Attachment 5

Handbook for Improving Performance of Inspection
(Only in Electronic Version.)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SOCIALIST REPUBLIC OF VIETNAM
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT (MONRE)

THE PROJECT FOR STRENGTHENING CAPACITY OF WATER ENVIRONMENTAL MANAGEMENT IN VIETNAM

HANDBOOK FOR

IMPROVING POLLUTION SOURCE INSPECTION

AND ENVIRONMENT CHECK PERFORMANCE

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J I C A E X P E R T T E A M

Preface

This draft handbook was prepared as a technical cooperation output of the Project for Strengthening Capacity of Water Environment Management in Vietnam (the Project) by Japanese International Cooperation Agency (JICA). The objective of this handbook is to disseminate knowledge and experience related to inspection and environment check obtained by Working Group (WG) members of pollution source inspection component. This handbook is not a legal document, but a guideline to assist relevant officers in charge of inspection and environment check to plan, implement, and conclude inspection and environment check for water environment management field. We really hope the handbook to be utilized as a training material and a reference tool for inspection and environment check in water environment management field in Vietnam.

JICA Expert Team

Handbook for Improving Pollution Source Inspection and Environment Check Performance

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CHAPTER 1 INTRODUCTION

1.1 Background of the Project for Preparing the Handbook

With rapid industrialization and urbanization in recent years, water qualities of rivers, lakes and canals in Hanoi, Ho Chi Minh and other cities in Vietnam are deteriorating due to discharge of untreated industrial and domestic wastewaters. In order to deal with such problems, the Government of Vietnam (GOV) has taken a series of steps to strengthen its pollution control, such as amendment of the Law on Environmental Protection in 2005, revisions of industrial wastewater standard and environmental standards on water, air and solid waste, enactment of Decree No.67/2003/ND-CP to mandate wastewater fee as an economic disincentive to decrease pollution load, and enactment of Decision No. 64/2003/QD-TTg to control pollution in selected industries with environmental priorities.

Despite such efforts, enforcement of environmental regulations is still lagging behind due to limited resources available for DONREs in charge of enforcement, and also limited support from regulated communities and civil society to promote environmental protection.

Under these circumstances, the GOV has requested the Government of Japan (GOJ) technical assistance to strengthen administrative capacity to manage water environment. Subsequently, the GOV and Japan International Cooperation Agency (JICA), which is an official agency in charge of Japanese international cooperation, discussed and agreed to implement this Project in accordance with the Record of Discussions (R/D) and Minutes of Meetings (M/M) signed by the GOV and JICA on 8th January, 2010, and has started the project named "The Project for Strengthening Capacity of Warer Environment Management in Vietnam" (the Project). This handbook was prepared by the Project to disseminate knowledge and experience related to inspection and environment check obtained the Project by JICA Expert Team and Working Group (WG) of pollution source inspection component.

1.2 Overall Progress of Pollution Source Inspection Component in the Project

The project activities were carried out by the Vietnamese counterpart (C/P) organizations whose environmental management capacities were strengthened through the Project. The C/P organizations established working groups (WGs) for each output of the Project to clarify the activities and responsibilities of participating officers and experts. The JICA Expert Team (JET) provided technical support and guidance to the C/P organizations.

(a) C3-1: Conduct capacity assessment of target DONREs regarding inspection for water pollution control.

From April 2011, JET carried out the following activities to identify needs for capacity development and training:

- Discuss with DONREs to confirm their needs for capacity development and training, and
- Distribute questionnaire for capacity assessment

In this section, the results of identification of needs for capacity development and trainings are described.

In August 2011, JET prepared the capacity assessment (CA) questionnaire sheets, and distributed them to each DONRE. For Output 2-3, totally 23 answered sheets were collected from all DONREs. In the questionnaire, DONRE staff who belong to the departments related to inspection and environment check, such as Inspection Department, EPA, and Water Resource Management Department, evaluated their capacities by themselves using 5-level evaluation method.

Based on their answers, the levels of the following capacities were considered to be relatively lower than other capacities, and to be developed:

- Experience to access relevant information to be referred to in preparation work,

- Knowledge for assessing effluent treatment system and operation condition, and
- Experience to monitor effluent quality and quantity using tools/equipment at site,

Table 1.2-1 Summary of CA on Inspection and Environment Check

Stage	Knowledge/Experience/Skill	Answer on Level of Capacity						
		5 (High-est)	**4**	**3**	**2**	**1 (Low-est)**	**Average**	
Preparation stage	Experience to prepare inspection/environment check plan	1	9	5		1	3.6	3.4
	Knowledge on a process to prepare inspection/environment check plan		8	6	2	1	3.2	
	Knowledge on documents and equipment to be prepared for inspection/environment check	1	8	5	1	1	3.4	
	Knowledge on latest environmental and effluent standards	4	8	8		1	3.7	
	Knowledge on information to be collected before implementing inspection/environment check	1	9	6		1	3.5	
	Experiences to refer EIA/EPP/EPC reports to find key issues	3	9	8	1	1	3.5	
	Experiences to refer past inspection/environment check report	2	11	6	1	1	3.6	
	Experiences to cooperate with other sections to collect information to be collected before implementing inspection/environment check	2	11	6	1	1	3.6	
	Experience to access an information system to collect past administrative sanctions	1	3	11	4	1	3.0	
	Skill to identify industrial sectors to be inspected carefully considering characteristics of industrial activities in each province/city	1	5	10		1	3.3	
Field work stage	Knowledge on information to be interviewed at sites	1	6	5	1	1	3.4	3.1
	Knowledge on documents you to be checked at sites based on the Law on Inspection/Law on environmental protection	1	6	8		1	3.4	
	Knowledge on information to be checked in the submitted self-monitoring reports prepared by the inspected enterprises	1	6	7	1	1	3.3	
	Knowledge on effluent treatment system operation condition		4	8	4	2	2.8	
	Experience to provide recommendations to improve water pollution management system during field work at sites	2	3	9	4		3.2	
	Experience to monitor effluent quality using tools/equipment at sites	2	4	7	6	1	3.0	
Post-field work stage	Experience to prepare inspection/environment check reports	2	10	5	1	1	3.6	3.4
	Knowledge on essential information to be included in inspection/environment check reports based on Law on Inspection and Environmental Inspection Manual by MONRE		8	7	1	1	3.3	
	Experience to refer relevant past inspection/environment check reports to prepare a new report	2	11	5		1	3.7	
	Experience to share information of water pollution sources obtained by inspection/environment check with other sections/organizations?	1	9	9		1	3.5	
	Experience to provide administrative sanctions	2	8	6	3	1	3.4	
	Experience to prepare an annual summary report of inspection/environment check	3	9	6	1	1	3.6	
	Knowledge on conditions to nominate enterprises as targets of the Circular 7/2007/ TT-BTNMT		6	7	2	1	3.1	

Note: 23 of answered questionnaire sheets were collected from all DONREs. However, some staffs did not answer all questions, so total number of answer in each question is lower that 23.
Highlighted capacities means that level of the capacities are relatively lower than other capacities.
Source: JET

(b) C3-2: Review existing guidelines on inspection.

The activity C3-2 was conducted during the period of June to August 2011 by JET. JET reviewed "Environmental Specialized Inspection Manual" prepared by MONRE. The manual shows procedures of inspection in the stages of preparation work, on-site work, and follow-up work. As a result of the review, the following main issues were found in water environment management field as shown in Table 1.2-2. Considering identified issues, this handbook was prepared.

Table 1.2-2 Summary of CA on Inspection and Environment Check

Category	Relevant Section	Main Findings	Approach to Capacity Development
Common	-	The manual has general instruction on inspection of environmental field. For capacity development on inspection in water environmental management field, specific capacity development activities are necessary.	- Capacity development activities on inspection and environment check in water environment field are implemented. - A handbook for improving inspection and environment check performance in water environment management field is prepared.
Legal requirement	Section 2.1 and 2.4	The manual lists relevant regulations on inspection. However, the manual was prepared in 2008, and some of the regulations have been modified.	- Latest relevant regulations on inspection are listed in the handbook for improving inspection and environment check performance.
Procedure of inspection	Section 3.1	The manual describe procedure of inspection in each phased of the work, preparation work, on-site work and follow-up work.	- Based on the results of capacity assessment, generally, officers related with inspection and environment check know required procedure of inspection and environment check. Joint work is conducted in accordance with the procedure.
Institutional Framework	Section 2.2 and 2.3	The manual defines each organization's responsibility for inspection and environment check.	- The Project provides assistance for capacity development to provincial/city DONRE officers related with inspection and environment check.
Capacity related with preparation work	Section 3.2.1	The manual describes necessary actions to be conducted in preparation work of inspection, and general information to be collected. However, there is no description on specific information to be collected for inspection related with water environment management field.	- In the Project, information to be collected for inspection related with water environment management field is clarified through joint work of inspection and environment check.
Capacity related with on-site work	Section 3.2.2	The manual describes the documents to be checked in on-site work particularly. On the other hand, guidance on several technical matters, such as water flow measurement, wastewater quality monitoring and how to check wastewater treatment system and its operation condition are not mentioned in the manual.	- In the Project, the following training is provided. ✓ Wastewater flow measurement ✓ Water quality measurement ✓ Assessment of wastewater system and its condition at site
Capacity related with follow-up work	Section 3.2.3 to 3.2.5	The manual describes general approaches to reporting and providing administrative sanction. For improving wastewater management by enterprises themselves, it is expected for inspectors to have capacity to instruct particular measures for solving found issues on wastewater system and its operation condition.	- In the Project, the following knowledge is provided. ✓ Appropriate wastewater treatment system by main industrial sector ✓ Key point to be improved for appropriate operation of wastewater treatment system ✓ Effectiveness of cleaner production technique for reducing impact on water environment by wastewater discharge

Source: JET

(c) C3-3: Clarify criteria for selecting primary/crucial pollution sources to be inspected as a part of DONREs' inspection plans.

The activity C3-3 was conducted by DONREs and JET. WG of each DONRE and JET discussed how to select target pollution sources to be inspected/checked. As a result of these discussions, the viewpoints shown in Table 3.1-1 were identified.

(d) C3-4: Based on the prepared plan, conduct environmental inspection and/or environment check.

The activity C3-4 has started from January 2012. JET implemented a series of OJT activities on inspection and environment check with each DONRE, for providing knowledge and recommendation on each work step of inspection and environment check, namely preparation work, on-site inspection, and follow-up work, and for exchanging opinions with DONRE officers to enhance their capacities.

(e) C3-5: Conduct joint analysis on the results of environmental inspection and/or environment check in order to improve the related capacity of DONREs through the training.

After the OJT activities, target DONREs and JET discussed the results of the inspections. The members pointed out several difficulties to obtain effective inspection results during different phases of inspection, namely preparation work, on-site work, and follow-up work phase. The discussed matters and recommendations provided are reflected to this handbook.

(f) C3-6: Conduct training on wastewater management to improve DONREs' administrative order and/or administrative guidance.

Through discussions with DONREs from May 2011 to February 2012, JET confirmed that all DONRE have training needs on wastewater treatment and production process improvement. Therefore, a training program shown in Table 1.2-3 was provided in October and November 2012, and in January 2013.

Table 1.2-3 Training Program on Wastewater Treatment and Production Process

Item	Contents		
Venue	HNI DONRE	HCMC DONRE	BRVT DONRE
Date	2013.1.10 - 11	2012.11.06 - 07	2012.10.02 - 03
Contents of training	- Measures to evaluate adequateness of wastewater treatment process and identify issues of the process - Knowledge on how to instruct improvement of wastewater treatment system - Knowledge on production process improvement including introduction of cleaner production technology - Knowledge on pollution load calculation - Site visit on focused industrial sectors		
Industrial sectors focused	Paper/paper mill	Textile and dyeing	Seafood processing
Note	Officers of other DONRE were invited		-

Source: JET

(g) C3-7: Conduct training on on-site inspection.

The activity C3-7 has started from June 2012 to train officers how to check appropriateness of wastewater treatment system and its operation condition, wastewater flow measurement, and field analysis by mobile equipment. The experiences and knowledge gained through the Project are described in the handbook.

CHAPTER 2 LEGAL AND INSTITUTIONAL BACKGROUND

Environmental inspection/check work should be based on legislation, laws and regulations on environmental protection and inspection, and administrative sanction.
A list of relevant legal laws and regulations are shown below and Attachment-1.

2.1 Regulation on Environmental Management

1) Law on Environmental Protection (No.52/2005/QH11)

Law on Environmental Protection stipulates responsibilities of enterprises to protect environment from pollutants they discharge, and for local administration to check status of environment management system/activities by enterprises. Environment check and inspection are planned and carried out based on the Law on Environmental Protection. The relevant articles are as follows:

- Handling of polluting production, business and service establishments (Article 49)
- Collection and treatment of waste water (Article 81)
- Waste water treatment systems (Article 82)
- Environmental protection inspectorate (Article 125)
- Responsibilities for environmental protection supervision and inspection (Article 126)
- Handling of violations (Article 127)
- Environment-related complaints, denunciations and lawsuits (Article 128)
- Environment-related disputes (Article 129)

2) Relevant Decrees and Decisions

The relevant Decrees and Circulars related to environmental management are as follows:

- Decree No. 80/2006/NĐ on Guidance for Implementation of Law on Environmental Protection
- Decision No. 62/2002/QĐ-BKHCNMT on Regulation on Environmental Protection in Industrial Park: Applied in Inspection of Environmental Protection in Industrial Zone, and Industrial Park
- Decree No. 88/2007/ND-CP on Urban and Industrial Zone Drainage
- Decree No.29/2011/ND-CP on Provisions of Strategic Environmental Assessment, Environmental Impact Assessment, and Environmental Protection Commitment
- Circular No.26/2011/TT-BTNMT on Guidelines for Strategic Environmental Assessment, Environmental Impact Assessment, and Environmental Protection Commitment
- Circular No. 08/2009/TT-BTNMT on Provision for Environmental Management and Protection of Economic Zones, Hi-tech Parks, Industrial Zones and Industrial Clusters
- Circular No. 08/2010/TT-BTNMT on Preparation for National Environmental Report, Sector's EIA Report and Report on Provincial existing Environmental Situation

2.2 Regulation on Inspection

1) Law on Inspection (No.56/2010/QH12)

Law on Inspection is a fundamental law to organize inspection team, plan and implement inspection activities. The law stipulates two types of inspection activities, named "administrative inspection" and "specialized inspection". The inspection activities related to environmental issues are categorized as specialized inspection. The relevant articles with inspection on environmental issues by provincial organizations are shown below:

- Purpose of inspection activities (Article 2)
- Agencies performing inspection (Article 4)
- Tasks and powers of provincial-level department inspectorates (Article 24)
- Elaboration and approval of inspection program orientations and inspection plans (Article 36)
- Specialized inspection forms (Article 37)
- Public notification of specialized inspection conclusions (Article 39)
- Handling of law violations of inspection decision issues (Article 42)
- Tasks and powers of members of specialized inspection teams (Article 54)
- Tasks and powers of specialized inspection decision issues (Article 55)

2) Relevant Decrees and Decisions

The relevant Decrees, Decisions and Circulars related to inspection and environment check are as follows:

- Decree No. 07/2012/ND-CP on Regulating agencies assigned with specialized inspection and operation of specialized inspection
- Decree No. 86/2011/ND-CP on Detail Guidance for Implementation of Law on Inspection
- Decree No. 117/2009/ND-CP on Handling of Violation for Environmental Protection
- Decision No. 2151/2006/QĐ-TTCP on Operation Rule of Inspection team
- Decree No. 35/2009/NĐ-CP on Organization and Activities of Inspectorate in Charge of Natural Resources and Environment
- Circular No.04/2012/TT-BTNMT on Guidance of Classification and Decision of List of Entities Causing Environmental Pollution Required Administrative Sanction

2.3 Regulation on Water Resource Management

1) Law on Water Resources (No.17/2012/QH13)

This law stipulates control and mitigation of adverse effects caused by water resource development.

- Principles for water resource management, protection, exploitation and usage and preventing, combating and overcoming the harm caused by water (Article 3)
- Consulting community, organization and individual involved in exploitation and use of water resource and wastewater discharge into water source (Article 6)
- Prohibited actions (Article 9)
- Responsibility for water resource protection (Article 25)
- Protection of the water source quality in agricultural production, aquaculture, industrial production, mining and other activities (Article 33)
- Wastewater discharge to the water source (Article 37)
- Right and obligation of organizations and individuals exploiting and using water resource (Article 43)
- Responsibility of People's Committees at all levels for state management in water resource (Article 71)
- Specialized inspection on water resource (Article 75)

2) Relevant Decrees and Decisions

Most of the Decrees, Circulars and Decisions related to to the former Law on Water Resources are suspended, and to be substituted to the new ones.

- Decree No. 149/2004/ND-CP dated 27/7/2004 of the Government on the issuance of permits for water resource exploration, exploitation and use, or for discharge of wastewater into water sources;
- Circular No. 02/2005/TT-BTNMT dated 24/6/2005 of MONRE, guiding the implementation of the Government's Decree No. 149/2004/ND-CP dated 27/7/2004 on the issuance of permits for water resource exploration, exploitation and use, or for discharge of wastewater into water sources;
- Decree No. 34/2005/ND-CP dated 17/3/2005 of the Government on sanctions against administrative violations of water resources management regulations.
- Circular No. 05/2005/TT-BTNMT dated 22/7/2005 of MONRE, guiding the implementation of the Government's Decree No. 34/2005/ND-CP dated 17/3/2005 on sanctions against administrative violations of water resources management regulations.
- Decree No. 38/2011/ND-CP dated 26/5/2011 of the Government amending and supplementing a number of articles providing for administrative procedures of the Decree No. 181/2004/ND-CP dated 29/10/2004, Decree No. 149/2004/ND-CP dated 27/7/2004, Decree No. 160/2005/ND-CP dated 27/12/2005

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2.4 Institutional Matters

The organizations listed in Table 2.4-1 are involved in inspection and environment check implemented at provincial level.

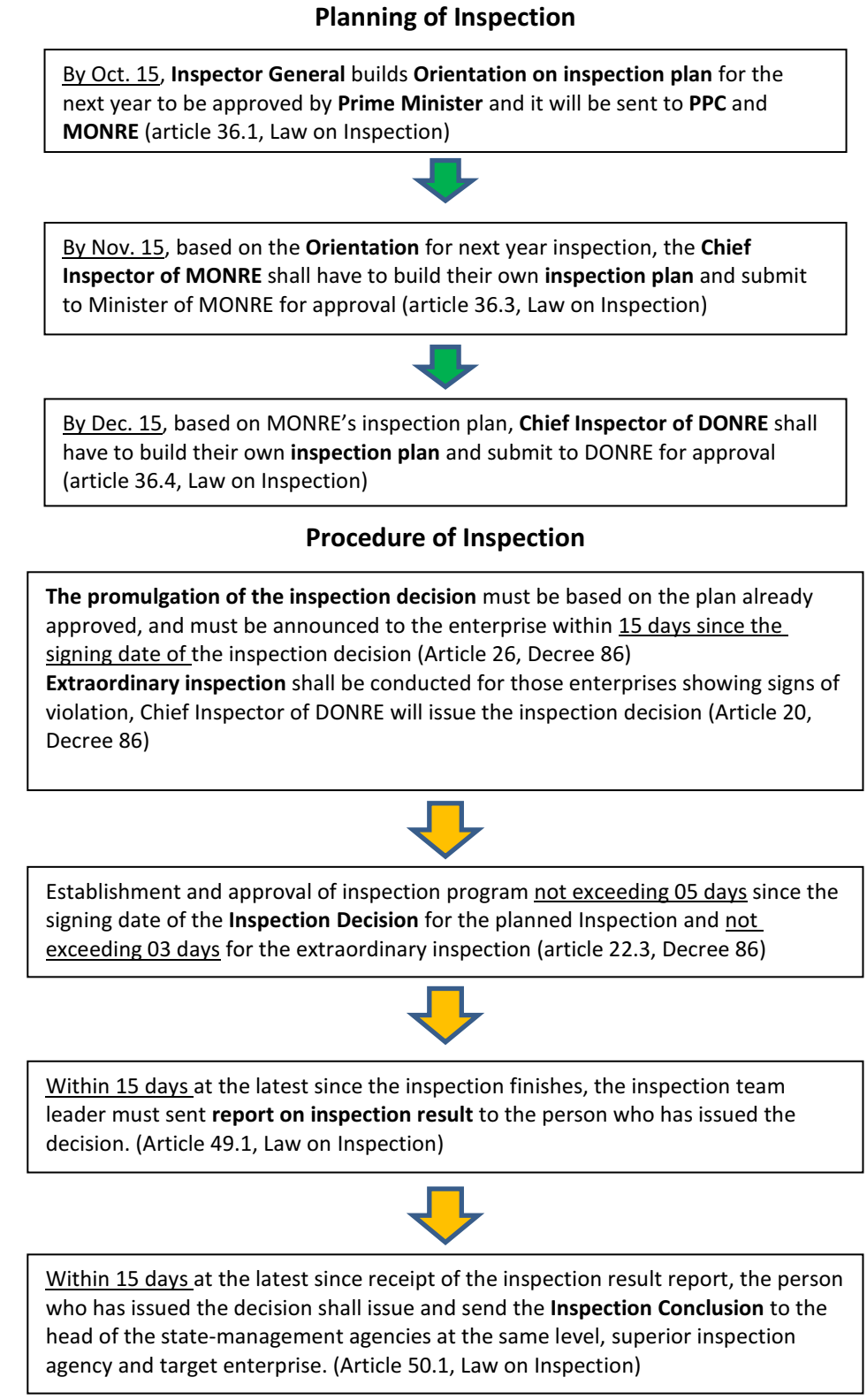
Table 2.4-1 Organizations Concerned with Inspection and Environment Check Activities at Provincial Level

Organizations	Activities and Tasks
Inspection Department of DONRE	Carry out environment-specialized inspection to give and impose administrative sanctions against violations, if they founded out.
Environmental Protection Agency (EPA) of DONRE	Carry out environment check for pollution sources and give recommendations to take appropriate protection measures..
Center for Environmental Monitoring of DONRE	Carry out sampling, field measurement and analysis for checking the compliance status to the national wastewater standards.
Water Resources Management Department of DONRE	Attend the environment check and inspection related wastewater discharge and water resources exploitation.
Environment Police Department	Carry out environment check to impose administrative sanctions and to make criminal accusation against violations.
District Level PCs	Carry out environment check for EPC/EPP registration projects to give recommendations and to impose administrative sanctions against violations.

Source: JET

2.5 Procedure of Inspection and Environment Check

General procedure of inspection and environment check prescribed in Decree No. 86/2011/ND-CP on Detailed Guideline for Implementation of Law on Inspection is summarized in Figure 2.5-1.



Source: JET

Figure 2.5-1 General Procedure of Inspection

CHAPTER 3 PROCEDURE OF INSPECTION RECOMMENDED

3.1 Preparation Work of Inspection and Environment Check

3.1.1 Identification of Criteria to Select Primary/crucial Pollution Sources

(1) Viewpoints to Select Primary/Crucial Pollution Sources

For preparing annual inspection and environment check plans, one of the important matters is to select primary/crucial pollution sources to be inspected/checked carefully. WG2-4 of each DONRE and JET discussed how to select the pollution sources to be inspected/checked, and identified the viewpoints important for selecting primary/crucial pollution sources (see Table 3.1-1).

Table 3.1-1 Viewpoints for Selecting Primary Crucial Pollution Sources

No	Category	Examples of Viewpoints	Items to be checked	Expected Information Source
1	Governmental strategy and instruction	Instruction for preparing inspection plan from national and provincial government	Yearly instruction from MONRE for planning of yearly inspection plan Yearly instruction from PPC for planning of yearly inspection plan	- Instruction document
2	Follow-up on previous administrative guidance given to pollution sources	Listed pollution sources by relevant decisions and circulars etc.	Decision No 64/2003/QD-TTg (According to preliminary analysis by Ouput-3, around 70% of target facilities have adopted countermeasures.) Circular No.04/2012/TT-BTNMT Other decisions and circulars, if any	- Record of countermeasures planned and implemented
3		History of penalties and administrative guidance given to pollution sources	Penalties given Administrative guidance given	- List of penalties and administrative guidance
4		History of countermeasures applied based on the administrative guidance given to pollution sources	Countermeasures adopted by pollution sources based on administrative guidance	- Record of follow-up inspection/environment check on the pollution sources given to the enterprises - Record from entity on how it has rectified the situation based on the instruction/guidance
5		Record of complaints/denounciations to pollution sources	Complaints on water environment issues	- Information from district DONRE
6	Obtention of information obtained by environment check	Pollution sources to be inspected based on the environment check results in past	Pollution sources without required environmental registrations Pollution sources paying insufficient amount of environmental protection fee for wastewater discharge Pollution sources discharging wastewater illegally Pollution sources having issues on their wastewater treatment system and its operation Quality of wastewater monitored	- Environment check report - Record from entity on how it has rectified the situation based on the instruction/guidance
7	Obtention of information obtained by inspection by Environmental Police Department	Pollution sources to be inspected based on the information from Environmental Police Department	Pollution sources discharging wastewater illegally Pollution sources having issues on their wastewater treatment system and its operation	- Report of Environmental Police Department
8	Primary industrial sectors and pollution sources on wastewater control	Type of industrial sectors to be checked	Each DONRE has own industrial sectors to be focused.	- List of pollution sources on industrial sectors to be focused
9		Amount of wastewater discharge or designed capacity	Annual amount of production by each enterprise Amount of collected environmental protection fee for wastewater discharge by each entity	- Basic statistical data of enterprises in TT-Hue province - Record of collected amount of environmental protection fee
10		Status of wastewater treatment facilities	Equipped condition of wastewater treatment facilities Operation condition of wastewater treatment facilities	- Minute of inspection and environment check
11	Others	Areas/zones to be focused	Areas polluted seriously Water body utilized for daily life/agriculture/fishery with receiving wastewater from enterprises	- Environmental monitoring information - Water pollution control plan in each province

Source: WG 2-4 of each DONRE and JET

3.1.2 Review of Relevant Information in Preparation Stage for Implementation of Effective Inspection and Environment Check

(1) Objectives of Information Review

Review of relevant information of the target enterprises in the preparation stage is essential and important for effective inspection and environment check. The reviewing work contributes to;

- Familiarizing officers with facility operations
- Conducting a timely inspection
- Minimizing inconvenience to the enterprises by not requesting data previously provided
- Clarifying technical and legal issues before entry, and
- Developing a sound and factual inspection/environment check report.

During reviewing of the relevant information, the following topics should be discussed and confirmed.

Objectives

- What is the purpose of this inspection/environment check?
- What is to be accomplished by this inspection/environment check?

Tasks

- What tasks are to be conducted?
- What information must be collected?
- What records will be reviewed?

Procedures

- What procedures are to be used?
- Will the inspection require special procedures?

Resources

- What personnel will be required?
- What equipment will be required?

(2) Types of Information to be Referred

The types of information to be reviewed are listed in Table 3.1-2. The example of available information sources are;

- Past inspection and environment check records,
- Past record of administrative sanctions,
- Enterprise self-monitoring reports,
- EIA/EPP/EPC documents,
- Legal approvals related to water environment management such as groundtwaer exploitation permission and wastewater discharge permission, and
- Record of environmental protection fee payment.

In the Project, each DONRE developed a pollution source inventory (PSI). JET recommended that Information obtained by inspection will be reflected into the PSI by updating the information stored in PSI. When the system of collecting and checking information in PSI is established, and reliability of the information stored in the PSI is secured, PSI will be one of the information sources for reviewing work in the preparation stage of inspection and environment check.

Table 3.1-2 Information to be Referred to during Preparation Work of Inspection/Environment Check

Category	Example of Information to be Referred
General Facility Information	- Maps showing facility location, including location of wastewater discharge pipes, and wastewater sampling points - Plant layout and process - Description of processing operations and wastewater discharges - Production amount
Requirements, Regulations, and Limitations	- EIA/EPC document - Wastewater discharge license - Groundwater exploitation license - Status of environmental protection fee payment
Facility Compliance and Enforcement History	- Previous inspection reports - Correspondence among facility, local, State, and Federal agencies - Documentation on past compliance violations, exceedences, status of requested regulatory corrective action, if any - Previous administrative guidance and function issued to facility - Enforcement actions such as compliance schedules and consent orders
Pollution Control and Treatment Systems	- Description of wastewater treatment system - Self-monitoring data and reports - Pollution control units, treatment methods, and monitoring systems

Source: WG2-4 and JET

(3) Proposals on Collecting Required Information for Preparation Work

1) Example of Table of Contents (TOC) of Enterprise Self-monitoring Report

An enterprise self-monitoring report is one of important information tools to grasp the latest status of the target enterprise. However, the information to be reported in a self-monitoring report has not been clearly stipulated in related laws and regulations, and some reports do not have enough information for reviewing work in the preparation stage of inspection ad environment check. In the Project, HPG DONRE, proposed a format of enterprise self-monitoring report as shown in Table 3.1-3. The TOC can be referred to by other DONREs to instruct local enterprises to report the specified information in their enterprise self-monitoring report.

Table 3.1-3 Proposed Standard TOC on Enterprise Self-monitoring Reports

I. INTRODUCTION 1.1. Overview of monitoring activities 1.2. Legal and technical basis of the performance report of environmental monitoring 1.3. Organization of implementation
II. OPERATIONAL AND ENVIRONMENTAL PROTECTION STATUS 2.1. General information of the entity 2.2. Sources of environmental impacts and measures to deal with negative environmental impacts being applied 2.3. Compliance with environmental laws
III. ACTIVITY MONITORING & ANALYSIS 3.1. Monitoring plan . 3.2. Monitoring and analysis activities . 3.2.1. Method and equipment 3.2.2 Sampling and preservation of samples 3.2.3. Monitoring results in the field . 3.2.4. Results of analysis in laboratory . 3.3. Ensuring quality control and monitoring and analysis (QA / QC). 3.3.1. Applying and maintaining quality management system 3.3.2. Quality assurance and quality control (QA / QC) 3.4. Comparing the results of the monitoring between March and August 2010
IV. Evaluation and recommendations 4.1. Results of compliance with environmental protection laws 4.2. Existing issues 4.3. Plan to solve existing issues .
V. Appendix Appendix 1: Location map of sampling . Appendix 2: Minutes of the field sampling. . Appendix 3: Results from in-situ quick measurement and water sampling. Appendix 4: Noise monitoring result sheet Appendix 5: Water sample analysis result sheet.. Appendix 6: Air monitoring and analysis result sheet . Appendix 7: Stack monitoring and analysis result sheet

Appendix 8: Photos from environmental monitoring activities
Appendix 9: Certificate of registration of science and technology .
Appendix 10: Certificate accredited laboratory in accordance with the requirements of ISO / IEC 17025-2005.

