

Initial Environmental Examination

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

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Supplementary Appendix 19-c

Initial Environmental Examination Upgrading of An Duong Water Treatment Plant from 100,000 m³ to 200,000 m³/day

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Abbreviations

ADB	Asian Development Bank
AP	Affected Person
CEMP	Contractor's Environmental Management Plan
CEMR	Contractor's Environmental Management Report
CPC	Commune People's Committee
DARD	Department of Agriculture and Rural Development
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
HPCPC	Hai Phong City People's Committee
HPWSCo	Hai Phong Water Supply Company
IEC	Information, Education and Communication
IEE	Initial Environmental Examination
M&R	Maintenance and Repair
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
WPC	Ward 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 (VND)
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 Upgrading of An Duong WTP from 100,000 m³ to 200,000 m³/day 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. Upgrading of An Duong WTP from 100,000 m³ to 200,000 m³/day

6. The proposed Upgrading of An Duong WTP from 100,000 m³ to 200,000 m³/day (or, the “Subproject”) will enhance the water production of the existing An Duong WTP to increase water supply in the serviced urban areas and to extend services to future urban expansion area south of the City Center. It is intended to meet the water requirements of 95 percent of an estimated 770,000 population, and those of companies/factories and the Dinh Vu Industrial Zone, in the City Center, by 2025. The Subproject components are as follows:

- (i) Upgraded An Duong WTP, 200,000 m³/day capacity ; and
- (ii) New transmission mains for treated water towards the southern section of Le Chan District, about 5 km in total length of D700 and D400 pipes.

7. The Subproject will be implemented in the City Center, specifically in Le Chan District, the most densely populated district. The existing An Duong WTP is situated along Ton Duc Thang Road at the northwest boundary of Le Chan. In the north and northwest, the WTP is bordered by the Ton Duc Thang Road; in the north northeast, by the An Duong Pagoda; in the east, by residential structures; in the southeast, by the Tran Nguyen Han High School; and in the south and west by residential structures. The transmission mains will be installed within road carriageways along the An Kim Hai Canal and the Ho Sen Road leading to Rao Bridge II. The first section of the alignment is densely populated; while the latter sections are the less populated areas for future urban expansion. No old transmission mains exist in the alignments. The Subproject sites have access to all basic infrastructures; and are about 13 to 28 km away from three of the City’s four disposal sites, and 21 to 29 km from three big quarries in Hai Phong. The 1,600-ha site of the VSIP Township and Industrial Park, which requires major filling and could make good use of the excess filling materials from the Subproject, is about 7 to 12 km from Subproject sites.

8. The Subproject will be implemented over a period of about 48 months, broken down into: i) 11.5 months of preparation of detailed design and bidding documents commencing in the 1st Quarter of 2012; ii) 11.5 months of procurement process starting in the 4th Quarter of 2013; and iii) about 25 months of construction starting in the 4th Quarter of 2014. Operation is estimated to start by 4th Quarter of 2016, even before defects liability period is over.

D. Summary of Impacts and Mitigation Measures

9. 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) the An Duong Temple being adjacent, and a school being very close to the perimeter fence of the An Duong WTP; ii) the Subprojects sites being in the City center; and iii) unsatisfactory raw water quality, Re River being one of the more polluted rivers in Hai Phong. 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, contamination of the distributed treated water since the operation of the An Duong WTP needs to continue while being upgraded; solid waste, water supply interruptions, traffic, access blocking, local flooding due to sedimentation and clogging of drainage systems, damage/s to other utility lines incurring service interruptions, disruption of socio-economic activities, and hazards to community and workers' health and safety. 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. The provision of a reliable system of safe potable water supply will have the following positive impacts or benefits: i) enhanced quality of life; ii) further 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.

10. The recommended environmental mitigation measures consist of actions, activities, plans and documents (including approval of the Full EIA Report, water use agreement, and building permit) 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) 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

11. Public consultation and participation during subproject preparation were conducted in the form of key informant interviews, socio-economic survey and focus group discussions. Information disclosed to date include: i) Subproject description and components; ii) locations; and iii) expected period of implementation. 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

12. 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.

13. 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 WPC. The WPC 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 WPC to raise the grievance to the most relevant institution, i.e., District or City Court.

G. Environmental Management Plan

14. 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 enhanced O&M Manual for implementation during operation.

15. The marginal cost for implementing the EMP is initially estimated to be VND 409 Million (USD 19,700) of fixed cost to cover:

- (i) 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, 8%
- (ii) environmental effects monitoring during construction, 88%
- (iii) environmental monitoring to establish baseline data of ambient environmental quality/levels prior to full operation, 4%.

16. The cost includes taxes; but excludes contingencies and inflation. The cost excludes the salaries of the Environmental Engineers and Grievance Point Person, who will be existing HPWSCo staffs seconded to the PMU for environmental management.

17. The PMU will have its full-time Environmental Engineer to oversee and monitor the implementation of the Subproject EMP. 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 Hai Phong City People's Committee through the Department of Natural Resources and Environment (DONRE) will approve the EIA Report of the Subproject. The concerned WPCs will be involved at the ward 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 Department of Health (DOH), Department of Agriculture and Rural Development (DARD), Department of Construction (DOC) and DONRE, will also have roles to play and responsibilities to carry out in the environmental management aspect of the Subproject.

18. Two approaches of capacity development on environmental management have been identified for conduct during the first four years of Project implementation, i.e., prior to the implementation of this Subproject: 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

19. The proposed Subproject will have substantial socio-economic and environmental benefits: (i) enhanced quality of life; (ii) further socio-economic growth; and (iii) improved local economy. Overall, it will substantially contribute to poverty alleviation in Hai Phong City.

20. 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.

21. 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 "I", which would be required a full EIA Report to be appraised and approved by the Hai Phong City People's Committee through the Department of Natural Resources and Environment (DONRE). The full EIA report for this Subproject will be prepared based on the IEE and its EMP.

II. POLICY, LEGAL & ADMINISTRATIVE FRAMEWORK

A. Policy and Legal Framework

22. 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.

23. 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.

24. 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.

25. 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

26. 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

27. The proposed Upgrading of An Duong WTP from 100,000 m³ to 200,000 m³/day (or, the “Subproject”) will enhance the water production of the existing An Duong WTP to increase water supply in the serviced urban areas and to extend services to future urban expansion area south of the City center. The Subproject components are as follows:

- (i) Upgraded An Duong WTP; and
- (ii) New transmission mains for treated water towards the southern section of Le Chan District. (No old/existing pipes in all subproject sites will be replaced. The proposed transmission mains will all be new installations.)

28. The Quan Vinh Intake Station, which feeds raw water to the An Duong WTP, will be upgraded to 220,000 m³/day capacity. However, the improvement work will be under a separate project to be funded by HPWSCo’s internal funds. It will be carried out timely with the Subproject.

A. Subproject Category and Requirements

29. 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 “I” project, which would be required a full EIA Report for appraisal and approval by the Hai Phong People’s Committee through its DONRE. The full EIA Report will be prepared based on the IEE and its EMP.

B. Need for the Subproject

30. 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. The An Duong WTP is one of the four WTPs supplying water to the interconnected distribution areas, specifically servicing the four districts comprising the City Center and areas along Road No. 353 to the direction of the He River Pumping Station. The pace of economic and social growth experienced in the City Center and along Road No. 353 has not been matched with improvement of the water supply system. The An Duong WTP was constructed in 1963 and underwent upgrades in 1973 and 2000. Its current capacity of 100,000 m³/day is no longer adequate to meet the increasing demand in its service area. In the past recent years, there had been many instances when the WTP produced treated water at the rate of about 130,000 m³/day, exceeding about one-third of its design capacity. Moreover, the trend of population growth experienced in the southern section of Le Chan warrants improvement in transmission capacity as well as extension of the transmission network to areas not currently covered by the system. According to the projections of water demand in the four districts comprising the City Center, the capacity of An Duong WTP needs to be approximately 193,000 m³/day to be able to meet total demand by 2025. It is, therefore, urgent to: i) upgrade and improve the An Duong WTP for it to sufficiently meet the present (already

reaching 130,000 m³/day at times) and long-term water demand (nearly 200,000 m³/day by 2025); and ii) to build new transmission mains to improve transmission capacity, and extend the coverage of the system to un-served areas, in the southern section of Le Chan.

C. Subproject Location

31. The Subproject will be implemented in the City Center, specifically in Le Chan District, the most densely populated district. The existing An Duong WTP is situated along Ton Duc Thang Road at the northwest boundary of Le Chan. It is bordered:

- (i) In the north and northwest, by the Ton Duc Thang Road
- (ii) In the north northeast, by the An Duong Pagoda
- (iii) In the east by residential structures
- (iv) In the southeast, by the Tran Nguyen Han High School;
- (v) In the south and west by residential structures.

32. The transmission mains will be installed underground within the outer lane of road carriageways:

- (i) From An Duong WTP to the intersection of Ho Sen Road and Thien Loi Road:
 - along WTP internal road from 2nd Pumping Station to the An Kim Hai Canal road;
 - along the An Kim Hai Canal road to Nguyen Van Linh Road, at the left side, center of the pipeline at 1.0-1.5 m from the road edge;
 - along An Kim Hai canal road from Nguyen Van Linh Road to Ho Sen Road, at the left side, center of the pipeline at 1.0 m from the road edge;
 - along Ho Sen Road from An Kim Hai Canal road to Thien Loi Road, at the right side, center of the pipeline at 1.0 m from the road edge.
- (ii) Along Ho Sen-Rao Bridge II Road, from Thien Loi Road to the pier of Rao Bridge II in Ngo Quyen District, at the right side, center of the pipeline at 1.0 m from the road kerb.

33. The first section of the alignment is densely populated; while the latter sections are the less populated areas for future urban expansion. The approximate distances of the Subproject locations 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. (Refer also to Figure 2 for the location of the transmission main alignments.)

