data of ambient environmental quality/levels prior to construction, 9.0%
 - environmental effects monitoring during construction, 87%
 - environmental monitoring to establish baseline data of ambient environmental quality/levels prior to full operation, 4.0%;
 - (ii) an annual marginal cost of VND 37 Million (USD 1,770) during operation to monitor the quality of Gia River downstream water; and

- (iii) a total of USD 122,000 for the engagement of Environmental Specialists to provide technical assistance to the PMU in environmental management.

19. The first two costs include taxes; but exclude contingencies and inflation. The costs exclude the salaries of the Environmental Engineers and Grievance Point Person, who will be existing HPWSCo staffs seconded to the PMU for environmental management.

20. The PMU will have its full-time Environmental Engineer to oversee and monitor the implementation of the Subproject EMP. The Environmental Specialist of the Project Implementation Assistance (PIA) Team will provide technical advice, guidance and support to the Environmental Engineer in overseeing EMP implementation. The PLG will be responsible for deciding on environmental management matters that will require action from the senior-management level. It will ensure adequate resources are allocated and are timely disbursed to process the necessary permits/approvals/agreements, to monitor EMP implementation and to undertake the environmental monitoring activities required from HPWSCo in the Environmental Monitoring Plan. The ADB will undertake reviews of relevant documents for clearance purposes or issuance of “No Objection Letters” accordingly, and carry out annual environmental review missions to review the environmental performance of the Subproject. The Design Consultant will incorporate EMP requirements and recommendations into the design, bid document and O&M Manual. The DPC of Thuy Nguyen will approve/certify the registration of the Subproject EPC. The concerned CPCs will be involved at the commune level, e.g., in public disclosure of Subproject environmental matters and coordination on matters that affect their communities. The civil works Contractor and the Operating Enterprise will be responsible for implementing all EMP-specified environmental mitigation and protection measures and environmental monitoring activities, and prepare monthly and semi-annual Environmental Management Reports (EMRs). Other GOV institutions, such as the District Natural Resources and Environment Office (DNREO or NREO), Department of Health (DOH), Department of Agriculture and Rural Development (DARD), Department of Construction (DOC) and Department of Natural Resources and Environment (DONRE), will also have roles to play and responsibilities to carry out in the environmental management aspect of the Subproject.

21. Two approaches of capacity development on environmental management have been identified: i) through participation in relevant courses and seminars as mentioned in the Preliminary Training Plan for HPWSCo Institutional Development; and ii) through “learning-by-doing”, conducted by the Environmental Specialist of the PIA Team as he/she provides technical assistance.

H. Conclusion

22. The proposed Subproject will have substantial socio-economic and environmental benefits: (i) improved quality of life; (ii) induced socio-economic growth; and (iii) improved local economy; in Thuy Nguyen District, particularly in its peri-urban area. Overall, it will substantially contribute to poverty alleviation in Hai Phong City.

23. The potential adverse impacts during construction can be mitigated without difficulty through strict compliance with environmental management requirements, particularly the full implementation of the CEMP/Subproject EMP. Contractor contractually bound to comply with the CEMP/Subproject EMP, and construction progress payment and collection of performance bond tied up with the Contractor’s performance in CEMP/Subproject EMP implementation, will considerably mitigate the adverse impacts during construction. Adequate incorporation of environmental considerations during design, and good performance in Subproject EMP implementation, will largely mitigate the potential adverse impacts during operation. Overall, the Subproject will unlikely cause irreversible impacts on the environment. The benefits that will be derived from the Subproject will far outweigh the

potential adverse impacts. With effective environmental management and monitoring in all stages of the Subproject, the environmental benefits from the Subproject can be fully gained.

24. Based on the findings of the IEE, the classification of the Subproject as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with the Safeguard Policy Statement of the ADB. Under GOV regulations, the Subproject is classified as Category “II”, which would be required an Environmental Protection Commitment for registration with, and certification by, the District People’s Committee through its Natural Resources and Environment Office. The EPC for this Subproject will be prepared based on the IEE and its EMP.

II. POLICY, LEGAL & ADMINISTRATIVE FRAMEWORK

A. Policy and Legal Framework

25. The basic GOV laws/policies that provide general framework and procedures/guidelines on environmental assessment are the:

Law on Environmental Protection of 29 November 2005, providing for environmental protection; for policies, measures and resources for environmental protection; and for the rights and obligations of organizations, household and individuals for environmental protection. Its Section 2, which includes Articles 18 to 23, discusses environmental impact assessment.

Decree 80/ND-CP of 09 August 2006, detailing and guiding the implementation of a number of articles of the Law on Environmental Protection regarding environmental standards; strategic environmental assessment; EIA and environmental protection commitments; and disclosure of environmental information and data, among others.

Decree 21/ND-CP of 28 February 2008, amending and supplementing some articles of Decree 80/2006/ND-CP, such as the list of projects for which a report on assessment of environmental impact must be prepared; the appraisal and approval process of EIA reports; and the requirement for projects that have not commenced after 24 months from the date of approval of the EIA reports, among others.

Circular 05/2008/TT-BTNMT of 08 December 2008, providing detailed instructions on the implementation of some contents relating to evaluation of strategic environment, of impact on environment and commitment to environment protection prescribed by Law on Environment Protection, Decree 80/2006/ND-CP and Decree 21/2008/ND-CP. The instructed contents include the preparation and assessment of reports on evaluation of strategic environment; the preparation, assessment and approval of reports and additional reports on evaluation of impacts on environment; the checking and certifying of the contents of reports; the examining regime, reporting on the assessment and approval of reports on evaluation of impacts on environments, certifying the commitment to environment protection. This Circular replaced Circular No. 08/2006/TT-BTNMT.

26. Relevant water sector specific laws/issuances include the:

Law on Water Resource (No. 8/1998/QH10 of 20 May 1998, provides for the management, protection, exploitation and use of water resource; the protection and combat against, and overcome of, the harmful effects of water.

QCVN 01:2009/BYT, or the National Technical Regulation on drinking water quality.

QCVN 08:2008/BTNMT, containing the national technical specifications on surface water quality.

QCVN 09:2008/BTNMT, containing the national technical specifications on ground water quality.

27. Other issuances relevant to the conduct of environmental assessment of water supply projects are, but not limited to, the following:

TCVN 5937-2005, specifying the ambient air quality standards.

TCVN 5938-2005, specifying the allowable maximum concentration of hazardous substances in ambient air.

TCVN 5949-1998 – specifying the permitted maximum levels of noise in public places and populated areas.

TCVN 6962:2001: specifying the permitted levels of vibration from construction and industrial activities in residential and public areas.

Law on Biodiversity, which took effect on 1 July 2009

Law on Aquatic Resource Protection, 1989.

28. Environmental conventions and protocols that the country is party of includes: the UNESCO World Heritage Convention, Ramsar Convention on Protection of Wetlands, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, also known as the Washington Convention), Convention on Biological Diversity (known informally as the Biodiversity Convention), Cartagena Protocol on Biosafety, Kyoto Protocol (on climate change). Decision No 2548/QĐ-UBND was issued by the Haiphong People's Committee on 27 November 2006, ratifying the project that promoted the sustainability of the protection of biodiversity and the white-headed langur in Cat Ba Island, funded by the Regional Natural Heritage Programme (RNHP).

B. Assessment and Approval Requirements

29. According to Circular No.05/2008/TT-BTNMT, dated December 8, 2008, water supply projects with design capacity of 50,000 m³/day or more are classified as Category “I” projects and are required full Environmental Impact Assessment (EIA). Water supply projects with lesser capacities are classified as Category “II” projects, which are required Environmental Protection Commitments (EPCs). Full EIA Reports are approved by the Hai Phong People's Committee through its DONRE. EPCs are approved by District People's Committee through its Natural Resources and Environment Office.

III. DESCRIPTION OF THE SUBPROJECT

30. The proposed Construction of Water Supply System in Northern Part of Cam River (or, the “Subproject”) will develop a new water supply system to the north of the City center to serve the peri-urban area in Hai Phong City's northernmost district, Thuy Nguyen. The Subproject will: i) draw water from the Gia River, an artificial water storage reservoir; ii) subject the drawn water to a treatment process that HPWSCO is basically familiar with but employing some improved technologies; iii) supply treated water to the nine communes along National Road 10 from Gia River in the north to Cam River in the south; and iv)

connect to the existing water supply network in the City Center. The Subproject components are as follows:

- (i) A new water treatment plant (WTP) in Northern Cam River;
- (ii) A new booster pumping station (BPS) in Tan Duong Commune; and
- (iii) New transmission mains for treated water from the WTP through nine communes to the BPS and from BPS to the existing network in the City center. (There are no old/existing pipes in all subproject sites. The proposed transmission mains will all be new installations.)

31. Some 28,000 new service connections will be served by the new system. These new connections, however, will be installed under a separate project to be funded by HPWSCO's internal funds; although installations will be carried out timely with the Subproject.

A. Subproject Category and Requirements

32. Under ADB classification, the Subproject is a Category "B" undertaking. For Category "B" projects, the ADB requires an IEE. Under GOV classification, it is a Category "II" project, which would be required an Environmental Protection Commitment (EPC) for registration with, and certification by, the District People's Committee through its Natural Resources and Environment Office. The EPC for this Subproject will be prepared based on the IEE and its EMP.

B. Need for the Subproject

33. The piped water supply system of Hai Phong presently services seven distribution areas, each with a water treatment plant. Four of the seven distribution areas are interconnected. The remaining three are independent systems. One of these independent systems is found in Thuy Nguyen District, which is supplied with 1,500 m³ of water per day by the Minh Duc WTP and which supplies water to around 3,500 households of Minh Duc town and its surrounding areas. For the remaining majority of Thuy Nguyen population, water is sourced from drilled wells, small-scale water supply systems using groundwater resources, and/or collected rainwater, exposing the residents to the health risks posed by water obtained from such sources. Thuy Nguyen District, particularly in the fast urbanizing communes between Minh Duc and Cam River, continues to receive urban spill from the congested City Center. The need for access to safe and reliable water supply has never been more urgent. The development of the VSIP Hai Phong Township and Industrial Park, a 1,600-ha urban, industrial, commercial and residential complex, right at the northern bank of the Cam River and east of the proposed Tan Duong Booster Pumping Station under this Subproject, was officially launched in January 2010. The continuing urban spill, the VSIP complex and the urban growth that will be induced by the operation of the VSIP complex will need a reliable system of potable water.

C. Subproject Location

34. The Subproject will be implemented in the urbanized and urbanizing areas of Thuy Nguyen District, the northernmost district of Hai Phong. The WTP will be situated in an 8-ha site, presently cultivated rice fields, in Trung Son Village of Northern Cam River Commune. The site is about 1 km north of the National Road 10 and is 0-100 m from the south bank of the Gia River. The site is bordered in its four sides as follows:

- (i) In the north, partly by Gia River and partly by rice field;
- (ii) In the east, by an earth dike road, about 5-6 m wide and lined with a row of trees on one side. Cultivated rice fields with ponds follow to the east of the row of trees.
- (iii) In the south, by a grave site and cultivated rice fields.
- (iv) In the west, by cultivated rice fields.

35. The WTP site is currently accessed from the National Road 10 through a combination of narrow commune road (partially concrete, and partially dirt, road) and an agricultural dike road. The concrete-paved segment of the commune road is lined with residential structures on both sides; with the Pham Northern Cam River High School somewhere along the east side. The dirt road segment of the commune road has residential structures on one side and the irrigation channel, power supply poles and rice fields on the other side. The agricultural dike road that leads to the WTP site ranges from 2 m to 5/6 m wide. In a section of the dike road nearer to the WTP, a grave site can be found within 35 m distance to the east. (This is a different grave site from that adjoining the southern boundary of the WTP site.) The WTP site has a flat terrain. Water table in the area is assumed shallow, since the area is widely rice fields and close to a river. Site has access to power supply.

36. The booster pumping station (BPS) will be developed in a 0.5-ha site in Tan Duong Commune near Binh Bridge, about 50 m south of National Road 10 and is, by road, within 11 km to the south from the WTP site.. The site, partly a freshwater marsh and partly cultivated rice land, has flat terrain and ground elevation lower than the road. The site is bordered on its west by a chip-sealed road without provisions for drainage. Site has access to power supply.

37. The transmission mains, except for the siphon section over the Cam River, will be installed underground within the outer lane of road carriageways:

- (i) along the WTP access road, from the WTP to National Road 10, at the left side, the center of the pipeline at 1.5 m from the road kerb;
- (ii) along National Road 10, from its junction with the WTP access road to Rung Ferry in Tam Hung Commune, at the left side, the center of pipeline at 1.0 to 1.5 m from the road kerb;
- (iii) along National Road 10, from its junction with the WTP access road to Nui Deo town, at the right side, the center of pipeline at 1.0 to 1.5 m from the road kerb;
- (iv) along the road from Nui Deo through Thuy Duong to Tan Duong BPS and further to the north bank of Cam River, at the right side, the center of pipeline at 0.6 to 1.0 m from the road kerb;
- (v) crossing the Cam River to So Dau Ward of Hong Bang District, to be installed over the Cam River parallel to the Binh Bridge, 80 m away upstream side, and then further southwards underground along the approach road to Binh Bridge to its T-junction, at the right side, the center of pipeline at 1.0 m from the road kerb.

38. From Pha Rung to the Nui Deo/Thuy Duong Communes, both sides of the National Road 10 is predominantly mixed residential-commercial development. Tan Duong Commune is predominantly rice fields and wetlands. Two pagodas and 2 grave sites can be found along the National Road 10.

39. The approximate distances of all Subproject sites to disposal sites, site needing filling and quarries are presented in **Table 1. Annex A** provides maps showing locations of the Subproject in different geographic contexts.

D. Size and Magnitude

40. The Subproject will develop a water supply system that will meet the water supply requirements of 90 percent of an estimated 97,000 population of 9 communes², industries,

² Tam Hung, Northern Cam River, Phuc Le, Thuy Trieu, Trung Ha, An Lu, Thuy Duong, Hoa Binh, Tan Duong

commercial establishments, and institutions in the urban area of the northern part of Cam River, including that of the VSIP Hai Phong Township and Industrial Park, by 2025.

Table 1. Distances of Subproject Sites to Disposal Sites and Quarries in Hai Phong

Disposal Site & Quarry	Approximate Distance to Subproject Site (km)		
	WTP	BPS	Trans. Main
Disposal Site			
1 Trang Cat Sanitary Landfill as	25	15	min 12, max 29
2 Dinh Vu Landfill	30	20	min 17, max 34
3 Gia Minh	20	18	min 20, max 23
Site needing filling			
1 VSIP Township & Industrial Park (1,600 ha)	7-10	1.5-2	min 0, max 11
Quarry			
1 Luu Ky Commune	20	18	min 13, max 22
2 Minh Tan Commune	7	16	min 4, max 17
3 Minh Duc Commune (West of Minh Duc Town	6	15	min 3, max 16

Distances measured on google map.

1. Northern Cam River WTP

41. The Northern Cam River WTP, will be constructed with an initial capacity of 25,000 m³/day, but can be expanded to an ultimate capacity of 200,000 m³/day. It will employ the water treatment process that HPWSCo is familiar with, i.e., pre-chlorination, mixing, alkalization, flocculation, sedimentation, rapid sand filtration, post-chlorination, sludge drying/backwash recovery, but with some improved technologies for optimized design and operations, e.g., vertical shaft mechanical rapid mixing and flocculation tanks, tube sedimentation tanks, and single media filtration, among others. The WTP will have the following facilities and infrastructure:

- (i) Raw water intake of reinforced concrete
- (ii) Raw water pumping station
- (iii) Receiving and flow splitting chamber of reinforced concrete
- (iv) Mechanical mixing tanks of reinforced concrete, 3 units with 1 mechanical mixer each
- (v) Mechanical flocculation tanks of reinforced concrete, 2 units, each unit to be 3 chambered and each chamber to be equipped with one mechanical flocculator (2 additional flocculation tanks to be also built for future use)
- (vi) Lamella sedimentation tanks of reinforced concrete, 4 units, each with 28 m x 4.5 m surface area dimensions
- (vii) Single media rapid filtration units of reinforced concrete structure, 4 units
- (viii) Treated water reservoir of reinforced concrete, 1 unit, 5,000 m³ storage capacity
- (ix) Treated water pumping station with 4 units of treated water pump and motor
- (x) Chemical building for chemical preparation and dosing
- (xi) Backwash and de-sludge water recovery pumping station, 1 unit, to have 2 collection tanks with storage capacity of 350 m³ each
- (xii) Sludge drying bed, 1 unit with 3 beds, of reinforced concrete
- (xiii) One administration and laboratory building, including supply of communication and laboratory equipment
- (xiv) One workshop building, one material storehouse, including supply of workshop tools
- (xv) Site infrastructure (physical, mechanical and electrical)
- (xvi) Access road to/from the National Road 10, about 1 km in length, 4.5-m wide carriageway and 1.5 m wide sidewalk on each side, requiring a ROW of 7.5 m.

2. Tan Duong BPS

42. Since it is intended to connect the new system in Thuy Nguyen to the existing system in the City center, the Tan Duong BPS will be constructed to increase the water supply pressure from the Thuy Nguyen side to match up with that on the Hai Phong side. On the other hand, when supplying water from Hai Phong to Thuy Nguyen, it is also necessary to raise the pressure to ensure the water supplied will meet the pressure requirements at all areas of Thuy Nguyen. The BPS will have the following facilities and infrastructure:

- (i) A pumping station, 140 m², to house 3 pumps, each with Q of 600-650 m³/h, Head of 45 m and Ntb of 110 kw (2 pumps to operate alternately and 1 pump as standby), a small workshop, equipment, etc.
- (ii) An operation management house, 2 storeys, a total floor area of 140 m²
- (iii) An equalizing reservoir, 2,500 m³ capacity
- (iv) A chlorine house
- (v) A warehouse, 80-100 m² in size
- (vi) Transformer station with 1 unit of 200 kVA transformer; high voltage electrical line (around 200 m AC70 cable), 6 electrical poles

3. Transmission Mains

43. Nearly 18 km of transmission main will be installed, with sizes ranging from D250 to D600, requiring 1-m wide trenches (average). Pipeline material will be ductile iron, except for the siphon pipe section crossing the Cam River which will be of HDPE. Table 2 gives the transmission main sizes at various sections.

Table 2. Transmission Main Details

No.	Items	Diameter	Length (m)
1	2 pipelines from WTP to National Rd 10	D600	1,050
2	Pipeline along National Rd 10 from WTP to Pha Rung	D250-300	4,405
3	Pipeline along National Rd 10 to Nui Deo	D500	5,200
4	Pipeline from Nui Deo to Tan Duong BPS to Cam River	D400	5,386
5	Pipeline from Tan Duong BPS through siphon to the existing network of the City center.	D400 2DN450	1,292 408
Total Length			17,796

E. Implementation Schedule

44. The Subproject will be implemented over a period of about 35 months, commencing in the 1st Quarter of 2012 with the preparation of the detailed design and bidding documents. Procurement for civil works will take about 12 months starting in the 2nd Quarter of 2012; and construction, about 20 months starting in the 2nd Quarter of 2013. Operation is estimated to start by the 1st Quarter of 2015, even before defects liability period is over.

F. Subproject Layouts

45. The layouts for the proposed Northern Cam River WTP and Tan Duong BPS, and the alignment of the proposed transmission mains are presented as **Figures 1, 2 and 3**.