Source: HACEM

2) Reviewing of Previous Inspection and Environment Check Record

Previous inspection and environment check reports are also important sources of information in the preparation stage. Table 3.1-4 shows the information in previous inspection and environment check report that have to be reviewed.

Table 3.1-4 Main Items to be Reviewed by Previous Inspection and Environment Check Report

Record	Main Items to be Reviewed
(1) Past Inspection Record	Status of operation (type of activity, amount of products, number of employee, amount of water usage)
	Status of environmental permission (1. EIA/EPC/EPP, 2. Wastewater discharge license, 3. Amount of paid environmental protection fee)
	Capacity and system of wastewater treatment plant
	Instruction to enterprise during on-site inspection (recorded instructions in minutes of inspection prepared at on-site work)
	Given sanction, if any
	Analytical results of wastewater characteristics
(2) Past Environment check Record	Status of operation (type of activity, amount of products, number of employee, amount of water usage)
	Factors causing possible environmental pollution (wastewater, sludge, hazardous chemicals and waste etc.)
	Capacity and system of wastewater treatment plant
	Process chart of wastewater treatment system, if any
	Status of environmental permission (1. EIA/EPC/EPP, 2. Wastewater discharge license, 3. Amount of paid environmental protection fee)
	Instruction to enterprise during on-site inspection (recorded instructions in minutes of inspection prepared at on-site work)
	Analytical results of wastewater characteristics

Source: JET

3.2 On-site Work of Inspection and Environment Check

Based on the capacity assessment activities implemented by the Project, it was found that knowledge on effluent treatment system and its operation condition, and experience to monitor effluent quality/quantity using tools/equipment at site, should be improved. In this section, information related to these two items are provided.

3.2.1 Knowledge and Experiences to Check Wastewater Management System

(1) Items to be Checked on Site

During field work, officers should check the following information related to wastewater treatment system and operation condition.

Table 3.2-1 Items to be Checked on Wastewater Treatment System and Operation at Site

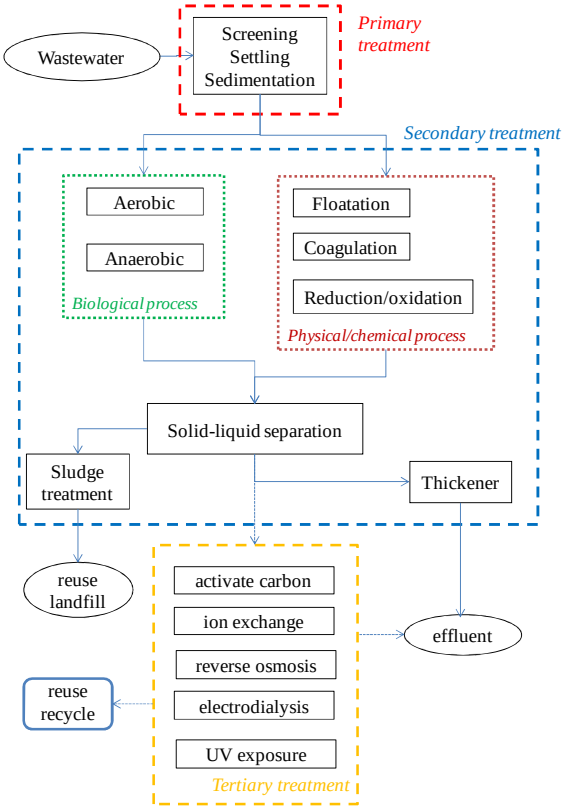
Category	Items to be Checked
Wastewater streams	- Sewerage network and wastewater discharge point. (Maps showing the discharge network) - Quantity of WW discharge m^3/d - Discharge outlets - Industrial/domestic effluents separate or mixed - Points of discharging and receiving bodies
Treatment Plant	location of the plant and surrounding units Units connected to the treatment plant Type and description of the treatment process - Description of treatment equipment and its design elements - Input / output water loads - Input/output water quality - Design and actual efficiency
Sludge Generation	- Sources of sludge generation

Category	Items to be Checked
	- Sludge treatment - Characterization of sludge produced - Quantity of sludge - Final sludge disposal methods
Chemicals Used	- Type of chemicals used - Amounts of chemicals - Storage facilities - List their main environmental and flammability properties
Plan for emergency	- Existing a by-pass sewer line - Existing an equalizing tank to hold wastewater in case of any process failure - Trained maintenance staff
Monitoring plan	- Indicators to be monitored - Sampling timetable - Sampling points - Lab conducting analysis (onside or outside) - Responsible person - Analyses protocols - Internal reports - Maintenance and calibration of self-monitoring instruments

Source: JET

(2) Process of Wastewater Treatment System

A general flow of wastewater treatment system is shown in Figure 3.2-1. When a wastewater treatment system is checked at site, the process of wastewater treatment should be checked.



Source: JET

Figure 3.2-1 General Process Flow of Wastewater Treatment System

The process of wastewater treatment system is dependent on the type of industrial sector. Officers should have knowledge on the processes of typical wastewater treatment systems of main industrial sectors in the area where the officers work for inspection and environment check.

Attachment-2 of this handbook introduces some examples of typical processes of manufacturing/processing and wastewater treatment systems by industrial sector.

(3) Visual Check on Wastewater Treatment System and Operation Condition at Site

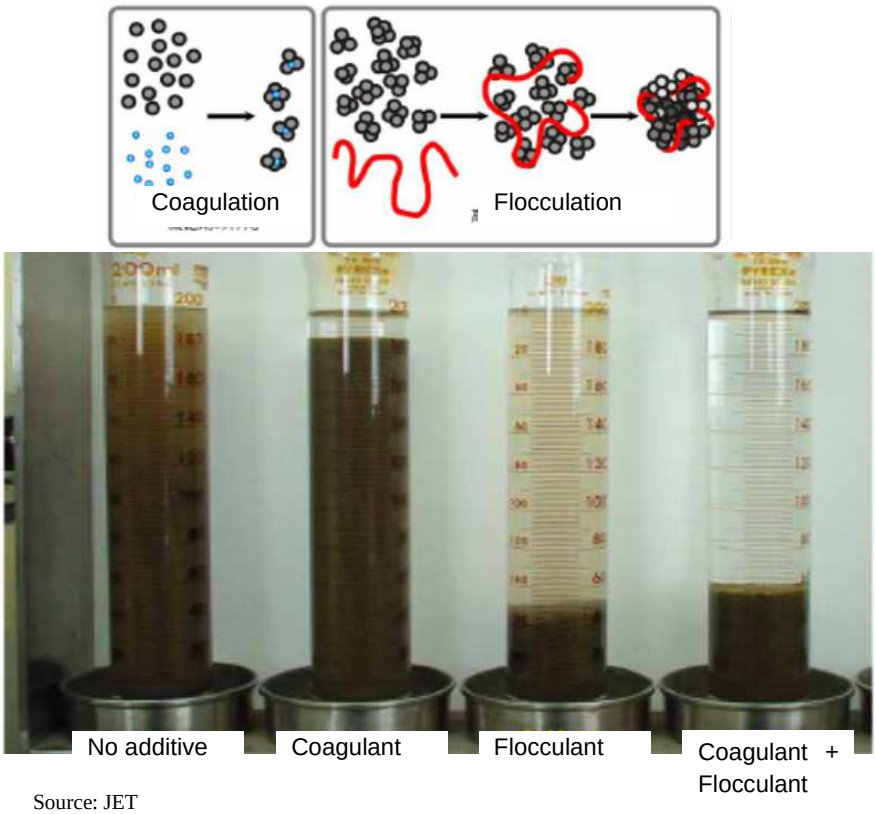
At the site, officers can check operation condition of wastewater treatment plant by visual/sensory check and review of operation records. Important points to be checked during on-site inspection of wastewater treatment are as follows.

Physical Treatment Process

- High levels of noise may indicate improper maintenance of mechanical equipment.
- If serious cogging or cracks are found, the facility is not maintained well.

Chemical Treatment Process

- By review of documents, type and amount of chemicals used should be checked.
- Record of generated sludge treatment should be checked.
- pH level should be checked whether chemical treatment process is operated well.
- Regarding chemical treatment process related to coagulation and flocculation process, its effectiveness is different depending on type of chemicals inputted such as coagulant and flocculant as shown in Figure 3.2-2. Officers should confirm the chemicals in use during field work.

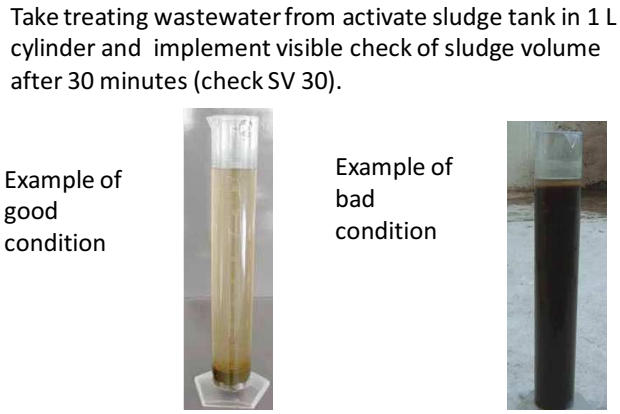


Source: JET

Figure 3.2-2 Effectiveness of Coagulant and Flocculant

Biological Treatment Process

- An extremely dark brown color with the odor of hydrogen sulphide in aeration tank of activated sludge treatment indicates poor oxidation. A dark brown color with an earthy smell of oxidized wastewater in the aeration tank is an indication of proper functioning of the system.
- When air bubbles on the surface of the aeration tank is observed, activate sludge tank is considered to be operated properly.
- Thick, dark, greasy, scummy layers of deep tan with brown foam covering surface of aeration tanks indicates that sludge is too old and may be over oxidized.
- Excessive, billowing, white foam in aeration tanks may be due to young sludge.
- Excessive, billowing, white foam in aeration tanks may be due to young sludge.
- Operation condition of activated sludge tank can be checked by sampling of treated wastewater as shown in Figure 3.2-3.



Source: JET

Figure 3.2-3 Checking of Activated Sludge Treatment System Operation Condition by Sampling Wastewater with Sludge

By checking operation record, condition of pH level, water temperature, dissolved oxygen concentration, and inflowing untreated wastewater quality, whether operation condition of activated sludge system is suitable or not should be confirmed. Examples of appropriate figures of pH level, water temperature, dissolved oxygen concentration are shown in Table 3.2-2.

Table 3.2-2 General Appropriate Figures on Several Parameters related to Operation of Activated Sludge System

Factor	General Appropriate Figure
pH	6-8
Water Temperature	20 -30 ^{o}C
DO	2 – 5 mg/L
Inflowing untreated wastewater quality	As stable as possible

Source: JET

(4) Maintenance of Wastewater Treatment System

According to the Output-3 of the Project, many enterprises that have wastewater treatment systems do not maintain their systems well. Officers in charge of inspection and environment check are desired to have knowledge on suitable maintenance of wastewater treatment system. Examples of check points are shown in Table 3.2-3.

Table 3.2-3 Checkpoints on Maintenance of Wastewater Treatment Facilities

No	Facilities/Equipment		Checkpoints
1	Primary sedimentation tank	Breakage of tank & attached equipment	Check for cracks, deformities, or other damage.
		Removal of suspended sludge	Interview whether settled sludge is removed regularly or not.
2	Chemical tank	Supply of chemicals	Check chemical consumption by operation record.
		Check for leakage	Check for any cracks or corrosion.
		Dissolution of chemicals	Confirm whether polymer coagulant is dissolved completely or not. If dissolved condition is unsuitable, clogging may be caused.
3	pH control tank	Operation condition of pH control tank	Interview on operation condition to confirm whether any measure is adopted to adjust pH value in relation to stableness of pH value and interval of supply oc chemicals.
		Location of pH electrode	Confirm whether pH electrode is installed at representative location in the tank or not. Usually, pH electrode is installed at near the outlet.
		pH meter maintenance	Check for pH meter maintenance condition, such as frequency of cleaning of pH electrode (ex. every day), ad calibration of pH meter (ex. every week).
4	Flocculation tank and settling tank	Amount of flocculating reagent	Check whether the operator of the tank controls amount of flocculating periodically or not by interview and reviewing operation record. Flocculation is insufficient if amount of reagent used is too small or too large.
		Stirring speed	Check whether the operator of the tank controls stirring speed of wastewater by interview to the operator and reviewing operation record.
		Appropriate pH range	Check whether the operator of the tank controls appropriate pH range or not by interview to the operator and reviewing operation record. Sufficient flocculation is not arisen if the pH value of the effluent is not adjusted in the suitable range for clocculation.
		Check inside tank and removal of setting sludge	Check whether sludge is removed periodically or not by interview to the operator and reviewing operation record.
5	Floatation separation tank	Removal of floating substances	Check whether floating objects is considered to be removed periodically by visible checking, interview to the operator and reviewing operation record.
		Air bubbles of pressurized water	If pressurized flotation units is used, check air bubbles to attain the fine bubbles to suit floating separation by adjusting air pressure and/or water level.
		Adjusting in-and out-flow of water	Check whether the ratio of effluent volume is adjusted by any measure or not by interview to the operator..
6	Biological treatment tank	Aeration tank	Check for the following conditions: (1) If fine flock or small pieces of sludge found in effluent, the tank may have too little load or too much air. (2) If large amount of suspended solids is observed and turbidity is high, the tank may have too much load, too little air, or bulking condition. (3) Filamentous microorganism may arise the following condition; ✓ Operated under low dissolved oxygen conditions ✓ Operated under high BOD-SS load conditions ✓ Ratio of BOD: N: P in the effluent considerably differs from appropriate value (100:5:1)
7	Filtration, sludge dewatering equipment	Filtration	Check for filtering machine whether damage or clogging on the filtering media is checked or not by interview to the operator and reviewing operation record.
		Sludge generated by dewatering	Check for the following conditions: (1) Check point for filter press: clogging of filter cloth and blocking of piping (2) Check point for belt press: side leak (sludge protruding from filter cloth – adjust sludge supply by re-checking aggregation condition), good extraction of sludge (3) Check point for centrifugal dewatering machine: dehydrator may be damaged even by small sand.

Source: "Guideline of Industrial Wastewater Management", JICA, The Project for Enhancing Capacity of VAST in Water Environment Protection Phase II, March 2009.

(5) Chemicals Used in Wastewater Treatment Systems

Typical chemicals used in wastewater treatment systems are shown in Table 3.2-4. In inspection and environment check, usage of chemical should be checked by interviewing the operators and reviewing the operation record.

Table 3.2-4 Chemicals Applied for Wastewater Treatment System

Process	Purpose	Chemicals	Amount required
Coagulants	Improved SS, BOD, COD, metals and oil & grease removal	Bentonite clay, Aluminum chloride, Aluminum hydrochloride, Aluminum sulfate, Ferric chloride, Ferrous sulfate	200 – 1,000 mg/L, depends on the concentration of SS and pH Jar testing is required
Flocculants	Flocculants for clarification, floatation and sludge dewatering	Acrylic acids, Polyacrylamide, DADMAC Anion ←→Cation	2 – 20 mg/L, depends on the concentration of SS and pH Jar testing is required
Sludge conditioner	Polymers to help dewatering of sludge	Perlite, Lime, Silicon dioxide	Around 1 % of sludge amount
Neutralization	Acids: Hydrochloric acid, Sulfuric acid Alkali: Hydrated lime, Sodium hydroxide		Depends on the concentration of hydrogen ion in wastewater
Heavy metal precipitant	Providing metals removal to ultra-low concentrations	Sodium sulfide	Depends on the metal concentration and pH of wastewater
Deformer	Eliminating forms from all processes: food processor, pulp & paper, textile, automobile and metal finishers	Silicon oil, Dimethylpolysiloxane	Depends on the amounts and characteristics of the wastewater; Prior testing is required.
Filter aid	Improving filtration and dewatering rates	Bentonite clay, Perlite	
Activated carbon	Powdered and granular products for removal of highly soluble contaminants including BOD, COD, pesticides, PCB and colors	Charcoal, Mineral coal	
Odor control agent	Control of offensive odors	Potassium permanganate	
Oxidizing agent	Decomposition of cyanide	Sodium hypochlorite	
Reducing agent	Hexavalent chromium reduction	Ferric sulfide, Sodium bisulfite	
Disinfection	Sterilization of treated water before discharge	Sodium hypochlorite	

Source: JET

(6) Concept on Production Process Improvement

Regarding production process improvement, introduction of cleaner production technology is one of the ways to be adopted. In the Project, lectures on how to introduce cleaner production technology were provided in accordance with requests by DONREs.

Cleaner production (CP) implies the pollution prevention approach in a production line, concentrating on avoiding pollution. CP can be realized by employing several steps, like:

- Process design/redesign to eliminate or reduce emissions to air, water and to reduce formation of waste and energy consumption;
- Substitution of fuels, chemicals, raw materials, etc. by means of environmentally less harmful ones; and
- Minimization and reduction of pollution by means of process control, maintenance, “end-of-pipe” technologies, etc.

CP is a common scheme that can be applied to renovation of industrial production process. It can be more beneficially used as a management tool, when it is applied together with the management of: energy efficiency; hazardous waste management; occupational health and safety; end-of-pipe; and environmental management system (EMS) by means of ISO 14001 or equivalent.

In general, CP technologies are adopted through rapid scan assessments and, then, full CP in-plant assessments made by specialized institutions in the fields, as shown in Box 3.2-1.

Box 3.2-1 Application Step of Cleaner Production Technologies

Step1: Rapid Scans
Quick scans consist of a rapid review and evaluation of the CP improvement potential of a subject industry. During a short-time visit, the consultant evaluates in which processes of the production line a company has the most potential for economic and environmental improvement through the application of CP and gives a rough estimation of how much these improvements could be.
The idea is to show the industries the benefits it might get from the application of CP, in the hope that the management will then be ready to invest in a full CP assessment.

Step 2: Full CP Assessments
The objective of full CP assessment is to analyze the situation of a subject industry; develop ideas for potential improvements; determine technical and financial feasibility as well as environmental relevance; and develop an action plan for their implementation.
The assessment covers the whole company or focus on selected processes. While the company staff is carrying out the work under the responsibility of a CP team, the consultants visit the company on a regular basis to support the team and ensure that the assessment is progressing according to plan.
The ultimate objective is that the company is able to apply CP on a continuous basis even after the consultants have completed their support. This requires not only the acquisition of specific skills, but also significant changes of attitudes within the company staff and management.

Source: Vietnam Cleaner Production Center, Situation Analysis Paper On Cleaner Production In Vietnam (2005)

3.2.2 Experiences and Skills of Field Measurement

(1) Parameters to be Checked by Each Industrial Sector

To check wastewater management system at site, officers in charge of inspection and environment check should have knowledge on anticipated characteristics of wastewater from different industrial sectors. Table 3.2-5 shows characteristics of representative parameters and possible sources. The parameters to be monitored in inspection and environment check are selected in accordance with the Circular No.04/2012/TT-BTNMT on Guidance of Classification and Decision of List of Entities Causing Environmental Pollution Required Administrative Sanction.

According to the Circular, characteristics of environmental parameters of the entity are determined as follows:

a) As regulated, environmental parameters of wastewater are required to be monitored periodically and recorded in EIA reports, Registration for meeting environmental standard, EPC, EPP, detailed EPP, and simple EPP of entities confirmed or approved by authorized/competent state agencies;

b) For the entities without such environmental parameters stipulated at part a) of this section, authorized state agency should monitor the parameters, based on characteristics and types of activities of the entity or each entity unit as stipulated in the Appendix enclosed with the Circular No.04/2012/TT-BTNMT.

Analytical reference sheet which introduces the Appendix of the Circular is shown in Attachment-3.

Table 3.2-5 Characteristics of Each Parameter with Main Possible Sources

Category	Parameter	Characteristic	Source (industry)	Causal material
Organic substances	BOD COD DO TOC	Microorganisms consume dissolved oxygen when ingesting organic substance, which may cause oxygen deficiency of the water body	Food industry, Pulp & paper, Petroleum, Chemical, Fermentation	Starch, Sugar, Protein, Oil & fat Petroleum, Organic chemicals
Turbidity	Suspended solids Turbidity	Concentrated SS may cause breathing problem and/or obstruction on photosynthesis.	Mining, Ceramic, Stone crushing, Pulp & paper, Food processing	Mineral, Soil, Clay Organic Particle/fiber
Oil and grease	Extractable by n-hexane	Oil can cause the death of organisms as breathing restraint or poisoning	Mineral oil: Petro, machinery, Iron, Ship building Plants & animals: food, Restaurant, Domestic wastes	Mineral oil, Grease and fats
Acid/alkali	pH	Suitable range of pH for aquatic life is 6.8 – 8.5	Mining, Plating, Steel, Tannery	Sulfuric/hydrochloric acid Lime, Caustic soda
Nutrients	Nitrogen Phosphorus	Cause of eutrophication	Sewage, Excrement, Food Livestock	Protein, Fertilizer Synthetic detergent
Color	Color	Sensuous pollution	pulp & paper, food, tannery, dyeing	Dye, Pigment, Lignin, Humic materials
Odor	Odor	Sensuous pollution	food, pulp & paper, etroleum, Chemical, Tannery, Sewage	Hydrogen sulfide, Ammonia, Fatty acid, Phenol, VOCs
Temperature	Water temperature	cooling water for condenser/equipment	oil refinery, ion and steel, Paper-pulp, Thermal power plant	Heated water
Microorganism	coliform	index on possibility of bacterial pathogen	sewage, excrement, livestock, food processing	Coliform, Bacterium
Heavy metals	Pb	gastritis, plumbism, cephalea, anemia, abortion	accumulator battery, leaded petrol, pigment	Chemicals, Mining products
	Cd	damage on liver/kidney, Ca metabolism	plating, battery, pigment	Chemicals, Mining products
	Hg	gastric ulcer, renal failure damage on nervous (organic-Hg)	battery, fluorescent, pesticides, catalyst on electrolyse process	Chemicals, Mining products
	As	alimentary disease, pigmentation on skin	mining, tannery, semiconductor	Chemicals, Mining products
	Cr (VI)	gastroenteritis, skin ulcer, cancerogenic	chemical process plating	Chemicals, Mining products

Source: JET

(2) Methods of Wastewater Sampling

In this section, grab sampling and composite sampling are explained.

Grab Sampling

Grab samples consist of either a single discreet sample or individual samples collected over a period of time not to exceed 15 minutes. The grab sample should be representative of the wastewater conditions at the time of sample collection. The sample volume depends on the type and number of analyses to be performed.

Composite Sampling

Composite samples are collected over time, either by continuous sampling or by mixing discrete samples. A composite sample represents the average wastewater characteristics during the compositing period. Various methods for compositing are available and are based on either time or flow proportioning. The choice of a flow proportional or time composite-sampling scheme depends on the permit requirements, variability of the wastewater flow or concentration of pollutants, equipment availability, and sampling location. The investigator must know each of these criteria before a sampling program can be initiated. If an investigator knows or suspects that there is significant variability in the wastewater flow or if the investigator knows nothing about the facility, a flow proportional sample is preferable. Otherwise, a time composite sample would be acceptable.

Procedure of sampling and sample management is shown in Attachment-4.

(3) Check of Wastewater Quality on site

By usage of field measurement devises, water quality condition can be checked at site. The measurable parameters on site are shown in Table 3.2-6.

Table 3.2-6 Water Quality Parameters can be checked on site

Parameter	Description
Temperature	Elevated temperatures resulting from discharges of heated water may have significant ecological impact.
Appearance	To record the general physical appearance of a sample, use any terms that briefly describe its visible characteristics. These terms may state the presence of color, turbidity, suspended solids, organisms and their immature forms, sediment, floating material, and similar particulate matter detectable by the unaided eye.
Color	Color in water may result from the presence of natural metallic ions (iron and manganese), humus and peat materials, plankton, weeds, and industrial wastes.
Odor	Man and other animals can avoid many potentially toxic foods and waters because of adverse sensory response. These senses often provide the first warning of potential hazards in the environment.
Turbidity	Turbidity in water is caused by suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, and plankton and other microscopic organisms. There is correlation between turbidity and TSS under certain conditions.
pH	Practically every phase of water supply and wastewater treatment, e.g., acid-base neutralization, water softening, precipitation, coagulation, disinfection, and corrosion control, is pH-dependent.
Electric conductivity (EC)	Ability of an aqueous solution to carry an electric current depends on the presence of ions; on their total concentration, mobility, and valence; and on the temperature of measurement.
Total dissolved solids (TDS)	Waters with high dissolved solids generally are of inferior palatability and may induce an unfavorable physiological reaction in the transient consumer. For these reasons, a limit of 500 mg/L of dissolved solids is desirable for drinking waters.
Dissolved oxygen (DO)	Natural stream purification processes require adequate oxygen levels in order to provide for aerobic life forms. As dissolved oxygen levels below 5.0 mg/l, aquatic life is put under stress.
Oxidation-reduction potential (ORP)	ORP is typically measured to determine the oxidizing or reducing potential of a water sample. Excess chlorine in wastewater effluent will result in a large positive ORP value and the presence of hydrogen sulfide will result in a large negative ORP value.

Source: JET

With the mobile water quality analyzer provided by the Project as shown in Table 3.2-7, officers of each DONRE could conduct field analysis of wastewaters.

Table 3.2-7 Equipment for On-site Inspection/Environment Check

Type	Model	Specification
Multi-parameter water quality analyzer	Horiba U-52	pH: 0 – 14, resolution 0.01 pH DO: 0 – 50 mg/L, resolution 0.01 mg/L EC: 0 – 10 S/m, resolution 0. 1 mS/m Salinity: 0 – 70 ppt (‰), resolution 0.1 ppt TDS: 0 – 100 g/L, resolution 0. 1 % of full scale Temperature: -10 – 55 ºC, resolution 0.01 ºC Turbidity: 0 – 800 NTU, resolution 0.01 NTU ORP: -2000 – +2000 mV, resolution 1 mV

Source: JET

Table 3.2-8 shows the example of water quality measurement using the equipment at the site visited during the OJT. A brief manual for Horiba U-52 is attached as Attachment-5.

Table 3.2-8 Equipment for On-site Inspection/Environment Check

Parameter	unit	Untreated wastewater (at bypass waterway)	Treated wastewater (outlet of WWTF)
Temperature	^{o}C	26.5	26.6
pH	-	7.22	7.77
EC	mS/cm	42.2	28.3
DO	mg/L	7.62	5.48
TDS	mg/L	25.6	17.7

Source: JET

(4) Measurement of Wastewater Volume

Enterprises should regularly measure the volumes of water both inlet and outlet of the plants in order to pay the water resources and discharging fee. To measure flow of clean water in a closed pipe, it is common to use a displacement or velocity water meter. However for measurement of wastewater volume, such water meter is often not suitable because pollutant in wastewater can damage the mechanism of flow meter, or because wastewater often flows in open channel, and not in closed pipe. Thus, the measuring device should be selected considering different characteristics of wastewater.

There are two types of wastewater flow: closed channel flow and open channel flow. Closed channel flow occurs under pressure in a liquid-full conduit (usually a pipe). The facility might have a metering device inserted into the conduit which measure flow. In practice, closed channel flow is normally encountered between treatment units in a wastewater treatment plant, where liquids and/or sludge are pumped under pressure.

Open channel flow occurs in conduits that are not liquid-full. Open channel is a partially full pipe not under pressure. For measurement of open channel flow, primary and secondary devices are used. Primary devices are standard hydraulic structures, such as flumes and weirs, that are inserted in the open channel. Inspectors can obtain accurate flow measurements merely by measuring the depth of liquid (head) at the specific point in the primary device. In a weir application, for example, the flow rate is a function of the head of liquid above the weir crest.

The way to measure the volume of water flow is shown in Attachment-5.

The Project has provided water flow probe which can measure flow velocity in a water way. The specification of the equipment is shown in Table 3.2-9. Using the equipment, officers of each DONRE could conduct field measurements of wastewater flow rates on site. A brief manual for the equipment is attached as Attachment-6.

Table 3.2-9 Equipment for On-site Inspection/Environment Check

Type	Model	Specification
Flow meter	Global Water FP211	Sensor type: Turbo-Prop propeller with magnetic pickup Measurement range: 0.1 – 6.1 m/s Length of supporting rod: 1.5 – 4.5 m

Source: JET

(5) Off-site Survey

Often many potential concerns can be identified prior to entering the facility, such as illegal discharges, stressed vegetation, spills, smoke, or illegal dumping. Offsite survey also provides an opportunity for officers to determine the direction of inspection and environment check, and make Post-Field Work of Inspection and Environment check.

3.3 Follow-up Work of Inspection and Environment check

3.3.1 System to Refer to Information of Previous Inspection and Environment Check

(1) Information to be Stored as Reference for Next Inspection and Environment Check

As explained in the Chapter 2, information obtained by previous inspection and environment check is useful for planning effective inspection and environment check. In Japan, many local administrations store such information as electronic data. An example of information stored in Japanese local administration is listed below.

- Name of officer s implementing inspection
- Date of inspection
- Code number of entities
- Name of entities
- Established year of entities
- Contact address of entities
- Type and scale of Specified production process registered
- Wastewater quality analytical results
- Amount of wastewater discharge
- Findings through on-site work
- Provided advices, disposition and penalty, if any

(2) Preparation of Pollution Source Inventory System by the Project

In this Project, pollution source inventories (PSIs) were prepared to store information of pollution sources by each DONRE. The information stored in the prepared PSI includes:

- Basic information of activities implemented by enterprises,
- The types of activities related to wastewater discharge,
- Compliance status with Environmental Protection Law, Law on Inspection and Law of Water Resource (Ex: EIA, EPC, and EPP permission, Inspection and Environmental check, etc.), and
- Wastewater treatment system and operation condition with characteristics of discahrged wastewater.