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

Disposal Site & Quarry	Approximate Distance to Subproject Site (km)	
	WTP	Transmission
Disposal Site		
1 Trang Cat Sanitary Landfill	13	min 13, max 14
2 Dinh Vu Landfill	17	min 19, max 20
3 Gia Minh	24	min 27, max 28
Site needing filling		
1 VSIP Township & Industrial Park (1,600 ha)	7	min 8, max 12
Quarry		
1 Luu Ky Commune	24	min 24, max 29
2 Minh Tan Commune	22	min 22, max 27
3 Minh Duc Commune (West of Minh Duc Town	21	min 21, max 26

Distances measured on google map.

D. Size and Magnitude

34. The Subproject will involve upgrading of the existing An Duong WTP to meet the water requirements of 95 percent of an estimated 770,000 population, and those of companies/factories and the Dinh Vu Industrial Zone, in the City Center, by 2025.

1. An Duong WTP

35. The An Duong WTP will be upgraded from its existing capacity of 100,000 m³/day to 200,000 m³/day. It will employ the same water treatment process, 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 upgrade will include following facilities and infrastructure:

- (i) Receiving and flow splitting chamber, 1 unit, two-chambered & of reinforced concrete
- (ii) Mechanical mixing tanks of reinforced concrete, 2 units with 1 mechanical mixer each
- (iii) Mechanical flocculation tanks of reinforced concrete, 2 units, each unit to be 3 chambered and each chamber to be equipped with one mechanical flocculator
- (iv) Lamella sedimentation tanks of reinforced concrete, 2 units, includes a total of 12 sedimentation tanks of 32 m x 6 m surface area dimensions each
- (v) Dual media rapid filtration units of reinforced concrete structure, 2 units
- (vi) Treated water reservoir of reinforced concrete, 2 units (1 unit of 12,000 m³ and 1 unit of 5,000 m³ storage capacities)
- (vii) Treated water pumping station, 1 unit, with 6 units of treated water pump and motor and 2 units of drainage pumps
- (viii) Rehabilitated and expanded backwash water pumping station to have 4 new pumps, 1 new compressor valves and pipe works
- (ix) New backwash and de-sludge water recovery pumping station, 1 unit, to have 2 collection tanks with storage capacity of 780 m³
- (x) Sludge drying bed, 1 unit with 6 basins, of reinforced concrete

2. Transmission Mains

36. About 5 km of transmission main will be installed as follows: i) from An Duong WTP to the intersection of Thien Loi Rd and Ho Sen, 4,310 m of D700; and ii) from Ho Sen to the pier of Rao Bridge 2, 750 m of D 400. Pipeline material will be ductile iron.

E. Implementation Schedule

37. The Subproject will be implemented over a period of about 48 months, broken down into: i) 11.5 months of preparation of detailed design and bidding documents commencing in the 1st Quarter of 2012; ii) 11.5 months of procurement process starting in the 4th Quarter of 2013; and iii) about 25 months of construction starting in the 4th Quarter of 2014. Operation is estimated to start by 4th Quarter of 2016, even before defects liability period is over.

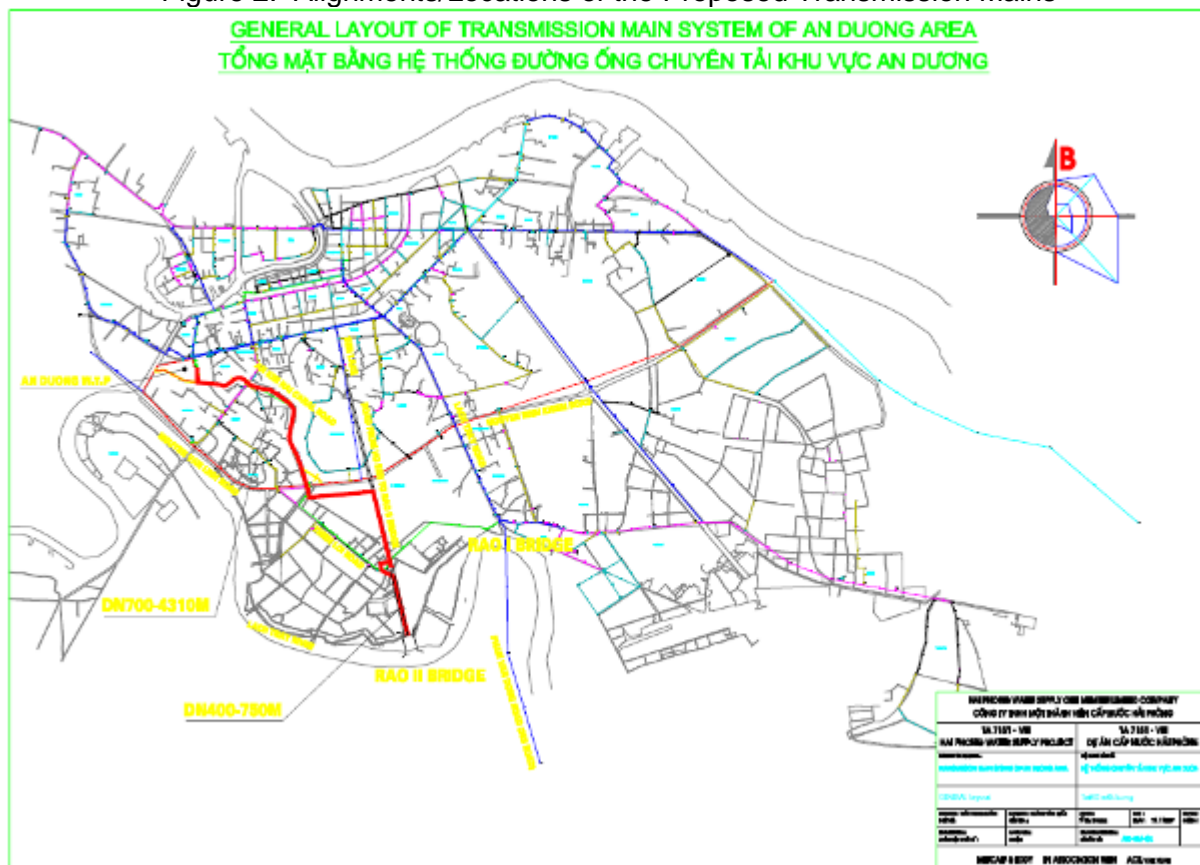
F. Subproject Layouts

38. The layout for the proposed upgrading of the An Duong WTP and the alignments of the proposed transmission mains are presented as **Figures 1 and 2**.

Figure 1. Layout of the Proposed Upgrading of An Duong WTP



Figure 2. Alignments/Locations of the Proposed Transmission Mains



IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical/Chemical Environment

39. 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)², Haiphong City is administratively subdivided into 15 districts, of which 7 are urban, and 8 are rural, districts.

40. Le Chan is one of the four urban districts comprising the City Center. It has a land area of 7.3 km², that is administratively subdivided into 15 wards.

1. Climate

41. 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.

42. 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**

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

2. Air Quality and Noise

44. 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). If set against the limits of the WHO's guidelines, the levels exceeded by a minimum of 33 percent and a maximum of 46 percent. **Annex B.3**

45. 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).³ 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

46. 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.

47. 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

48. 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 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.

³ TCVN 5949-1995: Standards in Public and Residential Areas of Viet Nam.

49. In Le Chan District, Lach Tray River is the main river. The Lach Tray River forms the boundary of Le Chan in the south. It is, however, not the relevant river for the Subproject, nor is it affected by the Subproject. The Re River which is the source of raw water for treatment in the An Duong WTP is in Vinh Khe Village of An Duong District. Water quality can vary and depends on changes of climate, as well as operational and management regulations of irrigation gates in the system. Water quality also depends on activities of inhabitants who live in the river basins. Generally, water quality changes according to the location on the length of river. Water quality is better in the upper stream areas. The 2008 quality monitoring report revealed that raw water from Re River (for samples taken at applicable point for Quan Vinh Pumping Station) has exceeded limits on coliform count and NH_4 . On few monitoring occasions, some parameters, e.g., NO_2 , Fe and DO, have exceeded their respective limits. **Annexes B.4 and B.5**

50. 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

51. 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 m^3/year .⁴ Despite its abundance, groundwater resource is less exploited.

6. Geology and Seismology

52. 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).

53. 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

⁴ Source: The Present State of Water Environment in Vietnam. A presentation in the 2nd WEPA Forum, 2007. Nguyen Thi Hue.

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.^{5,6,7} **Annexes B.6 and B.7**

7. Other Natural Hazards

54. 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.⁸ If an earthquake of magnitude Mw 9.0 occurs in the 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.⁹

55. 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)”.¹⁰ 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.

⁵ 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.

⁶ 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.

⁷ Country Report: Seismic Hazard of the Territory of Vietnam. Nguyen Anh Duong. Institute of Geophysics, Vietnamese Academy of Science and Technology.

⁸ National Report on Disaster Reduction in Vietnam. For the World Conference on Disaster Reduction. Kobe-Hyogo, Japan. 18-20 January 2005.

⁹ Country Report on Seismic Hazard of the Territory of Vietnam. Nguyen Anh Duong. Institute of Geophysics, Vietnamese Academy of Science and Technology.

¹⁰ 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.

B. Biological Environment

1. Aquatic and Coastal Resources

56. 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.

57. 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

58. 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 policephalus*) 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 forest area comprise of saline water flood forest, forest for timber exploitation, forest for fruit plantation, bamboo and cane forest. Le Chan is part of the City Center. There is no forest land within its jurisdiction.

3. Bio-diversity Conservation

59. 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.

60. 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.

61. 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

62. 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.

63. 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.

64. 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.