Figure 1. Layout of the Proposed Northern Cam River WTP

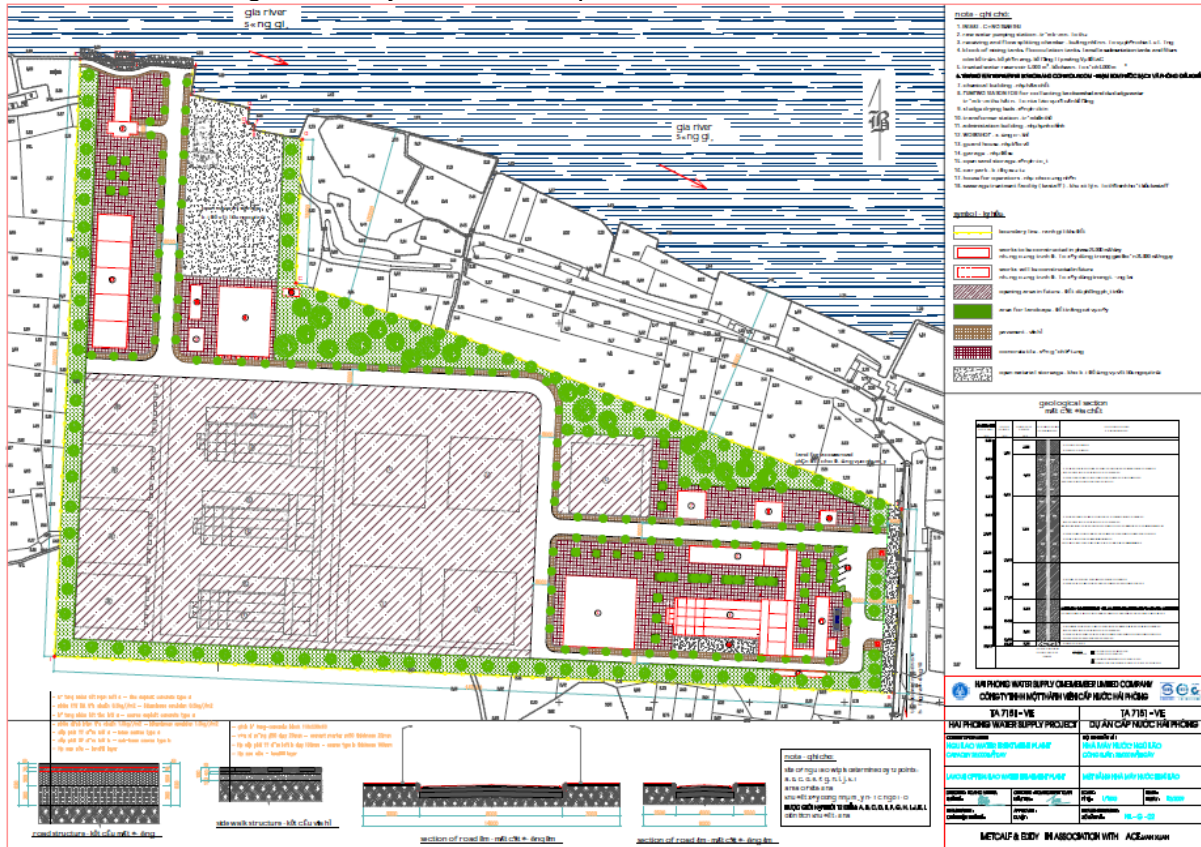


Figure 2. Layout of the Proposed Tan Duong BPS

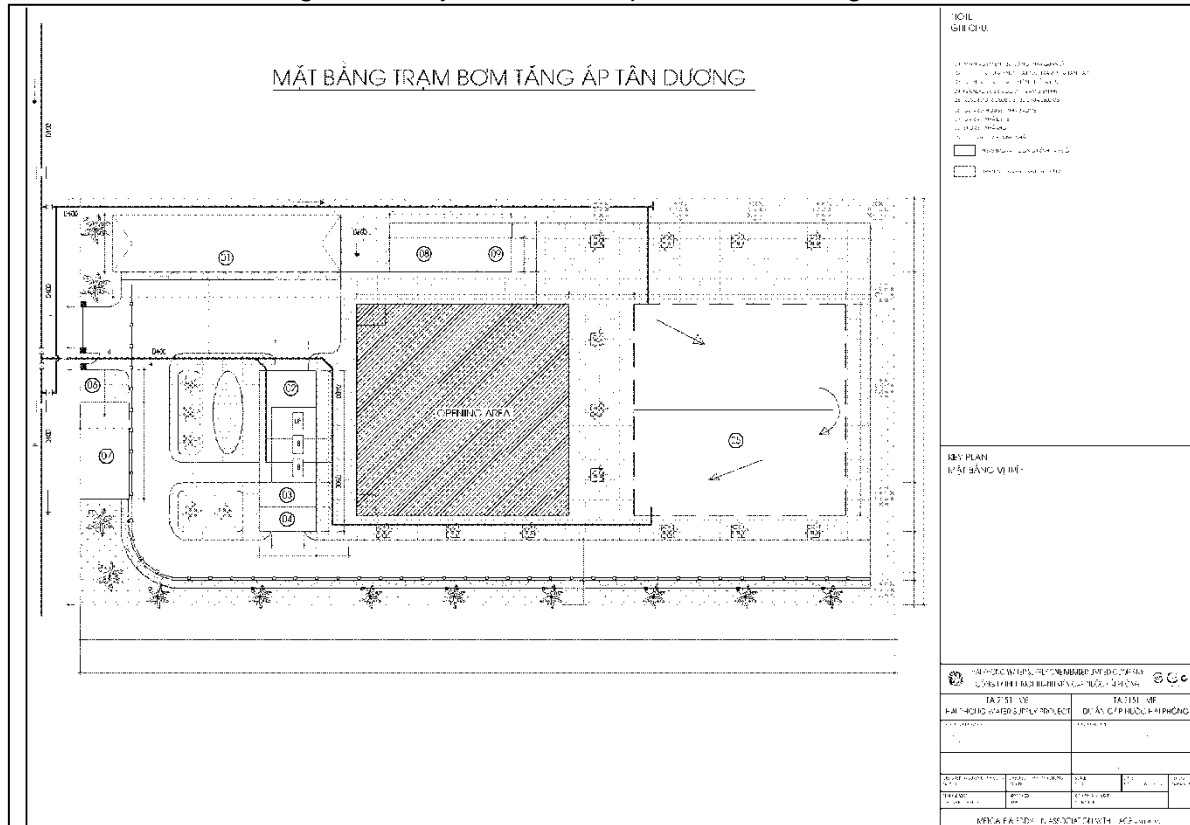
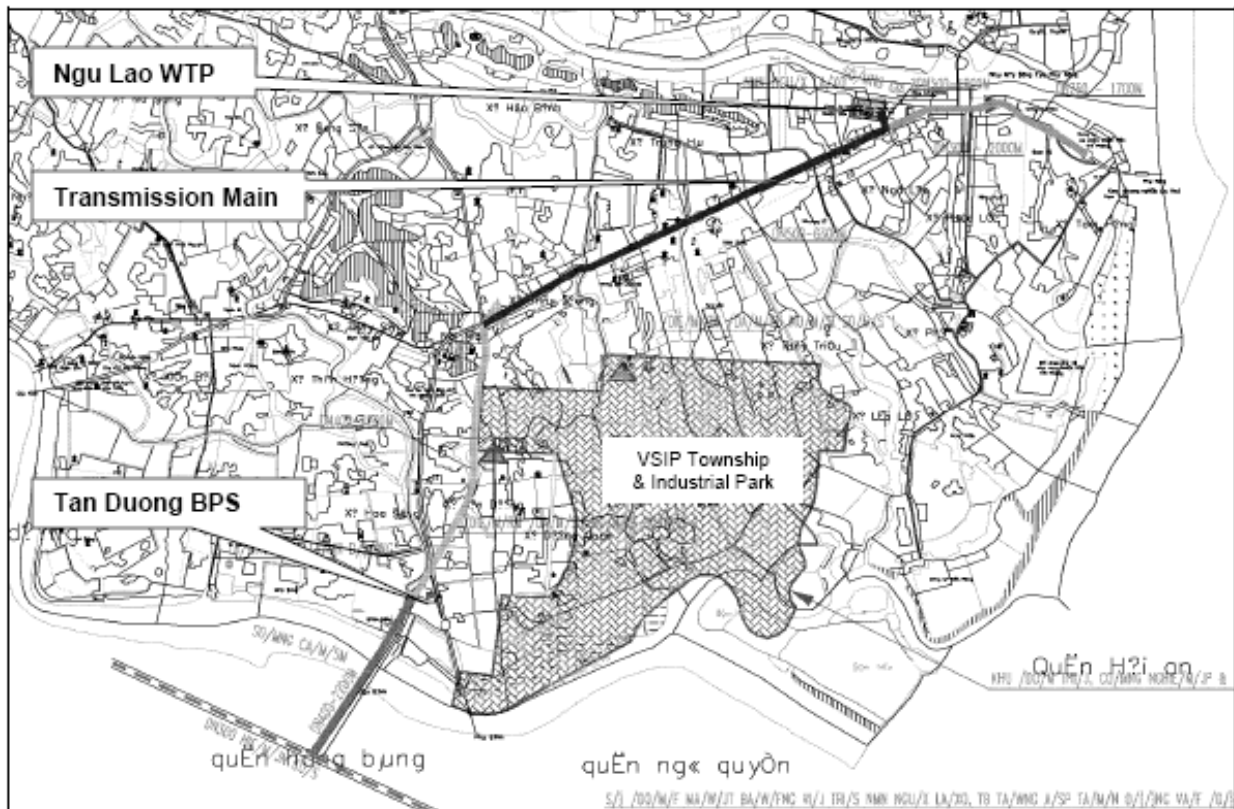


Figure 3. Alignment of the Proposed Transmission Mains



IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical/Chemical Environment

46. Hai Phong, a coastal city in Northeast Viet Nam, lies between 20°30' and 21°10' north latitude and 106°20' and 107°10' east longitude. It is about 100 km east of the country's capital, Hanoi. It borders with the Gulf of Tonkin of the South China Sea in the east, and with the Provinces of Thai Binh in the south, Hai Duong in the west, and Quang Ninh in the north. With a total (non-contiguous) land area of about 1,522 km² (or, 0.45 percent of the total land area of Viet Nam)³, Haiphong City is administratively subdivided into 15 districts, of which 7 are urban, and 8 are rural, districts.

47. Thuy Nguyen is a large district situated along the historical Bach Dang River. It is the northernmost district of Hai Phong, accounting for 242 km² (or 16 percent) of the total land area of Hai Phong. It borders with Quang Ninh Province in the north and northeast, An Duong District and the central Hai Phong in the south and southwest, and Nam Trieu Seaport in the southeast. It is administratively subdivided into 2 towns and 35 communes. Northern Cam River is one of the 35 communes of Thuy Nguyen and is situated SW of Minh Duc, the industrial town center of Thuy Nguyen District.

1. Climate

48. The climate of Hai Phong has two distinct seasons, winter and summer. It is influenced by tropical monsoons, which affect the entire Southeast Asia. The cold and dry northeastern monsoon brings in winter that lasts from November to March/April. The southeastern monsoon ushers in summer from May to October, characterized by heat, heavy rains and occasional typhoons. March and April are the transitional months from winter to summer. Based on the climate data for the period 1957-1997, the annual average temperature is 23°C. In winter, the average temperature is 19°C, in summer, 28°C. January is the coldest month and July is the hottest. Average relative humidity is 85%. It is most humid in February/March to April. Precipitation is high in the months of May to October, with about 83 percent of the annual precipitation occurring in these months. August is the wettest month. The average annual precipitation is about 1,700 mm. Evaporation is almost 700 mm annually on the average, and is about 40 percent of the average annual precipitation. Prevailing wind directions are NE in the winter and SE in the summer. The average maximum wind velocity during SE monsoon period ranges between 20 and 24 m/s; in the NE monsoon period, between 10 and 16 m/s. Storms and tropical low pressures usually occur between July and September. Wind speed during storm events ranges from 40 to 62 kph; during tropical low pressures, it ranges from 63 to 120 kph.

49. Based on more recent climate records of 2007 and 2008, the annual average temperature is approximately 23°C. Precipitation is high in the months of May to September/October. The wettest months are August and September. Annual precipitation was about 1,400 to 1,500 mm. Relative humidity averaged at 85 percent in 2007 and 87 percent 2008. **Annexes B.1 and B.2**

50. According to the 2009 report of the Ministry of Natural Resources and Environment (MONRE) entitled, *Climate Change, Sea Level Rise Scenarios for Vietnam*, the annual average temperature in Vietnam increased by 0.5 to 0.7°C over the period 1958–2007. The report provides projections in the changes in temperature and precipitation by climatic zone. Annual average temperature in the North Delta climatic zone (where Hai Phong is situated) is projected to increase by 0.5°C in 2020, 0.9°C in 2040, 1.5°C in 2060, 2.0°C in 2080, and

³ Sources: 1) Natural Conditions – Geographic Position. <http://www.haiphong.gov.vn>. 2) National Statistics Yearbook, 2008.

2.4°C in 2100. Annual rainfall in the North Delta is projected to increase by 1.6% in 2020, 3.2% in 2040, 5.0% in 2060, 6.6% in 2080, and 7.9% in 2100. The wet season will see more rains; the dry season, intensified dry spell.

2. Air Quality and Noise

51. The Environmental Monitoring Center of the DONRE conducts monitoring of suspended dust, sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and carbon monoxide (CO) six months per year at 11 locations within Hai Phong City. The 2008 monitoring results reveal that air pollution in Hai Phong is not caused by gas emissions but by suspended dust. Concentrations of SO₂, NO₂ and CO remained within the permitted values in TCVN 5937-2005, as well as within the limits set in WHO Ambient Air Quality Guidelines. Suspended dust levels were high, especially in areas where industrial activities and/or vehicular traffic were heavy. The stations in the City Center recorded exceeding suspended dust levels in the month of December by 5 to 25 percent (basing on GOV standards). In the three monitoring stations in Thuy Nguyen District, suspended dust levels in February, April and December 2008 have exceeded the GOV standard limit by a minimum of 30 percent and a maximum of 150 percent. (If set against the limits of the WHO's guidelines, the same three monitoring stations exceeded by a minimum of 31 percent and a maximum of 237 percent in the same three months; and Minh Duc Town exceeded in the months of August and October as well. **Annex B.3**

52. Noise level at crowded sections of the City is in the range of 65-92 dBA (the lower level being 10 percent beyond the standard limit set for residential areas, 60 dBA; and the higher level being 26 percent over that for mixed residential-industrial areas, 75 dBA).⁴ If set against the WHO's Guidelines for Community Noise, the lower level is 18 percent beyond the limit for residential and institutional; while the upper level is 31 percent beyond that for commercial and industrial.

3. Topography and Soils

53. Due to the deltaic characteristics of Hai Phong, its terrain is generally flat and very gently sloping. The northern part of the City has an appearance of plains alternated with hills; while the southern part is of low and almost flat terrain sloping to the sea. Ground elevation varies mostly between 0 and 4 meters above sea level. The highest areas are in Kien An, southwest of the City Center, where hills reach a maximum height of 140 m. Hills and mountains collectively comprise 15 percent of the total land area of Hai Phong, spread out on more than half of the northern part as continuous mountain ranges run in the NW-SE direction. Hills can be found in the Do Son and Thuy Nguyen Districts. An Duong District has a flat terrain.

54. Hai Phong soil consists of alluvial and marine sediments. According to general geological studies, clay layers has a total thickness of about 25 to 30 m. Soil conditions are generally not uniform. Top layer has thickness of 0.4 to 2.0 m with load intensity of 1.2 kg/cm². The second layer has thickness of 5 to 20 m with average load intensity of 0.5 kg/cm². The third layer has thickness of 3 to 22 m with load intensity of 0.7 kg/cm². Hard stratum of sandstone or siltstone has been found at the depth of 50 to 70 m from the ground surface. The island districts are mostly of limestone.

4. Surface Water

55. Hai Phong is located in the Bac Bo plain wherein meanders a dense network of rivers belonging to the Thai Binh and Red River System. The main rivers in Hai Phong are the Da

⁴ TCVN 5949-1995: Standards in Public and Residential Areas of Viet Nam.

Bach River, Cam River, Lach Tray River, Van Uc River and Thai Binh River. Small rivers/channels also play important role in the overall hydrological system of Hai Phong, e.g. Da Do River and An Kim Hai system (Sai River, Re River and Tam Bac Channel). Rivers are the main sources of water supply in Hai Phong; yet their waters are revealing pollution levels much higher than allowed. Flowing at low velocities, the rivers in Hai Phong have high silt content. The Re and Da Do Rivers are reported as the heavily polluted among the four sources of water supply.

56. In Thuy Nguyen District, the Cam, Da Bach and Kinh Thay Rivers are the main rivers. The Cam River forms the boundary of Thuy Nguyen District in the south and separates the District from the city's main urban center. The Kinh Thay River forms the boundary of Thuy Nguyen in the west. The Da Bach River borders the District in the north and east. Gia River, reportedly Hai Phong's cleanest river, is Thuy Nguyen's secondary river, basically an artificial water storage reservoir. It branches out from the Da Bach River in the west and joins Da Bach River again in the east. The Cam and Gia Rivers are the surface water bodies relevant to the subproject.

57. Cam River, 30 km tributary of Kinh Mon River, has a width of 500 to 600 m, depth of 6 to 8 m and Q_{\max} of 5,215 m³/s. With tidal flow, its has a Q_{\max} of 2,240 m³/s, V_{\max} of 2.58 m/s and V_{\min} of 1.05 m/s. In 1986, H_{\max} was 452 cm; while H_{\min} was 20 cm in 1969. The River has an average silt content of 3.9 kg/m³ and a tidal flow of 2.49 kg/m³. It has a maximum salinity of 2.88 percent. Mouth of the river is rapidly silted and blocked, causing all of its flow to reroute to the Dinh Vu Channel. According to the environmental monitoring report in 2006, Cam River water quality has exceeded the standard limits specified in TCVN 5942/1995 for COD, BOD, NH₄, suspended solids and coliform. **Annex B.4**

58. Raw water from Gia River has been continuously measured since 2006. Its maximum pH level of 8.65 exceeded standard limit very minimally. Turbidity is high in the summer months, when irrigation gates needed to be opened to support agriculture. During floods and typhoons, turbidity can reach as high as 50 NTU level. Chloride content is very low, indicating no salinity problems. Total hardness is about 82 mg CaCO₃ up to 148 mg CaCO₃ mg/l during the dry season. Nitrogen compounds such as NH₄, NO₂, NO₃, are generally low during rainy season but they exceed permitted levels during dry season owing to the high organic content and low dissolved oxygen level. As in all other water bodies, coliform count exceeds the standard limits; and is much higher in the dry season. In summary, all parameters would achieve most water quality standards without treatment, except for turbidity and coliform bacteria. **Annexes B.5 and B.6**

59. The nature of tidal fluctuations in the coast may cause salinity of the lower reaches of rivers, especially in the dry season. During high tide, seawater intrudes farther upstream of rivers, depending on the tide level and river discharge. River water is most saline 0 to 2 hours after low tide condition.

5. Groundwater

60. Hai Phong has two layers of groundwater. The first is in a layer of clay mixed with sand; while the second is in between clay soil and stone. In the first layer, groundwater is reached at 0.5 to 2.0 m below the ground surface. In the second layer, a thickness of 20 to 40 m, groundwater quality is unstable, can change rapidly from good to bad. The ground water level is not reduced in the dry season (November to April), but increases during the rainy season (May to October). According to the soil investigations in Trang Cat in 1995 and 1998, groundwater level is generally high, i.e., dry season values vary from 0.5 to 3 m from ground surface. Tidal circulation affects the level and quality of groundwater in nearby coastal areas. In the rainy season, salinity in the groundwater increases. NE Viet Nam, of which Hai Phong City is a part, has an estimated exploitable groundwater resource of 13.6

billion m³/year.⁵ Despite its abundance, groundwater resource is less exploited. The quality of groundwater in the coastal areas of Thuy Nguyen is salty.

6. Geology and Seismology

61. The geologic make up of Viet Nam consists of five structural blocks namely, the Northeast (NE), Northwest (NW), Truong Son, Kon Tum and Nam Bo. Haiphong is within the NE block, which is part of the South China plate. The NE block extends from Red River fault to the border with China in a NE trending. Strata and igneous rocks dating from the Early Paleozoic to the Quaternary periods have been found in the NE block. The typically formed geological layers in the Hai Phong area are decomposition of sediments on old rock layer (Jurassic period).

62. Viet Nam has a complex and numerous systems of faults. The NW-SE trending faults are the biggest and most active ones. The other systems are NE-SW trending, of sub-meridional directions (much smaller and younger faults), and of sub-latitudinal directions (undifferentiated faults, about 10 km thick). Seismicity in Viet Nam is strongly influenced by the two major belts, Circum-Pacific Belt and the Alpide Belt (Mediterranean-Himalayan), between which Viet Nam lies. The country has a high seismic hazard level, but not as great as of those countries that are situated within the so-called “Pacific Ring of Fire”, e.g., the Philippines, Indonesia and Japan, among others. Earthquakes in Viet Nam are strongly associated with active deep faults, especially the lateral strike ones. Due to the many active tectonic faults in North Viet Nam, this region is potentially vulnerable to geohazards. Ninety percent of the earthquakes occurred in the northwestern part of the country, making the NW more highly vulnerable to geohazards. Earthquakes in Viet Nam are crustal with depths of less than 3 km. Between 1900 and 2005, there have been 450 earthquakes of magnitudes 4 to 7. More than 50 of these events were of magnitudes 5 and above (intensities 7 and above). The two more prominent ones were of magnitudes 6.8 and 6.7 (intensity 8-9), which occurred in the NW, specifically in Dien Bien in 1935 and Tuan Giao in 1983, respectively.

^{6,7,8} **Annexes B.7 and B.8**

7. Other Natural Hazards

63. Hai Phong is not spared from the severe natural hazards, which low lying and coastal cities in Asia are now experiencing due to global warming. Hai Phong is lying in the area which is directly influenced by a lot of storms and tropical low pressures in Viet Nam, about 31% in total. Storms and tropical low pressures usually occur in between July to September with probability of 78%. The wind of storms is of level 6 – 7 (Beaufort scale: wind speed is 40 to 62 kph) and during tropical low pressures, the wind has level of 8 – 12 (Beaufort scale: wind speed is 63 to 120 kph). Based on the assessment of disaster severity in different geographic areas and in the coastal economic zone of Viet Nam, Northeast Viet Nam, the region where Hai Phong is situated, is more vulnerable to typhoon, storm surge, flashflood, whirlwind, drought and landslide.⁹ If an earthquake of magnitude Mw 9.0 occurs in the

⁵ Source: The Present State of Water Environment in Vietnam. A presentation in the 2nd WEPA Forum, 2007. Nguyen Thi Hue.

⁶ Some Characteristics of Crustal Structure and Tectonic Faults in North Vietnam. Dinh Van Toan, Nguyen Thi Hong Quang. Institute of Geological Sciences – Vietnamese Academy of Science and Technology.

⁷ Earthquake Hazard and Earthquake Risk Assessment in Vietnam. Seismic Risk Management for Countries of the Asia Pacific Region. December 2003. Bangkok. N.H.Phuong. Hanoi Institute of Oceanography. National Centre for Natural Science and Technology, Vietnam.

⁸ Country Report: Seismic Hazard of the Territory of Vietnam. Nguyen Anh Duong. Institute of Geophysics, Vietnamese Academy of Science and Technology.

⁹ National Report on Disaster Reduction in Vietnam. For the World Conference on Disaster Reduction. Kobe-Hyogo, Japan. 18-20 January 2005.

Manila Trench, tsunami will take about 2 hours to reach Viet Nam coastline and maximum tsunami height in Hai Phong will be about 1.4 m.¹⁰

64. According to the 2009 report of the Ministry of Natural Resources and Environment (MONRE) entitled, *Climate Change, Sea Level Rise Scenarios for Vietnam*, sea level has been rising at the rate of approximately 3 mm per year during the period of 1993–2008. This is found “consistent with the rate of 3.1 mm/yr reported at the global level over the period 1990–2000 (World Bank 2010).”¹¹ Under the medium scenario, sea level is projected to rise by 30 cm by 2020, 23 cm by 2040, 37 cm by 2060, 54 cm by 2080, and 75 cm by 2100. Given these projections, coastal areas/wetlands/marshes are exposed to inundation or conversion to open water; beaches will be eroded; coastal areas will become more vulnerable to flooding/exposed to storm surges during cyclones; water level of rivers will rise and inland flooding will worsen; there will be increasing saline intrusion into the groundwater regime, salinity of rivers and other freshwater courses will increase. Hai Phong, being a coastal city will be highly vulnerable to experiencing any combination, or all, of the aforementioned adverse consequences of sea level rise.

B. Biological Environment

1. Aquatic and Coastal Resources

65. Aquatic and coastal resources in Hai Phong are valuable to the local, as well as national, economy. In 2007, the fisheries sector contributed VND 858 billion to the economy. Hai Phong has about 1,000 species of shrimp, fish and tens of kinds of sea weeds of high economic value and which are widely popular in the international market, e.g., dragon shrimp, prawn, sea crab, dolphin, sea oyster, sea tortoise, pearl shell, virgin shell, abalone, among others. In Hai Phong seawaters, there are many large fishing grounds and the biggest one is surrounding Bach Long Vi Island with more than 10,000 square miles of abundant and stable yield. The tidal flats of coastal areas, islands and river mouths of more than 12,000 hectares are suitable not only for exploitation but also for salty and brackish water aquaculture of high value products. The subproject sites are all far from the coast and tidal flats.

66. An Hai in Tien Lang District is one of the six sites in the coastal zone of the Red River Delta that have been identified by the BirdLife International as Important Bird Areas (IBAs) under internationally recognized criteria. All subproject sites are far from An Hai IBA.