The main objective of inspection is to evaluate compliance by the target entity to be regulated on orders prescribed by relevant laws and regulations, and give administrative guidance and sanction on illegal cases. DONRE obtains information on latest status of wastewater management and environmental compliance by enterprises through inspection, and such information can be used for not only the main objective of inspection but also for planning and evaluating of administrative measures for water environment management. To utilize information obtained by inspection for broader water environment management, it is recommended that information obtained by inspection and environment check should be reflected into the PSI to upgrade and update information stored.

3.3.2 Way of Providing Administrative Guidance and Sanction

(1) Administrative Sanction by Decree 117

Administrative sanctions are imposed based on Decree No. 117/2009/ND-CP. Chief inspector and inspector on duty have the competence to give sanctions. According to this decree, not only monetary fines but also other sanctions (cease of operation, remedies, etc.) can be given out as shown in Box 3.3-2. Penalty fee on illegal wastewater discharge is shown in Table 3.3-1. It should be noted that the information described below will be revised in near future after the amendment of the Decree No.117 becomes effective.

Box 3.2-2 Excerption of Administrative Violations and Sanctions in Decree No.117

1. Sanctioning Competence

The Decree gives the sanctioning competences with different sanctioning degrees to the following:

Article 40: Commune-level People's Committee chairpersons, District-level People's Committee chairpersons, Provincial-level People's Committee chairpersons.

Article 41: Environmental policeman on duty, Heads of commune-level Public Security Sections, Heads of district-level Environmental Police divisions and Public Security Division, Director of Environmental Police department.

Article 42: Specialized environmental protection inspectors of provincial-level DONREs on duty, Chief inspectors of provincial-level DONREs, Chief inspector of General department of Environment, Chief inspector of MONRE.

2. Form of Sanctions for Administrative Violations

The Decree defines forms of sanctions, as follows:

Article 3:

1. Principal sanctions: Caution, fine,

2. Additional sanctions: Deprivation of the right, license, confiscation of material evidence and means,

3. Remedies: Forced application of measures, forced restoration, forced transportation, forced destruction, forced proper implementation of all contents of EIA, forced proper operation, construction and installation, forced compliance, forced termination, forced recovery or handling, forced restoration.

Article 4:

Handling for polluting or seriously polluting establishments: operation suspension, forced relocation, operation ban, publication of information,

§3. Forms of Administrative Violations subject to Fines, Remedies and Others

The Decree classifies forms of administrative violation subject to fines, remedies and others (related to the water environment), as follows:

Article 7: Violation of procedural regulations on EPCs or EPSs (Environmental Protection Scheme)

Article 8: Violation of procedural regulation on EIA

Article 10: Violation of regulations on wastewater discharge

Article 15: Violation of environmental protection regulations committed by establishment on the list of seriously polluting establishments or establishments subject to forced relocation

Article 33: Violation of regulations on environmental incident response and handling

Article 34: Violation of regulations on provision of consultancy services for preparing environmental impact assessment reports or services for appraising environmental impact assessment reports

Article 35: Violation of regulations on payment of environmental protection charges, environmental rehabilitation and restoration deposits or insurance for environmental damage compensation liability

Article 36: Violation of regulations on collection, management, exploitation and use of environmental data and information

Article 37: Violation of regulations on protection and use of facilities, equipment or means for environmental protection

Article 39: Obstructing environmental protection state management, inspection, examination, or administrative sanctioning

Source: Implementation Plan of Inspection and Administrative Guidance for 2012

Table 3.3-1 Penalty Fee on Illegal Wastewater Discharge

Amount of Wastewater Discharge		Level of Excess of Standard			
		1	2	3	4
		Less than 2 times in excess of standard	From 2 times to 5 times in excess of standard	From 5 times to 10 times in excess of standard	More than 10 times
a	Less than 10 m^3/day	From VND 100,000 to 500,000	From VND 500,000 to 2,000,000	From VND 2,000,000 to 8,000,000	From VND 8,000,000 to 20,000,000
b	10 m^3/day to less than 50 m^3/day	From VND 500,000 to 2,000,000	From VND 2,000,000 to 8,000,000	From VND 8,000,000 to 20,000,000	From VND 20,000,000 to 50,000,000
c	50 m^3/day to less than 500 m^3/day	From VND 2,000,000 to 10,000,000	From VND 8,000,000 to 20,000,000	From VND 20,000,000 to 50,000,000	From VND 50,000,000 to 100,000,000
d	500 m^3/day to less than 2,000 m^3/day	From VND 10,000,000 to 20,000,000	From VND 20,000,000 to 50,000,000	From VND 50,000,000 to 100,000,000	From VND 100,000,000 to 150,000,000
e	2,000 m^3/day to less than 5,000 m^3/day	From VND 20,000,000 to 50,000,000	From VND 50,000,000 to 100,000,000	From VND 100,000,000 to 150,000,000	From VND 150,000,000 to 200,000,000
f	5,000 m^3/day to less than 10,000 m^3/day	From VND 50,000,000 to 100,000,000	From VND 100,000,000 to 150,000,000	From VND 150,000,000 to 200,000,000	From VND 200,000,000 to 250,000,000
g	More than 10,000 m^3/day	From VND 100,000,000 to 150,000,000	From VND 150,000,000 to 200,000,000	From VND 200,000,000 to 250,000,000	From VND 250,000,000 to 300,000,000

Note: Fine increases between 20 % to 30 %, if wastewater contains hazardous substances.
Fine increases between 30 % to 40 %, if wastewater contains hazardous substances.
Fine increases between 40 % to 50 %, if wastewater contains hazardous substances.

Source: Decree No. 117/2009/ND-CP

(2) Circular No.04/2012/TT-BTNMT

Circular No.04/2012/TT-BTNMT stipulates the criteria to determine environmental pollution entities (related to wastewater) as shown in Table 3.3-2.

Table 3.3-2 Environmental Pollution Entity Designated by Circular No.04/2012/TT-BTNMT

Exceeding level than criteria		2 – 3 parameters exceeding criteria	4 – 5 parameters exceeding criteria	6 or more
x 2 – 5	with hazardous waste	≥ 500 m^3/day	≥ 200 m^3/day	≥ 100 m^3/day
	without hazardous waste	≥ 1000 m^3/day	≥ 500 m^3/day	≥ 200 m^3/day
x 5 – 10	with hazardous waste	≥ 200 m^3/day	≥ 100 m^3/day	≥ 50 m^3/day
	without hazardous waste	≥ 500 m^3/day	≥ 200 m^3/day	≥ 100 m^3/day
x 10 – 50	with hazardous waste	≥ 100 m^3/day	≥ 50 m^3/day	≥ 10 m^3/day
	without hazardous waste	≥ 200 m^3/day	≥ 100 m^3/day	≥ 50 m^3/day
x 50 or more	with hazardous waste	≥ 50 m^3/day	≥ 10 m^3/day	
	without hazardous waste	≥ 100 m^3/day	≥ 50 m^3/day	

Source: Circular No.04/2012/TT-BTNMT

Note: The following enterprises are also recognized as environmental pollution entity:

- Discharging wastewater with radioactives causing environmental radioactive contamination exceeding environmental standard, technical regulations.
- Discharging wastewater with pH ≤ 2 or > 12.5

(3) Technical Regulation on Industrial Wastewater

National technical regulation on industrial wastewater is stipulated by QCVNs:

QCVN 01: 2008/BTNMT; Natural Rubber Processing Industry
QCVN 11: 2008/BTNMT; Aquatic Products Processing Industry
QCVN 12: 2008/BTNMT; Pulp and Paper Mills
QCVN 13: 2008/BTNMT; Textile Industry
QCVN 14: 2008/BTNMT; Domestic Wastewater
QCVN 25: 2009/BTNMT; Solid Waste Landfill Site
QCVN 28: 2010/BTNMT; Health Care Wastewater
QCVN 29: 2010/BTNMT; Petroleum Terminal and Stations
QCVN 40: 2011/BTNMT; Industrial Wastewater (general)

In the QCVNs, the allowable maximum values of pollution parameters in industrial wastewater discharged into receiving water body is calculated as follows:

$C_{max} = C \times K_q \times K_f$

where:
- Cmax: allowable maximum value of pollution parameters in industrial wastewater discharged into receiving facilities;
- C: value of pollution parameter in industrial wastewater stipulated in the table of QCVN
- Kq: discharge coefficient of the receiving water body

1) Kq corresponding to receiving water (river, stream, rillet, ditch or canal)

Flow rate of receiving water: Q (m^3/s)	Kq
$Q \leq 50$	0.9*
$50 < Q \leq 200$	1
$200 < Q \leq 500$	1.1
$Q > 500$	1.2

Q is calculated as average value of flow rate of wastewater receiving during the 03 driest months of 03 successive years

*: If there is no data on flow discharge of rivers, streams, rillets, canals, and ditches, the value Kq=0.9 shall be applied

2) Kq corresponding to receiving water (reservoir, lake, pond or swamp)

Capacity of receiving water: V (m^3)	Kq
$V \leq 10 \times 10^6$	0.6*
$10 \times 10^6 < Q \leq 100 \times 10^6$	0.8
$Q > 100 \times 10^6$	1.0

V is calculated as average value of volumetric capacity of reservoirs, lakes, ponds and swamps during the 03 driest months of 03 successive years

*: If there is no data on volumetric capacity of reservoirs, lakes, ponds and swamps, the value Kq=0.6 shall be applied.

3) Kq corresponding to receiving water which is inshore water, coastal saline or brackish lagoons.

- Inshore waters used for the purpose of protection of marine/aquatic organisms, water sports and other recreations, and coastal saline and brackish lagoons, Kq = 1 shall be applied.
- Inshore waters not used for the purpose of protection of marine/aquatic organisms, water sports and other recreations, Kq = 1.3 shall be applied.

- Kf: discharge coefficient of the wastewater source

Discharge coefficient Kf of wastewater source is stipulated in table below:

Flow rate of discharging water:	Kf

F (m^3/24h)	
$F \leq 50$	1.2
$50 < F \leq 500$	1.1
$500 < F \leq 5,000$	1.0
$F > 5,000$	0.9

F shall be estimated with the highest wastewater discharge flow recorded in reports of EIA/ EPC/ EPP

The C value is classified in column A and B in the table of QCVN:

Column A: pollution parameters in industrial wastewater discharged into receiving water used for domestic water supply or aquaculture purposes

Column B: pollution parameters in industrial wastewater discharged into receiving water **not** used for domestic water supply or aquaculture purposes

Attachment-6 shows the C values on each QCVN.

The amount of fine for wastewater discharge is based on the calculated value, number of times exceeding, shown as below:

$N = C_{measured}/C_{max}$

where:

- N: number of times exceeding
- $C_{measured}$: monitoring data taken at the site
- C_{max}: allowable maximum value of pollution parameters calculated

Attachment-1: Relevant Legal Documents in order of Date Issued

Relevant Legal Documents in order of Date Issued

Decree				
No.	Code	Title	Date issued	Status
1	175-CP	Guidance on the execution of Law on Environmental protection dated December 27, 1993 (now replaced by Law on Environmental protection dated Nov 29, 2005)	October 18, 1994	Invalid since Sep 2009 and replaced by Decree 80/2006/NĐ-CP
2	36/CP	Decree to promulgate the regulations on industrial zone, Export Processing Zone, Hi-tech Zone	April 24, 1997	Replaced by Decree no. 29/2008/NĐ-CP dated March 14, 2008
3	67/2003/NĐ-CP	Decree on the environment protect fee for wastewater	June 13, 2003	Replaced by Decree 26/2010/NĐ-CP dated March 22, 2010. A new Decree is being prepared.
4	140/2006/NĐ-CP	Regulation on the environmental protection in the preparation, revision, approval and organization of execution of the development strategy, planning, plan, program and project	November 22, 2006	Valid
5	80/2006/NĐ-CP	Stipulation in detail for and guidance on the execution of some articles in the law on Environmental protection	August 09, 2006	Some articles are replaced by Decree 29/2011/NĐ-CP
6	81/2006/NĐ-CP	Decree on the handling of administrative violations in the environment protection.	August 09, 2006	Replaced by Decree 117/2009/NĐ-CP
7	59/2007/NĐ-CP	Decree on the management of solid waste	April 09, 2007	Valid
8	88/2007/NĐ-CP	Decree on the urban and industrial zone drainage	May 28, 2007	Valid
9	29/2008/NĐ-CP	Regulations on Industrial Zone, Export Processing Zone and Economic Zone	March 14 2008	Valid

10	117/2009/ND-CP	Decree on the handling of law violations in the domain of environmental protection	December 31, 2009	Valid
11	86/2011/NĐ-CP	Stipulation in detail for and guidance on the execution of some articles in the law on Inspection	September 22, 2012	Valid
12	07/2012/NĐ-CP	Stipulation on the agencies to be assigned with the function of professional inspection and their activity of professional inspection	February 09 2012	valid

…/…/ND-CP: Decree of Government

Circular				
No.	Code	Title	Date issued	Status
1	490./1998/TT-BKHCNMT	Guidance on preparation and revision of the EIA for investment projects	April 29, 1998	Invalid
2	01/2001/TTLT-BKHCNMT-BXD	Guidance on the environmental protection regulations in the selection of the location for, construction and operation of the landfill for solid waste	January 18, 2001	Replaced by Circular 12/2011/TT-BTNMT dated April 14, 2011
3	114/2006/TTLT-BTC-TNMT	Guidance on the management of budget for environment work	December 29, 2006	Replaced by Circular 45/2010/TTLT-BTC-BTNMT dated March 30th, 2010
4	08/2006/TT-BTNMT	Guidance on the strategic environmental assessment, EIA and environmental protection commitment	September 08, 2006	Valid
5	07/2007/TT-BTNMT	Guidance on the categorization of and decision of the list of environmental pollution facilities requiring to be handled	July 03, 2007	Partly replaced by Circular 04/2012/TT-BTNMT dated May 8th, 2012
6	04/2008/TT-BTNMT	Guidance on the preparation, approval or certification of the environmental	September 18, 2008	Valid

		protection project and checking, inspection on the execution of environmental protection project		
7	08/2009/TT-BTNMT	Regulation on environmental management and protection in the economic zone, hi-tech zone, industrial zone and industrial cluster	July 15th, 2009	Valid
8	08/2010/TT-BTNMT	Regulation on the preparation for national environmental report, sector's EIA report and report on provincial existing environmental situation.	March 8, 2010	Valid
9	05/2008/TT-BTNMT	Guidance on the strategic environmental assessment, EIA and environmental protection commitment	December 08, 2012	**3.1** Replaced by Circular 26/2011/BTNMT dated July 18, 2011
10	04 /2012/TT-BTNMT	Regulation on the criteria for identifying environmental pollution entities and serious environmental pollution entities	May 08, 2012	Valid

…/…/TT-BKHCNMT: Circular of Ministry of Science Technology & Environment

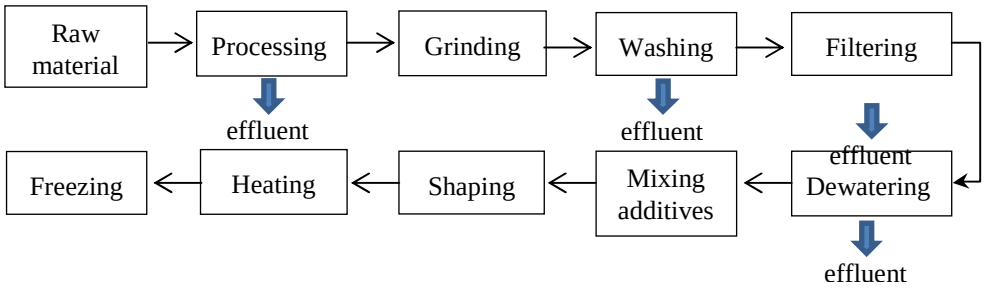
…/…/TT-BTNMT: Circular of Ministry of Natural Resources and Environment

Attachment-2: Flow Chart of Wastewater Treatment System by Each Industrial Sector

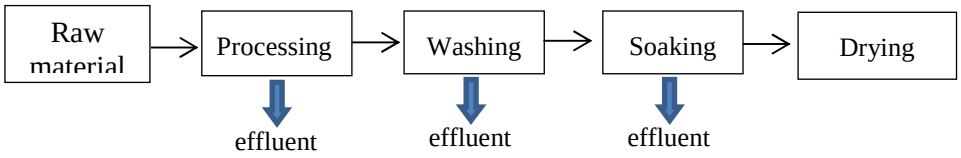
1) Seafood Processing Industry

Example flowchart of Production Process

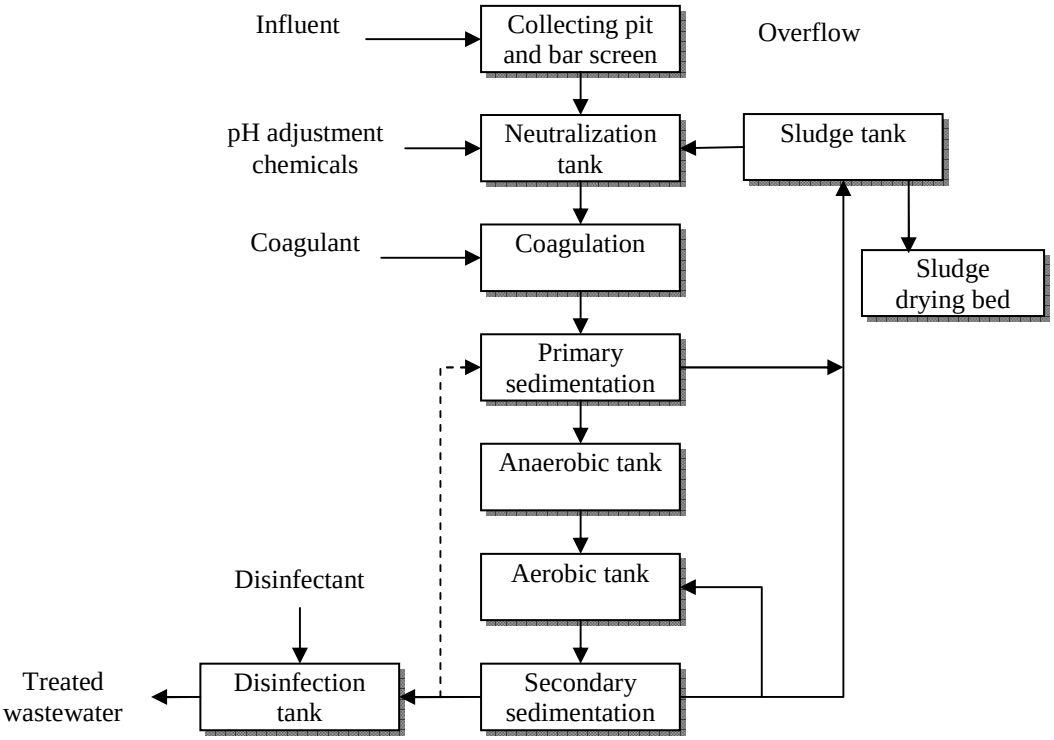
1) Surimi



2) Drying in the sun



Example flowchart of Wastewater Treatment Process



Source: "Wastewater Treatment Technology Manual" The Project for Enhancing Capacity of VAST in Water Environment Protection Phase II

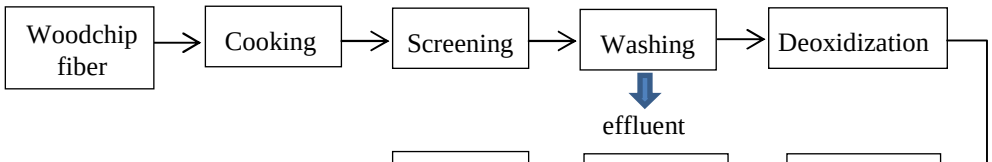
General Characteristic of Wastewater on Fish Processing
1) High concentration of organic materials and oil/fats 2) High concentration of particulates and semisolids 3) Seasonal change caused by amount of raw material supply and consumption Note: Wastewater characteristic is differ from type of raw materials and operation process

Water Consumption Rate (m^3/t-products)	
Fish fillet	40 – 85
Surimi	25 – 45
Frozen fish	4 – 6
Fish meal	3 – 5
Fish sauce	1 – 1.5

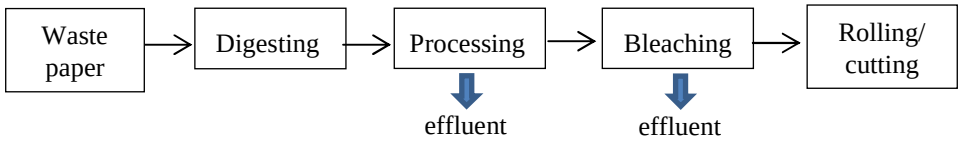
2) Pulp & Paper Product Industry

Example flowchart of industrial process

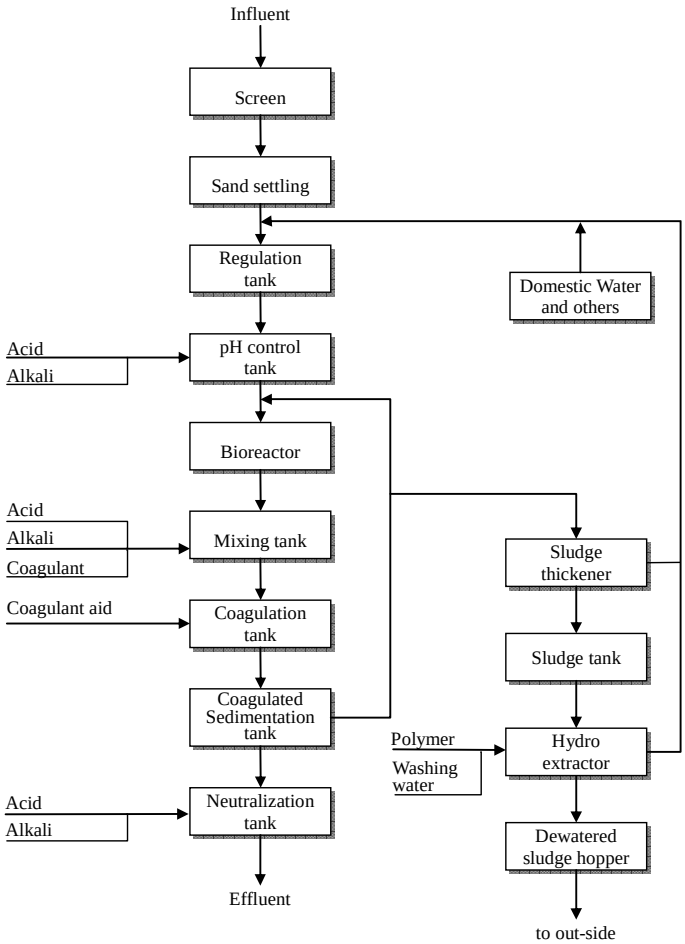
1) Kraft pulp



2) Recycle paper



Example flowchart of wastewater treatment process



Source: "Wastewater Treatment Technology Manual" The Project for Enhancing Capacity of VAST in Water Environment Protection Phase II

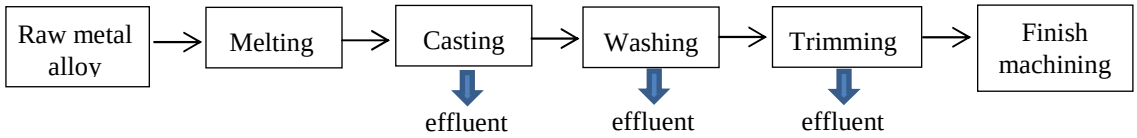
General Characteristic of Wastewater on Pulp and Paper Industry

1) Large amount of effluents
2) Colored and high concentration of COD from cooking wastewater on pulping process
3) A lot of fibers generated from paper making process, but no toxic substances

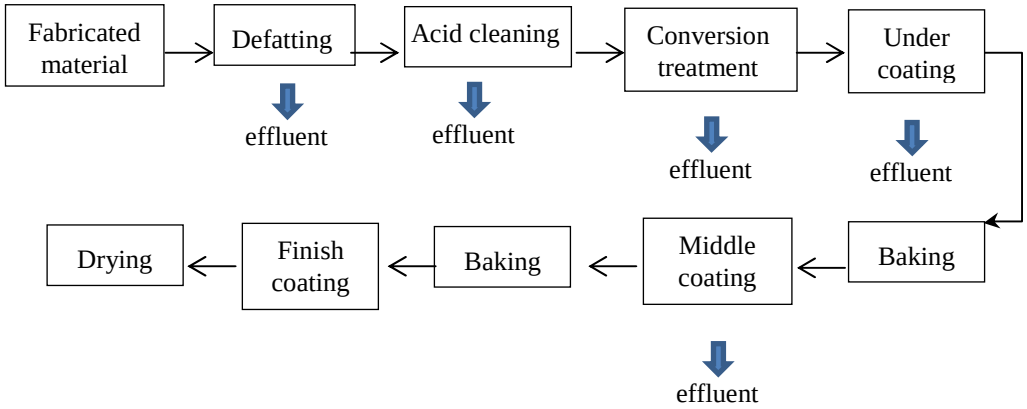
3) Machinery/metal processing Industry

Example flowchart of industrial process

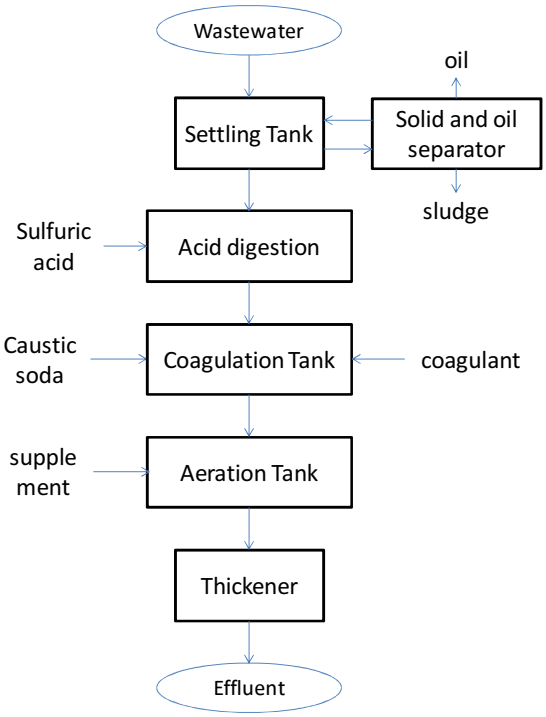
1) Die casting



2) Painting



Example flowchart of coolant wastewater treatment process in machinery industry

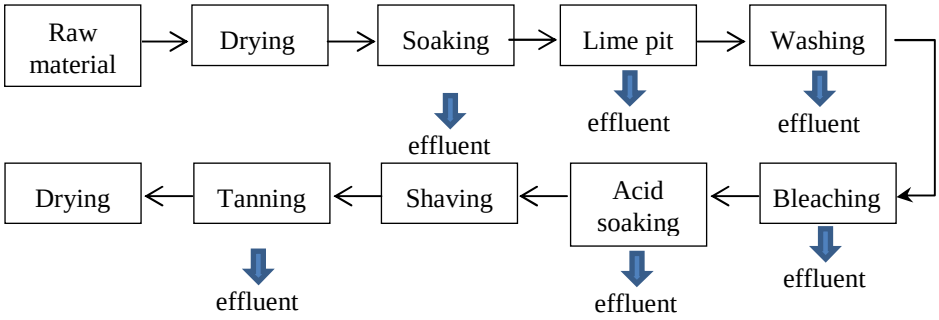


General Characteristic of Wastewater on Machinery Industry

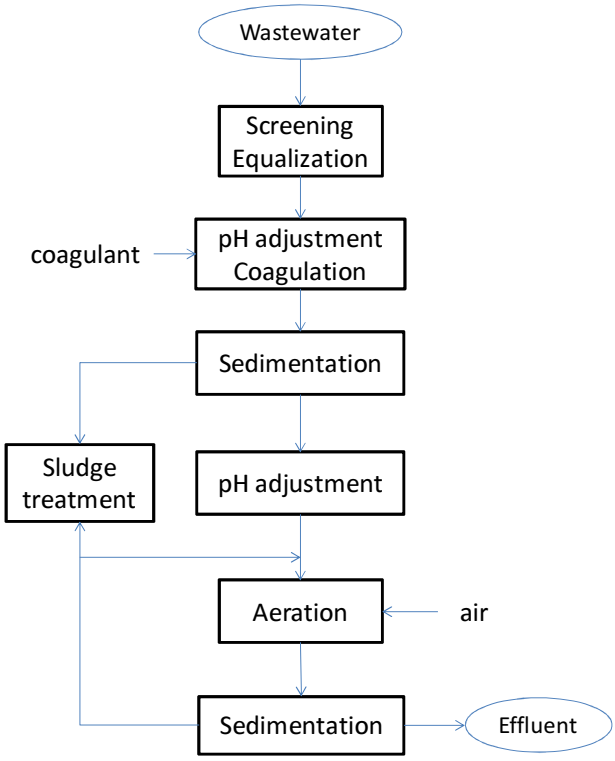
1) Oil/grease and organic solvents in coolant and rinse water
2) High turbidity with heavy metals from dust separating process
3) Paint and thinner components from coating process

4) Leather Processing Industry

Example flowchart of industrial process



Example flowchart of wastewater treatment process in leather industry



Source: "Guideline of Industrial Wastewater Management"
The Project for Enhancing Capacity of VAST in Water Environment Protection Phase II

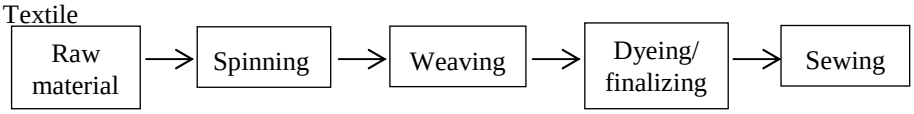
General Characteristic of Wastewater on Leather Industry