65. Le Chan is a small district but is the economic, political and cultural center of Hai Phong. It is the hub of industries and handicraft production enterprises. Its economic structure consists of 35 percent agriculture, 30 percent industry, and 35 percent services.

2. Infrastructure Development

66. 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 2**. The HPWSCo, the entity responsible for water supply in Hai Phong, has aimed at achieving a service coverage of 90 percent of the entire City by 2020. The Le Chan District is covered by the service area of the An Duong WTP. However, the pace of economic and social growth in the City Center has not been matched with improvement/enhancement of the water supply system.

Table 2. 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	

67. Wastewater and storm water management is the responsibility of the Hai Phong Sewerage and Drainage Company (HPSADCO). Outside the Quốc Bình 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.

68. 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. Collected solid wastes are disposed of at the sanitary landfill in Trang Cat, Hai An District.

3. Transportation

69. 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. Le Chan District, being in the City Center, has good access to all the major transport amenities of the City.

4. Land Use Development

70. 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.

71. Le Chan District's administrative jurisdiction claims 0.5 percent of the total land area of Hai Phong. In 2008, about 37 percent of Le Chan is homestead land; 30 percent is special use land; and 20 percent is agricultural land. The rest are unused/open lands and waterways. There is no forest land in the District.

D. Socio-economic Environment

1. Population

72. 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). Le Chan District registered 146,200 people, or nearly 9 percent of the City's total population, in the 1999 census. Le Chan population reportedly reached 200,700 (at an average annual growth rate of 3.6 percent from 1999), accounting for about 11 percent of the City's total population, and 24 percent of the City's urban population, in 2008.

73. 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). The entire population of Le Chan is urban population, representing 24 percent of the City's 2008 urban population.

74. The Subproject's service area, comprising the four districts in the City Center, had an estimated total population of nearly 657,000 in 2009, projected to have gone a little over 770,000 in 2025. The entire population of the Subproject's service area is urban population.

2. Ethnic Minorities

75. No ethnic minorities reside in the City Center.

3. Income and Employment

76. 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.¹¹ 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 0.75 Million for the poor and VND 4.87 Million for the non-poor. The average monthly income of the poor respondents is slightly higher than the City's average.

77. 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, 33 percent were working in the public sector and 27 percent in the private sector. Some 28 percent ran their own businesses; while 9 percent were involved in other forms of occupation. About 3 percent of the respondents were unemployed. No one was working in the agriculture/fishing sector or outside their commune/district of residence

4. Poverty

78. In 2004, the nationwide poverty rate in Viet Nam was 23.2 percent, decreasing an average annual rate of a little over 10% since 2002 (28.9 percent). In 2009, national poverty rate was 16 percent; in Hai Phong, 8.8 percent.¹² Of the 100 respondent households in the socio-economic survey of August-September 2009, about 2 percent are poor.

5. Health

79. 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.¹³ 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 inhabitants¹⁴. 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.

80. 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.

¹¹ 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.

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.

¹³ Haiphong Statistical Yearbook. 2008.

¹⁴ Comprehensive Development Design for the Health System in Viet Nam to 2010 and Vision By 2020. 30 June 2006. Hanoi.

6. Education

81. 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. Le Chan had 12 primary, 10 lower secondary, and 5 upper secondary, grade schools.

82. 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 Le Chan, the averages were: i) primary, 23.77; ii) lower secondary, 18.88; and iii) upper secondary, 18.57. The average numbers of pupils to a teacher in the primary and lower secondary levels in Le Chan were higher than that of the City.

83. 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 Le Chan, the averages were: i) primary, 33.99; ii) lower secondary, 38.01; and iii) upper secondary, 47.54. The average numbers of pupils in a class in all levels in Le Chan were higher than that of the City.

84. Based on the initial results of the socio-economic survey of 100 households in August-September 2009, 35 percent of the surveyed persons attended tertiary education; 42 percent completed secondary school; 18 percent had some secondary education; 5 percent completed primary school.

7. Access to Basic Infrastructure and Security of Tenure

85. Being in the urban center, Le Chan households have good access to basic infrastructure and services. Of the 100 household respondents in the socio-economic survey, all are connected to the national power grid and City's piped water supply; and 93 percent to the City's telephone services. Eighty-eight percent of the respondent households have flush toilets; 10 percent use pour-flush toilets; and the remaining 2 percent have pit latrines. All toilets have totally sealed septic tanks. Except for one septic tank that flows out to a soak away pit, all septic tanks lead effluents to combined sewers. Some 97 percent have access to solid waste collection services of the City. In terms of drainage, the survey results portray Le Chan as poorly draining and vulnerable to flooding. Only 6 percent of the respondent households are in areas that are not flood prone. The rest are in areas that flood either during typhoons (41 percent), during heavy rains (33 percent) or during high tide (20 percent). In terms of security of tenure, the survey revealed 70 percent of the respondent households own the house they reside in; 2 percent are renting; 12 percent are in an informal agreement with the rightful owner; 2 percent are illegal settlers; and the rest are in other modes of tenure.

E. Physical Cultural Resources

86. Sites of historical, cultural and/or architectural significance in Le Chan District include the following: i) house at No.1 Alley 42, Me Linh Street, An Bien Ward, which was the secret working/meeting place of the Hai Phong Provincial Committee of Vietnam Revolutionary Youth Association in the period 1927-1929 and of the Hai Phong Provincial Committee of Indochina Communist Party in the period 1929 -1930; ii) memorial stele for Comrade Nguyen Duc Canh, the first Secretary of Hai Phong City's Party, which can be found in No.124 Nguyen Duc Canh Street; iii) Hang Kenh Communal House, also referred to as Nhan Tho Communal House, situated on Nguyen Cong Tru Street, Hang Kenh Ward, which was built in 1719 under King Le Du Tong, reconstructed between 1841 and 1850, and declared a relic in 1962; iv) Du Hang Communal House, located in Du Hang Kenh Ward, which was built in 1856, reconstructed in 1905 and recognized as a historical and cultural relic in 1992;

and v) Nghe Temple, situated in Me Linh Ward, about 600 m from the Municipal Theatre towards the south-west.

87. None of the aforementioned structures are in close proximity to the proposed transmission main. The An Duong Temple is the nearest cultural site to the An Duong WTP. It is adjacent to the WTP and is separated from the WTP by a concrete wall. The next closest pagoda is about 70 m away from a section of the transmission main alignment.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Potential Issues/Concerns/Impacts

88. 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

89. 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) The An Duong Temple and Tran Nguyen High School are both adjacent to the WTP.
- (ii) The An Duong WTP is situated in the heart of the City, area that is densely populated and bustling with economic and socio-economic activities
- (iii) Pollution of raw water supply. Re River is one of the four more polluted rivers in Hai Phong. Upstream of the Quan Vinh Intake Station (serving the An Duong WTP), land use is predominantly rice fields interspersed with villages with low to medium-density population. Conversion of rice lands to urban uses continues.

90. Of moderate concern are:

- i) The potential conflict with/impacts on downstream users of Re River with the increase in intake by the Quan Vinh Station from the current 100,000 m³/day to the proposed 220,000 m³/day. From Quan Vinh Intake Station, the Re River flows further down for about 7 km to join the Cam River. For the first half of this length, Re River is used for irrigation. The remaining half courses through the City Center, where there is no dependence on the Re River water for socio-economic activities.
- ii) Hai Phong's vulnerability to earthquakes of moderate intensity, which should be considered in design.

91. The issues, concerns and constraints relative to siting can be mitigated difficulty through careful considerations of the issues and concerns into design, and the implementation of appropriate measures during construction and operation.

2. Issues/Concerns Relative to Design

92. The screening of identified potential concerns relative to design is presented in **Annex D**. The significant concern 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 combined sewers

or 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.

93. Of moderate concern from inadequate design are the: i) sustainability of proposed doubling of 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, Re River water, to ensure sustainability); ii) potential excessive algae growth in the new storage reservoirs for treated water; iii) proximity of transmission mains to the existing combined sewers or planned new sewer lines; iv) sustainability of supply of gravel, sand and soil to meet construction demand; v) 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 vi) occupational health and safety hazard to staff receiving and handling chlorine and other hazardous substances. The aforementioned concerns relative to design can be easily considered and addressed in the detailed design. **Section V B**

3. Issues/Concerns/Impacts During Construction

94. The five subprojects will be constructed in four packages, following a staggered implementation schedule. This Subproject will be constructed under Package 2, together with the construction for the rehabilitation and conversion of the Do Son WTP to a BPS. Construction will take about 25 months between the 4th Quarter of 2014 and 4th Quarter of 2016. Its overlaps with the construction phases of the other three packages will be as follows:

- (i) Construction will start when Package 1 will have been in the cleaning, inspection and repairs phase.
- (ii) Its peak construction period will have moved towards conclusion when Package 4 construction starts.
- (iii) It will be in its cleaning, inspection and repairs phase when Package 3 construction starts.

95. Subproject construction will concurrently take place in the: i) existing An Duong WTP site; and ii) alignments for the 5-km transmission main. For the transmission main, 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 an average 1.15-m wide trench for the pipeline and some working easement. There will be no existing water mains to dismantle and dispose of. The An Duong WTP will be kept in service while being upgraded to double capacity. The identified potential issues/concerns/impacts are screened in **Annex E**. The moderate and significant issues and impacts are presented below.

a. Physical/Chemical Environment

96. 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 3**, 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, construction workers and An Duong WTP staff. Unmitigated vibration could also lead to permanent damages of existing structures in the WTP and in the immediate

vicinity of the WTP. Gas emissions will contribute to overall concentration of greenhouse gases in the atmosphere.

Table 3. 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 Prolonged engine idling		√		√	√
21 No/deferred maintenance of equipment		√		√	√

97. Keeping the WTP in operation while construction is going on will pose significant risk of contaminating the treated water for distribution. The implementation set up is quite a delicate matter. However, An Duong WTP should not stop operation. It plays a very crucial role in the overall water supply system of the City. This set up requires very careful implementation strategy to avoid delivering unsafe water to the system.