2. Forests

67. Hai Phong has a total forest area of 17,300 hectares, of which 580 hectares (or, a little over 3 percent) are primeval forest that has many valuable and rare plants classified as special species for protection and many herb trees that are of interest to domestic and international medical specialists. Many species of bird, e.g., nightingale, parrots, francolin, eagles, sea-gull, swallow; and many kinds of precious animals, e.g., red face monkey, yellow face monkey, chamois, muntjac, water rat, red-tale squirrel, red-stomach squirrel, lynx, porcupine and white-head langurs, can be found in the primeval forest. The white-head langur/monkey (vooc dau trang, - *trachypithecus francoisi poliocephalus*) can only be found in the primeval forest in Cat Ba Island, where they live in herds and are classified as a rare species. Cat Ba Island is off Hai Phong City, some 50 km east. The remaining 97 percent of

¹⁰ Country Report on Seismic Hazard of the Territory of Vietnam. Nguyen Anh Duong. Institute of Geophysics, Vietnamese Academy of Science and Technology.

¹¹ Economics of Adaptation to Climate Change – Vietnam. The World Bank, Ministry of Foreign Affairs – Government of Netherlands, Department for International Development, Swiss Agency for Development and Cooperation. 2010.

forest area comprise of saline water flood forest, forest for timber exploitation, forest for fruit plantation, bamboo and cane forest. The subproject component locations, however, are not within, or in close proximity to, any forest.

3. Bio-diversity Conservation

68. Viet Nam joined many Conventions and Protocols related to biodiversity: i) The Convention on Biological Diversity (CBD), known informally as the Biodiversity Convention, adopted in Rio de Janeiro in June 1992; ii) the Ramsar Convention (also referred to as The Convention on Wetlands of International Importance, especially as Waterfowl Habitat), an international treaty for the conservation and sustainable utilization of wetlands; and iii) CITES (or, The Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention). The country through its National Assembly has approved in November 2009, the Biodiversity Law in became effective starting 01 July 2009. The Hai Phong People's Committee issued Decision No 2548/QĐ-UBND on 27 November 2006, ratifying a project that is aimed at sustaining the protection of biodiversity and the white-headed langur in Cat Ba Island.

69. The Cat Ba Archipelago and its Cat Ba National Park are regarded as important sites at provincial, regional and international level, due to the diversified species of plants, trees, birds and animals that can be found, some of which are mentioned in the previous section on Forest. In addition, there are about 1,400 vascular plants, including 23 endangered and critically endangered species have so far been recorded in the Red Data Book of Vietnam; IUCN Red List. Large and partly endangered mammals include the Cat Ba langur, the Southern Serow (*Naemorhaedus sumatraensis*), Rhesus macaque (*Macaca mulatta*), Leopard Cat (*Prionailurus bengalensis*), black giant squirrel (*Ratufa bicolor*), and civet cats (*Viverricula indica*, *Paradoxurus hermaphroditus*). The cave, land snail and butterfly fauna is rich including the most northerly cave-adapted crab species, plus four species of true cave snails. The Archipelago is considered a hotspot for land snail diversity. It is also conserving a considerable number of bat species, including the rare ones.

70. The Cat Ba Archipelago belongs to the list of the most important regions of diversified biology of the World Bank. It is a World Biosphere Conservation Area. For over ten years now, it has been receiving stable funding, through small-scale international projects on conservation and community development, and projects studies covering the Cat Ba National Park and its surrounding areas. The Subproject sites are far from the Cat Ba Archipelago, which is about 50 km off Hai Phong City.

C. Economic Environment

1. Economy

71. Among the three main sectors of the economy, the service sector leads in contributing to the City's gross domestic product (GDP). In 2005, its GDP contribution was 51 percent. In 2007, it contributed 52 percent. The industry sector contributed 36 percent in 2005 and 38 percent in 2007. Agriculture/forestry/fishing contributed 13 percent in 2000 and 10.5 percent in 2007.

72. Hai Phong is an industrial city. Its industries range from large-scale industries owned by the Central Government, to medium and small-size industries controlled by local authorities, and to small-scale industries of private individuals. The most important industrial sectors include machinery manufacturing, shoes and garment manufacturing, production of construction materials, food processing, and production of chemicals, fertilizers and rubber. Total revenue from exports in the first 5 months of 2008 is estimated at more than USD 534

million, equivalent to some 27 percent increase compared to the same period in 2007. More industrial zones are planned for development outside the urban center.

73. Commerce and trade is another sector that drives the local economy of Hai Phong. The number of commercial activities has increased rapidly during the past few years. An international tourist destination, Hai Phong attracts people to its naturally beautiful seascapes, unique traditional festivals, ceremonies, and places of historic and cultural interest. In 2005, more than 2.3 million visitors were recorded, of which over 500,000 were foreigners. Despite reduced contributions to the GDP, agriculture and fishery have remained key sectors of Hai Phong's economy.

74. The northern part of Cam River consists of the entire Thuy Nguyen district. It is still administratively a rural district, but portions, especially along the National Road 10, are urban in character. Its economic structure consists of 48 percent agriculture, 26 percent industry, and 26 percent services. Due to some geographical advantages, e.g., many stone pit in the area and Bach Dang River flowing into the sea at its location in Thuy Nguyen, the area offers opportunities for such industrial activities related to cement, shipbuilding and repairing, stone mining, calcium carbide, fishery and some handicrafts.

2. Infrastructure Development

75. Established in 1905, the City's piped water supply system has undergone series of upgrading and expansion. It currently services 90 percent of the central urban districts, Hong Bang, Le Chan, Ngo Quyen and residential areas of Hai An. In 2002, its scope of service covers 60 percent of Kien An District and 45 percent of Do Son town. Water is available 24 hours a day/7 days a week in the central urban areas; while in peri-urban areas, supply can be intermittent at times. Main water source is surface water obtained from the Rivers Da Do, Gia, Vat Cach, Sai and Chanh Duong. The system has 7 water treatment plants, supplying 7 service areas, as shown in **Table 3**. The HPWSCo, the entity responsible for water supply in Hai Phong, has aimed at achieving service coverage of 90 percent of the entire City by 2020. Except for Minh Duc town, the rest of Thuy Nguyen District is not served by piped water supply. The sources of water for domestic use include shallow wells, rainwater, water from the Gia River, and water vendors.

Table 3. Capacities and Service Areas of Water Treatment Plants in Hai Phong

No.	Water Treatment Plant	Capacity (m ³ /day)	Service Area	Year Constructed	Year Upgraded
1	An Duong	100,000	City Center	1963	1973, 2000
2	Cau Nguyet	60,000	Kien An	1977	1979, 2009
3	Vat Cach	11,000	Quan Toan, Hung Vuong, An Duong Town	1988	
4	Do Son	5,000	Do Son & Rd 353	1964	1991
5	Minh Duc	1,500	Minh Duc Town	2007	
6	Vinh Bao	5,000	Vinh Bao Town	2008	
7	Cai Gia	2,500	Cat Ba Town	2008	

76. Wastewater and storm water management is the responsibility of the Hai Phong Sewerage and Drainage Company (HPSADCO). Outside the Quoc Binh residential area, which is served with separate drainage and sewer systems, the rest of the City is partly served by combined drainage/sewer systems. A network of combined sewers serves the urban center; while some small-scale independent combined sewer systems serve peri-urban towns like Minh Duc town in Thuy Nguyen District. The combined sewers collect both effluent from septic tanks and storm water, and convey these to natural outfalls without further treatment. As of 2007, less than 70% of the total households had septic tanks. Generally, septic tanks are poorly constructed, undersized and are not easily accessible for desludging. Hence, most are not effectively achieving the intended treatment level of septic

tanks. Desludging services are carried out by HPSADCO and private operators. Septage sludge is hauled to the Trang Cat sanitary landfill where it undergoes further treatment in the sludge drying ponds and later in the composting area. In the Quốc Bình residential area, where storm water and wastewater are collected separately, wastewater is collected in a tank and is pumped directly into Lach Tray River. In the Bong Sen village, a small wastewater station exists and is still operational.

77. In Hai Phong, solid waste management services are provided by three entities. The Urban Environment Company (URENCO) services the four inner Districts of Hong Bang, Ngo Quyen, Le Chan, Hai An, and some industrial establishments, hospitals and health centers. The Do Son Public Works and Tourism Service Company services Do Son town, tourist areas and new urban area along Road No. 353. The Hai Phong Construction and Public Works Company services Kien An District. Hai Phong has four waste disposal sites, namely Trang Cat Sanitary Landfill, Dinh Vu Landfill, Gia Minh Landfill and Do Son Landfill.

3. Transportation

78. Hai Phong enjoys an excellent and convenient position for transportation to the rest of the country by land (road and railway), air, sea and inland waterway. A railway (Ga Hai Phong) and a good expressway connect the City with Ha Noi, the nation's capital, which is about 100 km away. Roads connect the City to Hon Gai-Cam Pha, the foremost coal mining area of the country, and with Ha Long Bay, a famous tourist spot of Viet Nam. The Hai Phong Port, the gateway to North Viet Nam is located in the southern bank of the Cam River. It handles some 90 percent of the volume of imports and exports in Northern Viet Nam. The City is connected to foreign countries through its Cat Bi International Airport. It has road connection with Yunnan Province and Guangxi Autonomous Region of Southwest China. Thuy Nguyen District is connected to the rest of the country through National Road 10 (connecting to the northern provinces of Quang Ninh, Thanh Hoa and Thai Binh) and through Provincial Roads 352 and 200 (connecting to the northwest Province of Hai Duong). The section of National Road 10 between Gia River and Binh Bridge (crossing Cam River) is the location for the major part of the Subproject's transmission main component.

4. Land Use Development

79. Based on 2008 statistics, 35 percent of the City's total land area is devoted to agriculture and 16 percent is forest land. Homesteads account for 6 percent and special uses, e.g., industries, commercial, institutional, etc, 22 percent. The rest cover lands that are unused, open and waterways. Decision No 04/2001/QĐ-TTĐ, dated 10 January 2001, modifying the Hai Phong's 2020 Master Plan, directs City expansion towards its outskirts, especially to the northern bank of Cam river, the Northwest, the Southeast, along Road 353 and eastern coastal area of the City. Land for urban construction is divided into main functional areas. Residential areas, totaling to 6,800 ha, includes the under-utilized/under-developed areas and expansion areas in the 7 Districts of Hong Bang, Ngo Quyen, Le Chan, Hai An, Kien An, Do Son and Thuy Nguyen. Some 4,500 ha are for industrial development. Functional (institutional) centers are intended to be in the new urban area in the northern bank of Cam River (Thuy Nguyen) in the long term. Tourism and resort areas will be in the inner urban area, in the outskirts, and in preserved rural natural areas, e.g., Thuy Nguyen northern landscape (Gia River), Do Son tourism resort and Cat Ba Island in connection to Ha Long Bay. Central urban areas will be for special purposes, such as residential areas for foreigners, training schools, scientific institutes, state offices, medical centers, convalescence, medical treatment centers, and sports & recreation centers. Other identified land use zones include the national security and defense area (to be in existing locations), the City's green belt and other construction areas.

80. Thuy Nguyen District's administrative jurisdiction claims about 16 percent of the total land area of Hai Phong. In 2008, about 44 percent of Thuy Nguyen is agricultural land; 30 percent is special use land; and homestead and forests each account for 6 percent. The rest are unused/open lands and waterways.

D. Socio-economic Environment

1. Population

81. Hai Phong registered a total population of 1.68 million people in the 1999 census, or an average annual growth rate of 14 percent from the 449,747 people of the 1989 census. Based on the Hai Phong Statistical Yearbook of 2008, Hai Phong population had reached 1.85 million by 2008 (or, growing at an annual rate of about 1 percent from 1999). Thuy Nguyen District registered 284,600 people in the 1999 census, or about 17% of the City's population. Thuy Nguyen population reportedly reached 308,000 (at an average annual growth rate of 0.9% from 1999), accounting for 16.7 percent of the City's population, in 2008.

82. The City's urban population in 2008 was nearly 45 percent of its total population. It grew at an average annual growth rate of about 4 percent between 1999 (569,771 people or 34 percent of the City's total population) and 2008 (825,600 people). About 5 percent of Thuy Nguyen's 2008 population is urban population, representing almost two percent of the City's total urban population.

83. The Subproject service area, comprising 9 communes, had a total population of 82,450 in 2009, and is projected to reach 96,700 in 2025.

2. Ethnic Minorities

84. No ethnic minorities reside in the Subproject-affected communes.

3. Income and Employment

85. In 2009, the average monthly income per capita nationwide was VND 636,000. In Hai Phong, it was VND 653,000, slightly higher than the national average.¹² Based on the initial results of the socio-economic survey in August-September 2009, average monthly income per capita was in the ranges of VND 0.9 Million for the poor and VND 3.75 Million for the non-poor. The average monthly income of the poor respondents is higher than the City's average.

86. In 2000, 71 percent of the population aged 15 years and over in Hai Phong were economically active. About 4.5 percent had no job. In 2008, of the 70 percent economically active population aged 15 years and over, 3.5 percent had no job. In the urban area, the rates of economically active population (aged 15 years and over) that were without job in 2008 was 4.2 percent, much smaller than that in 2000, 6.3 percent. The rural area experienced only a slight reduction from 3.7 percent in 2000 to 3 percent in 2008. Based on the initial results of the socio-economic survey, 77 percent of those surveyed were working in the agriculture/fishing sector; 10 percent in the public sector; 4 percent in the private sector; and 3 percent outside their commune/district of residence. Some 3 percent ran their own businesses; while the remaining 3 percent were involved in other forms of occupation. No one of the respondents was unemployed.

¹² Meet the Savings Demand: Mobilizing Micro-Savings Among the Poor in Vietnam. Report to the Vietnam Bank for Social Policy. March 2009. Tu Chi Nguyen.

4. Poverty

87. In 2004, the nationwide poverty rate in Viet Nam was 23.2 percent, decreasing an average annual rate of a little over 10 percent since 2002 (28.9 percent). In 2009, national poverty rate was 16.0 percent; in Hai Phong, 8.8 percent.¹³ Of the 100 respondent households in the socio-economic survey of August-September 2009, about 28 percent are poor.

5. Health

88. As of 2008, Hai Phong has 24 hospitals, 4 clinics, 1 sanatorium, 224 medical service units and 9 other health facilities, all of which provide a total of 5,540 patient beds.¹⁴ Of the total 5,540 patient beds, 4,200 are hospital beds. The number of hospital beds per 10,000 inhabitants is 22.8, which is higher than that of the country's ratio in 2005, i.e., 17.24 hospital beds per 10,000 inhabitants¹⁵. However, considering that the number of beds all over the country has been increasing after 2005, it is assumed that the Hai Phong ratio is at par with, or higher than, the national ratio in 2008. The Comprehensive Development Design for the Health System in Viet Nam to 2010 and Vision by 2020, dated 30 June 2006, the aimed for 18.5 beds/10,000 inhabitants. This makes Hai Phong ratio, by now, better than the nation's target ratio for 2010.

89. In 2008, Hai Phong had 1,349 doctors and 2,354 nurses. These give ratios of 7.3 doctors and 12.75 nurses per 10,000 inhabitants. The same report mentioned above revealed that in 2003 the ratios of doctors and nurses for every 10,000 inhabitants were 5.88 and 5.95. Considering again that the number of doctors and nurses have increased between 2003 and 2008, it is assumed that the Hai Phong ratios would be at par with that of the country by 2008. The country's vision is for the health system to reach the grass root level, aiming for each commune health worker to serve 1,400 to 1,600 inhabitants.

6. Education

90. As of 2008, Hai Phong had a total of 482 grade schools. Of these, 218 are primary, 194 are lower secondary, 58 are upper secondary, 10 are basic general (Levels I + II), and 2 are lower and upper secondary, grade schools. Thuy Nguyen had 38 primary, 36 lower secondary, and 9 upper secondary, grade schools. The number of pupils per teacher in Hai Phong for the same year averaged as follows: i) primary, 18.81; ii) lower secondary, 15.58; and iii) upper secondary, 20.43. In Thuy Nguyen, the averages were: i) primary, 17.66; ii) lower secondary, 16.71; and iii) upper secondary, 23.10. The number of pupils per class in Hai Phong averaged: i) primary, 29.88; ii) lower secondary, 35.89; and iii) upper secondary 47.34. In Thuy Nguyen, the averages were: i) primary, 28.77; ii) lower secondary, 36.66; and iii) upper secondary, 49. The average ratios for the lower and upper secondary levels in Thuy Nguyen were higher than that of the City.

91. Based on the initial results of the socio-economic survey of 100 households in August-September 2009, 9 percent of the surveyed persons attended tertiary education; 10 percent completed secondary school; 11 percent had some secondary education; 45 percent completed primary school; 20 percent had some primary education; and 5 percent had not attended school at all. In Thuy Nguyen, female's education level is normally lower male, this situation being normal in agricultural districts.

¹³ Meet the Savings Demand: Mobilizing Micro-Savings Among the Poor in Vietnam. Report to the Vietnam Bank for Social Policy. March 2009. Tu Chi Nguyen.

¹⁴ Haiphong Statistical Yearbook. 2008.

¹⁵ Comprehensive Development Design for the Health System in Viet Nam to 2010 and Vision By 2020. 30 June 2006. Hanoi.

7. Access to Basic Infrastructure and Security of Tenure

92. Thuy Nguyen District is connected to the national power grid. Only the Minh Duc town is served with piped water supply system of the City. Small networks of combined sewers are present in Thuy Nguyen and these are concentrated in the urbanizing areas. Of the 100 household respondents in the socio-economic survey, all are connected to the national power grid; and about 60 percent to the City's telephone services. No one of the respondent households is connected to the City's piped water supply system. About half are connected to small local piped network provided by entrepreneurs; 59 percent have dug wells; 11 percent have deep wells; 23 percent are saying they also obtain water from vendors; and 25 percent are saying they also resort to rainwater. For drinking water, 47 percent use water from the small piped network of entrepreneurs. The rest use rainwater and water from wells for drinking. In terms of sanitation facilities, almost half of the respondent household use pour-flush toilets; one-fourth have flush toilets and the remaining one-fourth use pit latrines. Some 66 percent of the toilets have septic tanks. Half of the septic tanks are one-chambered and leaching on site; the other half are totally sealed and connected to combined sewers. Only 20 percent of the respondent households have access to solid waste collection services. In terms of drainage, the survey results revealed that the Subproject area is not highly vulnerable to flooding. About 85 percent of the respondent households are not subject to flooding; while 8 percent are in areas that flood during typhoons. Ninety-three percent of the respondent households own the homestead land they reside in.

E. Physical Cultural Resources

93. There are a number of sites in Thuy Nguyen that are of historical, cultural, religious, architectural and aesthetic significance. Among them, the more prominent are: i) Kien Bai Communal House, located in Kien Bai Commune, built in the late 17th century, considered by the Government as a historical and cultural relic with high value of art in 1986.; ii) Trang Kenh historical relic and scenic site located in Minh Duc Town, known for its historical and cultural depth as well as for the impressive landscape that is created by a system of limestone mountains and rivers; iii) Bach Dang (Da Bach) River is known for its historical significance, where the national heroes defeated three Chinese feudal invasions; and iv) Dong Ly Communal House in My Dong Commune, recognized as a historical and cultural heritage in 1993. Temples in Thuy Nguyen that are known for festivities include the An Lu Temple, Phuc Le Temple and Prince Consort (Deo) Temple.

94. None of the aforementioned sites are close to any of the subproject sites. In the WTP site, two grave sites are in close proximity. One of these is immediately adjacent to the southern boundary of the WTP site. The other grave is at least 30 m from the access road alignment. Along the National Road 10, two temples and two grave sites can be found.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Potential Issues/Concerns/Impacts

95. Following ADB's Environmental Guidelines for Selected Infrastructure Projects, screening of potential issues, concerns and/or impacts relative to siting, design, construction and operation was carried out.

1. Issues/Concerns Relative to Siting

96. The screening of identified potential concerns relative to siting is presented in **Annex C**. Significant among the issues and concerns relative to the proposed Subproject sites include:

- (i) Proximity of the WTP site to the Gia River and a grave site. The WTP site is partially right along the bank of the Gia River, and adjacent to its southern boundary is a grave site, a physical cultural resource that needs to be protected from any damage during construction.
- (ii) Loss of land and income and displacement of community infrastructure associated with the acquisition of the WTP and BPS sites and of the ROW for the WTP access road. The construction of the Northern Cam River WTP will involve acquisition of 8 ha of actively cultivated, irrigated rice lands, affecting 102 land owners/tillers. The construction of the Tan Duong BPS will involve acquisition of 0.50 ha of rice fields and marsh lands, affecting 14 land owners. The acquisition/claiming of 7.5-m ROW for the WTP access road, wherein also transmission mains will be laid, will displace irrigation channels and power supply poles; and will affect portions of cultivated rice land & some crops. (The current width of the unpaved portion of the access road is about 3.5 m. The maximum width of the agricultural dike roads vary between 2.0 and 6 m.)
- (iii) Heavy urban development and dense population, as well as the volume of vehicular and pedestrian traffic in a large section of the transmission main alignment, i.e., along the National Road 10 and along the southern approach road to Binh Bridge in the City Center. Public health and safety will be put to risk, and socio-economic activities will be disrupted, during construction.
- (iv) Vulnerability of the WTP and BPS sites to flooding. Both of the WTP and BPS sites are inherently flood prone. The WTP site is vulnerable to flooding from overflow of the Gia River during storm or heavy rains. The BPS site is inherently flooded.

97. Of moderate concern are the following:

- (v) Potential contribution on the further pollution of Cam River, one of the four more polluted rivers in Hai Phong, during installation of the siphon transmission main parallel to the Binh Bridge (installation is estimated to last 2 to 3 weeks) .
- (vi) The existence of 2 pagodas, 2 grave sites and 2 schools along the transmission main alignment. During construction, the structural elements of these resources and institutions that are right along the sidewalk will be exposed to potential damage; and more importantly, the safety of their users will be at risk.
- (vii) Potential conflict with, impacts on, downstream users of Gia River (one user of which is the Minh Duc WTP (1,500 m³/day) which draws raw water from Gia River. The supply of, and demand for, Gia River water needs to be validated during the detailed design.
- (viii) Section of the access road that traverses through the village is used as main access by the villagers. It is almost fully lined on both sides with residential structures and has one secondary school along its east side; has no sidewalk on either side and, hence, villagers walk on the 3.0-3.5 m paved carriageway; and has heavily weeded earth drains. This section of the access road will have public safety, local flooding and access blocking concerns during construction.
- (ix) BPS site has no access to urban drainage system or natural outfall in its immediate vicinity. The nearest natural outfall is about 500 m to the south.

- (x) Moderate vulnerability of WTP access road to flooding during heavy rains.
- (xi) Vulnerability of Hai Phong to earthquakes of moderate intensity, which should be considered in design.