1) Fibers, fats with color from fur cleaning process
2) Alkaline wastewater from dehairing process
3) Chromium may contained in wastewater from tannery process

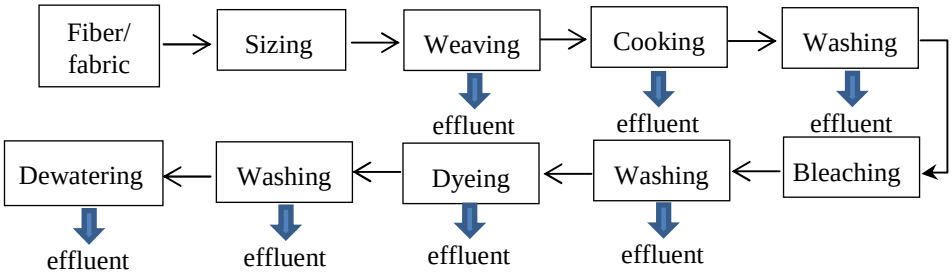
5) Textile Dyeing Industry

Example flowchart of industrial process

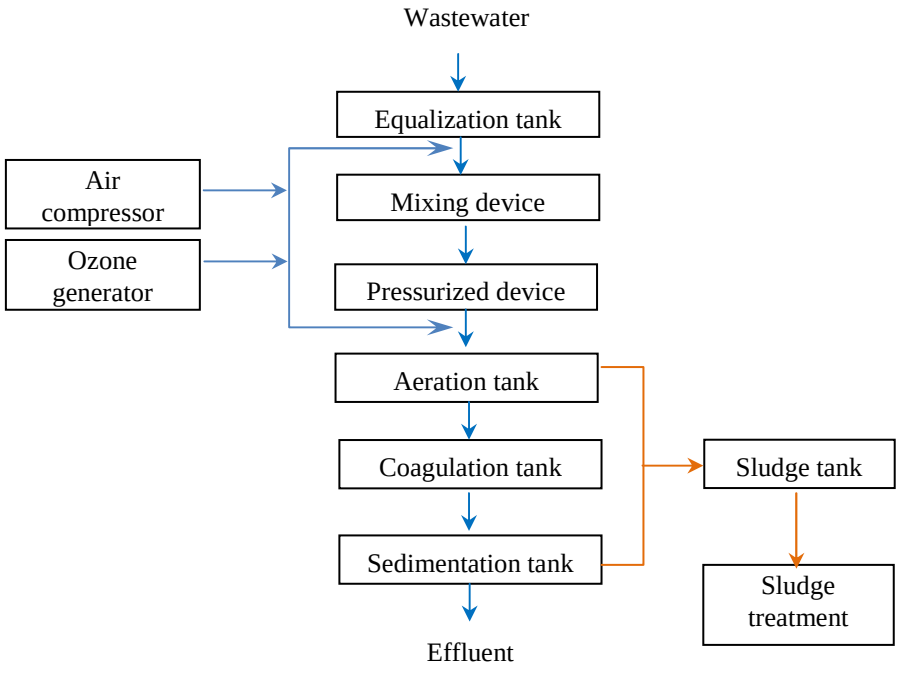
1) Textile



2) Dyeing



Example flowchart of wastewater treatment process



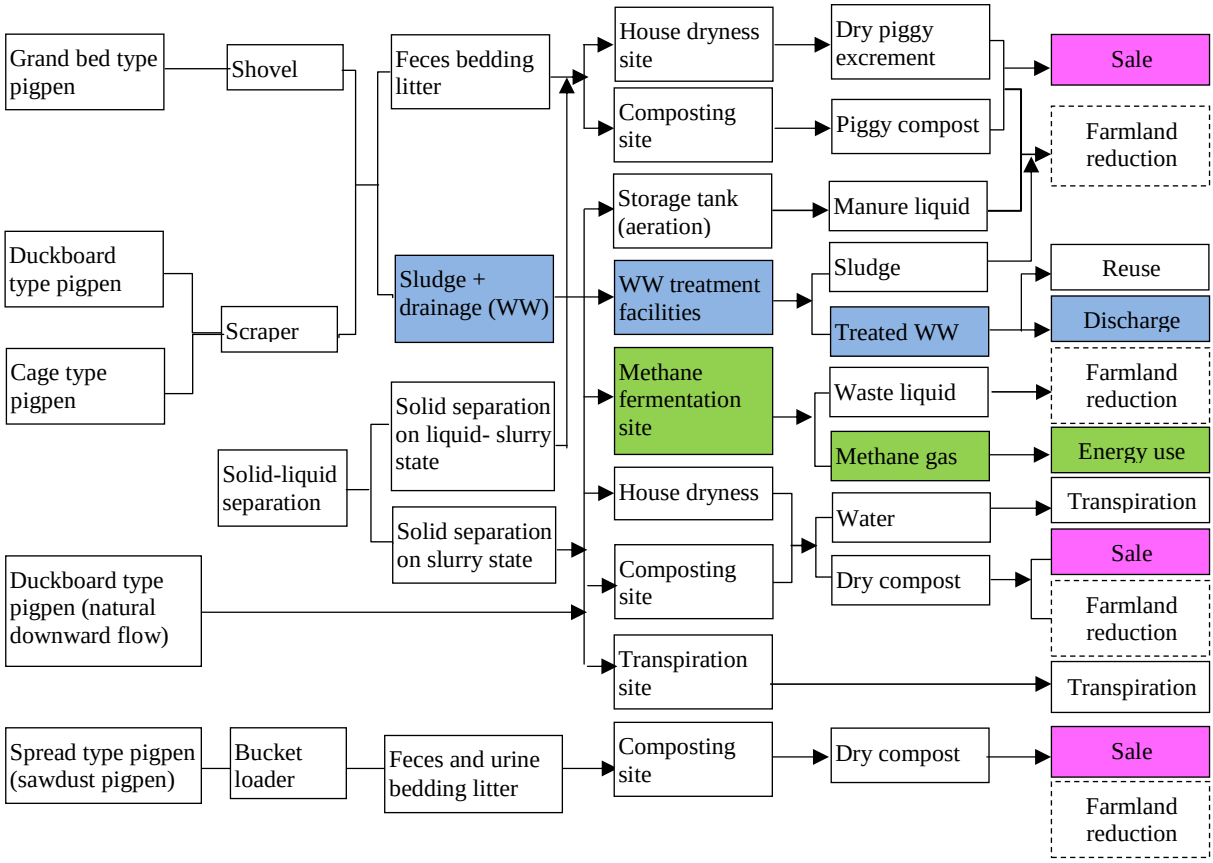
Processing method and its feature of coloring component

Processing method	Decolorant	COD removal	Amount of sludge	Economical efficiency
Condensation processing	60 – 70 %	30%	much	cheap
Ozone oxidation treatment	60 – 70 %	60 – 70 %	nothing	expensive
Fenton oxidation treatment	> 90 %	> 80 %	much	slightly expensive
Reduction processing	> 90 %	it gets worse	nothing	
Electrolytic oxidation processing	60 – 70 %	20 –30 %	nothing	
Electrolytic oxidation condensation processing	> 90 %	30 – 50 %	much	slightly expensive
Activated-carbon adsorption processing	80 – 90 %	> 90 %	nothing	slightly expensive

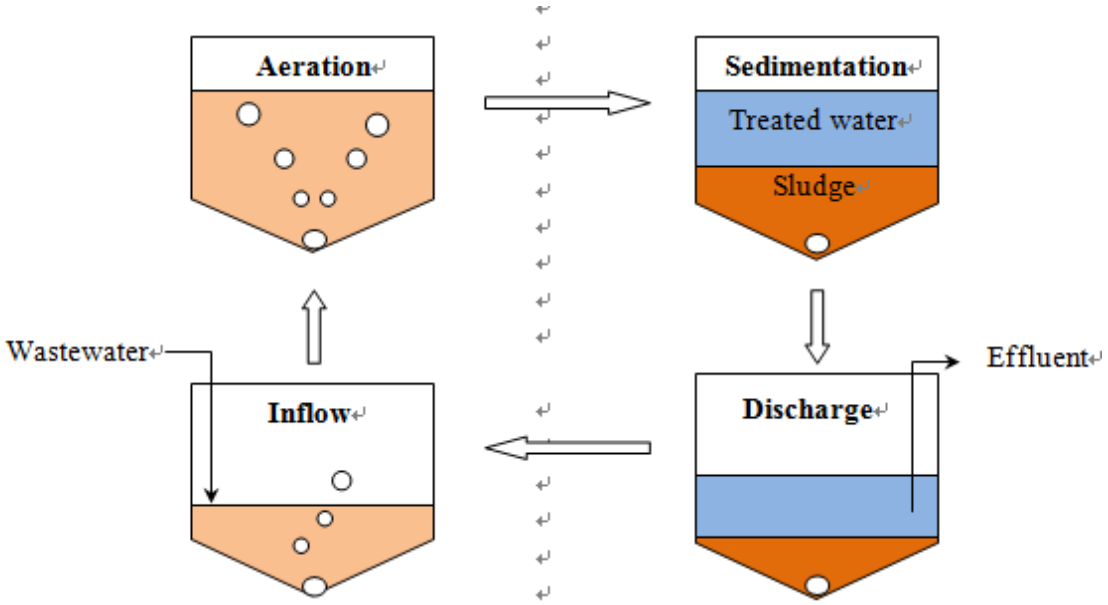
Source: “Wastewater Treatment Technology Manual”, The Project for Enhancing Capacity of VAST in Water Environment Protection Phase II

6) Livestock Farming

Treatment and usage on pig farming



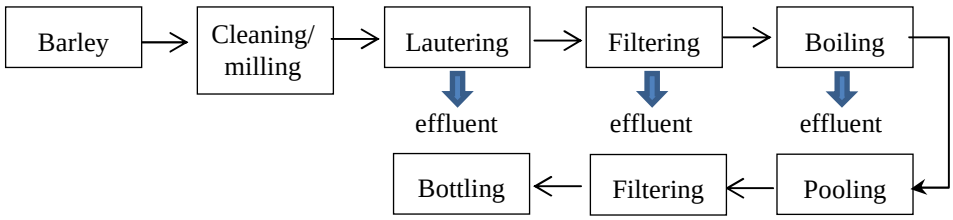
Process of batch reactor type activated sludge method



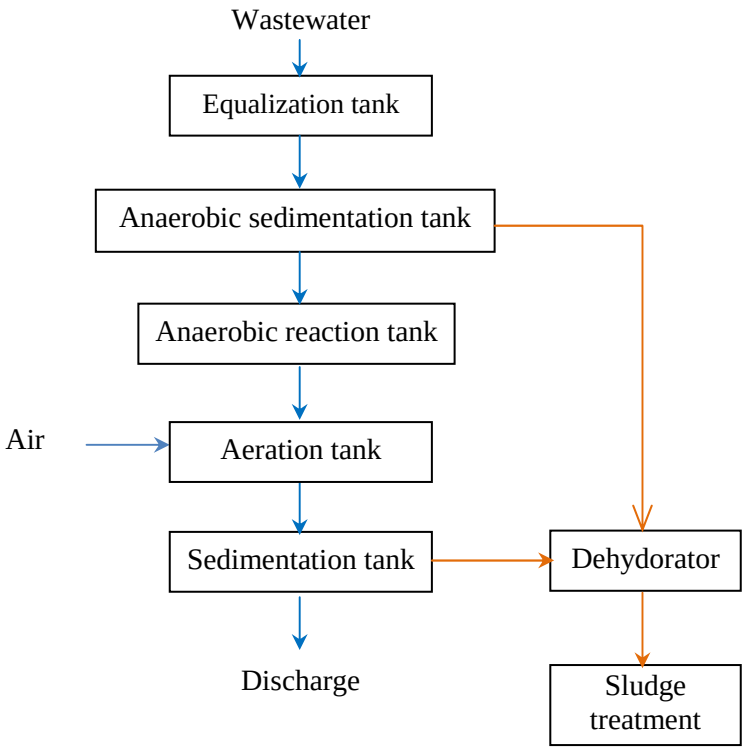
Source: "Wastewater Treatment Technology Manual"
The Project for Enhancing Capacity of VAST in Water Environment Protection Phase II

7) Beer Manufacturing Industry

Example flowchart of industrial process



Example flowchart of wastewater treatment process in beer brewing industry



General Characteristic of Wastewater from Beer/Brewing Industry

1) Rich of organic substances for COD, BOD, SS and organic-N
2) No toxic substances including heavy metals contains
3) Wastewater generated is suitable for biological treatment

8) Hospital Wastewater

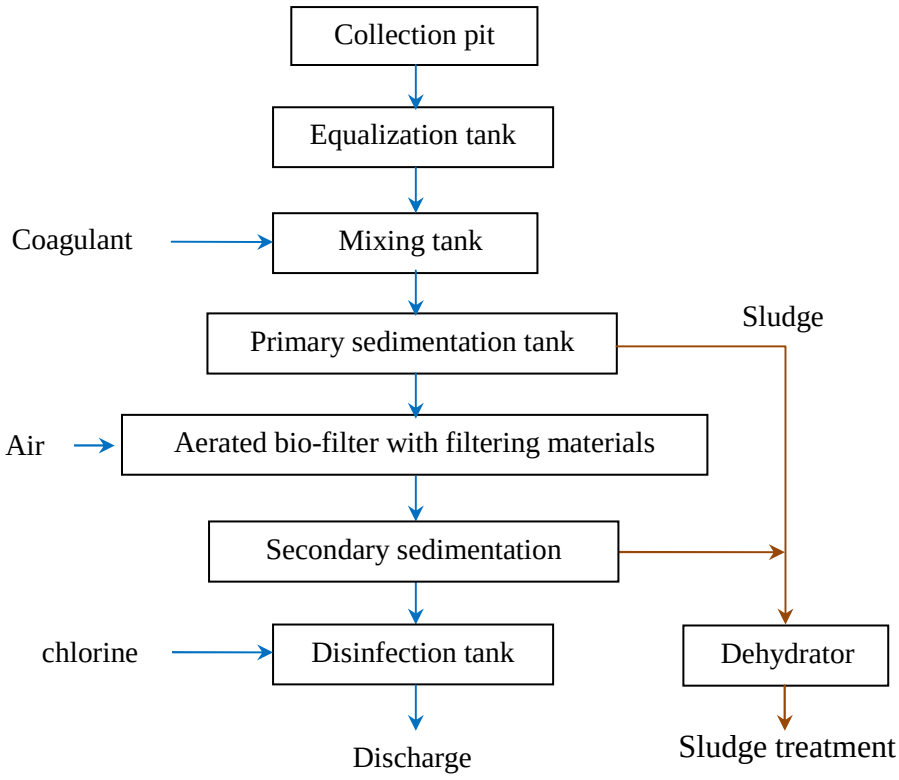
Sources of wastewater in hospital

- from medical activities: arising from clinics and laboratories
- from activities of patients/staff, kitchens/canteens, and cleaning
- rain water and surface flash water

Typical treatment technology

1) Trickling filter technology
2) Activated sludge technology
3) Submerged bio-filter
4) Stability biological pond

Flowchart of tricking treatment for hospital wastewater



General Characteristic of Wastewater from Hospital

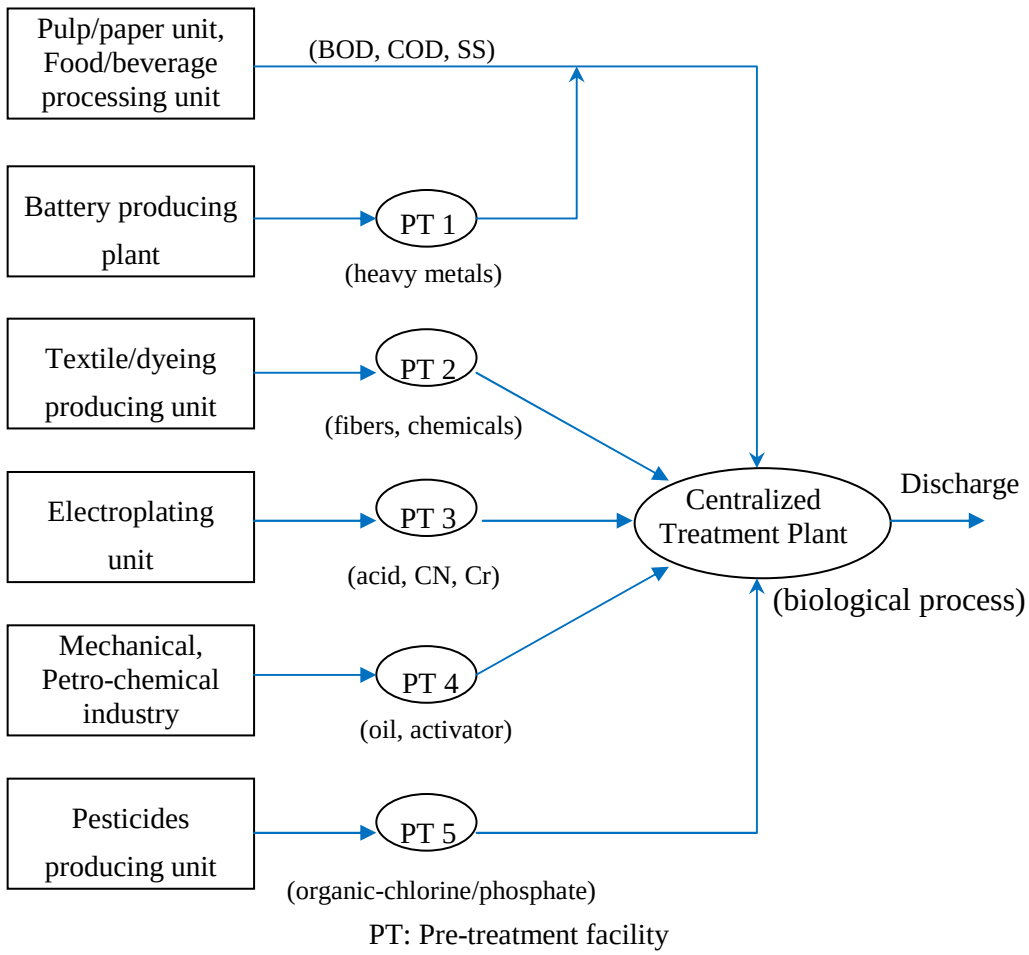
1) Medical wastes contain infectious pathogens which should be disinfected
2) Phenols used for sterilization and some chemicals may contain the wastewater
3) Several types of heavy metals such as Hg, Cr, Cu, and Mn,

9) Concept for Wastewater Treatment System in Industrial Park

Emphasis on establishing wastewater treatment system in Industrial Park

- Centralized treatment system is efficient with adequate design and operation management
- Toxic/harmful substances shall be eliminated individually before entering the centralized system
  1) Strong acid or alkali
  2) Heavy metals
  3) Oil and grease
  4) Inorganic toxic substances (CN, F, B, Cl, etc.)
  5) Organic toxic substances (PCBs, pesticides, volatile organic compounds, etc.)
- Centralized wastewater treatment system shall be simple process (biological treatment) in case of pre-treatment facilities are established individually.
- Processed water from one plant may be re-used by another (water cascading), passing through a pre-treatment facility as needed.

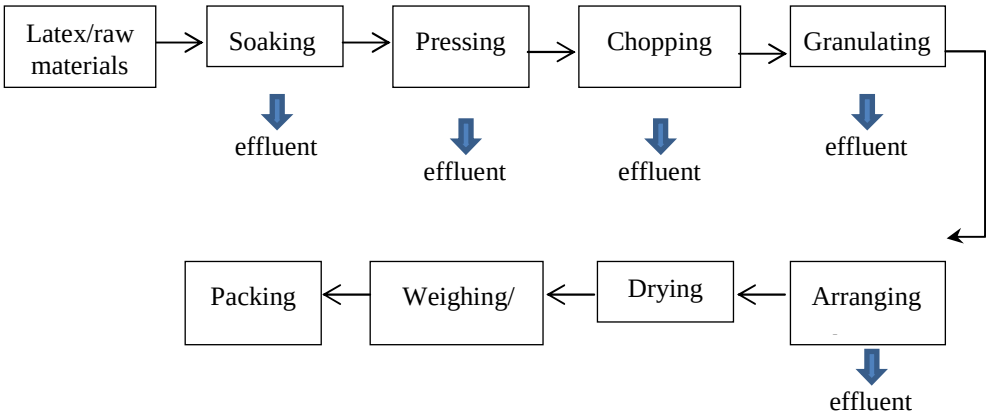
Ideal Network for Wastewater Treatment System in Industrial Park



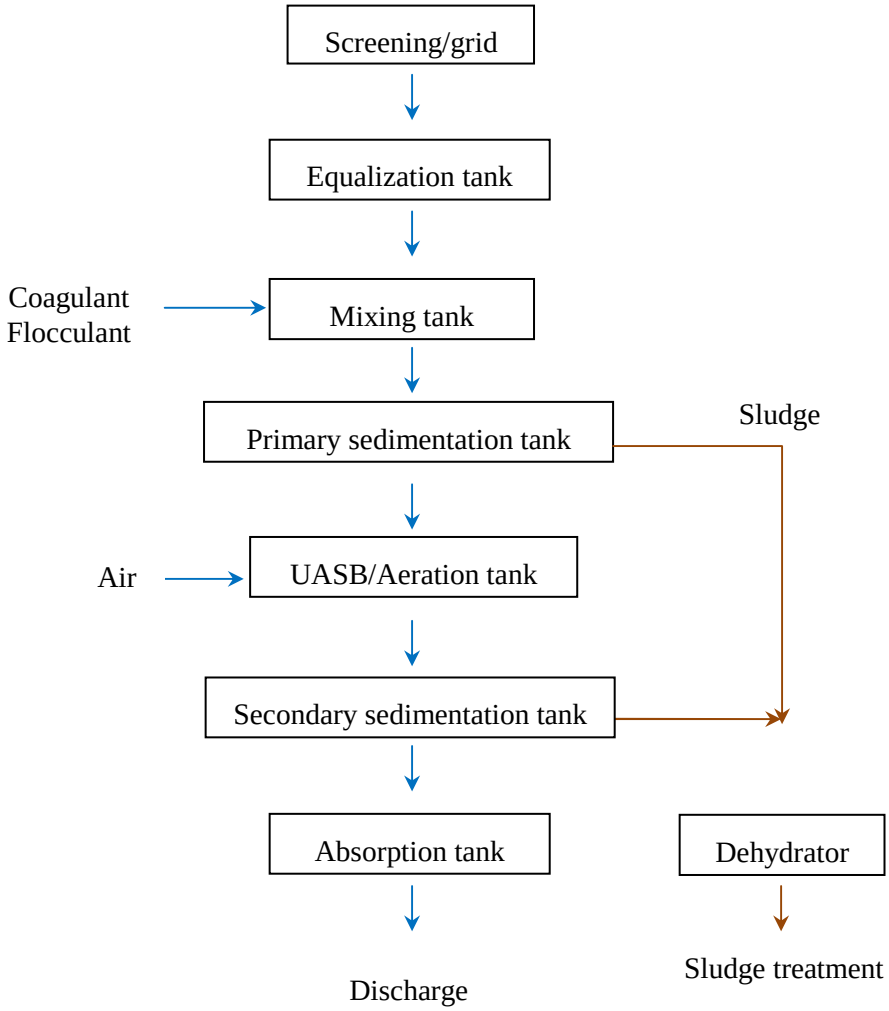
PT: Pre-treatment facility

10) Rubber Processing Industry

Example flowchart of the industrial process



Example flowchart of wastewater treatment process of the industry



Source: "Waste Abatement and Management in Natural Rubber Processing Sector", Asian Institute of Technology School of Environment, Resources and Development, April 2007

Attachment-3: Analyte Reference Sheet

Analysis Parameter	pH	Temparature	Color	BOD_5	COD	SS	As (Asenic)	Hg (Mercury)	Pb (Lead)	Cd (Cadmium)	Cr^{6+} (Chromium hexavalent)	Cr^{3+} (Chromium trivalent)	Cu (Copper)	Zn (Zinc)	Ni (Nickel)	Mn (Manganese)	Fe (Iron)	Sn (Tin)	CN (Cyanide)	Phenol	Oil and grease	Chlorine residue	PCBs	Organophosphprous	Organochlorine	Sulfar	Fluoride	Chloride	Total Nitrogen (T-N)	Ammonium (NH_4-N)	Nitrate (NO_3-N)	Total Phosphorous (T-P)	Phosphate (PO_4-P)	Coliform	Gross α activity	Gross β activity	Notes
Industrial Sector	Analysis Parameters Specified on "Circular No.04/2012/TT-BTNMT"																																			
1. Textile and Garment																																				QCVN 13
Dying units	x	x	x	x	x	x					x	x	x		x	x	x	x			x	x						x			x					
Garment units	x	x	x	x	x	x					x	x	x		x	x	x	x			x	x						x			x					
Textile unit	x	x	x	x	x	x					x	x	x		x	x	x	x			x	x						x			x					
Bleaching unit	x	x	x	x	x	x					x	x	x		x	x	x	x			x	x						x			x					
2. Beverage and foodstuff																																				
Confectionary	x	x	x	x	x	x																						x			x		x			
Brewing, beer	x	x	x	x	x	x																						x			x		x			
Dairy	x	x	x	x	x	x																						x	x		x		x			
Canned food	x	x	x	x	x	x														x					x		x	x	x		x					
Soft drink, mineral water	x	x	x	x	x	x														x					x		x	x	x		x					
Cooking oil	x	x	x	x	x	x														x					x		x	x	x		x					
3. Mineral exploitation																																				
Construction materials	x	x	x	x	x	x																						x			x			x	x	
Metal mineral	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x							x			x					
Coal mining	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x							x			x					
Oil and natural gas offshore	x	x	x	x	x	x															x							x			x					QCVN 35
4. Ferric products production units																																				
Metallurgy	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x							x			x					
Mechanic assembly	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x							x			x					
Metal recycling units	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x							x			x					
Metal plating	x	x	x	x	x	x					x	x	x	x	x		x		x	x								x	x		x					
Metal recycling from metallurgy process	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x							x			x					
Electronic spare parts	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x							x			x					
Metal casting	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x										x			x					
5. Mineral producing																																				
Chemical process	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				x	x		x	x		x			x	x	
Non-chemical process	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x										x			x			x	x	
6. Leather processing	x	x	x	x	x	x					x	x								x					x			x			x					
7. Paper and pulp production	x	x	x	x	x	x																			x			x			x					QCVN 12 (AOX)
8. Chemical production																																				
Chemical production	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x							x	x		x					
"Urea" fertilizer	x	x	x	x	x	x	x												x	x						x		x	x		x					
Phosphate	x	x	x	x	x	x																				x		x			x			x	x	

Analysis Parameter	pH	Temparature	Color	BOD_5	COD	SS	As (Asenic)	Hg (Mercury)	Pb (Lead)	Cd (Cadmium)	Cr^{6+} (Chromium hexavalent)	Cr^{3+} (Chromium trivalent)	Cu (Copper)	Zn (Zinc)	Ni (Nickel)	Mn (Manganese)	Fe (Iron)	Sn (Tin)	CN (Cyanide)	Phenol	Oil and grease	Chlorine residue	PCBs	Organophosphprous	Organochlorine	Sulfar	Fluoride	Chloride	Total Nitrogen (T-N)	Ammonium (NH_4-N)	Nitrate (NO_3-N)	Total Phosphorous (T-P)	Phosphate (PO_4-P)	Coliform	Gross α activity	Gross β activity	Notes
Industrial Sector	**Analysis Parameters Specified on "Circular No.04/2012/TT-BTNMT"**																																			
Melt phosphate	x	x	x	x	x	x																				x		x			x			x	x	
Super phosphate	x	x	x	x	x	x																				x		x			x			x	x	
Oil chemical filter unit	x	x	x	x	x	x													x	x								x			x					
Petroleum storage	x	x	x	x	x	x														x								x			x					
Petrro-chemical (surface activate, plastic chemical)	x	x	x	x	x	x												x	x	x								x			x					
Gas station	x	x	x	x	x	x														x								x			x					
Cleanser and detergent	x	x	x	x	x	x												x	x		x							x			x					
Cosmetic chemical. Pharmaceuical products	x	x	x	x	x	x												x	x		x							x			x					
Plastic manufacturing	x	x	x	x	x	x												x	x		x							x			x					
9. Rubber, latex production																																				
Rubber, latex	x	x	x	x	x	x																						x	x		x					QCVN 01
Footwear, rubber tyre	x	x	x	x	x	x												x	x		x							x			x					
10. Glass production	x	x	x		x	x												x	x		x							x			x					
11. Ceramic production	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x								x		x			x					
12. Electric production																																				
Thermal power	x	x																										x			x					
Battery production	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								x	x		x					
Dry-cell battery	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								x	x		x					
13. Industry with combustion process																																				
Usage of fuel oil	x	x	x		x	x														x								x			x					
Usage of coal/woods	x	x	x		x	x												x	x									x			x					
Usage of cashew nuts	x	x	x		x	x												x	x									x			x					
14. Agricultural product processing																																				
Suger production	x	x	x	x	x	x																				x	x	x			x		x			
Coffee processing	x	x	x	x	x	x																						x			x		x			
Cassava powder	x	x	x	x	x	x												x			x					x	x	x	x		x		x			
Cashew nut	x	x	x	x	x	x													x									x			x					
Vegitable and bulb	x	x	x	x	x	x																					x	x			x					
Seasoning powder	x	x	x	x	x	x												x	x									x			x					
Livestockl feedings	x	x	x	x	x	x																				x		x	x		x		x			
Cerial grain	x	x	x	x	x	x																						x			x		x			
Tea manufacturing	x	x	x	x	x	x																						x			x		x			
Bamboo and woody processing	x	x	x	x	x	x													x									x			x					
Handcraft unit	x	x	x	x	x	x																														

Analysis Parameter	pH	Temparature	Color	BOD_5	COD	SS	As (Asenic)	Hg (Mercury)	Pb (Lead)	Cd (Cadmium)	Cr^{6+} (Chromium hexavalent)	Cr^{3+} (Chromium trivalent)	Cu (Copper)	Zn (Zinc)	Ni (Nickel)	Mn (Manganese)	Fe (Iron)	Sn (Tin)	CN (Cyanide)	Phenol	Oil and grease	Chlorine residue	PCBs	Organophosphprous	Organochlorine	Sulfar	Fluoride	Chloride	Total Nitrogen (T-N)	Ammonium (NH_4-N)	Nitrate (NO_3-N)	Total Phosphorous (T-P)	Phosphate (PO_4-P)	Coliform	Gross α activity	Gross β activity	
Industrial Sector	**Analysis Parameters Specified on "Circular No.04/2012/TT-BTNMT"**																																			**Notes**
15. Organic, bio-fertilizer	x	x	x	x	x	x																						x			x		x			
16. Livestock and poultry farming																																				
Livestock/poultry raising	x	x	x	x	x	x																			x			x	x		x		x			Total & Fecal coliform and Salmonella
Slaughtering	x	x	x	x	x	x														x					x			x	x		x		x			
17. Pesticide storage	x	x	x		x	x													x				x	x												
18. Waste treatment facility																																				
Solid waste treatment unit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x										x	x		x		x			
Hazardous waste dumping	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x										x	x		x		x			
Temporal waste storage	x	x	x	x	x	x																						x	x		x		x			
Waste incineration	x	x	x	x	x	x																						x			x					
Centralized wastewater treatment plant	x	x	x	x	x	x																						x			x		x			
19. Construction material production																																				
Brick, tile,cement, etc	x	x	x		x	x																														
Concrete	x	x	x		x	x																														
20. Fisheries and aquaculture																																				QCVN 11
Aquaculture farms	x	x	x	x	x	x														x	x							x	x				x			
Fish processing unit	x	x	x	x	x	x														x	x							x	x				x			
Fish feedings	x	x	x	x	x	x														x	x							x	x				x			
21. Hospital, health center	x	x		x	x	x													x									x	x	x	x	x	x	x	x	QCVN 28 (pathogen)
22. Transportation																																				
Automobile and motorbike manufacturing	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x			x							x			x		x			
Bus stop, airport	x	x	x		x	x															x							x	x		x		x			
Car washing service	x	x	x		x	x															x							x			x		x			
Shipbuilding and repairing	x	x	x		x	x													x		x							x			x					
Ship scrapping	x	x	x		x	x															x							x			x		x			
Sea and river port	x	x	x		x	x															x							x			x		x			
23. Tourism																																				
Hotel and restaurant	x	x	x	x	x	x															x				x			x	x	x	x	x	x			QCVN 14 (Surfactants)
Resort, golf course	x	x	x	x	x	x															x				x			x	x	x	x	x	x			
Hot spring area	x	x	x	x	x	x															x							x	x		x		x			
24. Institute, laboratory	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x							x			x		x	x	x	

Attachment-4: Procedure of Water Sampling and Sample Management

Procedure of Water Sampling and Sample Management

1. Water Sampling

1.1 Standards of Sampling Methods

Sampling needs to be complied with one of following methods in Table 1.1. Methods referred to international standards or others issued by ministry or sector, or internal methods to be used need an approval document issued by an agency in charge of management of environmental monitoring.