98. Surface and ground water resources in close proximity to the transmission main alignment will be at moderate risk 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. 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. Unsafe distributed water, as well as degenerating surface and ground water resources, will impact on public health and safety and on aquatic life.

99. 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 in transmission main sites, there will be insufficient space to easily plan for strategic storage areas for wastes/spoils and aggregates. The management of waste/spoils and aggregates would have to be most carefully planned to avoid/mitigate contaminating treated water for distribution, nuisance, safety hazards, obstruction to surface drainage, and siltation of urban drains and natural drainage courses. It is estimated that a 50-m transmission main trench will generate 80 m³ of excavated soil and a residual soil after backfilling of 29 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 and the WTP include the: i) 1,600-ha site of the VSIP Township and Industrial Park in Thuy Nguyen District, between 7 and 12 km from Subproject sites; and ii) 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 13 km and a maximum of 24 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.

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

b. Socio-economic Environment

101. The upgrading of the WTP will bring about the following moderate to significant socio-economic issues/concerns/impacts:

- (i) Risk of delivering unsafe water as WTP will continue operation while being upgraded.
- (ii) Potential water supply interruption/s in the service area that may be caused by damages inflicted on the existing WTP system, structures, and parts.
- (iii) Significant traffic in the City Center due to the movement of materials delivery trucks and other construction-associated vehicles to and from Subproject sites, which will pose health and safety hazard to the communities in the area of influence of Subproject sites.
- (iv) Local (or potentially ward/s-wide) flooding or impoundment during rains is most likely with poorly managed construction wastes, spoils and aggregates finding their way into the drainage system.
- (v) Impacts on the An Duong Pagoda and Tran Nguyen High School and the persons using them.

102. 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 is anticipated to affect not only the roads on which installation works will be carried out but also some roads beyond the transmission main alignment, since Le Chan is the heart of the City Center. This will be caused by road blocking in transmission main alignment and movement of construction-associated vehicles to and from Subproject sites.
- (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 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. Crossing water connection pipes and crossing drainage culverts are likely to be encountered in some sections of the transmission main alignment. Accidental damage of water pipelines will expose supplied water to contamination.
- (v) Socio-economic activities in the area of influence of transmission main installation will be disrupted from access & road blockings and utility service interruptions. It is highly possible that informal socio-economic activities of vulnerable groups will be among those disrupted.

103. The health and safety of the community, construction workers and An Duong WTP staff 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 (including any one An Duong WTP staff) or construction worker.

104. The impacts on air quality (dust, gas emissions, harmful odors) and water resources (contamination of treated/supplied water, potential contamination of wells); 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.

105. Construction workers' health and safety will be directly and indirectly exposed to crosscutting threats from construction's impacts on air quality and (potentially on) treated/supplied water; 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; 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.

c. Physical Cultural Environment

106. The An Duong Pagoda, adjacent to the NNE of the WTP, is separated from the WTP by a concrete wall. Its exposure to potential damage/s during construction is assessed to be least. The potential for chance finds of physical cultural resources, e.g., graves, is assessed to be none to least. It would be advisable, however, for Contractor to meet with WPCs

affected by the transmission main installation prior to mobilization to discuss the steps to take should chance find of these resources occur.

4. Issues/Concerns/Impacts During Operation

107. 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

108. The upgraded operation of the An Duong WTP will generate a moderate increase in backwash water that needs to be managed on site, as well as sludge, which needs to be managed on site and off site.

b. Socio-Economic Environment

109. 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.

110. 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 the irrigation needs of agricultural lands.
- (ii) Occupational health and safety hazard, associated with the presence, use, delivery to the WTP, receiving at the WTP, accidental spills, and responding to accidental spills, of chlorine and other O/M&R hazardous substances.

111. The expanded capacity of the An Duong WTP and the extension of distribution network will provide more people and economic activities in the City Center access to reliable supply of safe water. Some intensification of urban activities is anticipated. Water demand will increase, and will increasingly put pressure on the system. More water consumption will result in the generation of more wastewater, which is a significant concern. Without parallel efforts in managing sewage and wastewater (critically, industrial wastewaters), the quality of life in the service area will deteriorate. Intensified urban development and socio-economic growth will confront City authorities with pressures to meet rising demand for other basic infrastructure services as well, e.g., drainage, wastewater/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.

5. Positive Impacts and Benefits

112. 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 operation of the Subproject will bring about the following benefits that will far outweigh the aforementioned adverse impacts: i) enhanced quality of life in the Subproject service areas, particularly in the urban wards; ii) further 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. Overall, the operation of the Subproject will support sustainable urban development in Hai Phong. 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, and solid waste management system; and iii) eventual expansion of water supply services.

B. Proposed Mitigation Measures

113. Measures to mitigate moderate to 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

114. 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 Re 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:
 - Appropriate protection of transmission mains against breakage caused by overburden.
 - 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.
 - If necessary, upgrade storage areas for solid waste, hazardous wastes, and hazardous substances to make them more secure from unauthorized entry and capable of containing spills.
 - Adequate provisions for leak detection.
 - Review of the location of chlorination point with respect to the upgrade.
- (iii) Adjust/enhance the O&M Manual to stipulate the operational procedures for the proper management/handling of chlorine and other hazardous substances; operational procedures for responding to spills of chemicals/hazardous substances; grievance redress mechanism; the

operational requirement to conduct monitoring of treated water according to the EMP and operational system for proactive, highly participatory leak vigilance and reporting system.

115. To mitigate potential delivery of unsafe water during construction, prepare a plan and set of specifications for protecting the WTP's system parts and components that will be operating during construction.

116. 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, Re 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 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, 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 roads 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.

117. The Environmental Management Plan, which will be finalized during detailed design and cleared by the ADB, shall form part of the bidding documents to attract 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.

118. Prior to award of contract:

- (i) The EIA Report shall have been approved by, the Hai Phong City People's Committee, and building/construction permit secured.
- (ii) Sufficient prior public information and signboards about the Subproject shall have been conducted in concerned wards and posted in strategic places, respectively.
- (iii) An intensive awareness program on potential rise of communicable diseases, such as SARS, A(H1N1), STD, HIV/AIDS with the entry of non-local construction workers into the Subproject wards shall have been conducted.
- (iv) Baseline data on the ambient levels of air quality, noise and vibration; and on health data in each of the affected wards shall have been established in the PMU.

2. Mitigating Issues/Concerns/Impacts During Construction

119. 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) Protecting the WTP's system parts and components that will be operating during construction according to the prescribed specifications, as the foremost activity.
- (ii) Confining exposing areas according to the Staking Plan.
- (iii) Limiting excavation segment along transmission main alignments to a maximum length of 30 m in all 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.
- (iv) 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.
- (v) 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.
- (vi) 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;
 - 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 WPCs 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.
- (vii) 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 Plan; and
 - fine tuning delivery of fine aggregates to Subproject sites to avoid stockpiling more than what would be needed.
- (viii) 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.
- (ix) Ensuring there is adequate proper sanitation facilities and water to meet sanitation needs, and requiring strict observance of sanitation practices by all.
- (x) Coordinating with traffic control agency and/or WPCs/DPC 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.
- (xi) 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.
- (xii) Ensuring safe alternative access to blocked accesses in coordination particularly with the affected property owners.
- (xiii) 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.
- (xiv) 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.
 - (xv) Ensuring the safety of pedestrians and An Duong WTP staff through provisions of covered and lighted walks with signages.
 - (xvi) 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.
 - (xvii) Setting up its Grievance Redress Team within the Subproject's Grievance Redress Mechanism.
 - (xviii) During mobilization, coordinating with pagoda and school authorities for the protection of their properties and users/students/school employees.
 - (xix) Proper restoration of sites according to the Sites Restoration Plan in the CEMP, at the completion of construction.

120. 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 WPCs and community representatives in monitoring EMP implementation.

3. Mitigating Issues/Concerns/Impacts During Operation

121. 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) Sufficient provisions in the budget for operation, maintenance and repair, as well as for emergency response.
- (viii) Hiring of competent staff particularly in critical aspects of O&M, adequate and appropriate equipment, tools, supplies and vehicles.
- (ix) Monitoring of the quality of raw water and treated water as provided for in the EMP.
- (x) Prompt action to arising issues/concerns/grievances.
- (xi) Instituting the necessary coordination with the concerned WPCs, Le Chan DPC and the City's Department of Health, particularly on the:

- trend of development upstream,
 - supply of, and demand for, Re River water,
 - monthly statistics on incidence of water-borne disease.
- (xii) 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.
- (xiii) Coordinate with DARD in drafting & implementing a water resource protection plan for the Re River from downstream of Sai River.
- (xiv) IEC on water conservation.
- (xv) Engaging/designating at least two staffs to oversee EMP implementation and prepare the Operational Environmental Management Reports.
122. 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

123. Consultation and participation during subproject preparation were conducted in the form of key informant interviews, socio-economic survey and focus group discussions.

124. 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 17 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.

125. Households in affected wards were consulted in the form of socio-economic survey 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.

126. 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

127. To date, the following have been disclosed: i) Subproject description and components; ii) locations of components; and iii) expected period of implementation.

VII. GRIEVANCE REDRESS MECHANISM

A. Purpose of the Mechanism

128. 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

129. 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

130. 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

131. Prior to the disclosure of the Subproject grievance redress mechanism to the affected wards, 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.

132. 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 Grievance Staff in coordination with the concerned WPC. 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.

133. 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 WPCs.