98. The issues, concerns and constraints relative to siting can be mitigated through a resettlement plan and compensation scheme agreed on with the affected persons & community; careful considerations of the issues and concerns into design; obtaining the necessary environmental permits/agreements; and the implementation of appropriate mitigation measures during construction and operation. **Section V B**

2. Issues/Concerns Relative to Design

99. The screening of identified potential concerns relative to design is presented in **Annex D**. Significant among the issues and concerns relative to design is the delivery of unsafe water to the system if one or any combination of the following is/are not adequately considered during, or incorporated into, the detailed design: i) raw water quality, including the likely impact of climate change on raw water quality; ii) protection of system components from damages by outsiders and/or from contamination caused by existing site conditions or environmental factors; iii) leak detection; iv) distance of transmission mains from existing drainage mains that are most likely receiving effluents from sanitation facilities, or from alignment of planned sewer lines; v) management/handling of chlorine and other hazardous substances during operation; and vi) significance of an environmentally responsible O&M Manual. Another potential significant concern is unsatisfactory resurfacing of road pavements affected by the installation of transmission mains due to inadequate standard specifications for road resurfacing in design.

100. Of moderate concern from inadequate design or inadequate considerations in design are the: i) sustainability of proposed initial and ultimate raw water withdrawal, i.e., withdrawal should not cause negative socio-economic and environmental consequences downstream (Albeit in both the Interim and Final Workshops, held in October 2009 and June 2010, respectively, the DARD had confirmed the availability of water for the intended withdrawal without impacting on downstream users, it would be safe to review the supply of, and demand for, Gia River water, to ensure sustainability); ii) potential excessive algae growth in storage reservoirs for treated water; iii) sustainability of supply of gravel, sand and soil to meet construction demand; iv) inadequate management of wastewater, solid and hazardous wastes, more particularly during construction, due to low capacity of existing landfills to receive more construction wastes; and v) occupational health and safety hazard to staff receiving and handling chlorine and other hazardous substances.

101. The design and technology that is proposed for the Subproject, particularly for the water treatment, is highly similar to the system that is presently ably run by the HPWSCo. The concerns relative to design can be easily considered and addressed in the detailed design. **Section V B**

3. Issues/Concerns/Impacts During Construction

102. The five subprojects will be constructed in four packages, following a staggered implementation schedule. This Subproject will be constructed under Package 1. Construction will take about 20 months between the 2nd Quarter of 2013 and 1st Quarter of 2015, including 3-4 months of cleaning, inspection and repairs. Package 2 constructions will start in the 4th Quarter of 2014, when Package 1 will have been in the cleaning, inspection and repairs phase.

103. Subproject construction will concurrently take place in the: i) 8-ha WTP site; ii) 0.5-ha BPS site; and iii) alignments for the 17.8 km transmission main (access road included).

The almost 1.1-km access road will be 7.5 m wide, to include 4.5-m carriageway and 2 sidewalks of 1.5 m width each. For the transmission mains outside the access road, the outer lanes of the concerned roads will be affected. The effective working width is assumed to cover almost the entire width of the outer lane, i.e., to include the 1-m wide (average) trench for the pipeline and some working easement. There will be no existing water mains to dismantle and dispose of. The identified potential issues/concerns/impacts during construction are screened in **Annex E**. The moderate and significant issues and impacts are presented below.

a. Physical/Chemical Environment

104. Dust/suspended particles, gas emissions, odor, noise and vibration, arising from construction activities, practices and materials, such as, but not limited to, those listed in **Table 4**, will be more significant during the peak construction period, which is estimated to last for 8 to 10 months. These issues/impacts will be temporary but, if not mitigated, will have potentials to result in long-term consequences in the health of the affected communities and the construction workers. Unmitigated vibration could also lead to permanent damages of structures. Gas emissions will contribute to overall concentration of greenhouse gases in the atmosphere.

Table 4. Some Direct Sources of Dust, Gas Emission, Odor, Noise & Vibration

Source	Issues/Impacts				
	Dust	Gas	Odor	Noise	Vibration
1 Earthworks (clearing, grubbing, excavation, filling/refilling of sites)	√			√	√
2 Transporting, conveying, loading & unloading of aggregates and cement and other construction materials	√	√		√	√
3 Movement of construction vehicles/trucks delivering materials	√	√		√	√
4 Operation of construction equipment	√	√		√	√
5 Dry exposed areas, prolonged paving of access roads, prolonged resurfacing of excavated roads	√				
6 Open stockpiles of dry soil, fine aggregates, cement	√				
7 Crushing, grinding, mixing, sanding, pavement breaking, drilling, screening	√			√	√
8 Handling/transport of solid wastes/spoils	√	√	√	√	√
9 Sweeping/cleaning of construction premises	√				
10 Burning of wastes		√	√		
11 Operation of generator set/s		√		√	√
12 Operation of air-conditioners in field offices & site accommodations		√			
13 Transportation of workforce		√			
14 Architectural and specialty applications, e.g., paints, lacquers, adhesives, sealants		√	√		
15 Poor storage of hazardous substances, or embodied emissions of hazardous substances/materials		√	√		
16 Power/energy consumption		√			
17 Gas emissions			√		
18 Poorly managed wastes		√	√		
19 Poor sanitation practices of construction workers			√		
20 Pile driving	√			√	√
21 Prolonged engine idling		√		√	√
22 No/deferred maintenance of equipment		√		√	√

105. Gia River and ground water resources in close proximity to the Subproject sites will be at significant and moderate risks, respectively, to contamination by improper and inadequate: i) storage and handling of solid and hazardous wastes on site prior to disposal; ii) sanitation facilities on site and practices by construction workers; iii) management of sediments from earthworks and stockpiles of sand, soil and spoils; and iv) careless handling of hazardous substances. Cam River will be exposed to the same risk at a much shorter period and much lesser magnitude during the installation of siphon pipeline over it to connect the new water supply system to the existing network in the City Center. Off site, other water resources will potentially be exposed to contamination from careless hauling and indiscriminate disposal of spoils and solid and hazardous wastes from Subproject sites, and careless hauling of hazardous substances to Subproject sites. Degenerating water resources will impact on public health and safety and on aquatic life. About 2 km downstream of the Subproject's WTP site is the Minh Duc town, which is served by the Minh Duc WTP that draws its raw water from Gia River. Downstream communities particularly along the south bank of Gia River are not served by any treated water supply system, and rely on other sources of water for their domestic needs, such as shallow wells and water from Gia River.

106. Water requirements during construction will have to be largely met using groundwater resources. Extraction of groundwater resources will have to consider its effects on the existing groundwater wells in the vicinity.

107. Construction will generate significant volume of wastes and spoils, and will require huge volume of aggregates, to be stored on-site. In the WTP and BPS sites, there will be ample spaces to easily plan for strategic storage areas for wastes/spoils and aggregates. However, in alignments for access road and transmission mains, space will be limited. Here, waste/spoils and aggregates management will have to be most carefully planned to avoid/mitigate nuisance, safety hazards, obstruction to surface drainage, and siltation of drainage courses. It is estimated that a 50-m transmission main trench will generate 70 m³ of excavated soil and a residual soil after backfilling of 25 m³. The amounts of residual soil anticipated from the WTP and BPS sites have not been estimated. Potential disposal/receiving sites for residual soil from transmission main trenches include the: i) WTP and BPS sites and some sections of the access road alignment, which will need large quantities of filling materials; ii) 1,600-ha site of the VSIP Township and Industrial Park east of the BPS site; and iii) low-lying private properties needing filling materials. Potential disposal sites for construction spoils and wastes are the three of the City's four landfills, which are about a minimum of 12 km and a maximum of 34 km distance from Subproject sites. The executing agency, however, needs to coordinate with City authorities on the capacities of these landfills to accept construction wastes.

108. Apart from the impacts on water resources, poorly managed wastes and spoils will have impacts on the health and safety of the community and the construction workers; create nuisance in the cultivated rice fields, communities, businesses and institutions close to Subproject sites; and cause local flooding in the vicinities.

b. Biological Environment

109. The risks to aquatic life (flora and fauna) in Gia River and the wetlands in the vicinity of the BPS site will be associated with inadequate management of construction wastes, wastewater, spoils, fine aggregates and hazardous substances in the WTP and BPS sites. At least one-third of the northern perimeter of the WTP site is right along the southern bank of the Gia River. The BPS site is partly wetland; and the wetlands in this vicinity are being used for duck-raising. (These wetlands are not natural wetlands. These were former rice fields that became perennially inundated after the construction of the nearby Binh Bridge. However, there are flora and fauna currently depending on them.)

110. Loss of rice plants & other vegetation beyond the limits of Subproject sites will result if sites clearing, excavation and construction vehicular flow/movement will not be managed well. No loss of wildlife or rare & endangered species will result from Subproject implementation. Subproject sites are all in populated urbanizing communes and away from any protected area, national park, or bio-diversity sites.

c. Socio-economic Environment

111. The construction of the WTP and its access road will bring about the following moderate to significant socio-economic issues/concerns/impacts:

- (i) Volume of vehicular traffic that will suddenly be brought through Trung Son Village will be a health and safety hazard to the community. The low community vehicular traffic will have to be temporarily rerouted to the road 200 m west of the existing access road. Rerouting will be finalized during the detailed design.
- (ii) Access and road blocking in Trung Son Village will pose safety hazard, constrict safe easy escape during emergencies, and bring inconvenience to the communities. The community, except for households living along the access road, will have to temporarily use the road 200 m west access road for access to the village.
- (iii) Local flooding or impoundment during rains is most likely. The earth drains along the access road alignment are silted and heavily weeded. Access road construction will exacerbate the inadequate drainage situation in the area with improper stockpile of aggregates and solid wastes, and obstruction of surface run-off/drainage routes.
- (iv) Accidental damages to existing utilities, resulting in service interruptions, are possible, during access road construction. Some irrigation channels, power supply poles, telephone lines and water connections to mini private water supply systems are likely to be affected.
- (v) Disruption of farming and other socio-economic activities in the immediate vicinities. Part of the access road alignment will use the existing agricultural dike road. During construction, access between farms/ponds and the National Road 10, and movements of farmers will somehow be constricted.
- (vi) Potential accidental damages to existing structures along the access road.

112. Transmission mains will be installed within road carriageways. Their centerlines will be in the range of 1.0-1.5 m from the road kerb or road edge. This implies that the outer lane of roads will be affected. Following are the issues/concerns/impacts:

- (i) Traffic and road blocking along National Road 10 and along the approach road to Bing Bridge in So Dau Ward in the City Center will be significant.
- (ii) Accesses to residences, businesses and institutions will be blocked or somehow obstructed. This condition will cause public inconvenience and pose constraint to safe easy access during fire and other emergencies.
- (iii) Urban drainage mains or earth drains will be vulnerable to deposition of sediments, spoils, and/or solid wastes, which will potentially cause local flooding or impoundment during rains.
- (iv) Accidental damages to existing utilities, resulting to service interruptions, are possible. Some power supply poles, telephone lines and crossing water pipes to/from mini private water supply systems are likely to be affected. Crossing drainage culverts are likely to be in some sections of the transmission main alignment.
- (v) Socio-economic activities will be disrupted from access and road blockings. In the busy section of National Road 10, e.g., Nui Deo town, informal socio-economic activities can be found on the sidewalks or on road shoulders. It is

possible that most of these informal socio-economic activities belong to vulnerable groups. Some formal socio-economic activities have also spilled onto sidewalks or road shoulders.

113. The construction of the BPS will bring about the following issues/concerns/impacts:
- (i) Volume of vehicular traffic that will suddenly enter and leave the access road, posing health and safety hazard to the low-density community south of the BPS site.
 - (ii) Disruption of farming, duck-raising and other socio-economic activities in the immediate vicinities.

114. The health and safety of both the community and the construction workers will be most at risk during construction. The environmental impacts brought about during construction are temporary. However, it could result in long-term consequences/damage to the health and well-being of any one community member or construction worker.

115. The impacts on air quality (dust, gas emissions, harmful odors) and water resources (degeneration of the Gia River on which some households depend for domestic use, potential contamination of wells, potential effects on existing wells by the extraction of groundwater for construction needs); the increased levels of noise and vibration; traffic congestion along major roads; huge volume of construction-associated vehicular movements; blocked accesses that constrict easy escape during emergency; open excavations; poorly managed construction wastes, wastewater and spoils; indiscriminate stockpiles of aggregates; hazardous substances transported to and stored in construction sites; accidental spills of hazardous substances; local flooding or water impoundment caused by obstructions in surface drainage routes and which will become breeding grounds of mosquitoes and other disease vectors; reckless drivers of construction-associated vehicles; entry of communicable and transmittable diseases to the community brought by the construction workforce; poor social behavior of some construction workers; potential fire and explosion; and lack of awareness on the hazards posed by Subproject implementation on community's health and safety, among others, provide crosscutting direct and indirect threats to community health and safety.

116. Construction workers' health and safety will be directly and indirectly exposed to crosscutting threats from construction's impacts on air quality; the high levels of noise and vibration from the operation of equipment; inadequate supply of safe potable water in construction sites; inadequate sanitation facilities; poor sanitation practices on site; poor housing conditions; traffic and reckless driving along transmission main sites; huge volume of construction-associated vehicular movements; open pits; poorly managed construction wastes, wastewater and spoils; improper stockpiles of aggregates; hazardous substances transported to and stored in construction sites; handling and accidental spills of hazardous substances; handling and operation of construction equipment; reckless drivers of construction-associated vehicles; communicable and transmittable diseases in the community and in the workforce; potential fire and explosion; potential collapse of any structure being built in the WTP and BPS sites; exposure to extreme weather; local flooding and impoundment caused by obstructions in surface drainage routes and which will become breeding grounds of mosquitoes and disease vectors; and lack of health and safety awareness and/or non-enforcement and non-observance of health and safety measures, among others.

d. Physical Cultural Environment

117. The grave site adjacent to the southern boundary of the WTP site will be significantly exposed to potential damage/s during construction. The potential for chance finds of physical cultural resources, e.g., graves, is assessed to be none to least. The sites are

actively cultivated/used land or existing roads; although the possibility of deeply buried physical cultural resources in the vicinity cannot be simply disregarded. There is, therefore, need for Contractor to sit down with the CPCs concerned prior to mobilization to discuss the steps to take should chance find of these resources occur.

4. Issues/Concerns/Impacts During Operation

118. The identified potential issues/concerns/impacts during operation are screened in **Annex F**. The moderate and significant issues and impacts are presented below.

a. Physical/Chemical Environment

119. WTP operational contribution to the degeneration of the quality of Gia River water will come from inadequate treatment of wastewater prior to discharge to Gia River, and from poorly managed sludge, solid wastes and hazardous wastes and chemicals that will find their way into the Gia River. Off site, other water resources will be potentially exposed to contamination from careless hauling and indiscriminate disposal of sludge and solid and hazardous wastes. Degenerating water resources will impact on public health and safety and on aquatic life. About 2 km downstream of the Subproject's WTP site is the Minh Duc town, which is served by the Minh Duc WTP that draws its raw water from Gia River.

b. Biological Environment

120. The risks to aquatic life (flora and fauna) in Gia River will be associated with the degeneration of the Gia River water resource as discussed in the preceding paragraph. The risks to aquatic life in the wetlands in the vicinity of the BPS will come from the poorly managed solid wastes and hazardous wastes and chemicals that will find their way into the wetlands.

c. Socio-Economic Environment

121. The significant concerns affecting the socio-economic environment during operation that will impact on community health and safety and economic/socio-economic activities include:

- (i) Delivery of unsafe water to the system due to deteriorating raw water quality; weak leak vigilance or detection; delayed response to leaks and/or broken mains; contamination from accidental spill of hazardous substances in the WTP; contamination from poorly managed sludge, solid and hazardous wastes; and /or contamination due to damages from external events, e.g., earthquake, flooding, sabotage.
- (ii) Unsustained operation due to deteriorating quality and quantity of raw water; inefficient operation, maintenance, and repair; and/or insufficient funds for operation, maintenance and repair.

122. Of moderate concern are:

- (i) Potential adverse impacts of the raw water withdrawal on downstream users, especially during the dry season, which will impact on community health and safety of people, and on economic/socio-economic activities, depending on the Minh Duc WTP system.
- (ii) Occupational health and safety hazard, associated with the presence, use, delivery to the WTP and BPS, receiving at the WTP and BPS, accidental spills, and responding to accidental spills, of chlorine and other O/M&R hazardous substances.

123. A reliable supply of safe potable water will introduce changes in water consumption. Urban development and new socio-economic activities will be induced. Water demand will increasingly rise, and will increasingly put pressure on the system. More water consumption will result in the generation of more wastewater. Without parallel efforts in managing sewage and wastewater (critically, industrial wastewaters), the quality of life in the service area will deteriorate. Induced urban development and socio-economic growth will confront the City Government with pressures to meet rising demand for other basic infrastructure services. These anticipated crosscutting effects of having a reliable water supply will require comprehensive planning for sustainable development, coordination of infrastructure provisions and appropriate development guide and controls.

5. Positive Impacts and Benefits

124. There will be opportunities for local employment and increased earnings of local enterprises during construction. Based on experience in Viet Nam, an average 40-50 percent of the construction employment is sourced from the local labor force. The opportunity for short-term employment, however, is citywide in scope, not necessarily limited to the labor force available in the communes of Subproject sites. The operation of the Subproject will bring about the following benefits that will considerably outweigh the aforementioned adverse impacts: i) improved quality of life in the Subproject service areas; ii) induced socio-economic growth, which will open up new or higher income and employment opportunities; and iii) improved local economy brought about by higher public revenues from intensifying economic activities and increased land values. The operation of the Subproject will support sustainable urban development in the peri-urban area in the northeast of Hai Phong, particularly the eastern part of Thuy Nguyen District. An expanded access to safe, potable water will substantially contribute to poverty alleviation in Hai Phong City. These developments and progress, however, will lead to accelerated land use changes (conversions and intensifications) and, as discussed above, rising demand for other basic infrastructures/services. Coordinated and well-timed efforts in the development processes will be necessary in the: i) updating/formulation and implementation/enforcement of land use plans, zoning and building regulations; ii) upgrading/provision of adequate basic infrastructure services such as, among others, sewerage system, regular maintenance of septic tanks, proper disposal of sludge and septage, solid waste management system; and iii) eventual expansion of water supply services.

B. Proposed Mitigation Measures

125. Measures to mitigate moderate and significant issues/concerns/impacts are presented in this Sub-section. The detailed set of mitigation measures can be found in the Environmental Mitigation Plan of the EMP (**Table H2 of Annex H**). “Prior to construction” covers the period of detailed design and procurement process, culminating in the award of Contract for civil works. “During Construction” covers the period after the awarding of the Contract for civil works until demobilization. “During Operation” commences at “Start Up and Commissioning”.

1. Mitigating Issues/Concerns Prior to Construction

126. To mitigate potential delivery of unsafe water during operation, implement the following during detailed design:

- (i) Conduct of a comprehensive quality test of raw water from Gia River to confirm the concentration levels of 32 parameters as specified in QCVN 08:2008/BTNMT, and review results against the limits set in Column A2 of said regulation and US EPA’s recommended fresh water quality criteria for the protection of aquatic life and human health, whichever is more stringent. Findings shall be considered in the final design of water treatment.

- (ii) Incorporate such essential considerations in the design as, among others:
 - Protection of system components from damages and/or water contamination by outsiders through secure perimeter fences around the WTP and BPS, appropriate protection of transmission mains against breakage caused by overburden, covered reservoirs, among others.
 - Protection of system components from damages and/or water contamination that may be caused by existing site conditions and environmental factors, e.g., site's vulnerability to geo-hazards such as flooding and earthquake, soil corrosivity, existing and proposed land use development, among others.
 - Provisions for secure storage facilities for solid waste, hazardous wastes, and hazardous substances, capable of containing spills.
 - Adequate provisions for leak detection.
 - Location of chlorination point that will allow sufficient dissipation of chlorine potency prior to discharge.
- (iii) Stipulate in the O&M Manual the operational procedures for the proper management/handling of chlorine and other hazardous substances; operational procedures for responding to spills of chemicals/hazardous substances; the grievance redress mechanism; operational requirement to conduct monitoring of treated water according to the EMP; and operational system for proactive, highly participatory leak vigilance and reporting system.

127. To mitigate some significant and moderate impacts during operation and during construction, implement the following during the detailed design:

- (i) Together with DARD, review the availability of, and demand for, Gia River water, to technically confirm the sustainability of the proposed raw water withdrawal. The review findings will provide basis for the water use agreement to be secured from the Irrigation Management Company of the Department of Agriculture and Rural Development in the early stages of the detailed design.
- (ii) Stipulate in the O&M Manual such operational requirements as the implementation of mitigation measures, monitoring of environmental effects and reporting as contained in the Subproject EMP; and the provision of sufficient institutional support (staff and budget/funds) for O/M&R and EMP implementation.
- (iii) Include as part of the design documents a Staking Plan to limit exposing areas and destroying vegetation (rice plants) to the minimum during construction.
- (iv) Specify in the working documents the restriction on excavation works in a road to a segment at a time, e.g., at a maximum length of 30 m in minor roads and 50 m in major roads, the estimated length that can be excavated, laid pipe in and backfilled in a day's work (8 AM – 5 PM).
- (v) Specify in the working documents the resurfacing of affected road sections to pre-excavation standard.
- (vi) Prepare Subproject Aggregates Management Plan (AMP), confirming location of aggregate sources, estimating sustainability of supply of, and demand for aggregates. This shall be used as basis for Contractor's AMP.

128. To mitigate the adverse impact of land and right-of-way acquisition, the draft Resettlement Plan and compensation scheme will be finalized during the preparation of detailed design, applying the results of the detailed measurement survey. Full compensation shall have been completed prior to land and right-of-way acquisition. The replacement of displaced power supply poles and telephone lines, the provision of at least a temporary but efficient irrigation channel to replace the affected sections of existing channels (the permanent to be built together with the access road), and the re-establishment of affected

water pipe lines of the small-scale water supply systems shall have been done and working to pre-displacement standards at least a month prior to the awarding of contract for civil works. Social preparation and an information, education and communication (IEC) program shall have been carried out prior to the implementation of the resettlement and compensation plan.

129. The Environmental Management Plan, which will be finalized during detailed design and cleared by the ADB, shall form part of the bidding documents to draw more environment-responsible bidders. Bidders shall prepare a Contractor's EMP (CEMP) that will address as minimum the requirements of the Subproject EMP. CEMP to include (but not limited to) Aggregates Management Plan, Excavation Segmentation Plan (linked to a Removed Soil Management Plan), Dust Control Plan, Noise and Vibration Mitigation Plan, Gas Emission Mitigation Plan, Solid and Hazardous Waste Management Plan, Traffic Management Plan, Sites Restoration Plan, Occupational Health and Safety Management Plan, Grievance Redress Mechanism, Emergency Response Mechanism, Environmental Management Organizational Set Up, Environmental Monitoring Plan. CEMPs shall be quantitatively and qualitatively evaluated against the Subproject EMP. CEMP of winning bidder shall have to be cleared by the ADB prior to the award of Contract. The contract for civil works shall explicitly stipulate the obligations of parties involved to institute the mitigation measures properly and carry out environmental monitoring according to the ADB-cleared CEMP and Subproject EMP, both to be appended in the Contract. Contract shall require Contractor to submit monthly Contractor's Environmental Management Report (CEMR), the outline of which shall be appended in the Contract. The Contract shall stipulate the tie-up of progress payment and collection of performance bond with the performance in CEMP/Subproject EMP implementation.