Table 1.1 Sampling Methods

No.	*Types of samples*	*Code of standards, methods*
1	Samples of river and spring water	TCVN 5996-1995 ISO 5667-6:1990(E) APHA 1060 B
2	Samples of pond and lake water	TCVN 5994-1995 ISO 5667-4:1987
3	Guidance on sampling of waste water	TCVN 5999-1995 ISO 5667-10:1992
4	Samples of bio-microorganism analysis	ISO 19458
5	Sediment sample	TCVN 6663-15: 2004 ISO 5667-15:1999
6	Guidance to take samples as plankton	APHA - 10200

Source: Decision__/2007/QD-BTNMT Process and Procedures on Continental Surface Water

1.2 Sample Type

Generally there are two types of sample called “grab sample” and “composite sample”. A grab sample is one collected at a particular time and place. It represents the condition of the water at the time of sampling. Grab samples must be collected carefully to make them as representative as possible of the water as a whole. Composite sample is a number of grab samples collected at define intervals of time over a fixed period and mixed. This sample presents the average characteristics of water flow over that particular period of time.

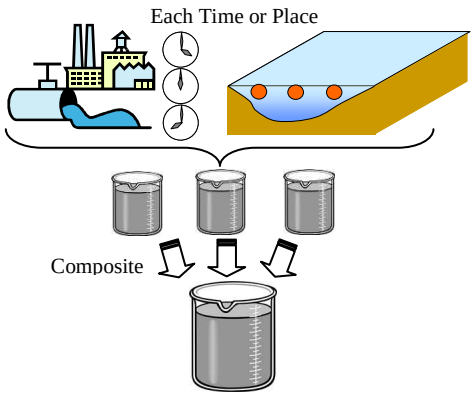


Figure 1.1 Image of Composite Sample

1.3 Selection of Sampling Point

Sampling points should be set as follows.

- When the width of a river is narrow such as a branch stream, take a sample in the centroid of a river.
- When the width of a river is wide such as the main stream, take 3 points of samples along the cross-section of a river. Mix them equally, then use the mixed sample as a representative sample of the sampling station.

1.4 Types of Water Sampler

Taking a sample directly to a container is the most desirable way to avoid contamination. However when there are some difficulties to take a sample directly, a handy instrument is used such as a bucket, dipper and so on. Such instruments made of polyethylene are often used. A rope can be attached to a bucket if necessary. Scoops with adjustable shafts (dipper) are convenient. Samplers made of stainless steel can be used but they are not used in tests for tracing amount of heavy metals.

1.5 Procedure of Sampling

General procedures of sampling are as follows.

1) Rinse a sampling vessel with river water on site 2-3 times. Care must be taken to avoid contamination of target water during rinsing.
2) Scoop up some water at a sampling site; quickly rinse a sample container with water
3) Fill a sampling container* with water and close it tight.
4) Take photograph with white board** during the sampling process.
5) After sample collection, fill out sample information forms.

Photo: Sampling and taking photograph

* Sample container shall be prepared as suitable for the analysis parameter, refer to Table 2.1.
** Sampling station name, code, date, sampling implementing organization, and factory name, if necessary, are mentioned on the white board.

1.6 QC Sample

In order to control quality during sampling, processing and preservation, QC samples (Field blank samples and Double field samples) should be used. QC sample should be taken at least once a sampling term. Section 4.3 mentions detail about QC.

1.7 On-Site Measurement

On-site water quality measurement methods are shown in the following table. It is important to calibrate the equipment before field survey.

1.8 Field note

The record of sampling and on-site measurement is written down on field note. At least, the following information is to be mentioned on the field note.

- Sampling Date/ Time
- Sampling Location
- Result of on-site measurement

Additionally, the following information is useful to evaluate the water quality data.

- Weather of sampling day or the day before sampling day
- Name of staff who take the sample

2 Sample Preservation, Transportation and Storage

2.1 Preservation

Preservative treatment and maximum permissible storage time suggested is shown in Table 2.1.

Table 2.1 Suggested Preservative Treatment and Maximum Permissible Storage Times

Parameter			Container	Minimum Sample Size (ml)	Preservation	Maximum Storage
1	Physical -chemical parameters	Water Temperature	P,G		Analyze immediately	0.25 h
2		Color	P,G	500	Refrigerate	48 h
3		Odor	G	500	Analyze as soon as possible; Refrigerate	6 h
4		Suspended solid	P,G	500-1000	Refrigerate	7 d
5		EC	P,G	100	Refrigerate	28d
6		Turbidity	P,G	100	Analyze same day; store in dark up to 24h, Refrigerate	24 h
7		TDS	P,G	200	Refrigerate	7 d
8		pH	P,G	50	Analyze immediately	0.25 h
9		DO	G	300	Analyze immediately	0.25 h
10		Hardness	P,G	100	Add HNO_3 or H_2SO_4 to pH<2	6 months
11	Nutrients	Ammonia (NH_4^+)	P,G	100	Analyze as soon as possible; Refrigerate	24h
12		Nitrate (NO_3^-)	P,G	100	Analyze as soon as possible; Refrigerate	48 h
13		Nitrite (NO_2^-)	P,G	100		48 h
14		Total nitrogen (T-N)	P,G	100		48 h
15		Phosphate （PO_4）	G(A)	100	For dissolved phosphate filter immediately; Refrigerate	48 h
16		Organic phosphorous	P,G (Container should have been cleaned with 1:1 HCl and rinsed with Deionized water. Don't use commercial detergents containing phosphate for cleaning glassware used in phosphate analysis)	100	Add H_2SO_4 to pH<2 and Refrigerate	28 d
17		Total phosphorus		100		28 d
18	Organic pollutants	COD	P,G	100	Analyze as soon as possible(24h), or add H_2SO_4 to pH<2; Refrigerate	7 d
19		BOD	P,G	1000	Refrigerate	24 h
20	Inorganic substance	Sodium (Na)	P	100	Add acid to pH<2	1 month
21		Potassium (K)	P	100	Add acid to pH<2	1 month
22		Calcium (Ca)	P,G	100	Add acid to pH<2	1 month
23		Magnesium (Mg)	P,G	100	Add acid to pH<2	1 month
24		Barium (Ba)	P,G	100	Add acid to pH<2 (not use H_2SO_4)	1 month
25		Boron (B)	P,(PTFE) or quartz	100	HNO_3 to pH < 2	28 days
26		Sulfate (SO_4^{2-})	P,G	100	Refrigerate	28 d
27		Chloride (Cl^-)	P,G	200	None required	28 d
28		Iron (Fe^-)	P(A),G(A)	100	For dissolved metals filter immediately; add HNO_3 to pH <2	6 months
29		Manganese (Mg)	P(A),G(A)	100		
30	Toxic parameters	Fluoride (F^-)	P	100	None required	28 d
31		Cyanide (CN^-)	P,G	500	Add NaOH to pH > 12, refrigerate in dark	24 h
32		Cadmium (Cd)	P(A),G(A)	100	For dissolved metals filter immediately; add HNO_3 to pH <2	6 months
33		Lead (Pb)		100		
34		Chromium (VI) (Cr(VI))	P(A),G(A)	1000	Refrigerate	24h
35		Chromium (III) (Cr(III))	P(A),G(A)	1000	Refrigerate	24h
36		Total Chromium (T-Cr)	P(A),G(A)	1000	For dissolved metals filter immediately; add HNO_3 to pH <2	6 months
38		Mercury (Hg)	P(A),G(A)	1000	Add NHO_3 to pH2, 4 Celsius degree, Refrigerate	28 days
39		Copper (Cu)	P(A),G(A)	100 each parameter	For dissolved metals filter immediately; add HNO_3 to pH <2	6 months
40		Zinc (Zn)				
41		Nickel (Ni)				
42		Tin (Sn)				
43		Selenium (Se)				
44		Arsenic (As)				
45	Others	Oil and Hydrocarbons	G, wide-mouth calibrated (Washed with soap, rinsed with water, and finally rinsed with solvent to remove any residues)	1000	Add HCl or H_2SO_4 to pH < 2; Refrigerate (Don't overfill the sample container and don't subdivide the sample in the laboratory. Refrigerate)	28 days
46		Phenol	P,G, PTFE-line cap	500	Refrigerate, add H_2SO_4 to pH < 2	28 days until extraction
47		Pesticides	G(S), PTFE-line cap	1000	Refrigerate, add 1000mg ascorbic acid/L if residual chlorine present	7 days
48		DDT	G	500	Refrigerate	24h
49		Surfactants	P,G	500	Refrigerate	24h
50		Coliform	Sterilized bottle	100	Refrigerate	8h
51		Total Coliform				
52		Herbicide	G	500	Refrigerate	24h

Parameter	Container	Minimum Sample Size (ml)	Preservation	Maximum Storage
P = Plastic (polyethylene or equivalent); G = Glass; G(A)or P(A)= rinsed with 1+1 HNO_3; G(B) = glass, borosilicate; G(S) = glass, rinsed with organic solvents or baked				

Source: APHA 1060.C

2.2 Transportation

Samples should be transported in transit containers with absorbers to avoid bottle breakage. Effects of light and heat should be avoided because sample quality can be changed quickly due to chemical reaction, and assimilation of creature. Water samples should be kept at around 4°C during transportation.

Photo: Sample Transportation with Refrigerant or Ice

Delivering of water samples from one party to another party should be carried out in the field (a field group shall give it to a transporter) or in a laboratory (a field group or sample receiver shall give it to a laboratory). Delivery of samples should be recorded with full signature of relevant parties. The record includes contents shown in the following table.

Table 2.2 Record Format for Delivering Water Samples

No	*Sampling date*	*Name of sample giver*	*Name of sampling station*	*Number of samples*	*Name of sample receiver*

2.3 Storage

A guideline for sampling transportation, stability, and preservation is presented in ISO 5667-3 and APHA.

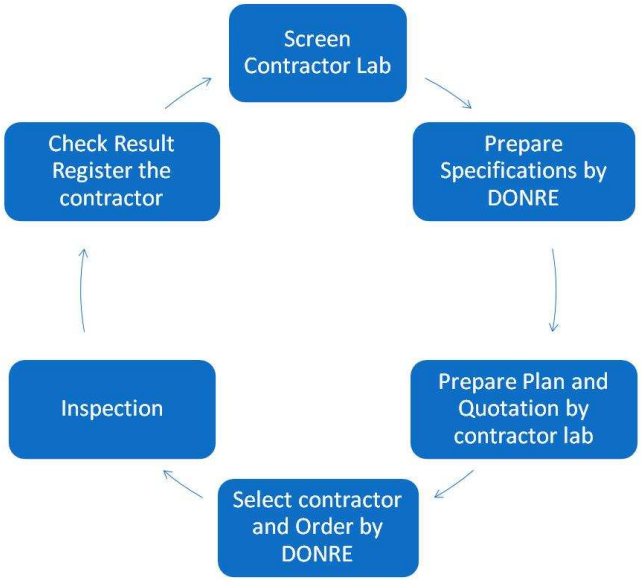
Photo: Sample Storage

Appropriate actions should be taken to preserve samples immediately after sampling. Generally, a sample should be refrigerated, treated by chemicals, or its pH should be controlled for preservation of target parameters depending on a test procedure for each parameter.

As a general rule, a collected sample must be stored in accordance with a specific method for each parameter. Suggested preservative treatment and maximum permissible storage time are listed in Table 2.1. For parameters other than those in Table 2.1, samples should generally be stored under a dark and cool conditi

on (around 4°C).

Quality Control for Contract Work



The laboratory or monitoring section intends

to outsource works to other laboratory in several reasons, such as unforeseen circumstances, workload, and some extra technical expertise. But, the work is to contract to a technically competent laboratory. This section proposes a way to control the quality of outsource laboratories. Policy for the outsourcing is discussed at first. Then, detail methods of the QC are explained in the section.

1) Screen contractor laboratory,
2) Preparation of specification by DONRE, 3) Preparation of work plan and quotation by the contractor laboratory,
4) Selection and ordering by DONRE,
5) Inspection, and
6) Checking result are the activities in the contract work. Then, when the DONRE find that the contractor laboratory performed well, the laboratory can be the candidate of the next contract work. Quality of the contract work is controlled by the activities.

1. Policy

To control the quality of the contract work, DONRE should have policy of the contract work as follows.

i. DONRE is responsible to the customer for the contractor's work.
ii. It is responsibility of the Quality Manager in the DONRE to assess and approve the competence level of subcontractor laboratory.

So, when PPC or other customer of DONRE complained about the report prepared by DONRE using the contractor laboratory. The DONRE should tackle on the matter by their responsibility.

2. Screening

Screening is selection of candidates for contract work. The candidates are selected from laboratories which demonstrate technical competence by possession or receipt of one or more of the following:

- VILAS
- Performance was confirmed by QC sample or reference material
- Audited by DONRE's auditors

For example, laboratory showed good performance in the last contract work would be audited by DONRE's auditors.

3. Preparation of the Specification

(1) Contents of the Specification

After screening the candidates, DONRE will send the specification which asks the candidates to prepare work plan of the contract work. In the specification, DONRE writes not only the contents of the monitoring but request related to QC and request the laboratory to accept inspection. An example of the specification contents is as follows.

Contents of the Specification
1. Request subcontractor to submit Work Plan
2. Contents of the environmental monitoring program
- Purpose of the environmental monitoring program
- Deadline of the subcontract work
- Place, Sample Name, Type of water body (River, Lake, etc)
- Analysis Parameter
- Analysis Methods (are to be Standard Method)
- Method of Sampling, Transportation, and Preservation
- Result format
3. Request Action to be taken for Abnormal Result (See Section 4.4.3 (2))

4. Request Data for QA/QC (See Section 4.4.3 (3))

(2) Request Action to be taken for Abnormal Result

When DONRE finds an abnormal result in the report or the certification of the contractor laboratory, DONRE asks the laboratory to find the reason or to re-analyze the sample. However, it might be too late. Because, usually the report is prepared one to two month(s) after the sampling, and, even DONRE ask the laboratory soon after they get the report, the water sample might be degrade and can't get accurate result in the analysis repeated.

To avoid the situation, DONRE requests the laboratory to take the following actions when they find the abnormal result during the analysis.

Action to be taken for the Abnormal Result

a. When subcontractor laboratory find an abnormal result during the analysis, the subcontractor has to inform DONRE as soon as possible.
b. The subcontractor should check the reason of the abnormal result.
c. The subcontractor should re-sample and/or re-analyze the sample in case.

When DONRE requests the laboratory to take action for the abnormal result, DONRE should define the criteria between abnormal and normal results in the specification. The criteria is defined by the condition of each sampling points and each monitoring parameter, and by the policy of each DONRE. Examples of the definition of the abnormal result are shown as follows.

Definition of Abnormal Result (Example)

a. Over Wastewater Standard Value
b. Higher than past result (ex. Over 3 times of the average of last 5 years)
c. Over the value which DONRE selected (ex. 1/2 of the Wastewater Standard Value)
d. Over the Highest value of last year

(3) Request for QA/QC

In the specification, DONRE requests the laboratory to set up a section, named quality management section, for checking data, and select a responsible person who in charge of quality management in the section. DONRE requests the laboratory to conduct internal quality control (see 4.3.2 (4)) and stock the results of the internal quality control as evidences of the activities.

4. Preparation of Work Plan

As response to the specification, each candidate laboratory prepares a work plan. Expected contents of the work plan are as follows.

Contents of the work plan

a. Contents of the Inspection
b. Formation for the activity (QC section, Representative for the Quality, Network in emergency case, System to check data)
c. Schedule of the activities
d. Reply of request from DONRE (Action for abnormal result, QA/QC)

5. Selection of the Contractor laboratory

By checking the work plan and the quotation submitted by the candidate, DONRE selects the contractor laboratory. DONRE should check detail and discuss when they find any difference between the specification and the work plan.

For example, if the laboratory can't conduct a water quality analysis by the method mentioned in the specification, the laboratory can write another analysis method in the work plan. Then, if DONRE can't accept the method, DONRE will not select the laboratory as the contractor.

6. Inspection of the Contract Work

DONRE can inspect the contractor's activity. There are two types of inspection which are field inspection and laboratory inspection. Field inspection is joining the contractor's field work and checking their activities. Laboratory inspection is visiting the contractor's laboratory and checking their activities in the laboratory. Key points for checking in the two inspections are as follows. When DONRE find any mistakes of the contractor through the inspection, DONRE suggests the contractor to correct the points.

<u>Check points in Field Inspection</u>

a. Person in charge of the field work is working
b. Place and Date/time is same as the plan
c. Sapling tool and sample bottle is appropriate and clean
d. Sampling is conducted appropriately
e. Basic data (Weather, Water temperature, Air temperature, Appearance, Name of the parson sampled) is recorded
f. Sampling and on-site measurement are conducted as planed
g. Volume of sample is enough for analysis (for duplication analysis in case) See attachment
h. Preservation Condition is suitable for the parameter ($5^{o}C$)
i. Chemicals are added for the preservation
j. Labeling and Picture

<u>Check points in Laboratory Inspection</u>

a. Laboratory room is clean enough to avoid contamination
b. Equipment is maintained based on SOP submitted and condition is recorded
c. Glassware looks clean enough to avoid contamination
d. Reagents are put in Chemical Storage
e. Name and other information are labeled on the reagent bottle
f. Samples are preserved following SOP
g. Analysis is conducted following SOP
h. Internal Quality Control is conducted as mentioned in the Plan.

i. Results of the internal quality control are recorded
j. Countermeasures are conducted as planed
k. Results of past 5 years are recorded

7. Checking Result

Before checking the result form the contractor laboratory, DONRE have to confirm the system to check the result in DONRE. Who will check? Who is the person in charge of the result? How to register the data? These questions are to be clear before receiving the result.
Outline of checking the result is as follows.

Outline of Check Result

a. Check any careless mistake
b. Check Significant figures
c. Compare the result against environmental standard values
d. Compare the results against past data
e. Check the relationship between parameters

Key points for checking result are as follows:

Reception of Analyzed Data

1) Test Report

Analyzed data should be mentioned in a test report. It is possible to judge whether a laboratory is trustable or not by confirming information in a test report. A test report is recommended to include following information, as appropriate:

- ✓ Title (e.g., "Test Report")
- ✓ Name and address of laboratory, and location where analysis were carried out if different from an address of laboratory
- ✓ Unique identification of a test report (such as a serial number), and on each page an identification in order to ensure that a page is recognized as a part of the test report, and a clear identification of the end of test report
- ✓ Name and address of customer
- ✓ Test method used
- ✓ Description, condition, and unclear identification of samples tested
- ✓ Date of receipt of test samples (where this is critical to validity and application of results) and dates of performance of test
- ✓ Test results with, where appropriate, units of measurement
- ✓ Name, function and signature or equivalent of person authorizing a test report
- ✓ Hard copies of test reports include page numbers and total number of pages.

2) Significant Figures

The significant figures of a record are the total number of digits which comprise the record, regardless of any decimal point. Thus 6.8 and 10 have two significant figures, and 215.73 and 1.2345 have five. By definition, continuous measurement data are usually only an approximation to the true value. Thus, a measurement of 1.5 may represent a true value of 1.5000, but it could also represent 1.45 or 1.54. Hence, a system is needed to decide how precisely to attempt to represent the true value. Data are often recorded with too many, and unjustified, significant figures; usually too many decimal places. Some measuring instruments may be capable of producing values far in excess of the precision required (e.g. pH 7.372) or, alternatively, derived data may be recorded to a precision not commensurate with the original measurement (e.g. 47.586 %).

In water quality analysis field, the result value is rounded to two or three digits. When DONRE staff find the result of which significant figure is over four, the laboratory should check the record and apply the correct significant figures.
Frequently, water samples contain concentrations of chemical variables which are below the limit of detection. These results are to be reported as not detected (ND) or less-than value (< [Lower Detection Limit]).

3) Comparison of Data

The following items are given as a method for judging validity of a result of analysis which came out from outsourcing.

1) Chorological and horizontal: By comparing with data which was measured in upper and lower side of a river basin, we evaluate validity of data. When an extreme data are founded comparing with other data, a measurement might have a mistake in a procedure.

2) Past data reference: By comparing with data which was measured in the past, we evaluate validity of data. When an extreme data are founded comparing with past data, a measurement might have a mistake in a procedure.

3) Physical characters: Validity of measured data is evaluated by considering physical quantities such as solubility and stability-constant.

   e.g. A saturated value of dissolved oxygen is decided by temperature and salinity of water. Then it is hardly to exceed extremely a saturated value.

   e.g. It is promptly oxidized from nitrite nitrogen to nitrate nitrogen. Therefore it is natural that a concentration of nitrite nitrogen is less than a concentration of nitrate nitrogen.

4) Other Parameters: Validity of measured data is evaluated by examining relation with different parameter.

   e.g. Conductivity is proportional to a sum of main dissolved material in water. Therefore, in tidal area a concentration of chloride ion which is a main ingredient of water quality and conductivity are in proportion to each other.

   e.g. Concentration of total nitrogen is a sum of nitrate nitrogen, nitrate nitrogen, ammonia nitrogen and organic nitrogen. So each ingredient should be smaller than total nitrogen.

   e.g. Turbidity and suspended solids are in proportion to each other.

5) Condition of Sampling Site: Validity of measured data is evaluated by considering relationship between a condition of sampling site and water quality of river.

6) Accurate recording: Out of foregoing check items, following items are easy to be miswritten.

   e.g. Unit inconsistency of conductivity

   Conductivity has many units (mS/m, μS/cm, S/m). Relations among units are, “1S/m＝1,000mS/m = 10,000μS/cm”.

   e.g. Conversion of Nitrogen

Nitrate nitrogen (NO_3-N) and nitric acid ion (NO_3) are sometimes listed in a same line. It is necessary to convert from NO_3 to NO_3-N when we compare data with a standard value.

Attachment-5: Measuring Methods of Water Flow Rate

Measurement of Water Flow Rate

(1) Water Meter

To measure the volume of water usage, it is common to use water meter.

Figure-1 Example of Water Meter

However for measurement of wastewater volume, water meter is not suitable because of the water quality. Impurities of wastewater give damage to the mechanism of flow meter. Non-mechanical meters such as electromagnetic and ultrasonic ones shall be used for wastewater flow at the point of filled pipeline.

(2) Flow Meter

Flow rate (Q) can be calculated from cross section area (A) and flow velocity (V) as a formula below:

$Q\ (m^3/s) = A\ (m^2) \times V\ (m/s)$

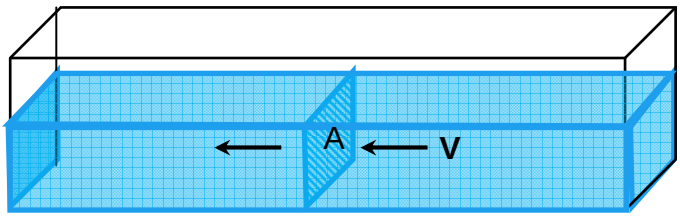
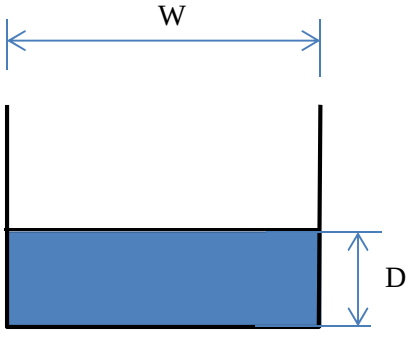


Figure-2 shows the example of flow rate measurement of wastewater using the equipment at the site visited on the OJT.

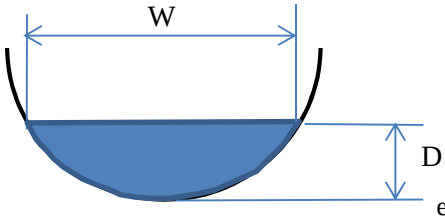
$Q\ (m^3/s) = W\ (m) \times D\ (m) \times V\ (m/s)$



W (m)	0.5
D (m)	0.05
V (m/s)	0.4
$Q\ (m^3/s)$	0.01
$Q\ (m^3/min)$	0.6
$Q\ (m^3/hr)$	36
$Q\ (m^3/day)$	864

experiance in HCMC DONRE

$Q\ (m^3/s) = W\ (m) \times D\ (m) \times 0.71 \times V\ (m/s)$



W (m)	0.27
D (m)	0.07
V (m/s)	1.0
Q (m^3/s)	0.0134
Q (m^3/min)	0.805
Q (m^3/hr)	48.3
Q (m^3/day)	1159

experiance in TT-Hue DONRE

Source: JET

Figure-2 Experience on Measurement of Flow Rate

(3) Bucket Method

In case of measuring a water discharge in rather small scale, it is useful to apply a simple 'bucket method' at the place of overfall. Procedure of the bucket method is as follows:

1) Receive the falling water by a bucket with known volume,

2) Measure the time required to fill up the bucket using a stop watch,

3) Repeat the measurement several times and calculate the average.

$Q = v/t$

where:
Q: flow rate (m^3/sec)
v: volume of a bucket (m^3)
t: time required to fill up the bucket (sec)

(4) Weir Method

Weirs can be applied for measuring flow rates in open channels.
The weirs are structures consisting of an obstruction such as a dam or bulkhead placed across the open channel with a specially shaped opening or notch. The weir results an increase in the water level, or head, which is measured upstream of the structure. The flow rate over a weir is a function of the head on the weir.
Common weir constructions are the rectangular weir, the triangular or v-notch weir, and the full width weir. Rough standards for selecting the weir are as follows:

triangular (v-notch) weir:	0.01 – 0.05 m^3/s (36 – 180 m^3/h)
rectangular weir:	0.05 – 0.15 m^3/s (180 – 540 m^3/h)
full width weir:	> 0.15 m^3/s (>540 m^3/h)

The crests of weir shall be kept the shape as shown in Figure-3.

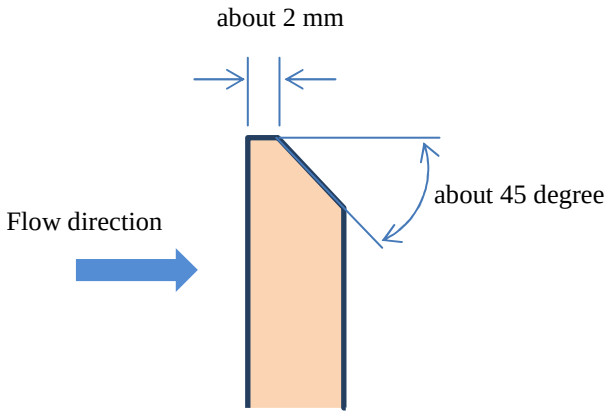


Figure-3 Crest of the weir

Measuring the Levels

For measuring the flow rate it's obviously necessary to measure the hydraulic head, then use the equations below for calculating. It's common to measure the levels with:

- measuring rod
- ultrasonic level transmitters
- pressure transmitters

Ultrasonic level transmitters are positioned above the flow without any direct contact with the flow. Point of measurement shall be set at the upstream of the weir more than 0.3 m (Figure-4).