2. During Construction and During Operation

a. Lodging Complaint

134. 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 WPCs; 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

135. 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

136. 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 working on the final measure not later than 5 days from the day discussion meeting is held.

d. Progress Tracking

137. 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

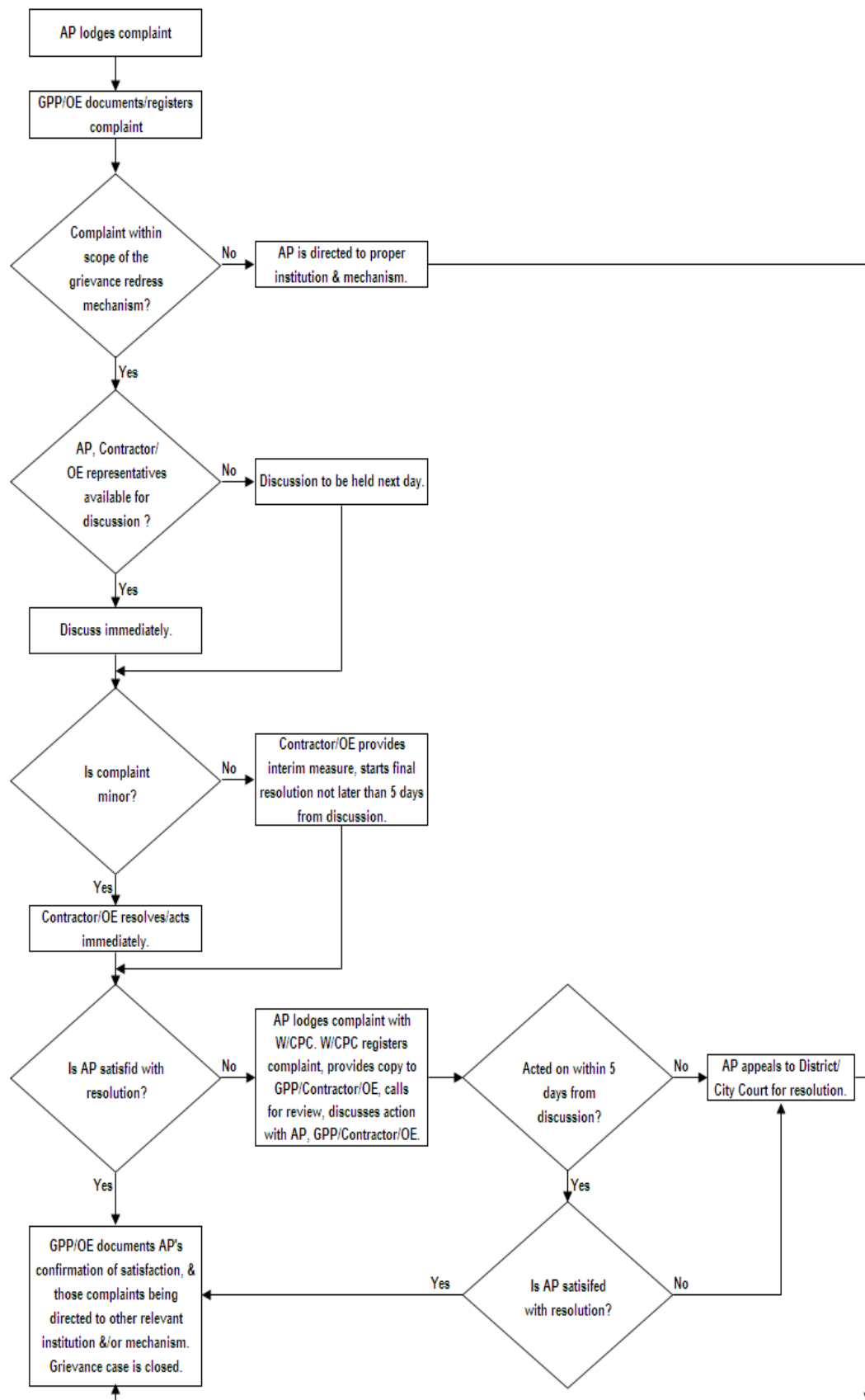
138. For at least a week after closure of grievance (that is, when action implemented has been satisfactorily confirmed in writing by the complainant), the GPP/OE shall monitor the effectiveness of the resolution. Monitoring shall be properly documented. The GPP/OE shall make sure that the status of 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 & wards on the implementation of the grievance redress mechanism. It will be an effective tool to gain the appreciation and respect of the villages and wards on the sincerity of the goal of the Subproject and the services of the HPWSCo.

f. Appeal for Dissatisfied Complainants/APs

139. In the event the issue persists, AP can lodge an appeal to his/her WPC. The WPC 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 proposed action/measure has not started within 5 days from the time of formal lodging of the appeal, AP can seek assistance from WPC 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 3**

Figure 3. Grievance Redress Procedure



GPP - Grievance Point Person
OE - Operating Enterprise

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

140. 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 Cost

141. The marginal cost for implementing the EMP is initially estimated to be VND 409 Million (USD 19,700) of fixed cost to cover:

- (i) 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, 8%
- (ii) environmental effects monitoring during construction, 88%
- (iii) environmental monitoring to establish baseline data of ambient environmental quality/levels prior to full operation, 4%.

142. The cost includes taxes, but excludes contingencies and inflation. The cost excludes 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

143. 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) Asian Development Bank (ADB)
- (iii) Design Consultant
- (iv) Civil Works Contractor (or Contractor
- (v) People's Committees, i.e., the WPCs concerned, DPC of Le Chan and Hai Phong City People's Committee
- (vi) GOV agencies, such as the Department of Health (DOH), Department of Agriculture and Rural Development (DARD), Department of Construction (DOC) and Department of Natural Resources and Environment (DONRE).

144. 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. (It is assumed that the capacity of the PMU in environmental management will have been strengthened after the “hands-on training” under Package 1. PIA technical assistance is assumed to cover only the first four years of Project implementation.)

145. 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 HPCPC through the DONRE will approve the EIA Report of the Subproject. The concerned WPCs will be involved at the ward 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

146. Two approaches of capacity development on environmental management have been identified for conduct during the first four years of Project implementation, i.e., prior to the implementation of this Subproject: 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

147. The proposed Subproject will double up water production in the existing An Duong WTP to improve the reliability of water supply in the serviced urban areas and to extend services to future urban expansion area south of the urban centers. It will: (i) enhance the quality of life in Subproject service areas, particularly the urban wards; (ii) further 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. Overall, an expanded access to, and more reliable, safe, potable water supply will support sustainable urban development, and substantially contribute to poverty alleviation, in Hai Phong City.

148. 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 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.

149. 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 “I”, which would be required a full EIA Report to be appraised and approved by the Hai Phong City People’s Committee through the Department of Natural Resources and Environment (DONRE). The full EIA report 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/Le Chan District Location in the Hai Phong City Context



Map 3 – Immediate Vicinity of An Duong WTP



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

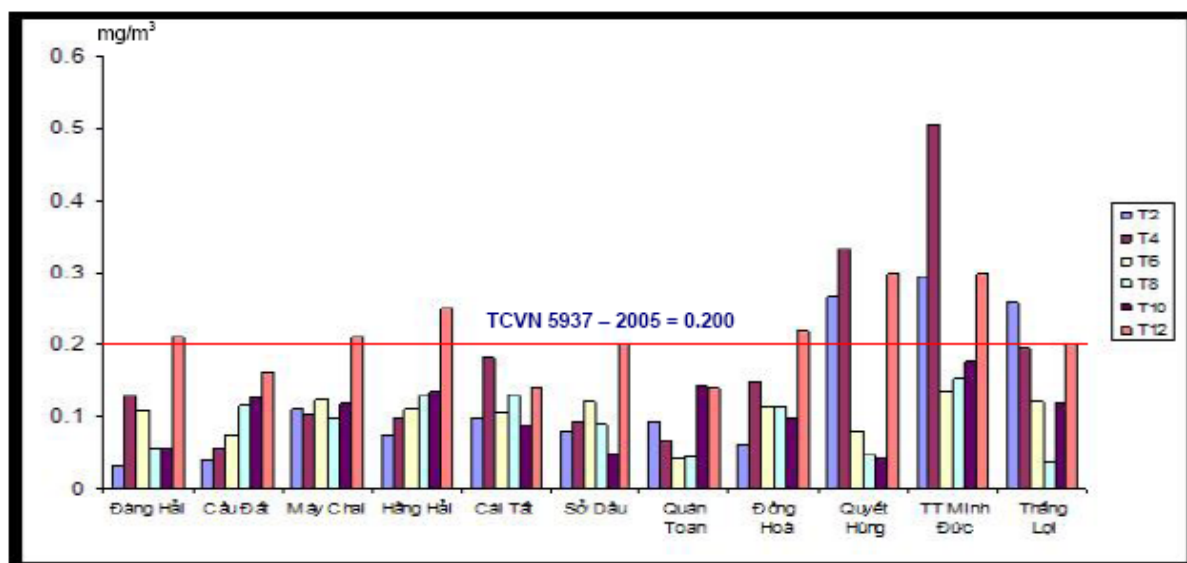
Source: Haiphong Statistical Yearbook 2008. Hai Phong Statistics Office