130. Prior to award of contract:

- (i) The Environmental Protection Commitment shall have been registered with, and certified by, the Thuy Nguyen DPC, and building/construction permit secured.
- (ii) Sufficient prior public information and signboards about the Subproject shall have been conducted in concerned communes and posted in strategic places, respectively.
- (iii) An intensive awareness program on potential rise of communicable diseases, such as, among others, SARS, A(H1N1), STD, HIV/AIDS with the entry of non-local construction workers into the Subproject communes and ward (So Dau) shall have been conducted.
- (iv) Baseline data on the quality of downstream Gia River water and ground water in the WTP and BPS vicinities, on the ambient levels of air quality, noise and vibration; and on health data in each of the affected communes shall have been established in the PMU.

2. Mitigating Issues/Concerns/Impacts During Construction

131. Measures to keep construction impacts in Subproject sites to the minimum or acceptable levels are basically such good engineering and construction practices as, but not limited to, the following:

- (i) Confining clearing and grubbing according to the Staking Plan.
- (ii) Limiting excavation segment along transmission main alignments to a maximum length of 30 m in minor, and 50 m in major, roads. Keeping pipe laying work following as close as possible to excavation work. Starting pipe laying when excavation reaches 8 m in length. Stopping excavation when it is 10 m ahead of pipe laying work. Backfilling segments in all roads properly at the end of each day's work.
- (iii) Controlling dust/suspended particles by, among others:

- watering of unpaved surfaces and stockpiles of sand and dry excavated materials, at least twice daily during dry weather
 - spreading crushed gravel over backfilled surface, if resurfacing cannot be implemented immediately;
 - protecting sand and soil stockpiles with wind barrier/wind screen placed against the prevailing wind direction;
 - limit speeds of construction vehicles in Subproject sites to 10 kph; and
 - requiring hauling trucks of fine aggregates and cement to put on tarpaulin cover and maintain at least 2 feet freeboard.
- (iv) Controlling gas emissions, to also mitigate contribution to greenhouse gases in the atmosphere, by, among others:
- using construction equipment/vehicles that emit least pollutants (preferably minimized used of diesel-fed equipment and, as much as possible, more alternatively-fuelled ones); have proofs of compliance with GOV and internationally recognized emission standards, e.g., UN/ECE, whichever is more stringent; and are maintained promptly;
 - instituting energy conservation measures, e.g., using environment-friendly lights, air conditioners and equipment in field offices and site accommodations and energy saving construction equipment and enforcing appropriate hours for their usage;
 - limiting engine idling to a maximum of 5 minutes;
 - having site accommodations at walking distance to Subproject sites, or providing mass transport for workers between Subprojects sites and housing;
 - using low VOC emitting materials, such as those complying with Green Seal Standards;
 - prompt maintenance of equipment.
- (v) Mitigating noise and vibration at source, along paths/routes and at the receiver, such as by:
- using construction equipment that emit least noise (e.g., with efficient mufflers, electrically powered, and/or hydraulic tools) and least vibration (e.g., equipped with shock absorber and has operational handbook specifying safety measures against vibration impacts);
 - spreading out transport of materials, wastes and spoils outside peak traffic hours;
 - routing heavily-loaded trucks outside residential areas and avoiding sensitive institutional areas, as much as possible; or if not possible, requiring them to observe the speed limits of 30 kph outside, and 10 kph within Subproject sites;
 - restricting noisy & vibration-causing equipment during the daytime, between 8 AM to 5 PM; necessary overtime not to go beyond 10 PM, should observe reduced noise threshold, should not use noisy and vibration-causing equipment, and should be coordinated beforehand with concerned CPCs for prior community notice;
 - setting up noise barriers, e.g., enclosure around generator set, sound shield around pavement breaker; and
 - applying techniques to reduce overall noise, such as mixing concrete off site, avoiding high material drops, using pre-fabricated structural parts.
- (vi) Managing sediments/silts, such as by:
- employing silt fences, sediment traps, sand bags, earth bunds, speed stilling humps along surface drainage routes, diversion drains for surface run-off, limiting of stockpile height to 2 m, and/or stockpiling away from surface drainage routes, whichever would be appropriate to site conditions, to avoid stockpiled sand or soil from being carried away or eroded by rain or wind;

- preparing and implementing a Removed Soil Management Plan linked to Excavation Segmentation/Management Plan; and
- fine tuning delivery of fine aggregates to Subproject sites to avoid stockpiling more than what would be needed.
- (vii) Implementing an eco-friendly solid and hazardous waste management system on site and off site, e.g., :
 - on site, through waste reduction, reuse, segregation, proper storage, no burning of wastes;
 - off site, by requiring proper cover and no drippings during hauling and by requiring haulers to submit manifests from the City-designated disposal sites for every disposal and from re-users or recyclers/junkshops for every delivery of recyclables (compliance to required manifest submissions will be tied up with the payment for the services of waste contractor and progress billing of Contractor); and
 - instituting measures to minimize hazardous wastes by using less hazardous substances.
- (viii) Ensuring there is adequate proper sanitation facilities and water to meet sanitation needs, and requiring strict observance of sanitation practices by all.
- (ix) Coordinating with traffic control agency and/or CPCs concerned on traffic management schemes, traffic rerouting, access blocking, installation of warning signage (including speed limits) and information billboards, posting of traffic (flag) persons at strategic points of affected segment of roads; prior public information at least two weeks before effectivity.
- (x) Requiring construction trucks to stay in the designated road lane en route to Subproject sites, to strategically display the required speed limit and designated lane to use in their bodies.
- (xi) Ensuring safe alternative access to blocked accesses in coordination particularly with the affected property owners.
- (xii) Engaging adequate number of people and providing adequate budget and support for environmental management, for implementing the ADB-cleared CEMP/Subproject EMP, i.e., supervising the implementation of mitigation measures, performing environmental effects monitoring and preparing the monthly Contractor's Environmental Management Report.
- (xiii) Protecting worker's health and ensuring worker's safety by, among others:
 - conducting health and safety orientation prior to mobilization;
 - arranging with the nearest primary and tertiary health institutions for immediate care, when necessary;
 - setting up a medical clinic on site, adequately equipped for monthly routine physical examination of workers and for first-aid care during emergencies; and
 - strictly enforcing the observance of health and safety rules during the entire construction period.
- (xiv) Ensuring the safety of pedestrians through the provisions of covered and lighted walks with signages in affected places.
- (xv) Setting up an emergency response team equipped with well-trained staff and adequate basic equipment (e.g., for fire-fighting, for first aid, stretchers, tools among others), supplies, communication facilities and emergency vehicle.
- (xvi) Setting up its Grievance Redress Team within the Subproject's Grievance Redress Mechanism.
- (xvii) During mobilization, coordinating with the CPCs concerned for the protection of the grave sites, and school authorities for the protection of the students and school employees.
- (xviii) Proper restoration of sites according to the Sites Restoration Plan in the CEMP, at the completion of construction.

132. The effective conduct of all of the following are crucial mitigation measures as well: i) construction management by the Contractor; ii) supervision of CEMP implementation by the Contractor's Environmental Management Engineer; iii) construction supervision by the PMU; iv) monitoring of CEMP/Subproject EMP implementation by PMU Environmental Engineer, v) monitoring of the observance of the Grievance Redress Mechanism by the PMU Grievance Point Person; and vi) encouraging the participation of concerned CPCs and community representatives in monitoring EMP implementation.

3. Mitigating Issues/Concerns/Impacts During Operation

133. The magnitude of impacts arising from Subproject operation will highly depend on the degree of environmental considerations made from the start of Subproject development through to construction. Hence, some mitigation measures for impacts relative to siting and design and during construction appropriately apply as well to impacts during operation. The basic mitigation measures include:

- (i) Design that carefully incorporates environmental considerations.
- (ii) An O&M Manual that incorporates the proposed mitigation measures and environmental monitoring and reporting specified in the EMP.
- (iii) Securing the required water use agreement.
- (iv) Effective supervision of detailed design and construction by the PMU.
- (v) Securing the required building/construction permit.
- (vi) Quality construction by Contractor.
- (vii) Securing permit to operate.
- (viii) Sufficient provisions in the budget for operation, maintenance and repair, as well as for emergency response.
- (ix) Hiring of competent staff particularly in critical aspects of O&M, adequate and appropriate equipment, tools, supplies and vehicles.
- (x) Monitoring of the quality of raw water (upstream and downstream) and treated water as provided for in the EMP.
- (xi) Prompt action to arising issues/concerns/grievances.
- (xii) Instituting the necessary coordination with the concerned CPCs, Thuy Nguyen DPC and the City's Department of Health, on a regular basis, particularly on the:
 - trend of development upstream, at least every three years,
 - supply of, and demand for, Gia River water, at least every three years,
 - monthly statistics on incidence of water-borne disease.
- (xiii) Vigilance on the water supply and demand situation to allow timely planning and programming of system upgrading and mitigate the risk of the system becoming inefficient to meet increasing demand.
- (xiv) Coordinate with DARD in drafting & implementing a water resource protection plan for the Gia/Bach Dang River system.
- (xv) IEC on water conservation.
- (xvi) Engaging/designating at least two staffs to oversee EMP implementation and prepare the operational Environmental Management Reports.

134. Some specific operational measures include (but not limited) to the following

- (i) Implementing an eco-friendly solid and hazardous waste management system on site (waste reduction, reuse, segregation, proper storage) and off site (requiring Contractor to ensure hauling with cover and without drippings and to submit manifests (including that for sludge disposal) from the City-designated disposal site/s for every disposal. Compliance to the required manifest submission will be tied up with the payment for the services
- (ii) Mechanism for quick response to spillage of wastes and hazardous substances and other emergencies.

- (iii) Proper housekeeping of premises and strict observance of good sanitation practices.
- (iv) Quick response to system leaks
- (v) Regular inspection of the system's components.
- (vi) Inspection for structural damages every after an abnormal natural hazard event, and prompt action on damages
- (vii) Monthly physical examination of staff handling CI and other hazardous substances in O/M&R.
- (viii) Physical examination of relevant staff after every conduct of emergency response.

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Participation Process

135. Consultation and participation during subproject preparation were conducted in the form of on-site informal discussions during field visits, key informant interviews, socio-economic survey and focus group discussions.

136. The field visit conducted by the Local Environmental Specialist and a PMU officer in July 2009 was a joint preliminary assessment of the environmental/cultural sensitiveness of the Subproject sites. Few informal interview/s with residents were made to find out the level of awareness of the residents of the Subproject. Those interviewed confirmed their awareness of the proposed Subproject and desire to have access to potable water supply.

137. Two visits to the Subproject sites were held in August 2009. The first visit was conducted by the Local and International Environmental Specialists to jointly assess the Subproject sites, including the potential extent of displacement of people, houses, infrastructures, socio-economic activities relative to land and ROW acquisition. The second visit was held together with the PPTA Social Team. The objective was to have an on-site discussion on the extent of potential displacements from land and ROW acquisitions. Random interviews of residents were made on both visits to find out further the extent of information the local residents have on the Subproject and their awareness of the inconvenience that the construction of the Subproject would bring. Those interviewed knew about the Subproject, welcomed the Subproject in order to have access to safe water supply, and informed that the degree of public inconvenience can be sacrificed to obtain the long-term benefits from the Subproject.

138. Key staffs of some existing HPWSCo enterprises were consulted in August 2009 on environmental management measures being implemented by HPWSCo enterprises, as well as on their experiences with raised grievances during construction and operation and with ROW acquisition. Following are some of the salient notes of the discussions.

In An Duong WTP, no backwash water is discharged outside the WTP, as this is re-circulated. For sludge management, a private contractor is engaged for the collection and disposal of sludge. As to where sludge is disposed of, however, is not monitored. The An Duong WTP Laboratory Unit is capable of handling tests of, and analyzing, raw and drinking water quality for majority of the parameters. For heavy metal content tests, the Laboratory engages the services of Quality Assurance and Testing Center in Hanoi. Raw water quality tests for 16 parameters are done monthly. Drinking water quality tests are made daily, weekly or monthly depending on the parameters, following the stipulations of Decision No. 1329/2002/BYT/QD and TCVN 5502:2003.

In Don Son WTP, for waters it is receiving from the An Duong WTP, Cau Nguyet WTP and Song He Intake Pumping Station, and the water it is supplying to the distribution network, the Do Son WTP monitors temperature, color, smell, turbidity before sedimentation, turbidity after sedimentation, conductivity, pH, hardness, chlorine, dissolved oxygen, chlorine residue, coliform and e-coli, and total dissolved solids, daily. Whenever there are complaints, these are mostly received through telephone calls to the WTP. Complaints are mostly on the smell of the supplied water, and are acted on as quickly as possible. Should there be unresolved complaints, or in the event complainants are not satisfied with the resolution, complainants are free to elevate their concerns to the HPWSCO through its Customer Relations Office.

During the recent upgrading of the Cau Nguyet WTP, the more common complaints received during construction were on dust, noise and accidents. Complainants were directly raising their concerns to the Contractor, who normally resolved the complaints on its own. With respect to ROW acquisition for access road, local residents were willing to give up portions of their lands in exchange for safe water supply, better access and appreciated land value resulting from a wider road.

139. Households in affected communes were consulted in the form of socio-economic survey, inventory of losses and focus group discussion held between August and October 2009 by the PPTA Social Team. **Section IV D** and **Annex G** provide relevant findings from the socio-economic survey and focus group discussion, respectively.

140. The joint social-resettlement-environmental public consultation earlier planned in March 2010 did not take place. This IEE & its EMP will undergo finalization during the detailed design stage. To incorporate further opinions of, and inputs from, stakeholders into the final IEE & EMP, it would be valuable to subject the findings of this IEE and its EMP to a multi-stakeholder consultation in the first quarter of the detailed design stage. Public consultations will continue throughout Subproject implementation. In public consultations, all stakeholders must be invited and encouraged to participate in the consultations. Suggestions from the general public may be sought through the mass media, when necessary. The PMU, contractor and/or operator shall be open to contact by the public on matters concerning the progress of the Subproject, adverse impacts, mitigation measures and environmental monitoring. During actual implementation of the Subproject, the Final IEE and its EMP will be available in the PMU Office and Subproject Field Office/s for the perusal of interested parties. Copies may be made available upon formal request.

B. Information Disclosed To Date

141. To date, the following have been disclosed: i) Subproject description and components; ii) locations of components; iii) expected period of implementation; iv) extent of land to be acquired/withdrawn; v) potential affected farmlands and households; and vi) expected adverse impacts during construction (discussed during random interviews with affected residents).

VII. GRIEVANCE REDRESS MECHANISM

A. Purpose of the Mechanism

142. The grievance redress mechanism is meant for persons seeking satisfactory resolution to their complaints on the environmental performance of the Subproject. The mechanism will ensure that: i) the basic rights and interests of every person affected by poor environmental performance of the Subproject are protected; and ii) their concerns arising from the poor environmental performance of the Subproject during the conduct of pre-construction, construction and operation activities are effectively and timely addressed.

B. Access to the Mechanism

143. Any person who has complaint regarding the environmental performance of the Subproject during pre-construction, construction and operation phases shall have access to the grievance redress mechanism described in the subsequent section. The Subproject through the Grievance Point Person (GPP) shall ensure that:

- (i) the grievance redress mechanism is publicly disclosed, and posted in the offices of the affected communes and in strategic places of the Subproject's area of influence;
- (ii) the grievance redress mechanism is accessible to all segments of affected villages/communes; and
- (iii) the public, most especially the residents and passers-by in the vicinities of influence of the Subproject, is aware of their rights to access, and shall have access to, the mechanism free of administrative and legal charges.

C. The Grievance Redress Mechanism

144. Managing grievances takes a step-by-step process. It requires assigning responsibilities and specifying timelines for prompt responses/actions to grievances to avoid prolonging the misery of affected person/s (AP/s). Grievances raised on environmental impacts are critical to the health and wellness of APs. Hence, timelines for responses/actions are critical. The recommended grievance redress mechanism features step/s to be observed prior to construction, during construction and during operation. Informally, a complainant can approach or call the PMU, the Contractor or the Operator to raise his/her complaints/concerns. If complaint is not acted on promptly, or if complainant is not satisfied with the resolution undertaken, he/she can call or approach the HPWSCo's Customer Relations Office. The formal mechanism is discussed in the succeeding paragraphs.

1. Prior to Construction

145. Prior to the disclosure of the Subproject grievance redress mechanism to the affected communes, the PMU shall have hired one Grievance Point Person (GPP) to handle grievances lodged during construction. The GPP will be under the supervision of the Environmental Engineer. Sufficient support system, i.e., communication facilities, recording, and reporting system and funds, among others, shall have been set up to sustain the productive implementation of the grievance redress mechanism.

146. At the latest, one month prior to the start of construction, the grievance mechanism should have been disclosed to affected villages and communes by the GPP in coordination with the concerned CPCs. It may be disclosed during social preparation and IEC campaign, or preferably, during an independent IEE disclosure. The information to be disclosed/ explained shall, at least, include: i) the objective/purpose of the grievance redress mechanism; ii) who can raise grievances; iii) what grievances are within the scope of the Subproject mechanism; iv) what potential grievances are outside the scope of the Subproject mechanism and should be directed to established mechanisms outside the Subproject; v) no cost involved on the part of complainants; vi) the benefits from/advantages of using the grievance redress mechanism, as opposed to an informal resolution approach (e.g., rights and protection guaranteed, etc.); vii) the step-by-step procedure; viii) the entities involved in the mechanism, their respective designated liaison and grievance persons, their contact numbers and addresses; (Contractor shall have a grievance action team that should be introduced to the villages & communes during construction mobilization); ix) the types of immediate response that complainants will expect from the entities when they lodge complaint, which will vary depending on the time (daytime or nighttime), day (weekday or

weekend), weather (fine or stormy), and magnitude of impact complained about (minor or major), among others.

147. The GPP makes sure that the mechanism (including the names and contact details of point persons of involved entities) is also posted at the offices of affected CPCs.

2. During Construction and During Operation

a. Lodging Complaint

148. It is possible that affected persons (APs) lodge complaints to any of the following: i) third parties, e.g., village association, NGO, religious groups; ii) Subproject-affected CPCs; iii) Contractor, during construction; iv) Subproject Operating Enterprise, during operation; and v) the PMU, through its Grievance Point Person, prior to construction and during construction.

b. Grievance Documentation/Registration

149. The Grievance Point Person (GPP) and the Operating Enterprise (OE) will be responsible for documenting and registering complaints received during construction and operation, respectively. Other potential complaint recipients shall make sure that the received complaints are documented by, and registered with, the GPP/OE as soon as possible. The GPP/OE shall make sure that documented/registered complaints are acknowledged, duly referenced and complainants informed of the expected action timelines as set forth in the established mechanism. The GPP/OE shall inform the AP immediately if the grievance is within, or outside, the purview of the mechanism. If it is outside the scope, AP shall be directed to the proper institution and/or proper mechanism for the complaint.

c. Review, Investigation, Resolution

150. If it is covered by the mechanism, the complaint will be immediately reviewed, investigated and discussed together with Contractor's/OE's duly designated grievance officer, if conditions allow, that is, both AP and Contractor's/OE's grievance officer are available for discussion. If not, the review, investigation and discussion should take place immediately the next day. The discussion will cover the measures to implement based on the review and investigation. If impact/issue is minor, the Contractor/OE shall immediately act on the complaint. Minor impacts/issues are generally those that would not require thorough review and investigation and are easy to resolve. If impact/issue will need thorough review and investigation, more work to be done, and/or supplies/parts to be procured, to resolve, the Contractor/OE shall immediately provide the most suitable interim measure to reduce impact; and to start work on the final measure not later than 5 days from the day discussion meeting is held.

d. Progress Tracking

151. The GPP/OE shall keep track of, and document, the progress of each step for record purposes, future reference and for monitoring and evaluation of the effectiveness of the mechanism. If, according to the AP, the impact has been resolved satisfactorily, GPP/OE shall obtain a written confirmation of satisfaction from the complainant, which will form part of the grievance documentation.