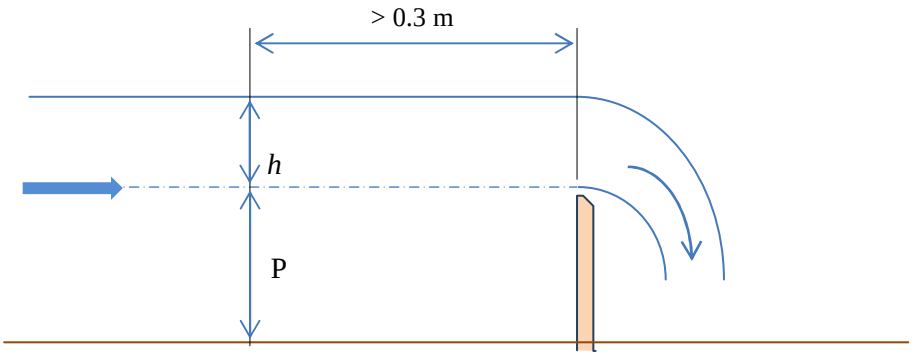


Figure-4 Measuring point of hydraulic head (*h*)

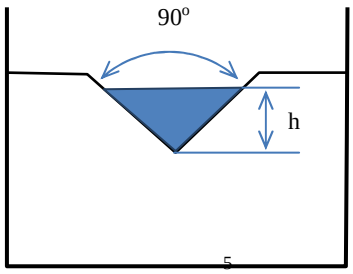
Guideline for designing and operation weirs

1. The weir should be set at the lower end of a long pool sufficiently wide and deep to give an even smooth flow
2. The centerline of the weir notch should be parallel to the direction of the flow
3. The face of the weir should be vertical, not leaning upstream nor downstream
4. The crest of the weir should be level, so far water passing over it will be of the same depth at all points along the crest
5. The upstream edge should be sharp so that the nappe touches the crest only at the upstream edge
6. Ideally, though not always practical, the height of the crest above the bottom of the pool, P, should be at least three times the depth of water flowing over the weir crest
7. The sides of the pool should be at a distance from the sides of the crest not less than twice the depth of the water passing over the crest (for rectangular weir)
8. For accurate measurements, the depth over the crest should be more than one-third the length of the crest
9. The depth of water over the crest should be no less than 5 cm, as it is difficult to obtain sufficiently accurate depth reading with small depths
10. The crest should be placed high enough so water will freely below the weir, leaving an air space under the over-falling sheet of water.

Source: BIE 5300/6300 Lectures, Utah State University

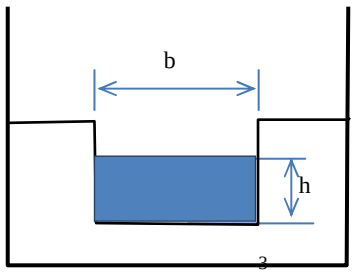
Calculation of water flow rate

Triangular (V-notch) weir



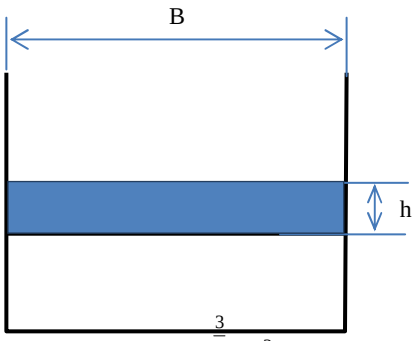
$$Q = 1.404\ h^{\frac{5}{2}}\ (\mathrm{m}^3/\mathrm{s})$$

Rectangular weir



$$Q = 1.84(b - 0.2h)\,h^{\frac{3}{2}}\ (\mathrm{m}^3/\mathrm{s})$$

Full width weir



$$Q = 1.84Bh^{\frac{3}{2}}\ (\mathrm{m}^3/\mathrm{s})$$

Source: JIS K 0094.8

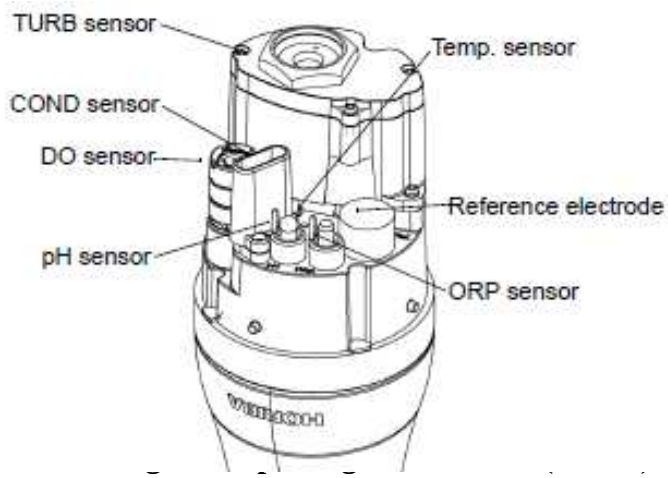
Attachment-6: Brief Manual for the Field Equipment

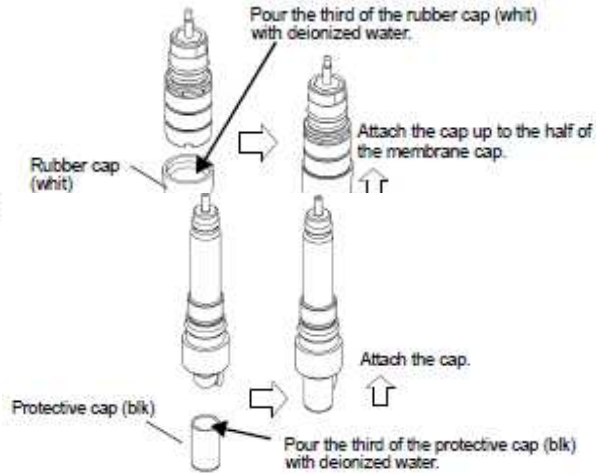
HORIBA U-52 Multi Water Quality Checker
Quick Manual

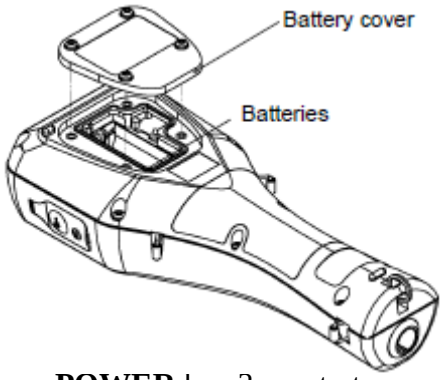
Parameters can be selected

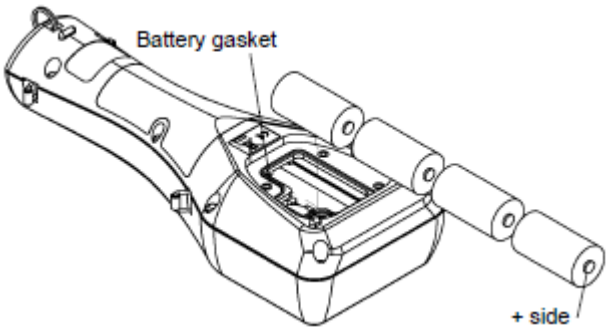
- **Temperature**
- **pH**
- **ORP** (Oxidation Reduction Potential)
- **Cond** (Electrical Conductivity)
- **Turb** (Turbidity)
- **DO** (Dissolved Oxygen)
- **TDS** (Total Dissolved Solids)
- **Salinity**
- **Seawater Specific Gravity** (SG)

Sensor Probe



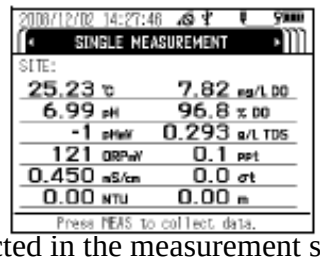






Measu

- Press **POWER** key 3 sec. to turn on power **ON**.
- **MEASUREMENT** screen appears after 10 sec.



(Measurement)

a. **Check each sensor** (caps on pH & DO are removed) an ed.

b. Check that **SINGLE MEASUREMENT** has been selected in the measurement screen.

c. **Submerge the sensor probe in the sample**, gently shaking them in the sample to remove any air bubbles from the sensors. - If the sample is non-flowing, move the cable slowly up and down (move the sensor probe at a rate of roughly 20 to 30 cm a second) to ensure that fresh sample is continuously supplied to the DO sensor.

d. When the measurement values are stable, **press MEAS key to acquire the 5- second average.**

e. Press the **ENTER key to save** the held measurement values, or press the **ESC key to**

cancel the operation.

Setting Mode

When SINGLE MEASUREMENT appears, press the right (▷) key to switch the display to the "**SETTINGS**" screen.

1) Setting sites

Press the down (▽) key to move the cursor to "**Site**", then press the ENTER key.

- Select site
- Create new site
- Delete site

2) **Unit for report**

Press the down (▽) key to move the cursor to "**Unit for report**", then press the ENTER key.

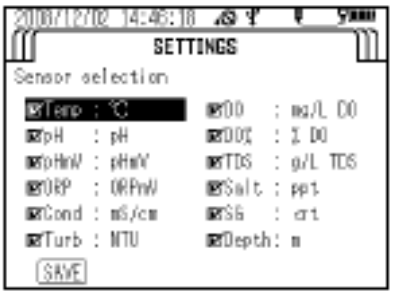
- Temperature (**°C**, °F, K)
- Turb (**NTU**, FMU, ppm)
- Cond (**mS/cm**, S/m, Fix S/m)
- SG (**σt**, σ0, σ15)
- Salt (**ppt**, % salt)

3) **Sensor selection**

Press the down (▽) key to move the cursor to "**Sensor selection** ", then press the ENTER key.

Move the cursor to each measurement parameter to change, then press the ENTER key. A check in the check box of a measurement parameter indicates it will be displayed.

To save the changes, move the cursor to SAVE, then press the ENTER key.



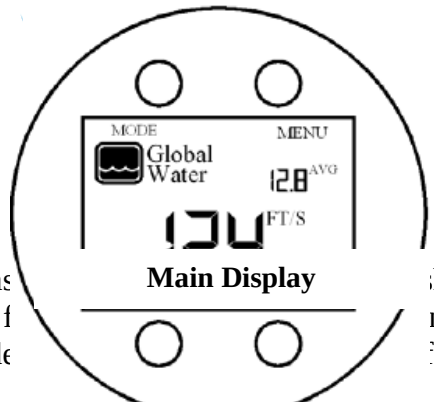
FP211 Global Water Flow Probe
Quick Manual

f. **Remove any debris** that may interfere with the flow probe's propeller. Make sure that the propeller turns freely by blowing on it.

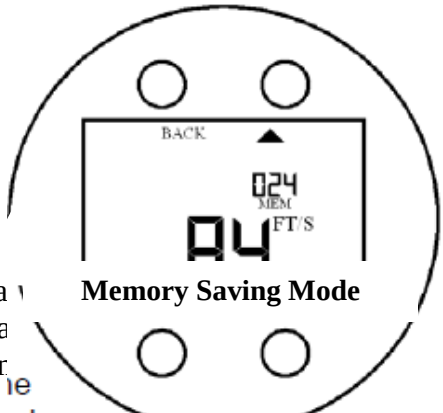
g. **Point the propeller** directly into the flow you wish to measure. Face the arrow inside the propeller housing downstream.

h. Place the propeller at the desired measuring point and **press the RESET button** to begin taking new average, minimum and maximum readings. As long as the probe remains in the flow, the averaging continues. One reading is taken per second, and a continuous average is displayed. Keep stable the probe for 20-40 seconds to obtain an accurate average value.
To stop averaging press the **SAVE** button, in Save Data mode the averaging is halted. Or press **BACK** to resume averaging without storing the data to memory.

i. When the **SAVE** button is pressed, the save data screen is displayed and the function of the buttons is changed. In this mode, the averaging and accumulation of minimum and maximum values is halted. The upper display shows the next empty memory location, in this case 024. The lower display shows the current average reading. Pressing the **SET** button (lower right) stores the current parameters to the memory location. There are a total of 30 memory locations.



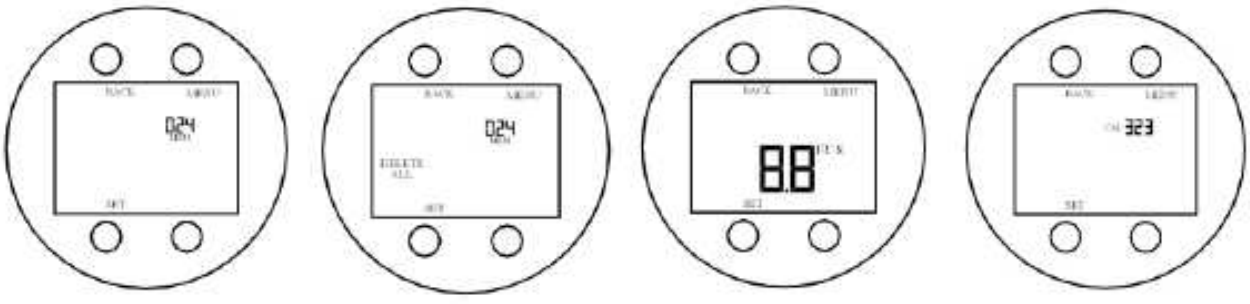
Main Display



Memory Saving Mode

j. It has should last a use. The f not replacea ower mode ect after 5 r

k. To enter the setup menu, press and hold the **MENU** button for 2 seconds. Each press of the **MENU** button cycles through 1 of 4 options, Press **BACK** at any time to return to the main display mode. The 4 menu options are View data, Delete All Data, Set Velocity Units and Set Calibration Number; press **SET** to enter the setup screen for the current menu function.



l. [**View Data**] From the **View Data** menu screen, press **SET** to review recorded data. The memory location is shown in the upper display and the data is shown in the lower larger

display. Use the **UP** and **DOWN** arrow buttons to change the memory location you wish to view. Use the **MODE** button to select the average, minimum or maximum data value for the selected memory location.

m. [**Delete All**] From the Delete All menu screen, press **SET** to delete all stored data.

n. [**Set Flow Units**] From the Set Units menu display, Press **SET** to change the Flow Units. The lower display shows the current flow units of either FT/S or M/S.

o. [**Set Calibration Factor**] The calibration factor is factory set and will generally **not need to be changed**.

<Specification of Global Water FP211>

Sensor type: Turbo-Prop propeller with magnetic pickup

Measurement range: 0.1 – 6.1 m/s

Length of supporting rod: 1.5 – 4.5 m

Calibration & Maintenance for the Field Equipment

JET, SCOWEM

1. Water Quality Checker, HORIBA U-52

1.1 Specification of the equipment

Parameter	Measuring range
Temperature	-10 – 55 ^{o}C
pH	0 – 14
Dissolved Oxygen (DO)	0 – 50 mg/L
Electric Conductivity (EC)	0 – 10 S/m
Salinity	0 – 70 ppt
Total Dissolved Solids (TDS)	0 – 100 g/L
Turbidity	0 – 800 NTU
Oxidation Reduction Potential (ORP)	-2000 – +2000 mV

1.2 Calibration required

Parameter	Frequency	Standard	Note
pH	before use	pH 4: phthalate pH 7: phosphate pH 9: borate	Auto calibration using attached solution pH 4.00 EC 4.49 ms/cm Turbidity 0.00 NTU
EC	when deteriorated	Potassium chloride (KCl)	
Turbidity	when deteriorated	Hexamethylene tetramine	
DO	before use	Air O_2 saturated water	10-20 minutes required to stabilize
Temperature	when deteriorated	Standard powder No. 160-22	
ORP	when deteriorated	known temperature	

pH 4.00 → 0.05 mol/L of potassium hydrogen phthalate

Air →DO calibration

Temperature (^{o}C)	DO (mg/L)
15	10.74
20	9.72
25	8.95
30	8.28

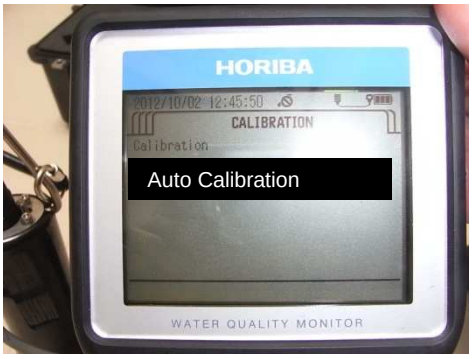
JIS K 0101

[Auto Calibration]

Chemical solution is attached for the calibration of pH, conductivity and turbidity.

Pour the solution into the transparent cup to the line – “with Turb measurement gauge line.

A cap should be removed from pH sensor beforehand. Then wash the sensor probe with deionized water.



Then press the control unit’s CAL key to set the calibration mode, then move the cursor to “Auto Calibration”, press ENTER

Immerse the probe in the transparent cup, then place into the black calibration cup to black out.

When all the sensor values have stabilized, press the ENTER key to start calibration. Calibration is finished when the message "Cal complete.

The calibrated values appear as follows at 25 ^{o}C

pH:	4.01
Cond.:	4.49 mS/cm
Turb.:	0.00 NTU

1.3 Maintenance required

(1) Storage

Pour the third of the rubber cap provided with deionized water and cover the sensor pH: black (small), DO: white (big)

(2) Routine care

Clean up the sensors by water and brush

(3) Every 2 months

Replace the membrane cap with polishing the electrodes

2. Water Flow Meter, Global Water FP211

2.1 Specification of the equipment

Range:	0.1 – 6.1 m/s
Accuracy:	0.1 m/s
Averaging:	once per second
Sensor type:	propeller with magnetic pickup
Rod length:	1.5 – 4.7 m
Power:	internal Lithium, non-replaceable (approx. 5 years' life)

2.2 Calibration required

Factory calibrated and <u>should not need to be changed</u>

2.3 Maintenance required

(1) Probe handle

When the Flow Probe expansion joint becomes submerged, dry the probe by separating the two handle sections.

(2) Cleaning the prop

The propeller should turn freely. If not, rinse the probe in clean water and remove any visible strings or other debris from the prop bearing.

Attachment-7: C values on the QCVN

Technical Regulations on Industrial Wastewater

No.	Parameter	Unit	QCVN 40: General		QCVN 01: Rubber		QCVN 11: Aquatic		QCVN 12: Pulp & Paper			QCVN 13: Textile		QCVN 14: Domestic		QCVN 25: Landfill site			QCVN 28: Hospital		QCVN 29: Oil Terminal			
			A	B	A	B	A	B	A	B1	B2	A	B	A	B	A	B1	B2	A	B	A	B1	B2	B3
1	Temperature	^0C	40	40								40	40											
2	Color (exsisting)	Pt/Co	50	150					50	100	150	50	150											
	(newly built)								20	50	100	20												
	Odour	-	-									offenseless												
3	pH	-	6-9	5.5-9	6-9	6-9	6-9	5.5-9	6-9	5.5-9	5.5-9	6-9	5.5-9	5-9	5-9				6.5-8.5	6.5-8.5	6-9	5.5-9	5.5-9	5.5-9
4	BOD_5	mg/l	30	50	30	50	30	50	30	50	100	30	50	30	50	30	100	50	30	50				
5	COD (existing)	mg/l	75	150	50	250	50	80	80	200	300	50	150			50	400	300	50	100	50	100	150	150
	(newly built)								50	150	200													
6	Suspended Solid	mg/l	50	100	50	100	50	100	50	100	100	50	100	50	100				50	100	50	100	120	120
7	Arsenic	mg/l	0.05	0.1																				
8	Mercury	mg/l	0.005	0.01																				
9	Lead	mg/l	0.1	0.5																				
10	Cadimium	mg/l	0.05	0.1																				
11	Chromium (VI)	mg/l	0.05	0.1								0.05	0.1											
12	Chromium (III)	mg/l	0.2	1								0.2	1											
13	Copper	mg/l	2	2								2	2											
14	Zinc	mg/l	3	3																				
15	Nickel	mg/l	0.2	0.5																				
16	Manganese	mg/l	0.5	1																				
17	Iron	mg/l	1	5								1	5											
18	Total Cyanide	mg/l	0.07	0.1																				
19	Total Phenol	mg/l	0.1	0.5																				
20	Mineral oil & grease	mg/l	5	10								5	5								5	15	18	30
	Animal-vegetable oil and fat	mg/l	-	-			10	20						10	20				10	20				
21	Sulfide	mg/l	0.2	0.5																				
	Sulfur as H_2S	mg/l												1	4				1	4				
22	Fluoride	mg/l	5	10																				
23	NH_4^+-N	mg/l	5	10	5	40	10	20						5	10	5	25	25	5	10				
	NO_3^--N													30	50				30	50				
24	T-N	mg/l	20	40	15	60	30	60								15	60	60						
	PO_4^--P													6	10				6	10				
25	T-P	mg/l	4	6																				
26	Chloride	mg/l	500	1000																				
27	Chlroine residual	mg/l	1	2			1	2				1	2											
28	Pesticide: organic chlorine	mg/l	0.05	0.1																				
29	Pesticide: organic phosphrous	mg/l	0.3	1																				
30	PCBs	mg/l	0.003	0.01																				
31	Coliform	MPN/100ml	3000	5000			3000	5000						3000	5000				3000	5000				
32	Gross α activity	Bq/l	0.1	0.1															0.1	0.1				
33	Gross β activity	Bq/l	1	1															1	1				
	TDS	mg/l												500	1000									
	Absorbable organic halogen	mg/l							7.5	15	15													
	Total surfactants													5	10									
	Salmonella																		ND	ND				
	Shigella																		ND	ND				
	Vibrio cholerae																		ND	ND				

C
valu

A: discharging into water sources for domestic and aqaculture use
B: discharging into other waters

B1: paper production
B2: pulp and paper

B1: operation before 01/2010
B2: operation after 01/2010

B1: warehouse/storage of oil
B2: facility with car washing
B3: facility without car washing

Attachment 6

Manual for Procedures for Development of Pollution Source Inventory
(Only in Electronic Version.)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SOCIALIST REPUBLIC OF VIETNAM
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT (MONRE)

THE PROJECT FOR STRENGTHENING CAPACITY OF WATER ENVIRONMENTAL MANAGEMENT IN VIETNAM

MANUAL FOR

PROCEDURE OF DEVELOPMENT OF WATER POL-

LUTION SOURCE INVENTORY (PSI)

May 2013

J I C A E X P E R T T E A M

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LIST OF ABBREVIATIONS

ACIC	: ASEAN Common Industrial Classification
BOD	: Biochemical Oxygen Demand
BRVT	: Ba Ria-Vung Tau
COD	: Chemical Oxygen Demand
DONRE	: Departments of Natural Resources and Environment
DQO	: Data Quality Objectives
EIA	: Environmental Impact Assessment
EMP	: Environmental Monitoring Plan
EPC	: Environmental Protection Commitment
EPP	: Environmental Protection Plan
FIP	: Factory Inspection Plan
GIS	: Geographical Information System
HCMC	: Ho Chi Minh City
HNI	: Hanoi
IC	: Industrial Cluster
NREC	: Natural Resources and Environment Consulting
PLU	: Pollution Load Unit
PSI	: Pollution Source Inventory
QC	:Quality Control
QCVN	: National Technical Regulation
SIHYMETE	: Sub-Institute of Hydrometeorology & Environment of South Vietnam
VEA	: Vietnamese Environment Administration
VILAS	: Vietnam Laboratory Accreditation Scheme
VSIC	: Vietnam Standard Industrial Classification

PART A. GENERAL DESCRIPTION OF WATER POLLUTION SOURCE INVENTORY

A-1 Preface

Many of industrial manufacturing processes produce some quantities of wastewaters. In almost all cases, the indiscriminate disposal of these wastewaters has a detrimental effect upon the environment. The continued growth of Vietnamese industry will undoubtedly require significant reductions in the amounts of pollutants in wastewaters now being discharged to the environment.

Understanding the status of discharges and/or releases of water pollutants to the environment media such as surface water body is the starting point of water quality management and control. Information and data concerning water discharges can be obtained from variety of ways such as source survey, regular monitoring, factory inspection and so on. These kinds of information and data are, therefore, vital and crucial requirement for the management and control of water quality problems. A Pollution Source Inventory (PSI) can provide these kinds of information systematically. Thus, the management and control of water quality necessitates the pollution source inventory.

In order to solve water resource problems in terms of water quality, proper water resource management programs have to be implemented. A water PSI is an indispensable component of any water resource management programs. Water PSI allows the identification and evaluation of water pollution problems, as well as the verification of pollution control measures taken and the compliance of polluters with regulatory measures. In this respect, water PSI is the foundation on which water quality management is based.

A-2 Component of This Manual

This manual is composed of the following three chapters including this chapter:

PART A: GENERAL DESCRIPTION OF WATER POLLUTION SOURCE INVENTORY,

PART B: DEVELOPMENT OF WATER POLLUTION SOURCE INVENTORY, AND

PART C: EXAMPLE OF DEVELOPING WATER POLLUTION SOURCE INVENTORY

A-3 Objectives of This Manual

This manual is intended to provide consistent and unambiguous procedures of the development of water PSI, which are defined in the next section of this manual (A-5), for the management and control of environmental water quality by relevant personnel of the central and local regulatory agencies. The procedures contained in this manual reflect the experiences of 5 DONREs[1] in the JICA Project[2] and will serve as a reference for experienced persons in the field of PSI, whereas inexperienced persons will find the manual useful as a logical guideline to learn how to develop a water PSI.

A-4 Expected User of This Manual

This manual intends to provide broad general directions and guidance for developing a water PSI to the personnel of the regulatory agencies in Vietnam. The expected users of this manu-

[1] Target 5 DONREs in the Project, DONREs of Hanoi, Hai Phong, TT-Hue, Ho Chi Minh City, and Ba Ria Vung Tau.
[2] The Project for Strengthening Capacity of Water Environmental Management in Vietnam.

al are as follows.

(1) Vietnamese Environment Administration (VEA)

This manual assists VEA to:

- prepare a plan to develop PSI for water pollution management,
- develop pollution source database system,
- understand ways to use PSI for management of water pollution related to industrial wastewaters.

(2) Departments of Natural Resources and Environment (DONREs)

This manual assists DONREs to:

- prepare a plan to develop PSI considering water pollution management,
- review existing PSI,
- check reliability of pollution source information collected,
- share pollution source information and data.

A-5 Definition of Water Pollution Source Inventory

(1) Type of Inventory

A word "inventory" is commonly used in the field of environmental management and protection as a meaning of "a list of itemized environmental issues that provides data and information to manage and control environmental problems". There are diverse types of inventories according to the end use of them. The following list gives several typical environmental related inventories:

1. Water pollution source inventory,
2. Toxic release inventory,
3. Air emissions inventory,
4. National resources inventory,
5. Greenhouse Gas inventory,
6. Substance-specific inventory.

Among a variety of inventories mentioned above, this manual takes up the water pollution source inventory (PSI) for water pollution management and control.

(2) Definition of water PSI

A PSI is a kind of database compiled mainly focusing on pollution source related information. A water PSI can be defined as follows:

"Pollution source inventory is a comprehensive list of pollution sources and water pollutants of their discharges within a specific geographical area for a specific time interval."

Although a PSI is a kind of database, the distinctive feature of PSI is that the PSI is to be developed with a clear intention of the management and control of water quality and/or water resources. In other word, the PSI has specific objectives of the end use such as understanding pollution tendency and compliance status of polluters with regulations in a specific area etc.

A-6 Function and Objectives of Water PSI

A water PSI has a function as one of support tools for the following objectives:

- Identify serious pollution sources and/or pollutants to be controlled,
- Identify and evaluate pollutants of concern,
- Grasp the compliance status of polluters with the environmental requirements,
- Set target values on reduction of pollution load,
- Develop pollution source management/control strategies,
- Evaluate effectiveness of pollution source control measures before and after implementation of pollution source management plan,
- Input necessary data and information to water quality modeling, and
- Input necessary data and information to health risk assessment.

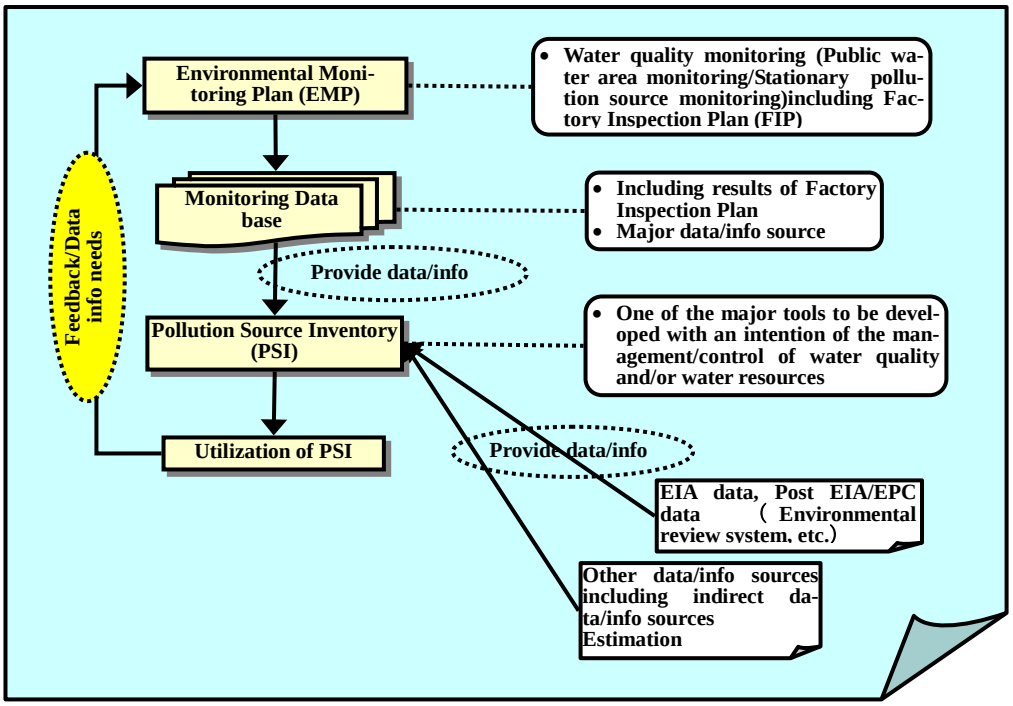
A-7 Linkage between Water Pollution Source Inventory, Factory Inspection and Water Quality Monitoring

There are several management tools for management and control of pollution sources. A water PSI is one of support tools to plan, implement, and evaluate pollution sources. Together with the water PSI, a water quality or pollution source monitoring and a factory inspection are the major management tools that have close relationships with the water PSI. Integrated use of these management tools is essential for the effective management and control of pollution sources.