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

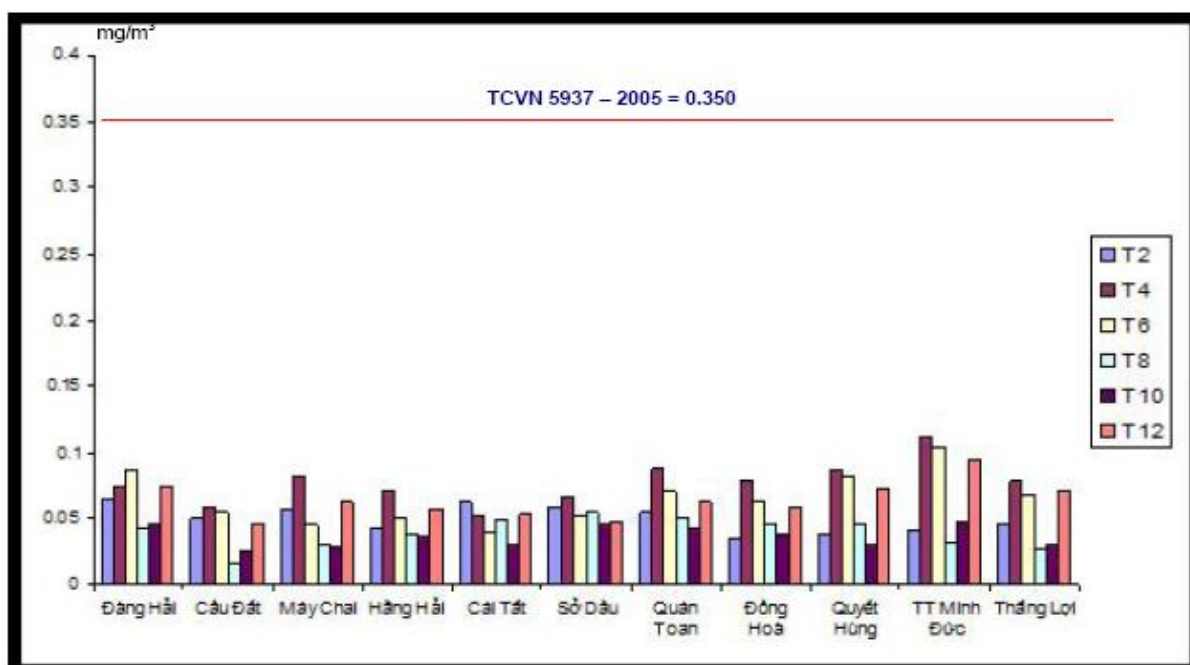
B.3 Air Quality Monitoring Report, 2008**Suspended Dust**

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.

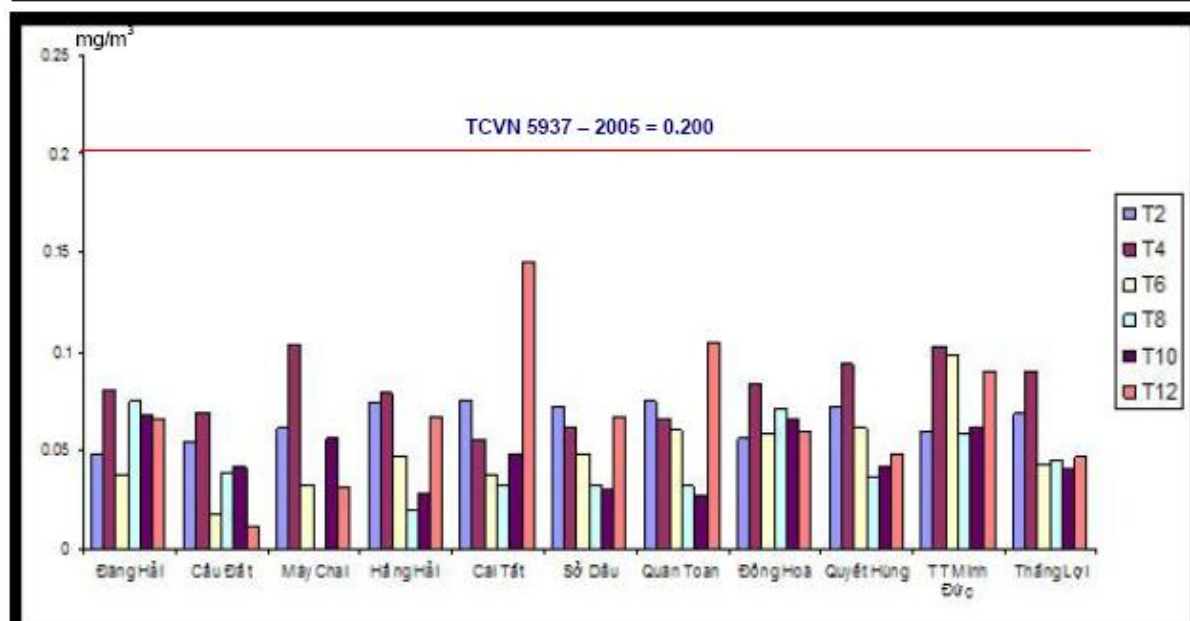
**Sulfur Dioxide (SO₂)**

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					



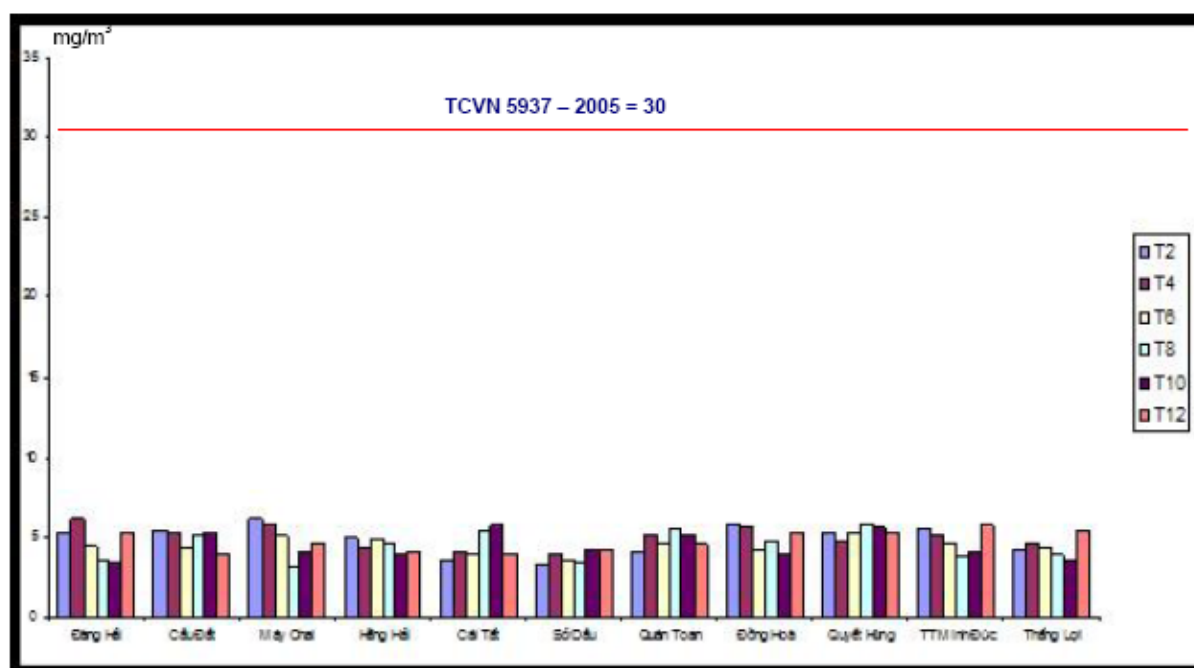
Nitrogen Dioxide (NO₂)

Monitoring Point				2008 Results (mg/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	0.048	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	Quyet 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 Tat 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 Typical Raw Water Quality of Re River, 2006 -2008 ^

No.	Parameter	Result		QCVN		US EPA	
				08:2008/BTNMT		National Recommended Water	
		Lowest	Highest	A1	A2	Qlty Criteria (mg/l)	
						Freshwater	Human health*
1	Temperature (°C)	16.1	30.05	-	-		
2	Turbidity (NTU)	10.1	39.78	-	-		
3	pH	7.06	7.6	6-8.5	6-8.5		5-9
4	Conductivity (µS/cm)	256	463	-	-		
5	Cl ⁻ (mg/l)	20.36	64.68	250	400		
6	Total Alkalinity (mg/l)	-	-	-	-		
7	Total hardness, CaCO ₃ (mg/l)	86.00	150.00	-	-		
8	KMnO ₄ (mgO ₂ /l)	1.78	5.10	-	-		
9	Total Fe	0.04	0.50	0.50	1.00	1.00 (chronic)	
10	NH ₄ ⁺ (mg/l)	0.00	0.40	0.10	0.20		
11	NO ₃ ⁻ (mg/l)	0.02	0.80	2.00	5.00		10
12	NO ₂ ⁻ (mg/l)	0.00	0.19	0.01	0.02		
13	PO ₄ ³⁻ (mg/l)	-	-	0.10	0.20		0.10
14	Total Dissolved Solids (mg/l)	130.00	298.00	-	-	250	
15	Fecal Coliform (VK/100ml)	725	5,050	20	50		
16	Coliform (VK/100ml)	2,200	9,587	2,500	5,000		

B.5 Water Quality Report, 2008 – Re River (Quan Vinh Pumping Station, Vinh Khe Village, An Duong Town, An Duong District) ^^