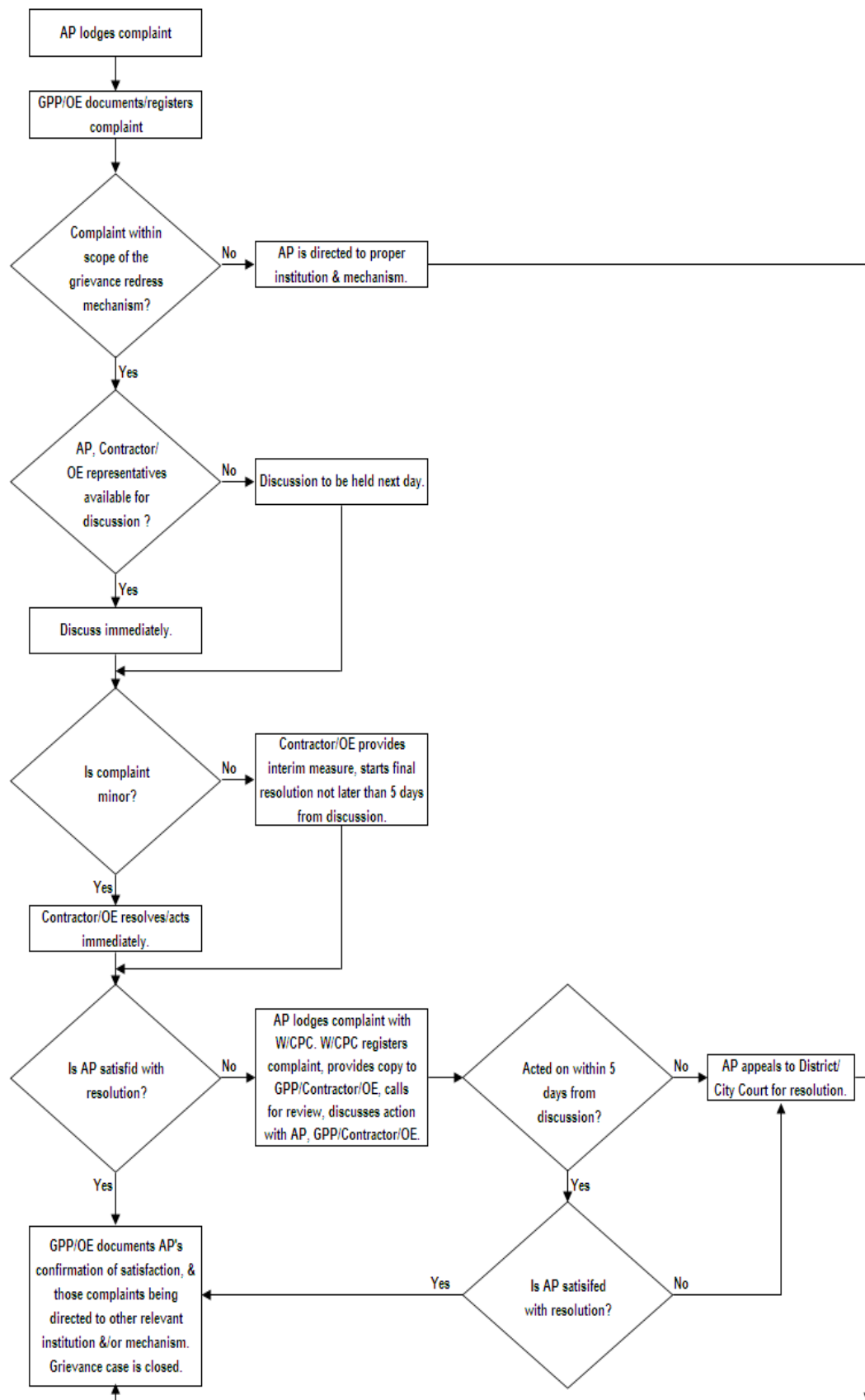
e. Monitoring and Evaluation

152. For at least a week after closure of grievance (that is, when action implemented has been satisfactorily confirmed in writing by the complainant), the GPP/OE shall monitor the effectiveness of the resolution. Monitoring shall be properly documented. The GPP/OE shall make sure that the status of grievance management is reported monthly to the PMU/HPWSCO's Customer Relations Office. The report shall provide comprehensive information on number of grievance received, timeframe of actions made, number of action backlogs, efficiency rate, and remarks particularly on the constraints and lessons learned. Reports shall serve as basis for evaluating the effectiveness of the mechanism and shall help in determining improvements to strengthen the mechanism and improve the environmental management of the Subproject. It is also advisable to use the monitoring reports to report back to the concerned villages & communes on the implementation of the grievance redress mechanism. It will be an effective tool to gain the appreciation and respect of the villages and communes on the sincerity of the goal of the Subproject and the services of the HPWSCO.

f. Appeal for Dissatisfied Complainants/APs

153. In the event the issue persists, AP can lodge an appeal to his/her CPC. The CPC shall immediately: i) record the appeal; ii) contact the GPP, Contractor or OE, provide them with copy of the appeal; and iii) call for a meeting to review the history of the grievance and discuss the appeal and quick resolution of the issue. If the agreed on proposed action/measure has not started within 5 days from the time of formal lodging of the appeal, or if the issue still persists, AP can seek assistance from CPC to raise the grievance to the most relevant institution, i.e., District or City Court. It is highly unlikely that grievance redress process for the Subproject will reach the level wherein Complainants need to go through the "appeal" stage. **Figure 4**

Figure 4. Grievance Redress Procedure



GPP - Grievance Point Person
OE - Operating Enterprise

VIII. ENVIRONMENTAL MANAGEMENT PLAN**A. Environmental Management Plan**

154. The EMP is the framework for environmental impact mitigation and effects monitoring during Subproject implementation. The draft EMP is featured as **Annex H**. It will be finalized by the PMU based on the detailed design, with technical assistance from the Environmental Specialist of the Project Implementation Assistance (PIA) Team. The Plan will be carried out by the Detailed Design Consultants, the PMU, the Contractor for civil works, and the Operating Enterprise.

B. Preliminary Costs

155. The marginal costs for implementing the EMP are initially estimated to include:

- (i) VND 778 Million (USD 37,400) of fixed cost to cover:
 - confirming raw water quality for use as basis in detailed design, and environmental monitoring to establish baseline data of ambient environmental quality/levels prior to construction, 9%
 - environmental effects monitoring during construction, 87%
 - environmental monitoring to establish baseline data of ambient environmental quality/levels prior to full operation, 4%;
- (ii) an annual marginal cost of VND 37 Million (USD 1,770) during operation to monitor the quality of Gia River downstream water; and
- (iii) a total of USD 122,000 for the engagement of Environmental Specialists to provide technical assistance to the PMU in environmental management.

156. The first two costs include taxes; but exclude contingencies and inflation. The costs exclude the salaries of the Environmental Engineers and Grievance Point Person, who will be existing HPWSCo staffs seconded to the PMU for environmental management. **Table H12 of Annex H** provides a detailed breakdown of costs.

C. Implementation Arrangements

157. The institutions that will have major and minor roles and responsibilities in the environmental management of the Subproject include the following entities/institutions/expert:

- (i) Hai Phong Water Supply Company (HPWSCo), its Project Lending Group, Project Management Unit, & Operating Enterprise for the Subproject
- (ii) Project Implementation Assistance Team, its Environmental Specialist
- (iii) Asian Development Bank (ADB)
- (iv) Design Consultant
- (v) Civil Works Contractor
- (vi) People's Committees, i.e., the CPCs concerned and DPC of Thuy Nguyen
- (vii) GOV agencies, such as the District Natural Resources and Environment Office (DNREO or NREO), Department of Health (DOH), Department of Agriculture and Rural Development (DARD), Department of Construction (DOC) and Department of Natural Resources and Environment (DONRE).

158. The HPWSCo will be the executing agency for the Project. It is under the administrative jurisdiction of the Hai Phong City People's Committee (HPCPC) and will represent, and inform, the latter accordingly in all Project-related matters. A Project Leading Group (PLG) has been established to provide overall guidance and support to project preparation and implementation. It is chaired by a Vice Director of HPWSCo; and officials and staff from the various departments of the HPWSCo sit as members. The PLG will be responsible for deciding on environmental management matters that will require action from

the senior-management level. It will ensure adequate resources are allocated and are timely disbursed to process the necessary permits/approvals/agreements, to monitor EMP implementation and to undertake the environmental monitoring activities required from HPWSCo in the Environmental Monitoring Plan. A Project Management Unit (PMU) has also been established to undertake and manage the day-to-day activities of the Project. Its full-time Environmental Engineer will oversee and monitor the implementation of the Subproject EMP. The Project Implementation Assistance (PIA) Team will have an Environmental Specialist, who will provide technical advice, guidance, support and “hands-on training” to the PMU, particularly its Environmental Engineer, in project/subproject environmental management.

159. The ADB will undertake reviews of relevant documents for clearance purposes or issuance of “No Objection Letters” accordingly, and carry out annual environmental review missions to review the environmental performance of the Subproject. The Design Consultant will incorporate EMP requirements and recommendations into the design, bid document and O&M Manual. The DPC of Thuy Nguyen will approve/certify the registration of the Subproject EPC. The concerned CPCs will be involved at the commune level, e.g., in public disclosure of Subproject environmental matters and coordination on matters that affect their communities. The civil works Contractor and the Operating Enterprise will be responsible for implementing all EMP-specified environmental mitigation and protection measures and environmental monitoring activities, and prepare monthly and semi-annual Environmental Monitoring Reports (EMRs). Roles and responsibilities of all institutions involved are summarized in **Table H11 of Annex H**.

D. Capacity Development

160. Two approaches of capacity development on environmental management have been identified: i) through participation in relevant courses and seminars as included in the Preliminary Training Plan for HPWSCo Institutional Development and the cost requirement of which is included in the overall budget for the Preliminary Training Plan; and ii) through “learning-by-doing”, conducted by the Environmental Specialist of the PIA Team as he/she provides technical assistance. The draft ToR for the Environmental Specialist, featured as **End Note H2 of Annex H**, has been designed towards this objective. Albeit all institutions involved in the Project/Subproject environmental management will be encouraged and invited to participate, the Environmental Specialist will highly focus on training the PMU, especially its Environmental Engineer and (environmental) Grievance Point Person.

IX. CONCLUSION AND RECOMMENDATION

161. The proposed Subproject will basically be an extension of the safe drinking water coverage from the City center, to the peri-urban area northeast, of Hai Phong, across the Cam River. It will: (i) improve the quality of life; (ii) induce socio-economic growth, opening up new or higher income and employment opportunities; and (iii) improve local economy brought about by higher public revenues from intensifying economic activities and increased land values; in Thuy Nguyen District, particularly in its peri-urban area. Overall, an expanded access to safe, potable water will substantially contribute to poverty alleviation in Hai Phong City.

162. The constraints posed by the inherent features of subproject sites can easily be met without threatening or weakening the natural environment and resources. The potential adverse impacts during construction will be temporary, more severe during the peak construction period; however, can be mitigated without difficulty through strict compliance with environmental management requirements, particularly the full implementation of the CEMP/Subproject EMP. Having the Contractor contractually bound to comply with the

CEMP/Subproject EMP, and tying up the construction progress payment and collection of performance bond with the Contractor's performance in CEMP/Subproject EMP implementation, will considerably mitigate the adverse impacts during construction. The adequate incorporation of environmental considerations during design, and good performance in Subproject EMP implementation, will mitigate the potential adverse impacts during operation. Overall, the proposed Subproject will unlikely cause irreversible adverse impacts on the environment. The benefits that will be derived from the Subproject will far outweigh the adverse impacts. With effective environmental management and monitoring in all stages of the Subproject, the environmental benefits from the Subproject can be fully gained.

163. Based on the findings of the IEE, the classification of the Subproject as Category "B" is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with the Safeguard Policy Statement of the ADB. Under GOV regulations, the Subproject is classified as Category "II", which would be required an EPC for registration with, and certification by, the District People's Committee through its Natural Resources and Environment Office. The EPC for this Subproject will be prepared based on the IEE and its EMP.

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Annex A. Subproject Location

Map 1 – Hai Phong City Location in the Viet Nam & Greater Mekong Subregion Contexts



Map 2 – Subproject/Thuy Nguyen District Location in the Hai Phong City Context

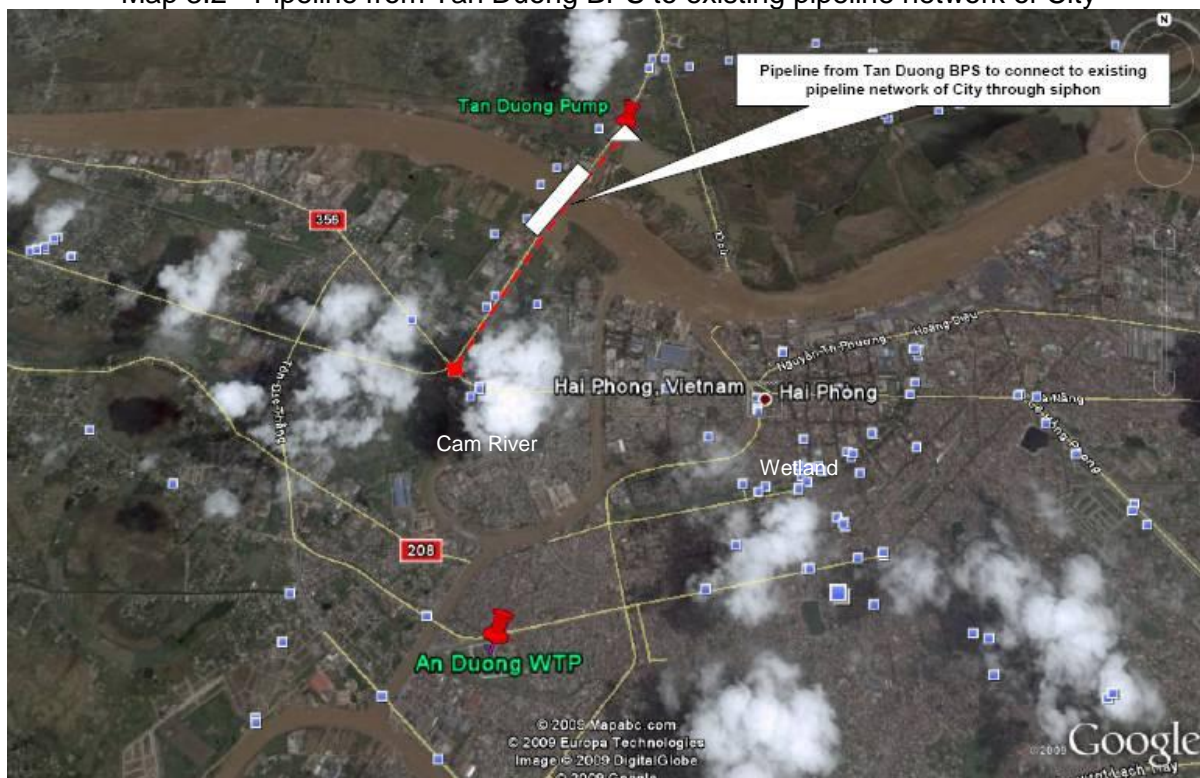


Map 3 – Location of Subproject Components in the Thuy Nguyen District Context

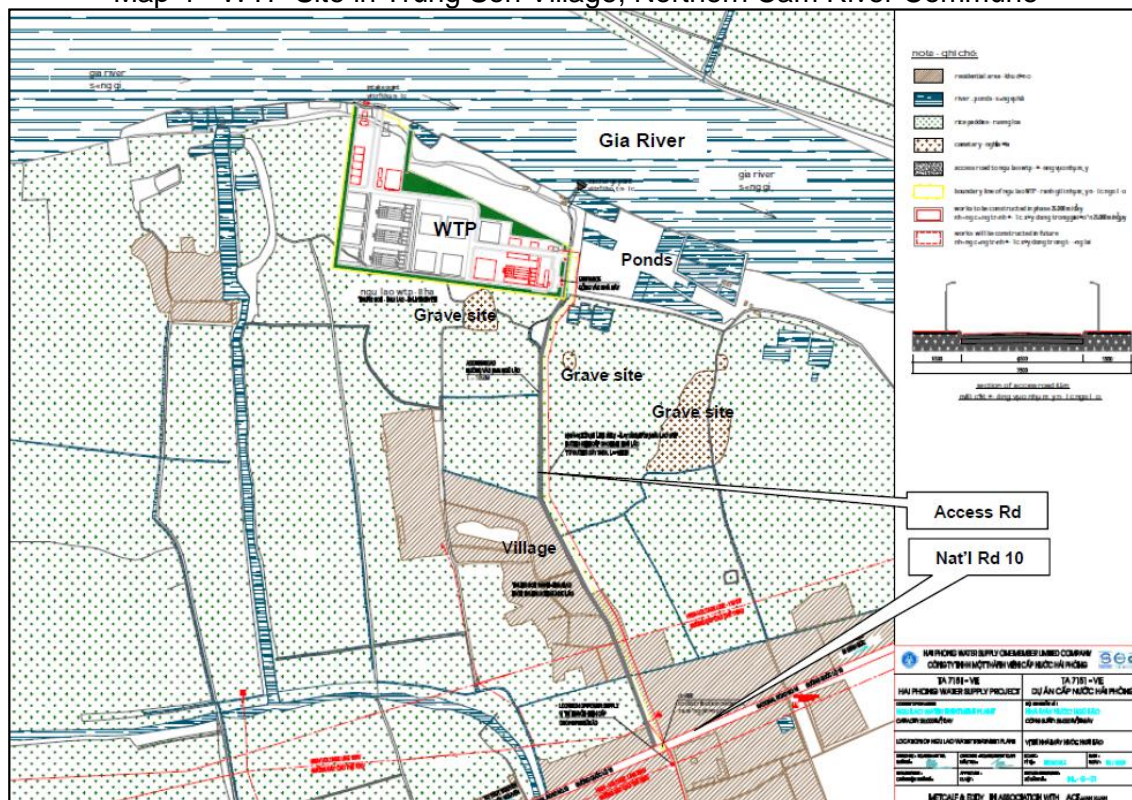
Map 3.1 - Northern Cam River WTP to Tan Duong BPS



Map 3.2 - Pipeline from Tan Duong BPS to existing pipeline network of City



Map 4 - WTP Site in Trung Son Village, Northern Cam River Commune



Map 5 – BPS Site in Tan Duong Commune



Annex B. Physical Resources Details

B.1 Monthly Precipitation, Evaporation & Humidity Hai Phong, 1957–1997

Particulars	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainy Days	9	14	18	14	12	15	14	17	13	10	6	5
Rain max., mm	68	37	54	184	184	167	224	362	182	343	149	35
Rain ave., mm	33	37	54	99	187	244	214	377	232	154	42	16
Evaporation, mm	55	35	32	39	62	66	71	56	64	76	75	68
Rain Surplus, mm	-22	+2	+22	+60	+125	+178	+143	+321	+168	+78	-33	-52
Rel. Humidity, %	84	88	91	90	87	86	86	88	85	81	77	77

Source: Phu Lien Meteorological Station,

Rainy days: Average number of rainy days per month

Rain (max): Average highest rainfall of month

Rain (ave.): Average monthly rainfall

B.2 Climate Data, Hai Phong, 2000, 2005-2008

Average Temperature (°C)

Month	2000	2005	2006	2007	2008
January	17.6	15.7	17.2	16.4	15.1
February	15.9	17.4	18.1	20.5	13.0
March	19.5	18.2	19.0	20.2	20.0
April	24.2	23.0	23.8	22.1	23.5
May	26.3	27.7	26.3	26.1	26.0
June	27.7	28.8	28.5	29.0	27.2
July	28.4	28.2	28.5	29.0	28.1
August	27.5	27.4	26.8	28.0	27.5
September	27.0	27.3	26.6	26.4	27.0
October	25.0	25.2	26.4	24.8	25.9
November	21.5	22.0	24.1	20.8	21.0
December	18.0	16.6	18.1	19.9	18.1
Annual Average	23.2	23.1	23.6	23.6	22.7

Average Relative Humidity (%)

Month	2000	2005	2006	2007	2008
January	89.0	84.0	84.0	77.0	88.0
February	92.0	91.0	91.0	87.0	86.0
March	95.0	88.0	92.0	95.0	89.0
April	93.0	90.0	89.0	86.0	91.0
May	94.0	87.0	85.0	84.0	88.0
June	91.0	85.0	87.0	86.0	92.0
July	91.0	86.0	85.0	87.0	87.0
August	90.0	91.0	90.0	88.0	92.0
September	85.0	86.0	81.0	86.0	90.0
October	85.0	82.0	83.0	82.0	86.0
November	80.0	80.0	80.0	73.0	80.0
December	75.0	76.0	73.0	85.0	80.0
Annual Average	88.3	86.2	85.0	84.7	87.4

Total Rainfall (mm)

Month	2000	2005	2006	2007	2008
January	2.7	8.1	0.5	8.7	61.0
February	26.2	24.6	26.3	14.5	33.6
March	62.0	36.1	40.0	34.5	33.5
April	14.8	11.7	83.8	82.8	38.8
May	203.2	153.9	60.4	117.6	167.7
June	114.6	201.0	196.6	217.7	214.2
July	250.0	253.7	182.7	151.8	134.0
August	300.0	313.1	679.5	261.4	372.7
September	250.0	212.6	127.7	339.4	383.9
October	130.0	20.7	0.3	121.3	29.9
November	50.0	243.7	59.2	5.9	56.4
December	30.0	30.4	-	18.3	36.6
Total Rainfall	1,433.5	1,509.6	1,457.0	1,373.9	1,562.3
Annual Average	119.5	125.8	121.4	114.5	130.2

Total Sunshine Hours

Month	2000	2005	2006	2007	2008
January	55	23	78	83	70
February	29	59	36	67	45
March	53	40	19	6	85
April	106	80	110	76	79
May	147	218	174	182	187
June	176	141	179	213	114
July	217	127	171	257	147
August	170	154	118	147	141
September	180	179	191	137	126
October	200	151	182	155	149
November	150	131	184	197	151
December	130	69	129	62	138
Annual Average	1,613	1,372	1,571	1,582	1,432

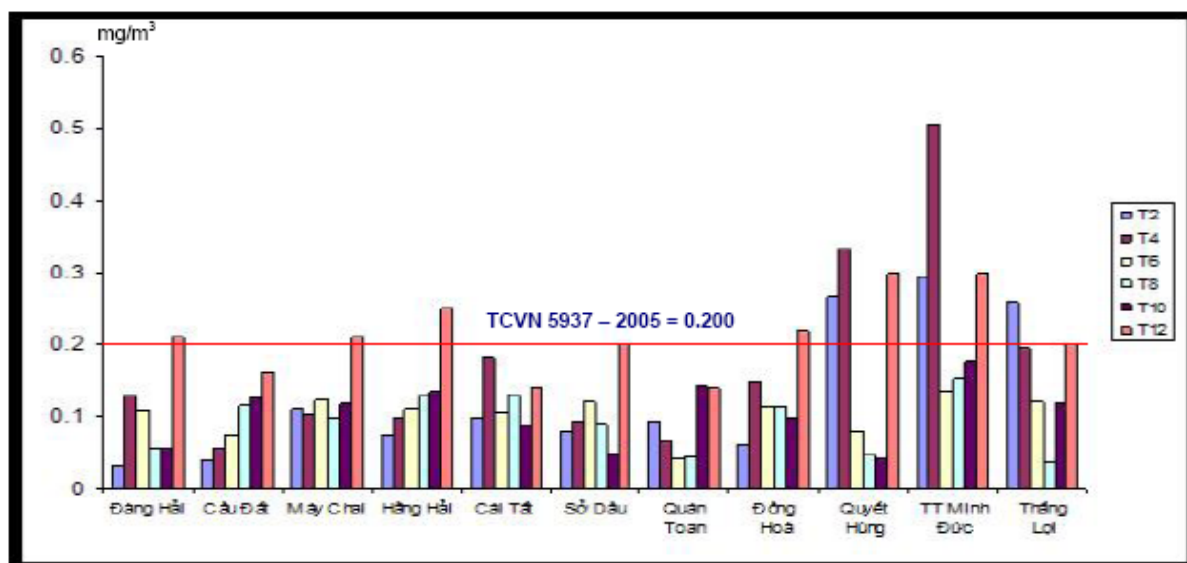
Source: Haiphong Statistical Yearbook 2008. Hai Phong Statistics Office