Monitoring of water qualities can be carried out in a variety of ways: by making quantitative measurements of physical, chemical, and biological characteristic and qualitative descriptions of some features such as odor, transparency, etc. However, it should be noted that the prime objective of monitoring is to provide information which directly or indirectly aids management and control of water resources, whether this is done by establishing trends, checking compliance with guide/standard, or determining the effects of contaminant transfer.

On the other hand, a pollution source inventory (PSI) is a kind of database compiled mainly focusing on pollution source related information, and can provide information on pollution sources.

In order to evaluate the effects and/or the contributions of pollution sources to the environmental water qualities, it is necessary to examine and compare thoroughly both data of the monitoring results of ambient water and the inventory of pollution sources. The data of the inventory accelerate and support the utilization of the monitoring data. Data provided by the inventory are also useful to water quality modeling calculation. Figure A-1 below shows the relationships between Environmental Management Plan, Factory Inspection and Pollution Source Inventory.



Source: JET

Figure A-1 Relationship between EMP, FIP and PSI

A-8 Form of Water PSI

According to the definition and function of a water PSI, the form of water PSI should include the following items:

- The identified areas covered by the water PSI,
- The types of activities that cause discharges,
- The records of certification and/or registration of environmental authorization or compliance systems to be applied,
- The chemical or physical identity of the pollutants included,
- The time period of data and information inventoried.

A-9 Legal Basis of Water Pollution Inventory

Although, there are no laws and regulations that directly regulate development and usage of water PSI at present in Vietnam, the Government of Vietnam has promulgated a number of legal documents which concern management of water quality and water resources. Depending on the objectives of PSI use, the pollution-source-related laws and regulations regulate the development and the usage of the water PSI. Table below summarizes laws and regulations which directly or indirectly prescribe the management, organization, rights and responsibilities of development of a water PSI.

Table A-1 Major Laws and Regulations Concerning Development of PSI

No	Law/Regulation	Date	Contents
1	Law NO. 52, Order No. 29/2005/L-CTN (amended LEP from LEP of 1993)	Nov. 2005	Vietnamese basic environmental protection law (New LEP, LEP 2005)
2	Law No. 8	May 1998	Law on Water Resource
3	Decision No. 16/2007/QD-TTg	Jan. 2007	Overall scheme on national resources and environmental monitoring system until 2020
4	Decree No. 175/CP	Oct. 1994	Providing Guidance for the Implementation of the Law on Environmental Protection. Appendix I.2 (THE CONTENT FOR DETAILED ENVIRONMENT IMPACT ASSESSMENT REPORT)
5	Decree No. 61/1998/ND-CP	Aug. 1998	On The Inspection and Control Work with Regard to the Enterprises
6	Decision No. 64/2003/QD-TTg	Apr. 2003	The National Action Plan on strictly handling establishments that cause serious environmental pollution
7	Decree No. 67/2003/ND-CP	Jun. 2003	Environmental protection fees for wastewater
8	Decree No. 34/2005/ND-CP	Jul. 2003	Regulation for administrative penalties for pollution of water resources
9	Decree No. 121/2004/ND-CP	May 2004	Regulations on sanctioning of administrative violations in the field of environmental protection
10	Decree No. 149/2004/ND-CP	Jun. 2004	Licensing of wastewater discharge in water resources
11	Decree No. 80-2006-ND-CP	Aug. 2006	Detailed stipulation and implementing instruction of some articles of the Law on Environment Protection. Amended to Decree 29/2011/ND-CP
12	Decree No. 81/2006/ND-CP	Aug. 2006	Sanctioning of administrative violations in the domain of environmental protection
13	Decree No. 102/2008/ND-CP	Sept. 2008	On the Collection, Management, Exploitation and Use of Natural Resources and Environmental Data
14	Decree No. 117/2009/ND-CP	Dec. 2009	On the Handling of Law Violations in the Domain of Environmental Protection
15	Circular No. 2781//1996/TT-KCM	Dec. 1996	Guidance on procedures for the Grant, Renewal and Withdrawal of Certificates of Environmental Standards for Industrial Facilities
16	Circular No. 08/2006/TT-BTNMT	Sept. 2006	Guideline for EIA and EPC
17	Circular No.07/2007/TT-BTNMT	Jul. 2007	Guiding the classification and decision of list of units causing environmental pollutants that need sanction
18	Circular No. 07 / 2009/TT-BTNMT	Jul. 2009	Regarding the collection, management, exploitation and use of data on natural resources and environment
19	Circular No. 08/2009/TT-BTNMT	Jul. 2009	Providing for the environmental management and protection of economic zones, hi-tech parks, industrial parks and industrial complexes
20	Circular No. 26/2011/TT-BTNMT	Jul. 2011	Detailed guide of SEA, EIA and EPC (Follow Decree No. 29/2011/ND-CP)
21	Circular No. 48/2011/TT-BTNMT	Feb. 2011	Amendment and supplement to some Articles of Circular No. 08/2009/TT-BTNMT, providing for the environmental management and protection of Economic Zones (EZs), Hi-Tech Parks (HTPs), Industrial Parks (IDPs) and Industrial Complexes (ICs)
22	Circular No. 04/2012/TT-BTNMT	May, 2012	The criteria for determing the basis of environmental pollution, cause serious environmental pollution.
23	Decree No. 29/2011/ND-CP	Apr. 2011	Provision of the Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA), Environmental Protection Commitment (EPC)
24	Decision No. 10/2007/QD-TTg	Jan. 2007	The system of economic sectors in Vietnam (Industrial classification code)

Source: JET

Together with the laws and regulations that regulate management and control of water quality, Vietnam has also a set of national water quality standards for both ambient water and effluent. Table A-2 summarizes the water standards related to water PSI.

Table A-2 Water Quality Standards Related to PSI

No.	Standard/Regulation	Contents
1	QCVN 24/2009/BTMNT	National Technical Regulation on Industrial Wastewater (Amended to QCVN 40/2011/BTNMT)
2	QCVN 40/2011/BTNMT	National Technical Regulation on Industrial Wastewater
3	QCVN 08: 2008/BTNMT	National Technical Regulation on Surface water quality
4	QCVN 01: 2008/BTNMT	National Technical Regulation on Effluent from Natural Rubber Processing Industry
5	QCVN 09: 2008/BTNMT	National Technical Regulation on groundwater quality
6	QCVN 10: 2008/BTNMT	National Technical Regulation on coastal water quality
7	QCVN 11: 2008/BTNMT	National Technical Regulation on Seafood Processing Industry
8	QCVN 12: 2008/BTNMT	National Technical Regulation on Pulp and Paper Industry
9	QCVN 13: 2008/BTNMT	National Technical Regulation on Textile Industry
10	QCVN 14: 2008/BTNMT	National Technical Regulation on Wastewater
11	TCVN 6663-1:2011	Water quality - Part 1: How to set up sampling programs and sampling techniques (Equivalent to ISO 5667-1:2006)
12	TCVN 6663-3:2008	Water quality - Sampling. Guiding the preservation and handling of samples (Equivalent to ISO 5667-3: 2003)
13	TCVN 5999:1995	Water quality - Sampling. Guidance on sampling of waste water. (Equivalent to ISO 5667 -10: 1992)
14	TCVN 4557:1988	Water quality - Determination of temperature
15	TCVN 6492:2011	Water quality - Determination of pH (Equivalent to ISO 10523:2008)
16	TCVN 6185:2008	Water quality - Examination and determination of color
17	TCVN 6001-1:2008	Water quality - Determination of biochemical oxygen demand after n days (BODn) - Part 1: Methods for dilution and culture have supplement allylthiourea. (Equivalent to ISO 5815-1: 2003
18	TCVN 6001-2:2008	Water quality - Determination of biochemical oxygen demand after n days (BODn) - Part 2: Method for undiluted m Europe. (Equivalent to ISO 5815-2:2003)
19	TCVN 6491:1999	Water quality - Determination of chemical oxygen demand (COD). (Equivalent to ISO 6060:1989)
20	TCVN 6625:2000	Water quality - Determination of suspended solids by filtration through glass fiber filters. (Equivalent to ISO 11923:1997)
21	TCVN 6626:2000	Water quality - Determination of arsenic - Method of measuring the pH of the atomic absorption (hydrogen technology)
22	TCVN 7877:2008	Water quality - Determination of mercury. (Equivalent to ISO 5666:1999)
23	TCVN 6193:1996	Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead. Spectrometric method of flame atomic absorption
24	TCVN 6222:2008	Water quality - Determination of chromium - Method of measuring the pH of the atomic absorption
25	TCVN 6658:2000	Water quality - Determination of hexavalent chrome - Photometric method using 1,5 - diphenylcacbazid
26	TCVN 6002:1995	Water quality - Determination of manganese - Photometric method using formaldoxim
27	TCVN 6177:1996	Water quality - Determination of iron by spectrometric method using reagents 1.10 - phenantrolin
28	TCVN 6665:2011 (ISO 11885:2007)	Water quality-Determination of selected elements by optical emission spectra induced pair Plasma (ICP-OES)
29	TCVN 6181:1996	Water quality - Determination of total cyanide. (Equivalent to ISO 6703 -1:1984)
30	TCVN 6494-1:2011	Water quality - Determination of dissolved anions by liquid ion chromatography method - Part 1: Determination of bromide, chloride, fluoride, nitrate, nitr it, phosphates and soluble sulfate. (Equivalent to ISO 10304 -1:2007)
31	TCVN 6216:1996	Water quality - Determination of phenol index - spectrometric method using 4-aminoantipyrin after distillation. (Equivalent to ISO 6439:1990)
32	TCVN 6199-1:1995	Water quality-Determination of phenol single chemotherapy choice. Part 1: Gas chromatographic method after enrichment by extraction. (Equivalent to ISO 8165/1: 1992)
33	TCVN 5070:1995	Water quality - Method for determining the volume of petroleum and petroleum products
34	TCVN 7875:2008	Water - Determination of oil and grease - infrared projection method
35	TCVN 6637:2000	Water quality-Determination of dissolved sulfide-optical measurement method using methylene blue. (Equivalent to ISO 10530:1992)
36	TCVN 5988:1995	Water quality - Determination of ammonium - Distillation method and titration. (Equivalent to ISO 5664:1984)
37	TCVN 6620:2000	Water quality - Determination of ammonium - voltage method
38	TCVN 6638:2000	Water quality - Determination of nitrogen - Inorganic chemical catalyst

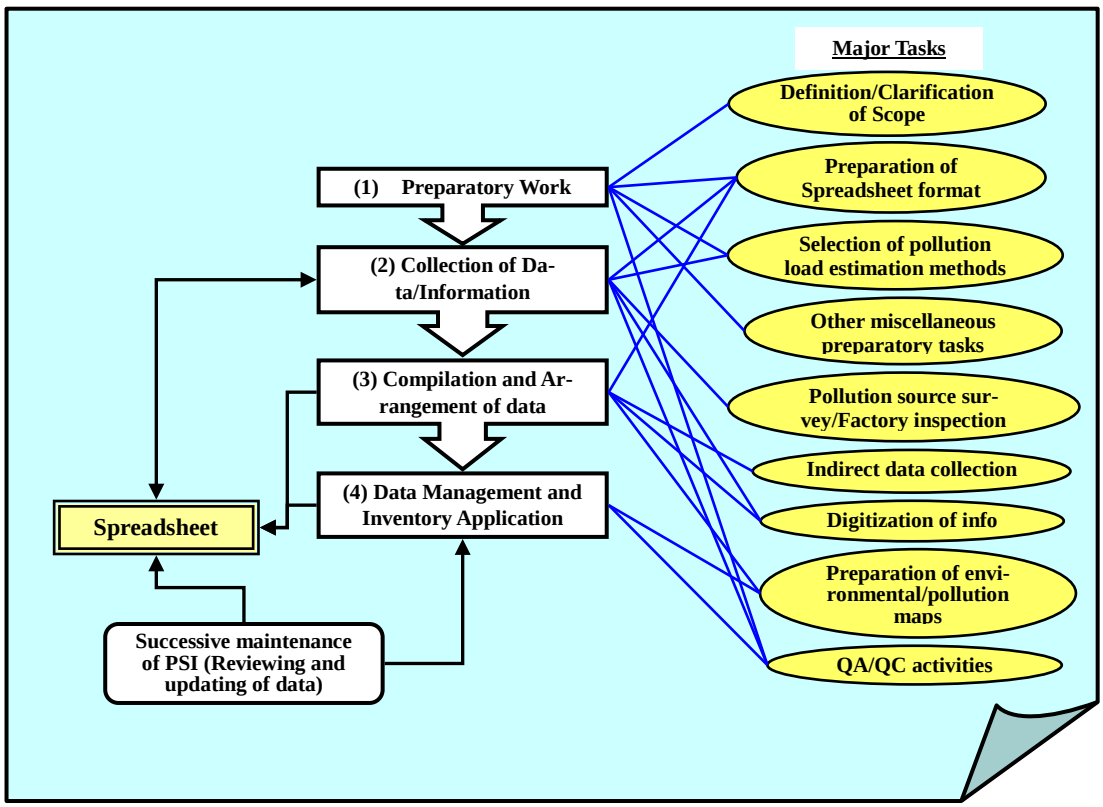
		after annealing devarda's alloy kh
39	TCVN 6202:2008	Water quality - Determination of phosphorus - measurement of pH using ammonium molybdate. (Equivalent toISO 6878:2004)
40	TCVN 8775:2011	Water quality - Determination of total coliform - membrane filtration technique
41	TCVN 6187-1:2009	Water quality - Detection and enumeration of Escherichia coli and coliform bacteria. Part 1: Membrane filtration method. (Equivalent to ISO 9308-1: 2000)
42	TCVN 6187-2:1996	Water quality - Detection and enumeration of coliform bacteria, coliform bacteria and Escherichia coli heat assumptions. Part 2: Method of multiple pipe (most probable number). (Equivalent toISO 9308 -2:1990 (E))
43	TCVN 6225-3:2011	Water quality - Determination of free chlorine and total chlorine. Part 3 - Iodometric titration method of determining total chlorine (Equivalent to ISO 7393-3:1990)
44	TCVN 7876:2008	Water - Determination of organochlorine pesticides - Gas chromatographic method of liquid-liquid extraction
45	TCVN 8062:2009	Determination of organic phosphorus compounds by gas chromatography - capillary column technique (Soil)
46	TCVN 6053:2011	Water quality - Measurement of total alpha radioactivity in non-saline water - Thick source method
47	TCVN 6219:2011	Water quality - Measurement of total beta radioactivity in water is not salty

Source: JET

PART B. DEVELOPMENT OF WATER POLLUTION SOURCE INVENTORY

B-1 Overall Procedure of Developing Water Pollution Source Inventory

Development of a water PSI can be divided into four (4) main components; (1) Preparatory work, (2) Collection of data and information, (3) Compilation and arrangement of data, and (4) Data management and inventory application. Each component is also made up of several elementary tasks. Figure below shows the concept of overall procedure of developing a water PSI and major tasks included in each component.



Source: JET

Figure B-1 Overall Procedure of Developing PSI

B-2 Developing Water PSI

(1) Preparatory Work

The preparatory work includes several tasks that enable the following two works; the collection of data/information and the compilation and arrangement of dada, to carry out them smoothly and effectively. The tasks include in the preparatory work are:

- ☑ Definition of the inventory use,
- ☑ Determination of Data Quality Objectives (DQOs),[3]
- ☑ Clarification of geographical boundary,

[3] DQOs are qualitative and quantitative statements to identify the level of uncertainty that a decision-maker is willing to accept. The purpose of DQOs is to ensure the final data will be sufficient for the intended use. (See "B-6 Data Quality Objectives (DQO)", Part B.)

- ☑ Definition of pollution source category,
- ☑ Definition of pollutants to be surveyed,
- ☑ Definition of discharge sources,
- ☑ Definition of time interval,
- ☑ Selection of data/information collection method,
- ☑ Selection of data/information estimation method/technique,
- ☑ Definition of all procedures to be used to determine discharges,
- ☑ Definition of ways of the data for storage, management, and documentation, and
- ☑ Other preparatory works concerned, if required.

Some of the tasks mentioned above overlap with those of the "(2) collection of data/information" shown in the figure above. The tasks in the preparatory work are basically to be conducted to determine the frameworks of water PSI and/or the procedures of the following works such as "collection of data/information". As given above, the major tasks of the preparatory work are definition and/or identification of the scope of inventory. Other major task that stretches over the preparatory work and the collection of data/information is pollution source surveying.

Defining the Scope of water PSI

The first step of planning the water PSI is to define the scope of the proposed inventory. Together with the identification of its use, the scope includes the following:

- ■ Definition of the inventory use,
- ■ Selection of pollutants,
- ■ Selection of category of discharge sources[4],
- ■ Selection of type of pollution sources/industrial sectors, and
- ■ Geographical boundaries.

Table below gives the example of the scope of PSI defined in the Project of Cau River Basin.

Table B-1 Example of Scope of PSI (Case of the Project of Cau River Basin)

Pollutant	Source category	Discharge source	Geographical bounda-
• BOD_5 • COD_{Cr} • NO_3 • NO_2 • NH_3 • PO_4 • SS • Other pollutants are to be inventoried as required	• Point source • Non-point source	• Factory • Mining area • Craft village • Livestock facility • Hospital • Solid waste disposal site • Domestic wastewater • Irrigation wastewater • Natural area source	• Cau river basin (Cau river model area: upstream area from Con river confluent point)
Inventory Use			
• Use for the management and control of a basin-wide water quality by relevant personnel of the central and local regulatory agencies • Grasp of general tendency of water pollution loads in the model area • Use for reference material for planning of management policy to the areas to be considered heavily polluted.			

Source: JET

Listing up of Discharge Sources

Once the scope of PSI has been defined, pollution sources should be listed up. The ultimate objective of listing up of the pollution sources is to prioritize and to select the discharge

[4] Discharge sources can be divided into two categories; one is point sources and the other is non-point sources or area sources. These Guidelines deal with only point sources.

sources to be inventoried according to their characteristics. The pollution source list is a crucial base of development of a water PSI. The pollution source list to be prepared contains the following items:

- Name of pollution source,
- Type of pollution source,
- Type of industrial sector,
- Location,
- Amount of wastewater discharges,
- Characteristics of wastewater,
- Wastewater discharge destination,
- Wastewater treatment facility
- Compliance status of environmental requirement or environmental authorization system

The pollution source list shall be prepared using the format shown below.

Name of DONRE _____

List of Pollution Sources **((Date/Month, Year))**

No.	Name of Pollution Source	Type of Pollution Source(1)	Industrial-sector(2)	Area Code(7)	Amount of WW(3)	Feature of WW				WW discharging destination(4)	WW tretment facility(5)	Priority(6)	Note
						Contain toxic materials	Contai materials difficult to treat	High conc. mineral oil	High conc. Organicmatter/oil				
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
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25													

Instructions:

(1) Type of Pollution Source:
F- Factory (industrial processing and manufacture)
C- Commercial facility, such as restaurant, gas station, etc.
H- Medical and social support activities
W- Water supply, Wastewater and Garbage management and tretment
O- Others

(2) Industrial sector:
Use one of the alphabetical division codes listed in the SIC.

(3) Amount of WW:
S- Less than 50 m3/day (Small scale)
L: More than 50 m3/day, but less than 200 m3/day (Large scale)
VL- More than 200 m3/day (Very large scale)

(4) Select one of the codes listed below to describe the wastewater discharging destination.
SW- Discharge to sewerage network
DI- Discharge to drainage system inside the factory
DO- Discharge to drainage system outside the factory
RV- Discharge to river/stream directly
LI- Discharge to land (infiltration)

(5) Select the wastewater treatment facilities applied.
N- Not equipped or not operated
A- Neutralization/Adjusting
C: Floatation
D- Sand filtration
E- Absorption by activated carbon
F- Oil separator
G- Activated sludge
H- Other biological treatment
I- Trickling filtration
J- Aeration pond
K- Anaerobic digestion
L- Other tretment

(6) Priority: Select one of the priority to be targeted
HT- Highest priority
HR- Higher priority
OT- Other priority

(7) Use one of the area codes defined by each DFEA to describe the location of the pollution source

Source: JET

Figure B-2 Example of Pollution Source List

(2) Collection of Data and Information

1) Classification of data/information collection method

There are several methods or techniques for gathering pollution source data/information in the course of developing a PSI. A key issue in inventory planning is what particular data/information collection methods or procedures will be followed. The methods can be categorized into two, namely the direct collection and indirect collection as shown below.

(a) Direct collection

- ❑ Source survey,
- ❑ Source inspection,
- ❑ Source test data, and
- ❑ Direct monitoring

(b) Indirect collection

- ❑ Reports of EIA, EPC, and EPP,
- ❑ Published literatures,
- ❑ Census and statistics,
- ❑ Discharge model,
- ❑ Estimation/calculation such as use of pollution load units, and
- ❑ Extrapolation

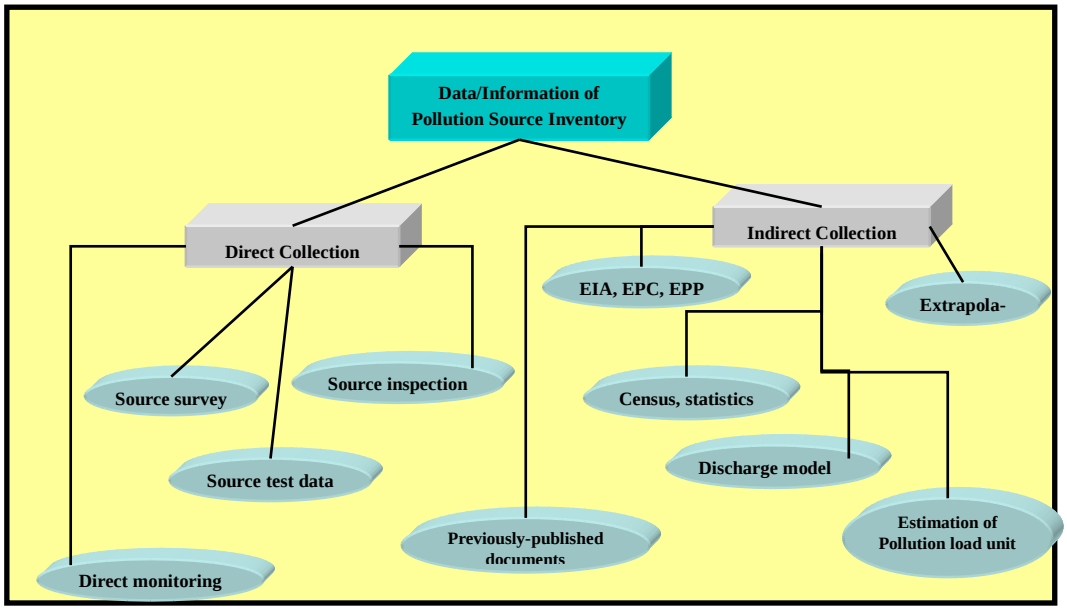
Table below summarizes collectable data and information by the direct and the indirect collection methods.

Table B-2 Sources of Data/Information and Types of Data/Information Collectable

Source Type		Major Data/Information
Direct Collection	Source survey	• Pollution load data/Pollution load unit • Facility activity data/information(Note) • Facility information • Spatial and temporal data • Pollutant/Speciation data/information
	Source inspection	• Pollution load data/Pollution load unit • Facility activity data/information • Source information • Spatial and temporal data • Pollutant/Speciation data/information
	Source test data	• Pollutant/Speciation data/information • Pollution load data/Pollution load unit
	Direct monitoring	• Pollutant/Speciation data/information
Indirect Collection	Report of EIA/EPP/EPC, Post EIA/EPP Report	• Pollutant/Speciation data/information • Pollution load data/Pollution load unit • Facility activity data/information • General facility data/information
	Published literatures	• General wastewater data/information • General facility data/information • Other related information
	Census and statistics	• General wastewater data/information • General facility data/information • Other related information
	Discharge model	• Wastewater data (quality and quantity)
	Estimates/calculations of Pollution load units	• Pollution load data/Pollution load unit • Pollutant/Speciation data/information
	Extrapolation	• Pollution load data/Pollution load unit • Pollutant/Speciation data/information

(Note): Facility activity data: is the data and information that presents conditions and/or status of operations of concerned facility, such as kind of products, amount of products, water consumption, number of employee, kind s and amount of raw materials, area of facility, etc.
Source: JET

The figure below shows the classification of data/information sources for the development of water PSI schematically.



Source: JET

Figure B-3 Data/Information Collection for Water PSI

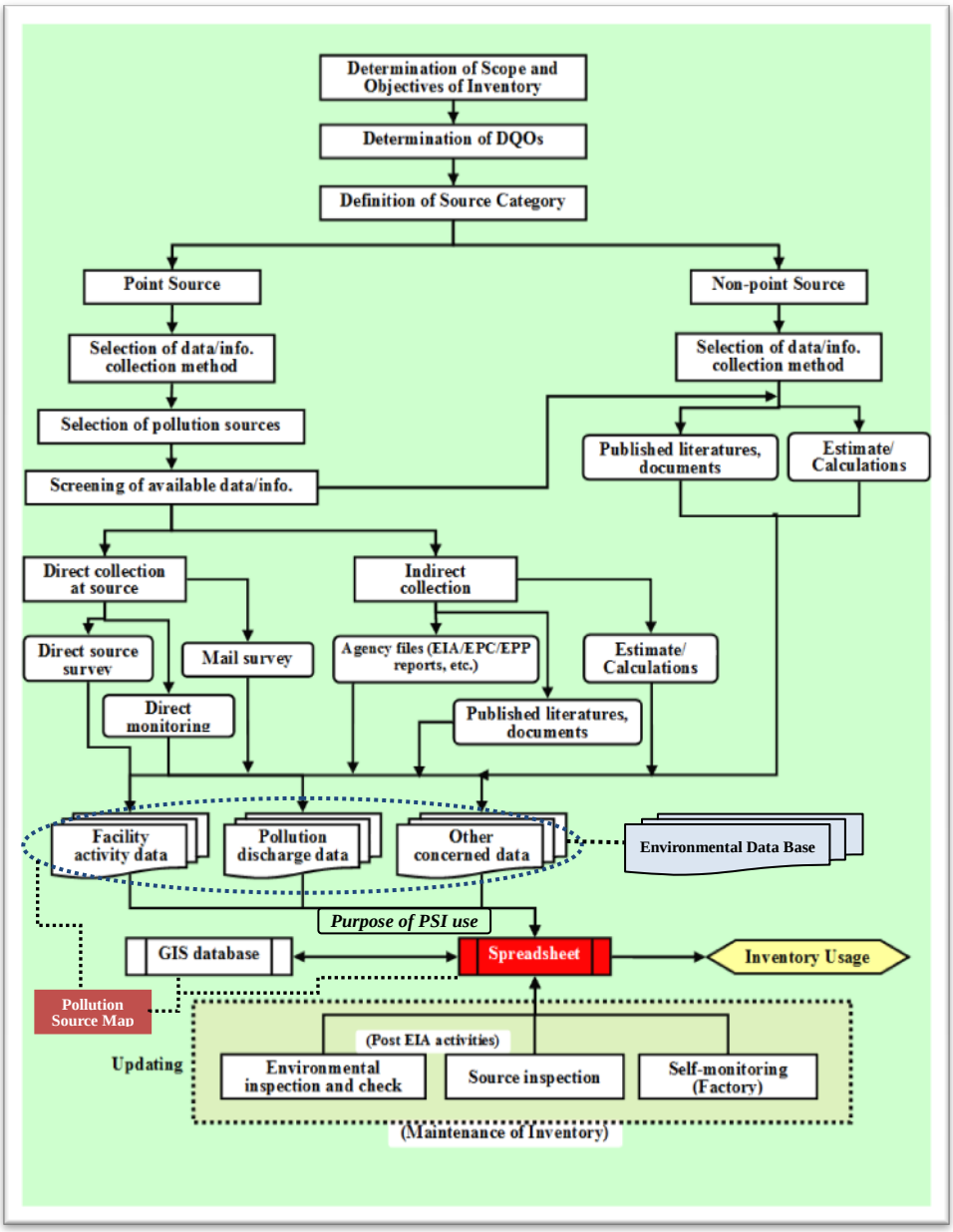
2) Strategy for data/information collection

In order to collect data/information for the development of PSI effectively and smoothly, following items should be kept in mind:

- Use of PSI
  - For what purpose the PSI will be used? Depending on the end use of PSI, range and kind of data/information are prescribed.
- Data/information collection methods
  - Should be selected considering the features of each pollution sources to best match the data/information quality and the available resources.
  - Combination of data/information gathering or estimation methods to ensure complete and accurate data/information for compilation of PSI.
  - Should always make efforts to collect as much detailed information as possible.

Overall procedures and process of data/information collection for development of PSI are shown in Figure B-4 below.

In addition to above, one of the crucial issues to be noted in the course of developing PSI is how to ensure the data quality which meet the end use of PSI. For this, the concept of the DQO should be applied in developing the PSI. The concept of DQO is shown in section B6.



Source: JET

Figure B-4 Overall Procedures and Process of Data/Information Collection

Among the diverse methods of data/information collection mentioned above, the most common method is the direct collection at pollution sources. The direct collection method can obtain data/information by contacting each point source in the target area. Questionnaire, on-site inspection, and relevant documents and ledger readily available in the agency are also some of the methods that are useful in collecting pollution source data/information as well as source activity data and control data. A key issue in inventory planning is what particular data collection procedures will be followed.