Month	Temp (°C)	Color (mgPt/l)	Smell	Turbidity (NTU)	pH	Conductivity (µS/cm)	Total Hardness (mg/l)	Cl ⁻ (mg/l)	Oxidation degree (mgO ₂ /l)	Coliform		TDS	NH ₄ /N (mg/l)	Mn (mg/l)	NO ₃ -/N (mg/l)	NO ₂ -/N (mg/l)	Fe (mg/l)
										Total (CFU/100ml)	Thermal (CFU/100ml)						
Jan	18.7	19	Not det	20.64	7.52	391	150	30.66	1.92	3485	725	209.0	0.15	0.14	0.04	<0.01	0.23
Feb	16.1	15	Not det	11.93	7.60	417	132	33.13	2.13	3810	788	240.0	0.12	0.05	0.04	0.01	0.15
Mar	22.6	17	Not det	11.56	7.54	452	142	38.51	2.95	6308	1280	247.0	0.11	0.08	0.05	0.02	0.16
Apr	26.2	19	stinking	19.26	7.49	385	142	30.46	3.31	6592	1875	247.0	0.52	0.07	0.80	0.19	0.23
May	29	22	Not det	28.64	7.46	307	115	21.33	2.83	6185	1600	159.5	0.20	0.24	0.04	<0.01	0.99
Jun	28.7	22	stinking	34.29	7.37	338	100	29.89	3.85	7731	1880	140.6	0.14	0.18	0.04	<0.01	0.88
Jul	30	26	stinking	27.34	7.41	357	106	43.23	4.86	6554	5050	146.5	0.25	0.32	0.02	<0.01	0.28
Aug	29.6	30	stinking	30.90	7.20	330	96	29.11	5.10	7100	2650	157.7	0.27	0.18	0.07	0.06	0.32
Sep	28	25	stinking	21.75	7.31	303	92	25.76	4.37	6862	2740	144.2	0.18	0.14	0.02	<0.01	0.23
Oct	27.5	24	stinking	16.94	7.34	302	86	26.42	3.85	4585	925	141.9	0.20	0.13	0.01	<0.01	0.24
Nov	24.1	23	stinking	26.54	7.34	308	94	25.16	4.03	3883	1000	142.7	0.16	0.11	0.06	0.03	0.25
Dec	20.8	19	Not det	27.87	7.47	255	98	20.90	2.98	4884	1420	135.7	0.13	0.09	0.03	0.01	0.25
Std 1a	-	-	-	-	6.0-8.5	-	-	250.00	≥ 6.00	2500	-	-	0.10	-	2.00	0.01	0.50
Std 1b	-	-	-	-	6.0-8.5	-	-	400.00	≥ 5.00	5000	-	-	0.20	-	5.00	0.02	1.00
EPA 1												250.0					1.00
EPA 2					5.0-9.0									0.05	10.0		
Exceeded national standard limit (A1)						Exceeded national standard limit (A2)						Exceeded 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)

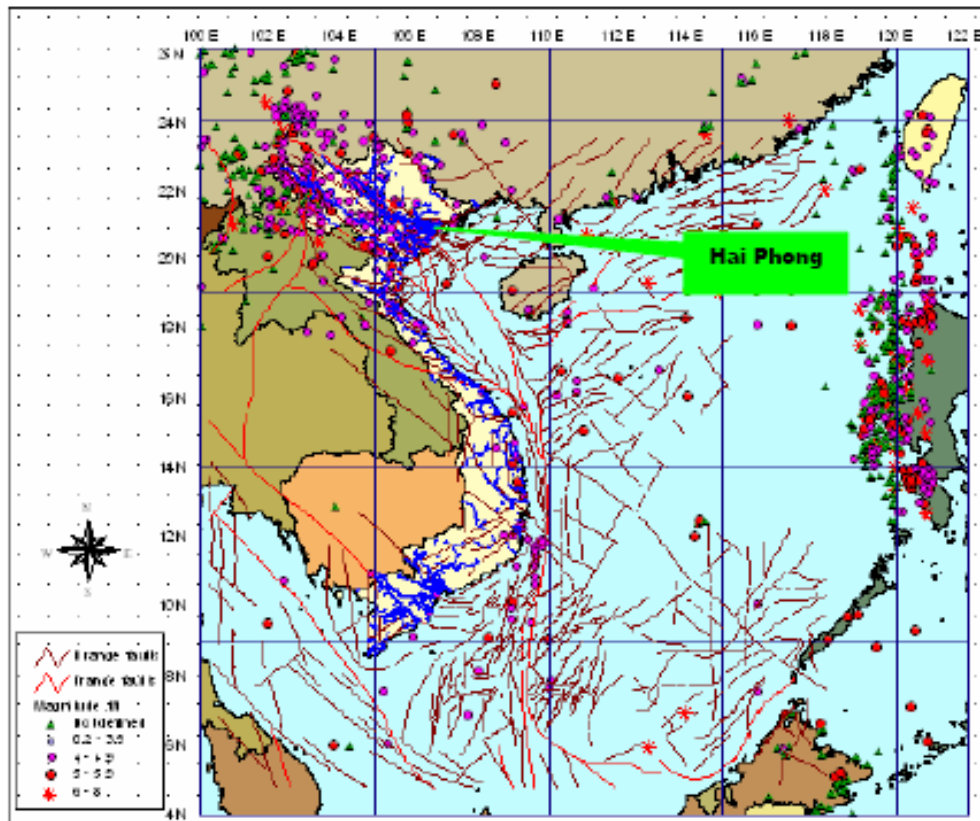
EPA 1: Freshwater (acute)

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

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

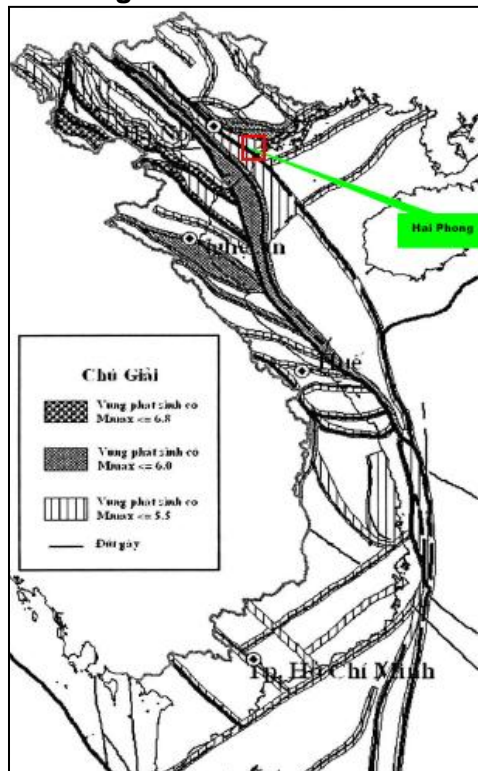
^^ Source: Laboratory Unit of An Duong WTP, HPWSCo

B.6 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.7 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

Issue / Concern / Impact		Magnitude*		Remarks
Particular	Type	WTP	TM	
1 Adjacent to environmentally sensitive areas, physical cultural resources & sensitive institutions	-	S	N-L	<ul style="list-style-type: none"> An Duong Temple & Tran Nguyen High School are adjacent to the An Duong WTP. Pagoda known nearest to transmission alignment is at least 60 m away. At least 2 schools known to be right along the transmission main alignment; with another school about 30 m away.
2 Planned in areas with ecosystem classification system, where basic surveys of plant/vertebrate taxa done.	-	N	N	
3 Encroaching into:	-			
- indigenous communities		N	N	
- habitats with species listed as globally endangered by International Union for Conservation of Nature		N	N	
- strictly protected areas (IUCN Categories I to III), including core zones of Biosphere Reserves & World Heritage Sites		N	N	
- primary/primeval forests		N	N	
- habitats with diverse domesticated species		N	N	
- habitats of migratory species listed as globally endangered by the IUCN or by Viet Nam		N	N	
- areas that are resources on which vulnerable groups depend to sustain their families		N	N	
- areas that have strong traditional lifestyles or traditional uses of biological resources.		N	N	
4 Project site/area of influence densely populated	-	S	S	<ul style="list-style-type: none"> Subproject sites in the City Center.
5 Heavy with urban development	-	S	S	
6 Land &/or ROW acquisition, loss of rice land, loss of land, housing structures, crops, income; displacement of irrigation channels and power supply poles	-	L	N	<ul style="list-style-type: none"> Acquisition of a small piece of land adjacent to WTP, about 400 m², owned by the power company, now occupied by an idle transformer station. No social concern involved.
7 Land value changes	+	L	M	<ul style="list-style-type: none"> Improved water supply will boost urban development economic activities, leading to intensified land uses.
8 Water use conflicts	-	M	N	<ul style="list-style-type: none"> From Quan Vinh Intake Station (serving the An Duong WTP), Re River flows further down for about 7 km to join the Cam River. For the first half of this length, Re River is used for irrigation. The remaining half courses through the City Center, and there is no dependence on Re River for socio-economic activities. In the Interim Workshop in Oct 2009, DARD has confirmed availability of water for the upgraded withdrawal 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	
10 Inducing irrational conversion of agricultural lands for urban use in the vicinity	-	N	N	
11 Pollution of raw water supply from waste discharge from communities / unsatisfactory raw water supply	-	S	N	<ul style="list-style-type: none"> Re River is one of the more polluted rivers in Hai Phong. Upstream of the Quan Vinh Intake Station (serving the An Duong WTP) land use is predominantly rice fields interspersed with villages with low to medium-density population. Rice land conversion to urban uses continues.
12 Pollution of downstream communities	-	N	N	
13 Vulnerability to flooding during heavy rains	-	N	N	
14 Earthquake damage risk / proximity to fault line	-	M	M	<ul style="list-style-type: none"> Based on the Country Report on Seismic Hazard of the Territory of Viet Nam, southern half of the is crossed by an active NW-SE trending fault line & that maximum magnitude of earthquake expected to shake the City is 5.5.
15 Vulnerability to erosion	-	N	N	
16 Concerns on access to trunk infrastructure				
- No access road / access road with concern	-	N	NA	
- No power supply	-	N	NA	
- No access to urban drainage	-	N	NA	

Subcomponent

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"> Downstream of the Quan Vinh Intake Station, rice fields rely on Re River for irrigation. 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: <ul style="list-style-type: none"> - inadequate consideration of raw water quality - inadequate protection of system components, e.g. 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 	-	S	<ul style="list-style-type: none"> Re River is one of the four more polluted rivers in Hai Phong. 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.
3 Over pumping leading to ground subsidence	-	N	
4 Excessive algae growth in reservoirs	-	M	<ul style="list-style-type: none"> Two units of new reservoirs (12,000 m³ & 5,000 m³) will be a component of the upgrading of the WTP. Existing reservoirs in the WTP are adequately covered.
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"> Existing WTP is well secured. Its perimeter is lined with trees (within WTP property). Existing transmission mains are buried underground.
6 Transmission/distribution main alignment issues: <ul style="list-style-type: none"> - Non-resurfacing or inadequate resurfacing of excavated areas 		S	<ul style="list-style-type: none"> Transmission mains will be built in road ROWs, along City Center roads. 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	-	M	<ul style="list-style-type: none"> Combined sewer system exists in the City Center. The City Master Plan provides for upgrade & expansion of system. Transmission main alignment must be coordinated with the authorities concerned.
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 21-29 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: <ul style="list-style-type: none"> - 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 	-	L-M	<ul style="list-style-type: none"> Existing An Duong WTP is well kept. Backwash water is recovered and recycled. Sludge collection & disposal is contracted out to private entities. Whether or not sludge is disposed of appropriately, however, requires more monitoring. Being in the City Center, the WTP has access to the City's combined sewers. Subproject sites are 13-28 km away from 3 of the City's four landfills. However, 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"> Existing An Duong WTP is well run, with competent staff. Proposed doubling of WTP capacity will require doubling up in care in handling of CI & other hazardous substances that will be received, used and stored on site.