Parameter	2007	2008
Temperature (°C)		
Annual Average	+23.6	+22.7
Minimum Monthly Average	Jan, +16.4	Feb, +13.0
Maximum Monthly Average	Jun & Jul, +29.0	Jul, +28.1
Hottest months	May–Sep, +26-29	May–Oct, +26-28
Rainfall (mm)		
Total	1,374	1,562
Higher precipitation, >100 to > 300	May–Oct	May–Sep
Lower precipitation <100	Nov–Apr, <85	Oct–Apr, <65
Wettest month/s	Sep, >300	Aug & Sep, >300
Month/s with least precipitation	Jan & Nov, <10	Oct, <30
Relative Humidity (%)		
Average	84.7	87.4
Highest	Mar, 95.0	Apr, Jun, Aug, Sep, 90.0 & >
Lowest	Nov, 73.0	Nov & Dec, 80
Sunshine (hours)		
Total	1,582	1,432
Months with > 100 hours	May–Nov	May–Dec
Month with least sunshine hours	Mar, 6	Feb, 45
Month with most sunshine hours	Jul, 257	May, 187

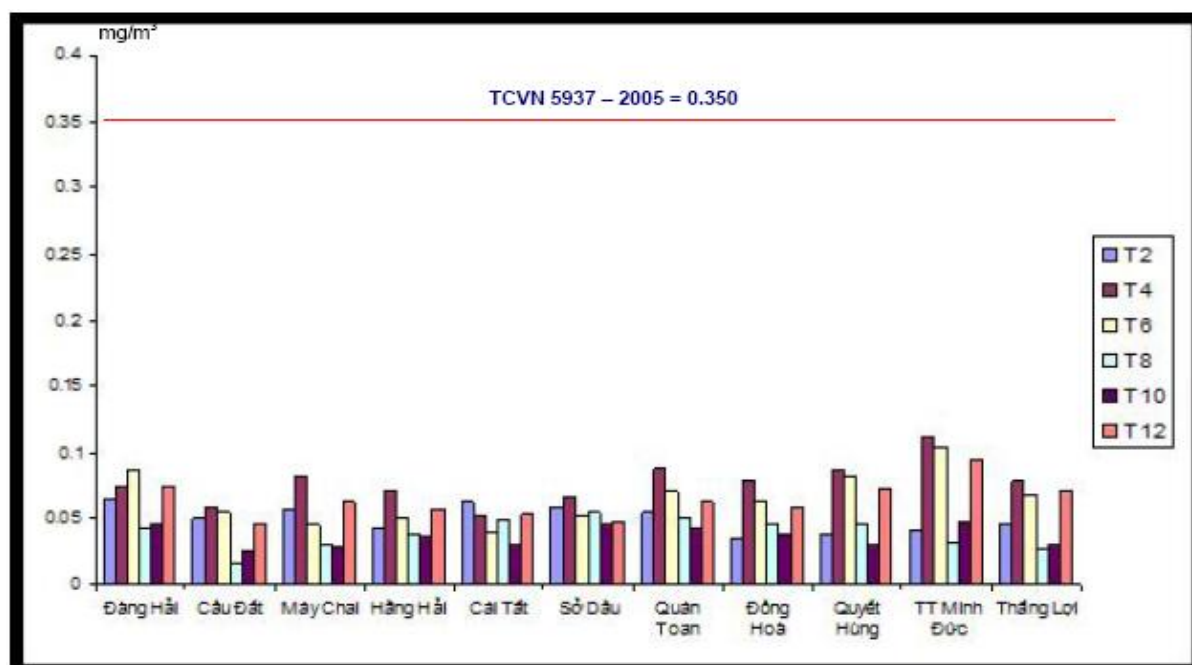
B.3 Air Quality Monitoring Report, 2008**Suspended Dust**

Monitoring Point				2008 Results (mg/m ³)					
No.	Site	Coordinates		Feb	Apr	Jun	Aug	Oct	Dec
		Latitude	Longitude						
1	Dong Hai Ward	20°50,639' N	106°43,380' E	0.033	0.129	0.108	0.056	0.056	0.210
2	DOST	20°51,160' N	106°41,197' E	0.040	0.058	0.074	0.116	0.125	0.160
3	May Chai Ward	20°52,326' N	106°42,175' E	0.110	0.103	0.124	0.098	0.119	0.210
4	Marine University	20°50,271' N	106°41,703' E	0.075	0.098	0.110	0.129	0.135	0.250
5	Cai Tat Dam	20°49,757' N	106°39,058' E	0.100	0.182	0.105	0.130	0.089	0.140
6	So Dau Ward	20°52,288' N	106°39,521' E	0.080	0.095	0.120	0.091	0.049	0.200
7	Quan Toan Ward	20°53,479' N	106°36,424' E	0.094	0.066	0.043	0.044	0.144	0.140
8	Dong Hoa Ward (Kien An)	20°49,761' N	106°39,988' E	0.061	0.148	0.114	0.114	0.100	0.220
9	Quyét Hong residential, Thuy Nguyen.	20°58,008' N	106°43,465' E	0.266	0.334	0.079	0.046	0.042	0.300
10	Minh Duc town- Thuy Nguyen.	20°57,233' N	106°41,630' E	0.293	0.506	0.135	0.152	0.178	0.300
11	Thang Loi residential, Thuy Nguyen.	20°57,713' N	106°44,759' E	0.260	0.196	0.121	0.036	0.119	0.200
TCVN 5937 - 2005				0.200					

0.196 Results that have almost reached, reached or exceeded standard limit.

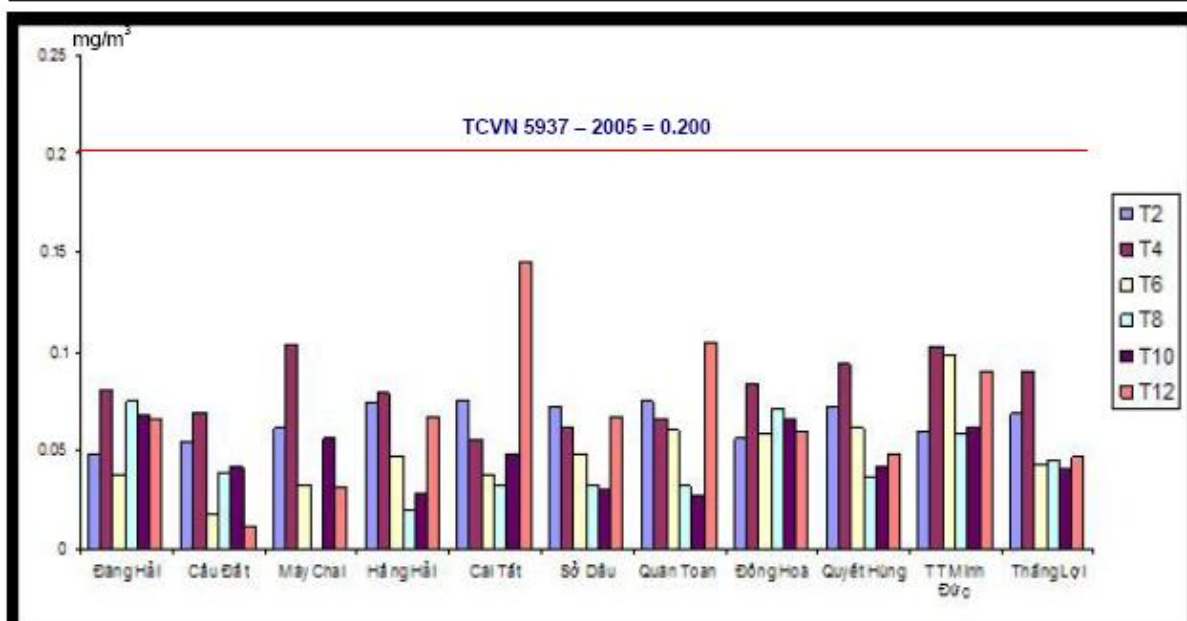
**Sulfur Dioxide (SO₂)**

Monitoring Point				2008 Results (mg/m ³)					
No.	Site	Coordinates		Feb	Apr	Jun	Aug	Oct	Dec
		Latitude	Longitude						
1	Dong Hai Ward	20°50,639' N	106°43,380' E	0.065	0.074	0.086	0.043	0.047	0.075
2	DOST	20°51,160' N	106°41,197' E	0.051	0.059	0.054	0.016	0.025	0.046
3	May Chai Ward	20°52,326' N	106°42,175' E	0.057	0.082	0.045	0.031	0.029	0.062
4	Marine University	20°50,271' N	106°41,703' E	0.043	0.071	0.051	0.038	0.037	0.057
5	Cai Tat Dam	20°49,757' N	106°39,058' E	0.062	0.052	0.040	0.049	0.030	0.053
6	So Dau Ward	20°52,288' N	106°39,521' E	0.059	0.067	0.052	0.054	0.045	0.048
7	Quan Toan Ward	20°53,479' N	106°36,424' E	0.054	0.088	0.071	0.050	0.042	0.062
8	Dong Hoa Ward (Kien An)	20°49,761' N	106°39,988' E	0.035	0.079	0.063	0.046	0.039	0.059
9	Quyét Hong residential, Thuy Nguyen.	20°58,008' N	106°43,465' E	0.039	0.086	0.083	0.045	0.031	0.073
10	Minh Duc town- Thuy Nguyen.	20°57,233' N	106°41,630' E	0.041	0.112	0.104	0.032	0.048	0.095
11	Thang Loi residential, Thuy Nguyen.	20°57,713' N	106°44,759' E	0.046	0.079	0.068	0.026	0.031	0.071
TCVN 5937 - 2005				0.350					



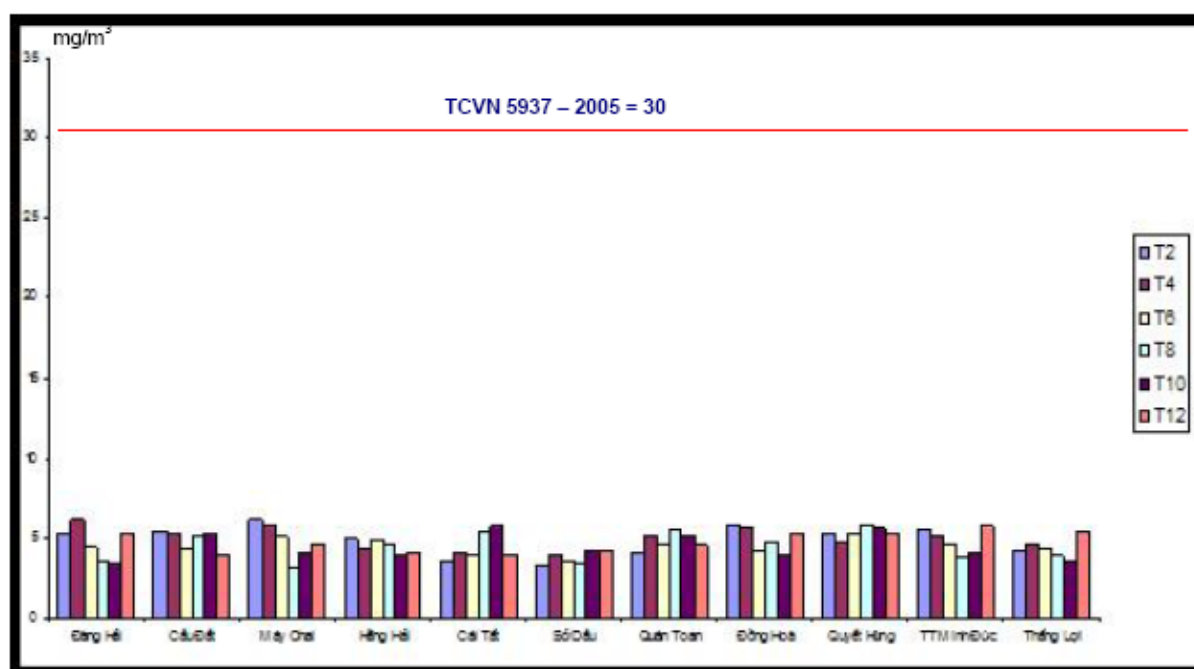
Nitrogen Dioxide (NO₂)

Monitoring Point				2008 Results (mg/m³)					
No.	Site	Coordinates		Feb	Apr	Jun	Aug	Oct	Dec
		Latitude	Longitude						
1	Dong Hai Ward	20°50.639' N	106°43.380' E	0.048	0.081	0.038	0.075	0.068	0.066
2	DOST	20°51.160' N	106°41.197' E	0.054	0.069	0.018	0.039	0.041	0.011
3	May Chai Ward	20°52.326' N	106°42.175' E	0.061	0.103	0.032	0.063	0.056	0.031
4	Marine University	20°50.271' N	106°41.703' E	0.074	0.079	0.047	0.020	0.028	0.067
5	Cai Tat Dam	20°49.757' N	106°39.058' E	0.075	0.055	0.037	0.033	0.048	0.145
6	So Dau Ward	20°52.288' N	106°39.521' E	0.072	0.062	0.048	0.032	0.030	0.067
7	Quan Toan Ward	20°53.479' N	106°36.424' E	0.075	0.066	0.060	0.032	0.027	0.105
8	Dong Hoa Ward (Kien An)	20°49.761' N	106°39.988' E	0.056	0.083	0.058	0.071	0.066	0.059
9	Quyét Hong residential, Thuy Nguyen.	20°58.008' N	106°43.465' E	0.072	0.094	0.061	0.036	0.042	0.048
10	Minh Duc town- Thuy Nguyen.	20°57.233' N	106°41.630' E	0.059	0.102	0.098	0.058	0.061	0.089
11	Thang Loi residential, Thuy Nguyen.	20°57.713' N	106°44.759' E	0.069	0.090	0.043	0.045	0.040	0.046
TCVN 5937 - 2005				0.200					



Carbon Monoxide (CO)

No.	Monitoring Point		2008 Results (mg/m ³)						
	Site	Coordinates		Feb	Apr	Jun	Aug	Oct	Dec
		Latitude	Longitude						
1	Dong Hai Ward	20°50,639' N	106°43,380' E	5.32	6.21	4.45	3.59	3.45	5.35
2	DOST	20°51,160' N	106°41,197' E	5.45	5.36	4.36	5.12	5.29	3.86
3	May Chai Ward	20°52,326' N	106°42,175' E	6.21	5.89	5.12	3.11	4.12	4.63
4	Marine University	20°50,271' N	106°41,703' E	4.95	4.32	4.87	4.52	3.98	4.14
5	Cai Tet Dam	20°49,757' N	106°39,058' E	3.63	4.17	3.89	5.43	5.75	4.02
6	So Dau Ward	20°52,288' N	106°39,521' E	3.24	3.98	3.62	3.47	4.26	4.22
7	Quan Toan Ward	20°53,479' N	106°36,424' E	4.12	5.11	4.57	5.51	5.16	4.55
8	Dong Hoa Ward (Kien An)	20°49,761' N	106°39,988' E	5.71	5.62	4.26	4.81	3.99	5.26
9	Quyet Hong residential, Thuy Nguyen.	20°58,008' N	106°43,465' E	5.35	4.78	5.27	5.84	5.62	5.34
10	Minh Duc town- Thuy Nguyen.	20°57,233' N	106°41,630' E	5.48	5.24	4.6	3.75	4.1	5.76
11	Thang Loi residential, Thuy Nguyen.	20°57,713' N	106°44,759' E	4.18	4.69	4.32	3.94	3.55	5.43
TCVN 5937 - 2005				30.00					



Source: Hai Phong Environmental Monitoring Center

B.4 Some Main Water Quality Parameters for Water from Cam River ^

No.	Parameter	Cam River in Hai Phong			QCVN 08:2008/BTNMT		US EPA National Recommended Water Qlty Criteria (mg/l)	
		Upper Point at Sao Bien Training Ctr	Lower Point Near Cement Factory	Tam Bac River After Bus Station	A1	A2	Freshwater (acute)	Human health*
1	COD (mg/l)	16.82	19.87	22.68	10	15		
2	BOD ₅ (mg/l)	7.83	9.42	10.75	4	6		
3	NH ₄ ⁺ (mg/l)	1.39	0.46	1.28	0.1	0.2		
4	NO ₃ ⁻ (mg/l)	5.1	6.98	6.14	2	5		10
5	PO ₄ ³⁻ (mg/l)	0.3	0.25	0.27	0.1	0.2		0.1
6	SS (mg/l)	180.8	204.3	152.3	-	-		
7	Pb (mg/l)	0.018	0.03	0.013	0.02	0.02	0.065	
8	Cd (mg/l)	0.004	0.008	0.002	0.005	0.005	0.002	
9	Coliform (MPN/ml)	5950	7717	9567	2,500	5,000		

B.5 Typical Raw Water Quality of Gia River Artificial Water Storage Reservoir, 2006 -2008 ^^

No.	Parameter	Results		QCVN 08:2008/BTNMT		US EPA National Recommended Water Qlty Criteria (mg/l)	
		Lowest	Highest	A1	A2	Freshwater	Human health*
1	Temperature (°C)	13.00	31.00	-	-		
2	Turbidity (NTU)	4.63	13.80	-	-		
3	pH	7.21	8.65	6-8.5	6-8.5		5-9
4	Conductivity (μS/cm)	242	602	-	-		
5	Cl ⁻ (mg/l)	22.01	102.24	250	400		
6	Total Alkalinity (mg/l)	-	-	-	-		
7	Total hardness, CaCO ₃ (mg/l)	82.00	148.00	-	-		
8	KMnO ₄ (mgO ₂ /l)	1.44	4.08	-	-		
9	Total Fe	0.04	0.50	0.50	1.00	1.00 (chronic)	
10	NH ₄ ⁺ (mg/l)	0.00	0.50	0.10	0.20		
11	NO ₃ ⁻ (mg/l)	0.01	0.52	2.00	5.00		10
12	NO ₂ ⁻ (mg/l)	0.00	0.70	0.01	0.02		
13	PO ₄ ³⁻ (mg/l)	-	-	0.10	0.20		0.10
14	Total Dissolved Solids (mg/l)	105.60	419.00	-	-	250	
15	Fecal Coliform (VK/100ml)	50	4,000	20	50		
16	Coliform (VK/100ml)	100	10,000	2,500	5,000		

Exceeded national standard limit
Passed national standard limit; but exceeded US EPA criteria

^ Source: Report of National Inland Environmental Monitoring in the Northern Part of Vietnam, 2006. Featured in the Report on Water Quality Component. Nguyen Minh Son. IET, VAST.

^^ Source: Interim Report Supplementary Appendices. Hai Phong Water Supply Project. August 2009.

* For the consumption of water + organisms

B.6 Water Quality Report, 2008 – Gia River (Minh Duc Dam, Thuy Nguyen District, Hai Phong)

Month	Temp	Color	Smell	Turbidity	pH	Conduc- tivity	Total Hardness	Cl-	Oxidation degree	Coliform(CFU/100ml)		TDS	NH ₄ /N	Mn	NO ₃ -/N	NO ₂ -/N	Fe
	(°C)	(mgPt/l)		(NTU)				(mg/l)	(mgO ₂ /l)	Total	Thermal		(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Jan	19.3	10	Not det	7.20	8.15	561	128	80.94	2.24	300	200	311.0	0.07	0.04	0.03	<0.01	0.08
Feb	12.9	15	Not det	6.82	7.72	602	148	84.49	2.32	100	50	295.0	0.05	0.04	0.01	<0.01	0.08
Mar	23	20	Not det	7.04	8.59	532	137	76.68	2.72	100	100	320.0	0.06	0.04	0.02	<0.01	0.06
Apr	25.3	15	Not det	8.24	8.52	303	138	61.06	2.8	300	100	228.0	0.07	0.05	0.01	<0.01	0.06
May	30.6	20	Not det	8.06	8.38	443	120	59.64	1.76	300	100	208.2	0.08	0.08	0.01	<0.01	0.18
Jun	31.1	20	stinking	9.84	7.85	418	119	48.28	4.08	600	500	192.9	0.06	0.09	0.01	<0.01	0.15
Jul	29.8	20	stinking	13.10	8.47	377	112	39.05	4.0	600	50	173.1	0.09	0.09	0.01	<0.01	0.09
Aug	28	25	stinking	8.60	7.72	320	-	26.98	4.0	800	300	149.4	-	-	-	-	-
Sep	27.6	20	Not det	13.8	7.28	263	-	18.48	2.08	1,300	250	171.4	-	-	-	-	-
Oct	26.4	17	Not det	11.2	7.76	242	82	14.91	1.44	120	15	105.5	0.12	0.06	0.15	<0.01	0.09
Nov	22.3	12	Not det	11.2	7.67	251	-	17.04	1.76	100	30	125.9	-	-	-	-	-
Dec	19.3	15	Not det	10.4	7.80	257	-	25.56	2.24	300	50	141.3	-	-	-	-	-
Std 1a	-	-	-	-	6.0-8.5	-	-	250.00	≥ 6.00	2,500	-	-	0.10	-	2.00	0.01	0.50
Std 1b	-	-	-	-	6.0-8.5	-	-	400.00	≥ 5.00	5,000	-	-	0.20	-	5.00	0.02	1.00
EPA 1												250.0					1.00
EPA 2					5.0-9.0									0.05	10.0		

Source: Laboratory Unit of An Duong WTP, HPWSCO.

Exceeded national standard limit

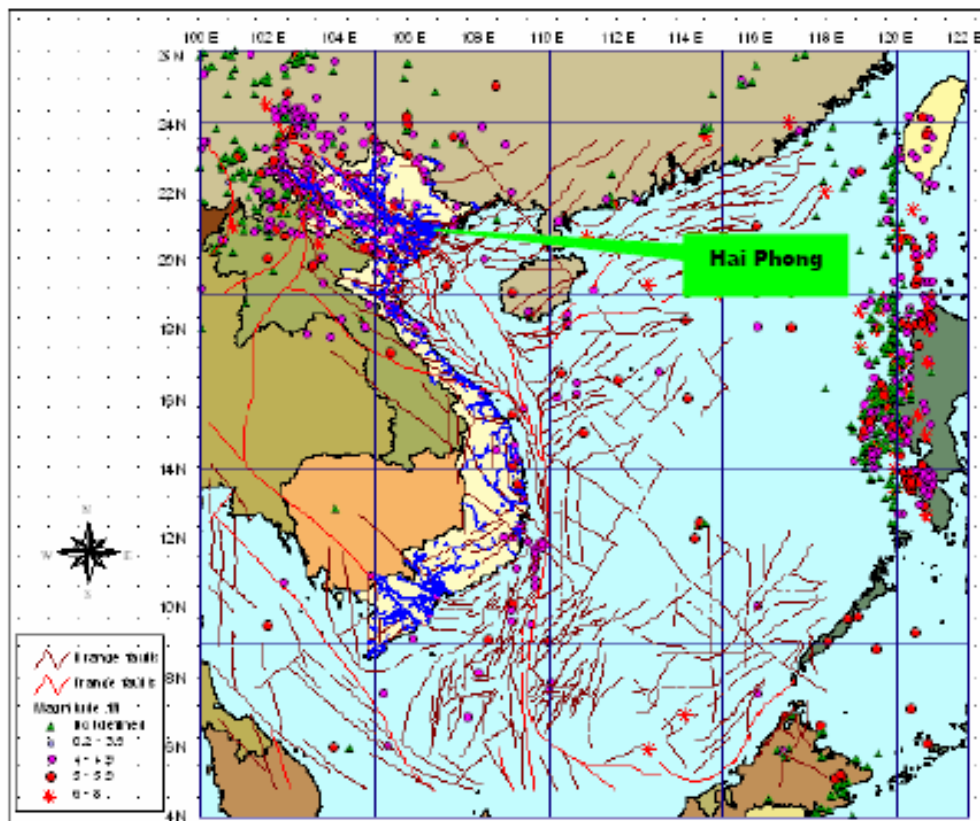
Exceeded US EPA standard limit

Std 1a: Maximum limits on surface water quality, according to QCVN 08:2008/BTNMT, for water supply and other purposes (A1)

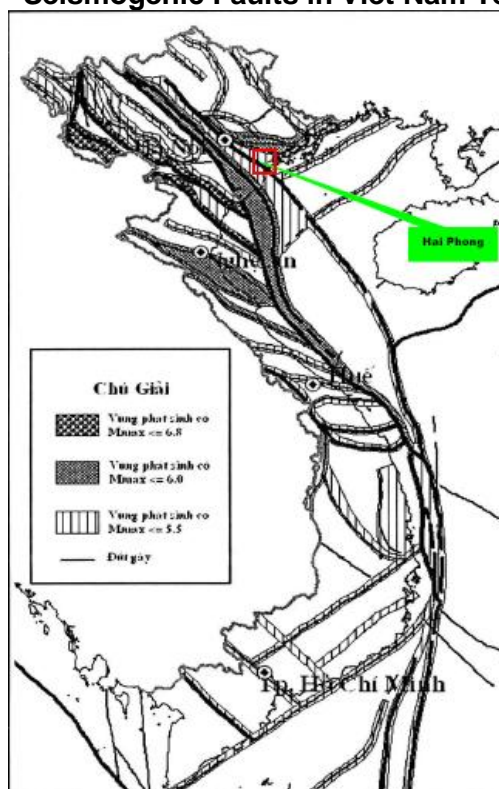
Std 1b: Maximum limits on surface water quality, according to QCVN 08:2008/BTNMT, for water supply activities requiring appropriate treatment technology (A2)

EPA 1: Freshwater (acute)

EPA 2: Human health for the consumption of water + organisms

B.7 Seismicity of Viet Nam and Adjacent Areas in South East Asia

Source: Earthquake Hazard and Earthquake Risk Assessment in Vietnam. Seismic Risk Management for Countries of the Asia Pacific Region. December 2003. Bangkok. N.H.Phuong. Hanoi Institute of Oceanography. National Centre for Natural Science and Technology. Vietnam

B.8 Seismogenic Faults in Viet Nam Territory

Source: Country Report: Seismic Hazard of the Territory of Vietnam. Nguyen Anh Duong. Institute of Geophysics, Vietnamese Academy of Science and Technology.

Annex C. Screening of Potential Issues/Concerns Relative to Siting

1/4

Issue / Concern / Impact		Magnitude Per Subproject Component*				Remarks
Particular	Type	WTP		TM	BPS	
		WTP	A Rd			
1 Adjacent to environmentally sensitive areas, physical cultural resources & sensitive institutions	-	S	L	N-M	N	<ul style="list-style-type: none">▪ WTP<ul style="list-style-type: none">- about a third of its N perimeter is right along the S bank of Gia River.- 1 grave site bordering the WTP site in its south.▪ Access Road & Transmission Main<ul style="list-style-type: none">- 1 other grave site is about 30-40 m away from the section near the WTP site.- Pham Ngu Lao High School along the access road.▪ Transmission Main<ul style="list-style-type: none">- 2 pagodas, 2 grave sites, 4 schools along the National Road 10.- from the BPS to the City Center will cross Cam River, installation will not be under the river bed, but alongside the Binh Bridge.▪ BPS site is partly rice field, partly wetland. The wetlands in the vicinity used to be rice fields that have become perennially inundated as adverse consequence of the construction of the Binh Bridge. To the E of the site, the VSIP Township & Industrial Park will be developed. Hence, the vicinity of the BPS site will, in the near future, be the new town to the north of the urban center of Hai Phong.
2 Planned in areas with ecosystem classification system, where basic surveys of plant/vertebrate taxa done.	-	N	N	N	N	
3 Encroaching into:	-					
- indigenous communities		N	N	N	N	
- habitats with species listed as globally endangered by International Union for Conservation of Nature		N	N	N	N	
- strictly protected areas (IUCN Categories I to III), including core zones of Biosphere Reserves & World Heritage Sites		N	N	N	N	
- primary/primeval forests		N	N	N	N	
- habitats with diverse domesticated species		N	N	N	N	
- habitats of migratory species listed as globally endangered by the IUCN or by Viet Nam		N	N	N	N	

Annex C. (continued)

2/4

Issue / Concern / Impact		Magnitude Per Subproject Component*				Remarks
Particular	Type	WTP		TM	BPS	
		WTP	A Rd			
- areas that are resources on which vulnerable groups depend to sustain their families		L	N-L	N	L	<ul style="list-style-type: none">WTP site, 12 of 102 AHs (or 12%) are vulnerable, 1 of which is a widow .BPS site, 1 of 14 Ahs (<10%) is vulnerable.A Rd, possible few vulnerable AHs affected
- areas that have strong traditional lifestyles or traditional uses of biological resources.		N	N	N	N	
4 Project site/area of influence densely populated & heavy with urban development	-	N-L	N-M	M-S	L	<ul style="list-style-type: none">WTP site is rice paddies. 2 houses in vicinity.Halfway of the access road goes through a village with medium-density population, remaining halfway through rice fieldsTransmission main alignment with varied population density and intensity of urban development.BPS site is wetlands & rice fields. Few houses in vicinity.
5 Land &/or ROW acquisition, loss of land, crops, & income; displacement of irrigation channels & power supply poles	-	S				<ul style="list-style-type: none">Acquisition of 8 ha of land for WTP will incur loss of irrigated rice lands & corresponding amount of crops & earnings for 102 land owners/tillers.About halfway of the 1-km access road (WTP to NR 10) portions of rice fields will be affected (& therefore incur losses of crops & earnings). Sections of the irrigation channels, some power supply poles will be displaced.Acquisition of 0.5 ha of land for BPS will incur loss of land for 14 landowners, crops & income.
7 Land value changes	+	L	M	S	S	<ul style="list-style-type: none">Improvement in water supply will boost urban development/ economic activities, resulting in positive change in land values.
8 Water use conflicts	-	M	NA	NA	NA	<ul style="list-style-type: none">Existing Minh Duc WTP sources raw water from Gia River (downstream of Ngu Lao WTP). In the Interim Workshop in Oct 2009, DARD confirmed availability of water for the Subproject without impacting on downstream users. In the Final Workshop on 1 June 2010, attended by the ADB Mission, DARD committed to supply sufficient raw water to the Ngu Lao WTP without impacts to lower areas.
9 Hazard of land subsidence	-	N	N	N	N	
10 Inducing irrational conversion of agricultural lands for urban use in the vicinity	-	N-L	N-L	N	N-L	<ul style="list-style-type: none">Subproject will acquire about 9 ha of agricultural land or, 0.1% of total agricultural land in Thuy Nguyen. (9 ha is the estimated total land requirement for WTP, BPS & access roads.)

Annex C. (continued)

3/4

Issue / Concern / Impact		Magnitude Per Subproject Component*				Remarks
Particular	Type	WTP	A Rd	TM	BPS	
						<ul style="list-style-type: none"> Subproject component sites are in the peri-urban areas of the City & urbanizing areas of Thuy Nguyen, where urban expansion of the City is directed. The VSIP Township & Industrial Park will be developed near the BPS site.
11 Pollution of raw water supply from waste discharge from communities / unsatisfactory raw water supply	-	L	NA	NA	NA	<ul style="list-style-type: none"> Both sides of upstream Gia River are either open or agricultural land (largely rice fields). Far upstream near the confluence of Gia & Da Bac Rivers is a ferry station. Quality of raw water from Gia River is monitored twice each year by the laboratory unit of An Duong WTP, the most recent results being used as basis for basic design.
12 Pollution of downstream Gia River and Cam River	-	M-S	NA	L	NA	<ul style="list-style-type: none"> Potential adverse impacts on Gia River during construction. During operation, potential adverse impacts from backwash discharge & sludge, septic tank effluent from the WTP site, mismanagement of chemicals used in operation & M&R. Potential adverse impacts on Cam River during the installation of the transmission main crossing the River. Installation is estimated to take at least one week, at most two weeks.
13 Vulnerability to flooding during heavy rains	-	S	M	N-M	S	<ul style="list-style-type: none"> Highly vulnerable to flooding from overflow of Gia River during heavy rains/storms. A rice land, water table in the site is shallow. Access roads to both WTP and BPS, as well as some sections of the transmission main alignment, are potentially flood prone. BPS site is partially wetland, perennially flooded.
14 Earthquake damage risk / proximity to fault line	-	M	M	M	M	<ul style="list-style-type: none"> Based on the Country Report on Seismic Hazard of the Territory of Vietnam, the southern half of the NE region is crossed by the active NW-SE trending fault line & the maximum earthquake magnitude expected to shake the City is 5.5.
15 Vulnerability to erosion	-	N	N	N	N	
16 Concerns on access to trunk infrastructure - No access road / access road with concern	-	M	NA	N	N	<ul style="list-style-type: none"> The access road through the Trung Son Village is the main access of the community. It only has a paved carriageway of about 3-4 m, no sidewalk on either side. People walk on the paved carriageway. Existing access for remaining halfway is agricultural dike road, need to build a proper road.

Annex C. (continued)

4/4

Issue / Concern / Impact		Magnitude Per Subproject Component*				Remarks
Particular	Type	WTP		TM	BPS	
		WTP	A Rd			
- No power supply	-	N	N	NA	N	<ul style="list-style-type: none">▪ The absence of urban drainage in vicinity of proposed Ngu Lao WTP for potential backwash discharge or effluent from the septic tank for WTP sanitation facilities is not a concern, because of the close proximity of the site to a natural outfall, the Gia River.▪ The portion of WTP access road through the village has earth drains but heavily weeded. The agricultural dike road is without drainage provisions.▪ BPS access road has no drainage provisions. BPS is close to National Rd 10, which is served by the drainage system
- No access to urban drainage	-	N	M	NA	M	

Subcomponent

AR Access Road
BPS Booster Pumping Station
TM Transmission Main
WTP Water Treatment Plant

Magnitude

NA Not applicable
N Not a concern
L Least
M Moderate
S Significant

Type of Impact

- Negative
+ Positive

Annex D. Screening of Potential Issues/Concerns Relative to Design

Issue / Concern / Impact			Remarks
Particular	Type	Magnitude	
1 Non-sustainability of proposed raw water withdrawal		M	<ul style="list-style-type: none"> The Minh Duc WTP sources raw water from the Gia River downstream of the proposed NL WTP. This is just one of the downstream users. DARD has twice confirmed the availability of raw water for the intended withdrawal without impacting on downstream users, i.e., first during the Interim Workshop in October 2009, second in the Final Workshop in June 2010.
2 Delivery of unsafe water to the system due to, among others: - inadequate consideration of raw water quality - inadequate protection of system components, e.g. intake structure, reservoirs, transmission mains, from damages/contamination by outsiders &/or existing site conditions/environmental factors - easy impairments of transmission mains - inadequate leak detection - inadequate distance from combined sewers - inadequate design of treatment, of facilities for storage & handling of CI & other hazardous substances	-	S	<ul style="list-style-type: none"> WTP & BPS in sites that are vulnerable to flooding, widely open, & surrounded by rice fields that may be employing fertilizers & pesticides. Basic design used results of regular raw water quality measurements for 16 parameters (50% of the parameters stipulated in QCVN 08:2008/BNMT). Transmission mains will be installed under roads that are subject to overburden &, if inadequately protected, easy impairment. Transmission mains will be installed nearer to road kerbs. Under the sidewalks are drainage mains which possibly receive effluent from sanitation facilities. Aside from water treatment, maintenance & repair activities also use hazardous substances.
3 Over pumping leading to ground subsidence	-	N	
4 Excessive algae growth in reservoirs	-	M	<ul style="list-style-type: none"> Reservoirs for treated water will be built in the Ngu Lao WTP (5,000 m3) & Tan Duong BPS (2,500 m3). If inadequately addressed in design of reservoirs, algal bloom will introduce taste & smell on supplied water
5 Inadequate buffer zones around system components to alleviate nuisances during operation and for protection against damages by outsiders	-	L	<ul style="list-style-type: none"> There is adequate space around WTP & BPS sites for buffer zones.
6 Transmission main alignment issues: - Non-resurfacing or inadequate resurfacing of excavated areas	-	S	<ul style="list-style-type: none"> Transmission mains will be built in road ROWs, largely along National Rd 10, a major road. No or inadequate specification for resurfacing will not only expose transmission main to easy impairment but will cause roads accidents.
- Encroaching into protected areas	-	N	
- Impairing environmental aesthetics	-	N	
- In same trench with sewer main	-	L	<ul style="list-style-type: none"> Subproject influence area is not sewered. National Road 10 has drainage which may be receiving effluent from septic tanks or directly from sanitation facilities. The City Master Plan provides for the upgrade & expansion of the existing wastewater management system. Inadequate coordination with relevant authorities during detailed design might lead to transmission main laid in proposed trench for sewers.
7 Unsustainable supply of gravel, sand, soil or unsustainable extraction of these materials to meet construction demand	-	M	<ul style="list-style-type: none"> Thuy Nguyen District has many quarry sites in its northern boundary. Three of the big sites are about 3-22 km from Subproject sites. However, whether or not these & other sites could sustainably meet Subproject's demand needs investigation during detailed design.
8 Unsustained operation in times of natural disaster due to power failure	-	L	<ul style="list-style-type: none"> Existing WTPs of HPWSCo have no generators. Power supply of City is quite stable. It is connected to the national grid supplied by 1 hydro-power & 2 thermal power plants. There is plan to build a thermal power plant in Hai Phong.
9 Inadequate management of wastewater, solid & hazardous wastes due to inadequate: - assessment of capacity of disposal sites to receive construction wastes & identifying of alternatives - consideration of level of access/inaccessibility to basic services - assessment of current practice	-	M	<ul style="list-style-type: none"> Vicinities of WTP & BPS sites not served by sewer or urban drainage system. In existing HPWSCo systems, sludge collection & disposal is contracted out to private entities. Whether or not sludge is disposed of appropriately requires more monitoring. In existing HPWSCo systems, backwash water is recovered/recycled. whether or not these sites have sufficient capacity to receive construction wastes needs investigation during detailed design.
10 Occupational health & safety hazard from receiving, storing, using CI & other hazardous substances for O/M&R.	-	M	<ul style="list-style-type: none"> Water will be treated through chlorination. CI will be received, handled & stored in the premises. Inadequate consideration in design of storage (of CI & other hazardous substances used in O/M&R) and CI mixing/ dosing technology will expose staff to safety and health hazard.

Magnitude

N Not a concern M Moderate
L Least S Significant

Type of Impact

- Negative
+ Positive

Annex E. Screening of Potential Issues/Impacts During Construction

Issue / Concern		Magnitude of Impact
1 Physical / Chemical Environment		
1.1 Air Quality		
(-) Total suspended particles		M-S
(-) Gas emissions		M
(-) Odor		L-M
(-) Noise		M-S
(-) Vibration		L-M
1.2 Water Resources and Quality		
(-) Degeneration of surface water		S
(-) Degeneration of ground water resources		L-M
(-) Generation of sewage / wastewater		M
(-) Generation of solid wastes		S
(-) Generation of hazardous wastes		M
(-) Erosion / sedimentation / siltation		L-S
2 Biological Environment		
(-) Impairment of marine / other natural habitats		M-S
(-) Loss of vegetation		L
(-) Disturbance of wildlife		N
3 Socio-Economic Environment		
(-) Traffic and road blocking		S
(-) Access blocking		S
(-) Local flooding		M
(-) Accidental damage to utilities, resulting in service interruptions		L-M
(-) Disruption of, impact on, socio-economic activities/livelihoods		M-S
(-) Impact on resources/socio-economic activities on which vulnerable groups depend to sustain their families		M
(-) Damage to structures along access road		M
(-) Damage to structures along transmission main alignment		N-L
(-) Community health and safety hazard		M-S
(-) Workers health and safety hazard		M-S
(+) Short-term employment of local population		M
4 Physical Cultural Environment		
(-) Damage to existing physical cultural resources		S
(-) Potential chance find of physical cultural resources		N-L

Magnitude

N Not a concern / negligible
 L Least
 M Moderate
 S Significant

Type

- Negative / adverse
 + Positive impact

Annex F. Screening of Potential Issues/Impacts During Operation

Issue / Concern		Magnitude of Impact
1 Physical / Chemical Environment		
1.1 Air Quality		
(-) Total suspended particles		N
(-) Gas emissions		N
(-) Odor		N-L
(-) Noise		N-L
(-) Vibration		N
1.2 Water Resources and Quality		
(-) Degeneration of surface water		M
(-) Degeneration of ground water resources		N-L
(-) Generation of sewage / wastewater		L
(-) Generation of solid wastes		L
(-) Generation of hazardous wastes		L
2 Biological Environment		
(-) Impairment of marine / other natural habitats		L-M
(-) Loss of vegetation		N
(-) Disturbance of wildlife		N
3 Socio-Economic Environment		
(-) Delivery of unsafe water		S
(-) Unsustained operation due to deterioration of quantity & quality of raw water		S
(-) Unsustained operation (quality of operation) due to inefficient O/M&R		S
(-) Unsustained operation in times of natural disaster due to power failure		L
(-) Degenerating quality & insufficient quantity of river water for downstream users & socio-economic activities / unsustainability of raw water withdrawal		M
(-) Occupational health and safety hazard associated with handling of CI & other hazardous substances for O/M&R		M
(-) Increased generation of wastewater		S
(-) Encourages irrational conversion of agricultural land in vicinity to urban use		L
(+) Enabling environment for enhancement of small/medium-scale enterprises		S
(+) Induced local economic development		S
(+) Enhanced urban environment / quality of life		S
4 Physical Cultural Environment		
(-) Damage to existing physical cultural resources		N

Magnitude

N Not a concern / negligible
 L Least
 M Moderate
 S Significant

Type

- Negative / adverse
 + Positive impact

Annex G. Relevant Notes from Focus Group Discussion

Date :	September 2009
Group :	LAR-affected HHs in Northern Cam River
Highlights of Discussion:	<ol style="list-style-type: none"> Experience on selling land <ul style="list-style-type: none"> In the past 3-4 years, some households had to sell their land to pay for children's university education, or for medical treatment. Some have heard about/witnessed lands being acquired for the development of industrial parks, shipyard, the Hai Phong Thermal Power Plant. Agricultural HHs do not want to sell their agricultural lands. If need to, they sell it to co-villagers, not to outsiders. <u>Expectations from/hopes on the land acquisition process</u> <ul style="list-style-type: none"> If the land acquisition is for building a system for clean water supply for the people, they are willing to give up their land should it be needed for the project. However, there should be adequate compensation. They agree to compensation rates of state regulations. <u>Other expectations, besides the compensation for withdrawn land</u> <ul style="list-style-type: none"> Since withdrawal of their land will render them jobless, they hope their children can work in the HPWScO as builders, digger and guard. They also hope for access to training for skills improvement, such as electrical or technical fields. <u>Preferred form of compensation for withdrawn land</u> <ul style="list-style-type: none"> They prefer to be compensated with another rice land to be able to plant rice. But if rice land is not available, they wish to be fully paid for land lost. They want compensation for time spent in the field to plant and produce rice. <u>Job & income opportunities brought by the Project</u> <ul style="list-style-type: none"> They expect LAR-affected HHs to be given priority to local employment during construction, e.g. as builder, digger, guard, cook. They expect to be trained for hiring during operation, as skilled worker, guard, pipe repairers, etc. They can also open small stores to sell goods that will meet basic goods/needs during construction <u>Their opinion on the Decision of Hai Phong on land price</u> <ul style="list-style-type: none"> They are aware that the compensation price for withdrawn land in Hai Phong is lower than that in the price framework set by the Government.

[illegible]

(Nhơn phú mỹ nam 10)
mặt đất

**GIẤY BIÊN NHẬN
RECEIPT**

DANH SÁCH CÁC ĐẠI BIỂU THAM DỰ CUỘC HỢP-DỰ ÁN CẤP NƯỚC HẢI
PHÒNG (ADB)
LIST OF PARTICIPANTS IN FDG – HAI PHONG WATER SUPPLY PROJECT
(ADB)

Ngày (Time):

No.	Tên (Name)	Đơn vị (Organization/Address)	Chữ ký (Signature)
1	Nguyễn Đình Dương	Thôn 5 Ngụ Lão	Dương
2	Đỗ Thị Ngọc Lan	Thôn 5 Ngụ Lão	Ngọc Lan
3	Phạm Thị Rùa	Thôn 5 Ngụ Lão	Rùa
4	Đỗ Văn Hiệp	Thôn 5 Ngụ Lão	Hiệp
5	Đỗ Văn Lương	Thôn 5 Ngụ Lão	Lương
6	Lâm Văn Phòng	Thôn 5 Ngụ Lão	Phòng
7	Lâm Văn Phòng	Thôn 5	Phòng
8	Đỗ Văn Lệ	Thôn 5	Lệ
9	Đỗ Văn Văn	Xóm 15	Văn
10	Lâm Văn Phòng	Thôn 5	Phòng
11	Vũ Văn Hưng	Thôn 15	Hưng
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Các hộ mất nước & nghèo.

**GIẤY BIÊN NHẬN
RECEIPT**

DANH SÁCH CÁC ĐẠI BIỂU THAM DỰ CUỘC HỢP-DỰ ÁN CẤP NƯỚC HẢI
PHÒNG (ADB)
LIST OF PARTICIPANTS IN FDG – HAI PHONG WATER SUPPLY PROJECT
(ADB)

Ngày (Time):

No.	Tên (Name)	Đơn vị (Organization/Address)	Chữ ký (Signature)
1	Trần Văn Nhung	Thôn 5	Nhung
2	Đỗ Thị Nhung	Xóm 5	Nhung
3	Đỗ Thị Nhung	Xóm 5	Nhung
4	Đỗ Thị Nhung	Xóm 5	Nhung
5	Đỗ Thị Nhung	Xóm 5	Nhung
6	Đỗ Thị Nhung	Xóm 5	Nhung
7	Phạm Thị Nhung	Xóm 5	Nhung
8	Đỗ Thị Nhung	Xóm 5	Nhung
9	Đỗ Thị Nhung	Xóm 5	Nhung
10	Đỗ Thị Nhung	Xóm 5	Nhung
11	Đỗ Thị Nhung	Xóm 5	Nhung
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