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		
(-) Contamination of the treated water supplied by An Duong WTP		S
(-) Degeneration of surface water		M
(-) Degeneration of ground water resources		L
(-) Generation of sewage / wastewater		M
(-) Generation of solid wastes		S
(-) Generation of hazardous wastes		M
(-) Erosion / sedimentation / siltation		L-M
2 Biological Environment		
(-) Impairment of marine / other natural habitats		N
(-) Loss of vegetation		N
(-) Disturbance of wildlife		N
3 Socio-Economic Environment		
(-) Water supply interruption in the service area		S
(-) Traffic and road blocking		S
(-) Access blocking		S
(-) Local flooding		S
(-) Accidental damage to utilities, resulting in service interruptions		M-S
(-) 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		L-M
(-) Damage to structures along transmission main alignment		N-L
(-) Community health and safety hazard		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		L
(-) 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
(-) Noise		N
(-) Vibration		N
1.2 Water Resources and Quality		
(-) Degeneration of surface water		N-L
(-) Degeneration of ground water resources		N
(-) Generation of sewage / wastewater		M
(-) Generation of solid wastes		M
(-) Generation of hazardous wastes		L
2 Biological Environment		
(-) Impairment of marine / other natural habitats		N-L
(-) 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		L
(-) 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		L
(-) Occupational health and safety hazard associated with handling of CI & other hazardous substances for O/M&R		L-M
(-) Increased generation of wastewater		S
(+) 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 Discussions

Date :	17-18 September 2009
Group:	Cafés, Hotels, Schools, Hospitals
Q1	Can you tell us how important water and sanitation is to your establishment?
A1	- Water and sanitation are two sectors very important to the health of the community. With water supply shortage and no quality assurance, diseases such as diarrhea, sore eyes, and other diseases associated with unhygienic conditions, will arise. Water and sanitation are closely related sectors.
Q2	Do you think you have enough water or sanitation facilities for the public you serve?
A2	- In small-scale restaurants & sanitation facilities, water supply is adequate. The concern is wastewater management. - Restaurants and cafes have enough water, but sometimes water has smell of iron. Hygiene, in general, is guaranteed. - The State Hospital said that sufficiency of water much of a concern. The problem is overloaded sanitation facilities, no guarantee of hygiene. - School, no guarantee of hygienic toilet. - Hotels have adequate water, but occasionally no water due to power outage.
Q3	If not, what do you do to get more water and to improve sanitation?
A3	- It is necessary to have improved safe water supply. - More training to raise awareness on environmental sanitation, and in particular the impact of hygiene on public health.
Q4	Do you ever worry that how you handle water or the condition of your sanitation facilities may make people sick?
A4	- Poor water quality also affects the quality of food and beverages. Public places such as restaurants, hotels, hospitals & schools should maintain hygiene to mitigate/avoid rise of infectious diseases.
Q5	How do your hospital/school/café/hotel affect public health? Does it play a role in public health?
A5	- Being public places, people converge in these places, a venue for communicating/transmitting diseases. - These places should have self-imposed social responsibility over public health by following hygiene standards.
Q6	Does your establishment try to conserve water? If yes, how?
A6	- Apply water-saving measures. - Educating students about the scarcity of water worldwide, thereby raising public awareness about water resources.
Q7	Have you ever complained to the company or the Government on the quality or quantity of water supply &/or the environment? And their reaction to your complaint?
A7	- No complaints about water supply, especially after the City completed the renovation of the water supply system. Enough water pressure, even during peak, except during power outages. - During loss of supply, several calls were made to ask about the loss of water. The reply was that the pipeline is being maintained. - Water enterprises are responsible for ensuring that supplied water is safe and potable. Water users/ customers have responsibilities to conserve water and ensure hygienic surroundings to avoid contaminating water sources.
Sector Q&A - Schools	
Q8	Do your schools teach about hygiene?
A8	- Schools are teaching sanitation & hygiene, but pupils have not applied what have been taught. - Lack of funds is constraining the construction of hygienic toilets and regular cleaning of toilets.
Q9	How many toilets does your school have for boys and for girls? Do you think this is enough?
A9	- Most schools have separate male and female toilets. Toilets, however, are not clean, not enough water to clean.
Q10	Do you think the toilets are clean and disinfected regularly? How do you know?
A10	- Toilets should be regularly disinfected and cleaned.
Q11	Does your school bathrooms keep water for hand-washing? If no, why not?
A11	- Most of the toilets in the schools lack water and not cleaned regularly, have become breeding places for mosquitoes. - Students are not responsible enough to ensure water taps are not dripping. Schools pay higher tariffs for water consumed. This aggravates the schools' problem of lack of funds.
Q12	Do you hear stories about your students being ill because of water-related illnesses? How often does this occur?
A12	- Sometimes students leave school due to diarrhea, causes of eating unhygienic foods, but it does not happen often.
Q13	Have organizations (like UNICEF) or a company sponsored a hygiene awareness week in your school or offered curriculum on hygiene?
A13	- No

Sector Q&A – Cafes/Restaurants/Hotels	
Q14	Do you use different water for cooking and different water for cleaning/washing dishes?
A14	- Use only water in the taps. In the urban center, there are no any alternative water sources.
Q15	Where do you wash dishes? If outside the café, ask why they don't use inside (is it a structural issue – no room, or a water issue – no internal plumbing, etc.)
A15	- Inside, for hygiene and aesthetics, to avoid guests see the work of cleaning, in addition to convenience for the service.
Q16	How do you wash dishes? (use basin, running water, soap) How do you rinse? Do you ever clean with hot water?
A16	- Use clean water in clean tap water and Sunlight (dish washing liquid), using brushes to clean cup with a cleaner solution. Sometimes mixed with hot water during winter.
Q17	Do you ever worry your customers might get sick because of the water you use or how you wash dishes?
A17	How clean is like everywhere, but we still worry it will bring bad reputation and affect our businesses.
Sector Q&A – Hospitals	
Q18	What proportion of your emergency room cases or admitted patients are due to water-born illness?
A18	- Rate of diseases related to water are higher in the summer, e.g., diarrhea, sore eyes, etc., due to unhygienic eating and drinking, and insufficient water in the summer. - Mainly people in rural areas, especially women suffering from gynecological diseases due to lack of awareness of various health hygiene and water supply is not guaranteed and is not accessible.
Q19	What do you think are the contributing factors of these sicknesses—water home, water drunk outside at restaurants, poor sanitation, etc.?
A19	- Lack of hygiene - Some areas (rural) lack of clean water should also cause diarrhea, fever, bleeding, itching, sore eyes
Q20	Do you think your hospital has enough toilets for both male and female patients? If not, why have not been more constructed (structural limitations, funding limitations, etc.)
A20	- Hospitals have enough toilets and separate for male and female. However, as toilets are overloaded and the level of awareness & practice of hygiene varies among users, adequate sanitation and hygiene in the toilets are not ensured.
Q21	Does your hospital have enough water to meet demand and keep the hospital clean and sanitary?
A21	- Enough.
Q22	Do you think your hospital toilets are kept as clean as they should be? If no, why not?
A22	- Not clean due to lack of awareness on hygiene, lack of cleaners, a number of deteriorated toilets and lack of O&M funds, many users.
Q23	Can you recall whether your hospital provides soap in the toilets? If not, what are the reasons?
A23	- Due to many patients, hospitals do not provide soap. That is the status of the general hospital in Vietnam. Lack of funds.
Q24	Does your hospital sponsor health and hygiene promotion programs, campaigns, etc in communities, schools, etc? If yes, what do you think has been the affect? And do you have any lessons you learned for future programs?
A24	- Only programs of the GOV, have not received aid from the foreign or ODA sources. - Programs such as expanded immunization, oral vaccines and drugs, propaganda about the negative impacts of poor health and hygiene to communities, such as boiling drinking, sleep with anti-mosquito net, mosquito spraying, have positive impact on local people.
Q25	How could HPWSCO or this project help you improve your water and sanitation situation?
A25	- In terms of reliable supply of safe/potable water. - In terms of support in rebuilding toilets and building new hospitals. - In terms of organizing training courses in health education related to environmental sanitation.
Q26	Are there specific health and hygiene behaviors among your patients that you think should be addressed in a public awareness program?
A26	- All patients must be fully aware of the significance of drinking clean water and eating hygienic foods, and personal health and hygiene.

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LIST OF PARTICIPANTS IN FDG – HAI PHONG WATER SUPPLY PROJECT (ADB)

Ngày (Time):

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	Ngô Thị Hằng	Cape 88 Minh Hải	
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	Thái Yên	Quang Minh Hotel	
	Lê Văn Minh	PMU	

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