Although data and information obtained through a direct collection method normally has the highest reliability, the direct collection method has a limitation, that is to say, the use of single direct collection method cannot gather all data/information needed for the development

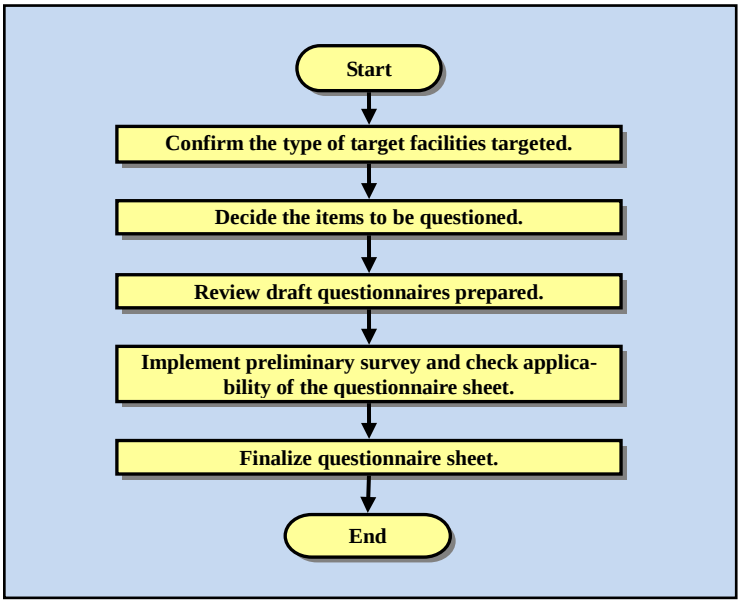
of a PSI. It should be also noted that the direct collection method is generally resource intensive compared to the indirect collection method. Therefore, one of a major inventory planning consideration is whether, and to what extent, data/information can be obtained by the indirect collection method. In order to complete a PSI, integrated use of more than two data/information collection methods is required.

Source survey

Although a source survey is a typical direct information collection method suitable for getting reliable information, it requires a lot of preparatory works. The preparatory works for source survey include the following:

- Listing up of target pollution sources/facilities,
- Classification of target pollution sources/facilities, and
- Meeting with target facilities for explanation and demonstration,

The source survey is generally conducted by using a pollution source survey format, namely a questionnaire. The survey format should be prepared depending on the type of target pollution sources before implementation of the survey. Process for preparation of the questionnaire sheet can be divided into the following steps.



Source: JET

Figure B-5 Process of Preparation of Questionnaire for Pollution Source Survey

An example of the questionnaire for facility survey, which is used in the questionnaire survey in BRVT conducted in November and December 2011, is shown in the next pages.

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness

Ba Ria- Vung Tau Province, (date)....
(month)...2011

ENTERPRISES INFORMATION COLLECTION FORM

I. ENTERPRISE INFORMATION

1.1. Name of enterprise:

1.2. Name of owner:

1.3. Name of Project/Factory:

1.4. National:

1.5. Address of enterprise:

1.6. Tel: ..... Fax:.....

1.7. Address of Factory :

1.8. Location of Factory:

+ X Coordinator:

+ Y Coordinator:

1.9. Year of operation:

1.10. Type of enterprise:

☐ Joint stock company ☐ Private Company

☐ State company ☐ 100% FDI Company

☐ Limited company ☐ Others:

1.11. Business sectors:

1.12. Code economics Vietnam

1.13. Business certificate:..... Date of issue:.....

1.14. Business Certificate (if any):..... by:.....
Date of issue: .....

15. Staff in charge of environment.....
Tel:.....Email:.....

II. PRODUCTION ACTIVITIES INFORMATION

2.1. The total area of land / building area:

2.2. Total employees: Number of direct employees:

2.3. Number of cases produced:

2.4. Number of working days in a year:

2.5. Catering for workers:
Was prepared from Plant Outside Number: ... ... / day.

2.6. Materials and chemicals for production

No.	Name of materials & chemicals	Used in the process	Unit	Consumed amount	Year of statistics

2.7. Fuels for production *(this data collection is not compulsory)*

No.	Name of fuels	Purpose of use	Unit	Consumed amount	Year of statistics
1	DO		litre/month		
2	FO		litre/month		
3	Lubricant		litre/month		
4	Gas		litre/month		
5	Coal		kg/month		
6	Firewood		m^3/month		
7	Electricity		kWh/month		

2.8 Production process in the enterprise:

2.9. Operation capacity:

No.		Name of main products	Unit	Output	Year of statistics
	Designed				
	Actual				
	Designed				
	Actual				

	Designed				
	Actual				

III. WATER CONSUMPTION, WASTESWATER AND TREATMENT METHODS INFORMATION

3.1. Water Resource and Usage

- ***Water resource to be used:***
  - + Kind of Water resource: Well(under-ground water) ☐ Water tank ☐
  - + supply water ☐ others ☐
  - + Nos of well :……., Nos of well being used:…….
  - + Actual exploited flow:……..m^3/day
  - + Exploiting permits: Yes ☐ No ☐ /Nos. permits:……
  - + Total amount of used water (supply water and underground water):……. m^3/day

No.	Code (name of well)	Coordinate		Diameter (mm)		Depth (m)	Flow (m^3)	Exploitation regime
		X	Y	Inner	Outer			

- ***Purpose of usage:***
  - + Supply water is used for:…… …… ……
  - + Underground water is used for:

……

……

3.2.Amount of Consumed Water and Discharge

Type	Wa[t]er usage amount (m^3/day)	Wastewate[r] discharge amount (m^3/day)	Discharged to(1)	Type of Treatment facility(2)
Production process	The average (m3/day): Peak (m3/day):	The average (m3/day): Peak (m3/day):		
Domestic usage	The average (m3/day): Peak (m3/day):	The average (m3/day): Peak (m3/day):		
Cooling water	The average (m3/day): Peak (m3/day):	The average (m3/day): Peak (m3/day):		
Others	The average (m3/day): Peak (m3/day):	The average (m3/day): Peak (m3/day):		

(1): Select one of the codes listed below to describe the wastewater discharging destination.

SW – Discharge to sewerage network, DI – Discharge to drainage system inside the factory

DO – Discharge to drainage system outside the factory, RV – Discharge to river/ stream directly (specify name of river/stream)

LI – Discharge to land (infiltration), Others: pond, lake, reservoir, etc.

(2): Select the wastewater treatment facilities applied.

A – Neutralization/Adjusting
B – Sedimentation
C – Activated sludge
H – Other biological treatment

☐ Others

IV. OPERATION INFORMATION:

4.1.Regular Monitoring

1. Does enterprise have regular monitoring? Yes ☐ No ☐
2. Frequency of monitoring
   (times/year):……
3. Monitoring methods :……
4. Appraisal unit:……
5. Parameters monitored
   Wastewater:
   ……
   ……
   Waste gas/Exhaust gas:
   ……
   Ambient air:
   ……
   Underground water:……
   Surface wate:……
   ……
6. Written evaluation of the results of environmental monitoring by management agencies:
7. Please enter the analytical results in latest self-monitoring report and attach the monitoring results from the report.
   Date monitored (Month/Year): (/)

pH	mg/L	Odor		Color		BOD_5	mg/L
COD_{Cr}	mg/L	SS	mg/L	NH_4^+	mg/L	T-N	mg/L
T-P	mg/L	Coliform	mg/L	AOX	mg/L	Oil & Grease	mg/L
Cr(III)	mg/L	Cr(VI)	mg/L	Total Fe	mg/L	Cu	mg/L
Chlorine residual	mg/L	Hg	mg/L	Pb	mg/L	As	mg/L
Cd	mg/L						

(Enclosing a copy of the results of regular monitoring times).

4.2. Environmental Permits: (listing and enclosing a copy):

Environmental Permits	No.	Issuing date
1. ☐ Approved Environmental Impact Assessment (EIA) ☐ EPP ☐ Certificate of registration of environmental standards ☐ EPC ☐ Environmental Protection Solution ☐ No environmental permits		
2. Acceptance Certificate of wastewater treatment system		
Permit exploitation of groundwater / river water		
Permit Sign discharge		
Waste water fee		
The report made the contents of the EIA		

V. INSPECTION RESULTS:

1. Has the enterprise been inspected by the State management agency on environmental protection : Yes □ No □

No.	Date of inspection	Inspection agency	Notes

2. Has the enterprise been fined for violating environmental regulations? Yes □ No □

No.	Number of Decision on sanctions	Decision-issuing agency	Fines	Reason of sanction

INTERVIEWER
(sign and write full name)

RESPONDENT
(sign and write full name)

(3) Compilation and Arrangement of Data

1) Preparation of Spreadsheet Format

The data needed to develop a PSI is drawn from a wide range of sources. The responsible agency for development of the PSI may collect some of the data specifically. The collected data and information are usually recorded and stored in a form of spreadsheet. The spreadsheet is used for processing of stored data, and then is used for management of the water quality and/or the water resources.

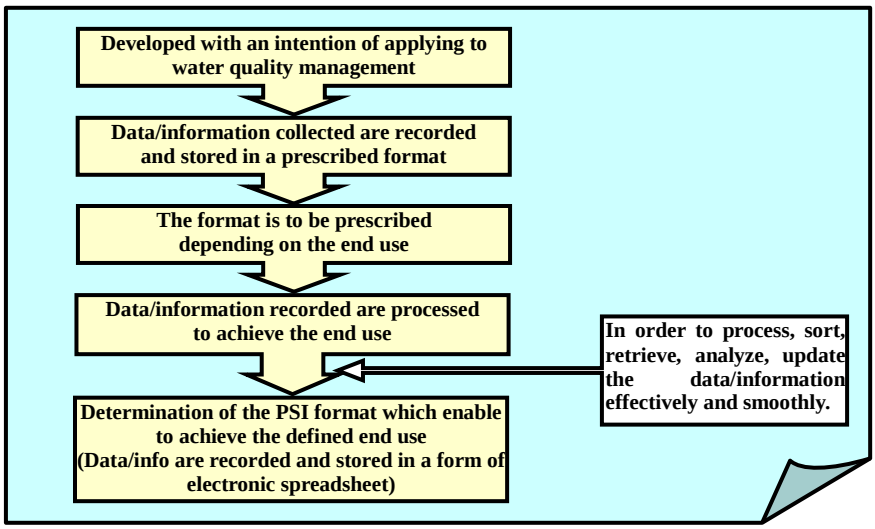
The form of PSI has to be designed considering the end use. The data elements inventoried in the PSI are summarized below. Data elements mentioned below are not necessarily included for all PSIs. Data elements to be inventoried in PSI should be selected according to the end use of the PSI.

Table B-3 Data Elements to be Inventoried in PSI

	Data Element	Recorded by:		Data Element	Recorded by:
Location	Province	Name, Code	Discharge information	Flow rate of wastewater	m^3/day, etc.
	City/Town/District	Name, Code		Wastewater treatment facility	Code (Type of facility)
	Ward/Town/Commune	Name, Code		Destination of wastewater	Code
	Latitude	x coordinate		Sampling data	Date
	Longitude	y coordinate		pH	Concentration
Source information	Pollution source category	Name, Code		EC	Concentration
	Industrial type	Name, VSIC		TDS	Concentration
	Major products	Name, Amount		BOD_5	Concentration
	No. of employee	No. of employee		COD_{Cr}	Concentration
	Area of source	Hectare		NO_3-N	Concentration
	Annual turnover	Milln. DON, Code		NO_2-N	Concentration
	Business type	Capital type code		NH_3-N	Concentration
	River basins	River basin Code		TKN	Concentration
	Data/Info. source	Code		PO_4	Concentration
	EIA/EPC	Yes/No, Date		SS	Concentration
Environmental requirement	EIA-	Status		T-Coliform	Concentration
	EPP	Status		T-Cr	Concentration
	EPC	Status		Cr(III)	Concentration
	WW fee	Status		CN	Concentration
	WW discharge license	Status		Pb	Concentration
	Others	Status		Other pollutants as required	Concentration

Source: JET

The figure below shows the series of procedures that start from data/information collection and end by the determination of the PSI format. The PSI format is to be prepared in a form of electronic spreadsheet using a computer.



Source: JET

Figure B-6 Preparation of PSI Format

To maintain acceptable data quality, it is important to practice adequate quality control (QC) measures during the development and review of spreadsheets. The information presented in a spreadsheet should be evaluated to determine if input data are transcribed correctly, calculated results are technically sound, and the final results are reported in a manner that will allow the data to be evaluated. A typical form of PSI spreadsheet is shown in next page. The form shall be modified according to the use of PSI.

Figure B-6 illustrates the process of data collection and preparation of PSI spreadsheet.

Example of Form of PSI Spreadsheet (1/2)

No.	Priority(Note1)	Pollution Source Facility							Pollution Source Location							Facility Information														Source of data/info
		Industrial type		Facility Name	Industrial classification code				Address	Province	Code1	Code2	Code3	x	y	Major Product				Raw Material		Water consumption	No. of employee	Number of operation days per year	Number of operation days per month	Area (ha)	Annual turnover (miln. SP)	Business type		
		Name	Code (Level 1)		Level2	Level3	Level4	Level5			Province	City/District/ Town	Ward/Town/ Commune	Latitude	Longitude	Name 1	(Ton/y)	Name 2	(Ton/y)	Name	(Ton/y)	(m^3/day)								
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2																													
3																													
4																													
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20																													

(Note1): To be classified into 3 categories, Highest, Higher, and Others

Example of Water PSI Spreadsheet

Example of Form of PSI Spreadsheet (2/2)

No.	Environmental Requirement/Environmental Authorization System						Wastewater treatment facility	Wastewater Information																	
								WW Destination	Flow rate of WW (m^3/d)		Temp.	pH	EC	BOD	COD_{Cr}	SS	NO_3-N	NO_2-N	NH_3-N	PO_4	T-Coliform	
	EIA	EPP	EPC	WW Fee	WW discharge license				Production Line	Domestic wastewater													
											(℃)	(-)	(μ S/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)		
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2) Coding/Digitization of information

Data and information collected are recorded and stored in a prescribed format, namely in a form of spreadsheet. The PSI is developed for water quality management. Therefore, the format of PSI should be designed considering this end use of the inventory. The data and information recorded are processed to achieve the end use. In order to process, sort, retrieve, analyze, update the data and information effectively and smoothly, data and information are recorded and stored in computer. Applying of a Geographical Information System (GIS), which can be a useful tool in handling spatially distributed data, is a typical example of a computer use with a PSI. GIS is used to locate each point source and to define the boundary around each area source. Pollution source information stored in a GIS can be overlaid with other spatially-referenced data, such as information on administrative boundaries or water basins, allowing various spatial analysis that would be too labor-intensive without a GIS.

Use of computer with a PSI expands and promotes the potential application of the PSI, as is the case of GIS application. However, it should be noted that **the use of sophisticated computer technology can be made possible only when the data and information collected are digitized**. Followings are the data and information to be digitized for the development of the PSI.

- Industrial sector

Type of industrial sector is to be digitized using Vietnam Standard Industrial Classification 2007 (VSIC 2007). VSIC 2007 was built by the General Statistics Office (GSO) on the basis of International Standard Industrial Classification revision 4 (ISIC Rev.4), the Draft ASEAN Common Industrial Classification (ACIC), the current status of the use of Viet Nam Standard Industrial Classification issued 1993, and also the statistical survey demand[1].

The structure of VSIC 2007 comprises five Levels as follows:

- Level 1 comprises 21 branches coded by the letters of the alphabet in alphabetical order from A to U (Alphabet letter: Section)

- Level 2 comprises 88 branches; with each branch coded by **two numbers** after those of the corresponding **Level 1** (2-digit: Division)

- Level 3 comprises 242 branches; with each branch coded by **three numbers** after those of the corresponding **Level 2** (3-digit: Group)

- Level 4 comprises 437 branches; with each branch coded by **four numbers** after those of the corresponding **Level 3** (4-digit: Class)

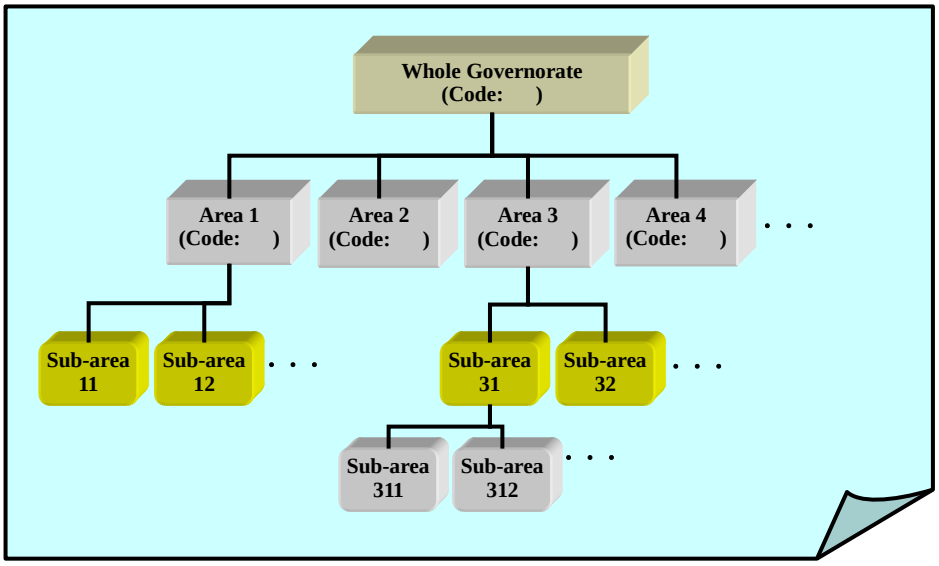
- Level 5 comprises 642 branches; with each branch coded by **five numbers** after those of the corresponding **Level 4** (5-digit: Sub-class)

- Location of pollution source

Location of pollution sources are to be recorded using the area codes defined by each DONRE. Coding of area should be made based on the area zoning defined by the Provincial Peoples Committee and/or other competent authorities considering the geographical and economical conditions of each province. Example of the structure of area coding is shown below.

Detailed information on the pollution source location can be expressed using the Global Positioning System (abbreviated GPS) (latitude: X and longitude: Y).

[1] The provision on the contents of each economic industry of VSIC 2007 was issued by the Minister of Ministry of Planning and Investment at the decision numbered 337/2007/QD-BKH.



Source: JET

Figure B-7 Structure of Coding Rule of Area Zoning

- Other data to be coded/digitized as required[1]

Prior to entry of data in the form of PSI, coding rule should be set. Followings are the example of coding for typical data element.

i) Type of pollution source

F- Factory (industrial processing and manufacture), C- Commercial facility, such as restaurant, gas station, etc., H- Medical and social support activities, W- Water supply, Wastewater and Garbage management and treatment

ii) Destination of wastewater

SW- Discharge to sewerage network, DI- Discharge to drainage system inside the factory, DO- Discharge to drainage system outside the factory, RV- Discharge to river/stream directly, LI- Discharge to land (infiltration)

iii) Wastewater treatment facility

N- Not equipped or not operated, A- Neutralization/Adjusting, C: Floatation, D- Sand filtration, E- Absorption by activated carbon, F- Oil separator, G- Activated sludge, H- Other biological treatment, I- Trickling filtration, J- Aeration pond, K- Anaerobic digestion, L- Other treatment

B-3 Sustainable development and use of PSI

(1) Organization

The development and usage of water PSI rely significantly upon sound institutional arrangements. These should include organizational structure in each related-agency as well as at the central coordinating level, inter-agency cooperation structures and definition of the responsibilities of the agen-

[1] See Figure B-2 Example of Pollution Source List.

cies/organizations involved. A commonly agreed strategic action plan is needed, based upon the national plans, and commitments by each concerned agency/organization. At present, data and information on pollution sources are collected by some departments/divisions of DONRE such as Environmental Protection Agency (EPA), Division of Inspection and so on according to their mandates and responsibilities. However, data and information collected by various departments are not necessarily shared sufficiently yet, mainly due to strong tendency to comply with the old system and regulations.

In order to develop and manage the water PSI efficiently and effectively as well as to use the water PSI sustainably, it is advisable that the whole water PSI management is administered uniformly by a single body. Therefore, the concerned departments/sections have to set up a joint body which coordinates and supervises the implementation of PSI development and management based on inter-departmental agreements. Table below summarizes the current demarcation of role and responsibility of departments/sections in DONRE for environmental management activities.

Table B-4 Role and Responsibility of Environmental Management Activity in DONRE

Activity	Responsible Depart-	
Environmental authorization (EIA/EPP, EPC)	EPA	Setting up of joint body for unified management
Environmental review/check	EPA	
Environmental monitoring	Monitoring center	
Environmental inspection	Dept. of inspection	
Management of water PSI	**(Administrative body of PSI)** ⇦	

Source: JET

Considering the situations above, it is advisable to establish the following institutional/organizational arrangement for the sustainable development and use of PSI.

- To establish inter-division cooperation structure in DONRE defining and clarifying the responsibilities of the divisions involved, (Example: Establishment of a PSI administrative committee in DONRE)
- To appoint persons in charge of PSI by DONRE leader,
- To make it a duty to report PSI-concerned activities to DONRE leader and/or higher organizations such as PPC,

(2) Collection of data and information

As mentioned above, PSI can be developed by collaborative effort of multiple departments/divisions such as EPA, Monitoring Center. In the process of PSI development, collection of data and information entail a number of important decisions, such as how to collect data and information, what types of data and information are to be collected, how accurate and reliable the collected data and information should be within limited resources, time and budget. Therefore, together with the establishment of institutional/organizational structure mentioned above, adoption of the following countermeasures is recommended for the sustainable development of PSI:

- Clarification of data and information collection methods and data sources
  - ✧ To establish data/information collection methods depending on budget, human resources, available time, acceptable errors, etc.,
  - ✧ To clarify and select the types of data/information based on the laws and regulations such as Circular 04/2012/TT-BTNMT,
- To utilize DONRE owned files and data/information

- ✧ Utilization of the results of environmental inspection, the reports of environmental checking, the environmental monitoring reports, enterprise monitoring reports, etc.,
- ✧ Prioritize and list the DONRE owned files and data/information such as Reports of environmental inspection, EIA Reports, post EIA Reports, etc.

➢ Reexamination of PSI format according to the end use of PSI

- ✧ Modification and/or simplification of the PSI format currently used,
- ✧ Reconstruction of PSI format by using developed computer application such as MS ACCESS currently developed by using MS EXCEL.

➢ Promotion of QA/QC for data and information for development of PSI

- ✧ For practical use of PSI, reliability and accuracy of data and information to be collected is crucial matter. In order to ensure the reliability and the accuracy of data and information, procedures of QA/QC and DQOs should be followed through the PSI development process. (see B-6 and B-7 of this Part B)

(3) Legal basis

At present, there are no laws and regulations which directly regulate the development and the use of PSI in Vietnam. In order to initiate the development and the use of PSI, establishment of laws or regulations which directly govern PSI is recommended.

(4) Resources

Resource to develop a water PSI can be divided into human resources and equipment as shown below.

i) Human resources

- ➢ Supervisor for developing the water PSI,
- ➢ Inventory surveyor,
- ➢ Data arrangement staff, and
- ➢ GIS expert

To collect reliable information to establish a water PSI, the ability of inventory surveyors are very important. The inventory surveyors should have the following knowledge and skills:

- Understanding of the objectives and the necessity of required data and information to establish the water PSI,
- Knowledge in legislation to clarify jurisdiction of the water PSI,
- Knowledge on Quality Control (QC) to secure reliability of collected data,
- Knowledge on existing information source to collect required data,
- Communication skills with non-cooperative targets,
- Knowledge on general concentration of wastewater discharged from highest priority targets

ii) Equipment

- ● Computer to store database,
- ● GIS application, and
- ● Internet

(5) Network to Collect Existing Information

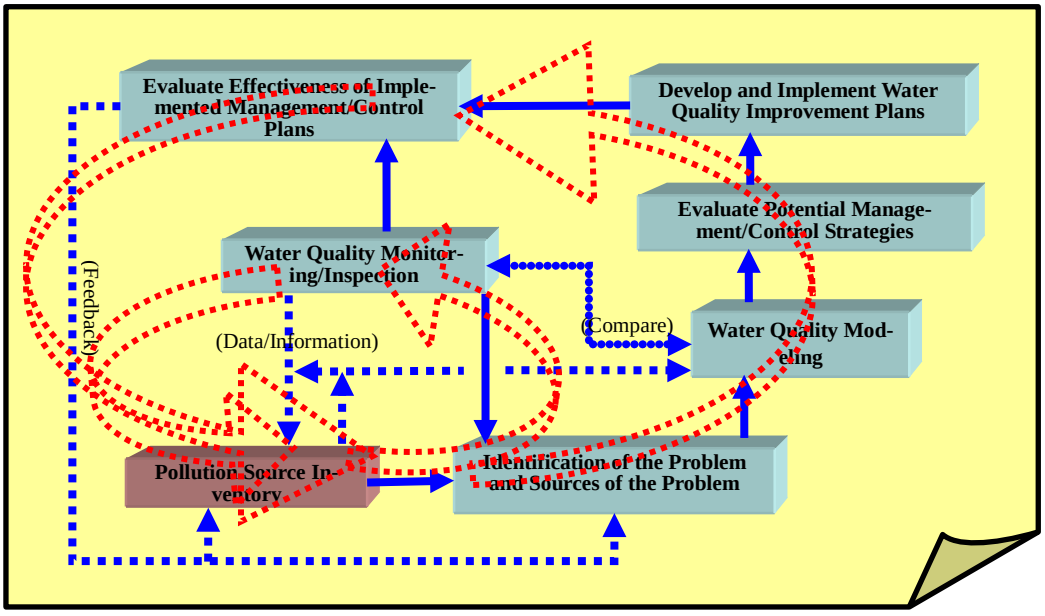
Reliable data can be obtained by direct source survey, but the target facilities frequently do not have required data to establish the water PSI. It is important to use existing information such as EIA reports to supplement the direct source survey, and also establish information network to the concerned organizations at the district level to exchange existing information.

(6) Cooperation with Experts for Indirect Collection of Required Data

Indirect collection of required information should be carried out to establish the water PSI. Some measures on indirect collection require special technical knowledge and skills. Human resource information to cooperate with such experts should be shared at province or district level.

(7) PSI cycle

Sustainability of development of PSI is ensured by integrating several tasks mentioned above. For this, it is recommended to establish the PSI cycle depicted below.



Source: JET

Figure B-8 PSI Cycle for Sustainable Development of PSI

B-4 Estimation of Pollution Loads

(1) General

One of the major uses of PSI is to evaluate the status of pollution in the target area caused by wastewaters discharged from pollution sources. In order to evaluate the status of pollution, the pollutants discharged from the sources must be identified and quantified. The biggest concern is how to quantify and/or estimate the pollutants from the sources. As mentioned above, one of the best methods to collect reliable data/information is the use of data/information of source survey or source test. However, it is often difficult to estimate or quantify all pollutants to be inventoried in PSIs due to the lack of source survey/test data.

In order to supplement the lack of source survey/test data entered in a PSI form, several methodologies or techniques are proposed to estimate loads of pollutants. In general, they can be categorized into four types of methodologies or techniques including source survey/test data:

- ❑ Sampling or direct monitoring (source survey/test data),
- ❑ Pollution load unit,
- ❑ Mass balance, and
- ❑ Other engineering calculations.

Source survey/test data or continuous monitoring data are usually preferred for estimating a source's discharges because those data provide the best representation of the source's discharges.[(Note)] These kinds of data are normally obtained in concentration, and can be easily converted to pollutants discharge rates, namely pollution loads, if information on wastewater quantity is also known.

In case where source survey/test data, continuous monitoring data or parametric monitoring data are unavailable, another method must be used to estimate discharges. Thus, estimation methods of pollution load units and mass balance are frequently the best or the only method available for estimating discharges, in spite of their limitations. Here, it should be noted that there are two kinds of pollution load units. One is the pollution load unit which is calculated with the information collected by inventory survey and existing pollution load unit by each pollution source, and the other is one which is calculated with the figures obtained by census and existing pollution load units.

If none of these methods can be employed to estimate discharges, an approximation or engineering estimate based on available process, physical, chemical, and discharge knowledge may be used. Where the risks of adverse environmental or regulatory effects are high, the more sophisticated and costly discharge determination methods such as continuous monitoring or source survey may be necessary. Conversely, where the risks are low, less expensive estimation methods such as the use of pollution load units and discharge models may be acceptable.

(2) Pollution load unit (PLU)

1) Significance of pollution load unit

As mentioned above, there are several methodologies or techniques to estimate pollution load. Among them, pollution load unit is one of the most useful tools available for estimating discharges from both point and non-point sources. A pollution load unit is an estimate of the quantity of pollutant released to the watercourses as a result of some activity such as washing of product or dressing up of ore, divided by the level of the pollution source activity. Usually, pollution load units are expressed as the weight of pollutant divided by weight or volume of product, area, number of employee, duration of the activity discharging the pollutant, etc. with the underlying assumption that a linear relationship exist between discharges and specific activity level over the probable range of application.

Pollution load unit (PLU) can be defined as follows:

Definition of Pollution Load Unit:
Quantified indicator to present the wastewater discharges per unit activity of facilities such as amount of product, number of employee, area of facilities, etc.

[(Note)] Although source survey/test data usually have a higher reliability, two items should be noted when using source survey/test data to evaluate the discharges. First, because most source survey/test data are generally only conducted over several hours or days at most, adjustments may need to be made when using these data to estimate discharges over longer time intervals or conditions different from those under which the survey/test ere performed. Second, a source survey/test supplied by a plant may not adequately describe a given facility's annual or seasonal operating pattern.

Following s show the example of representative PLUs:

- **PLU Examples**

  * BOD: 18.8 kg/m^3 of beer (Malting and brewing industry)
  * TSS: 3.9 kg/m^3 of beer (Malting and brewing industry)
  * BOD: 7.3 kg/employee/year (Restaurants)

  (Source: Rapid Inventory Techniques in Environmental Pollution, WHO 1993)

  * COD: 1.21 kg/worker/day (Dye and Textile Industry)
  * T-N: 3.58 kg/ton-product (Clothing, Garment, Washing, Iron)

  (Source: Center for Environmental Chemistry (CTC))

2) Available PLU in Vietnam

In response to request of MONRE, Center for Environmental Chemistry (CTC) has developed a system for pollution load unit in order to deal with Decree No.67/2003/ND-CP [(Note1)]. The CTC's PLU system has been developed based on the Vietnamese and foreign country's data and information regarding eleven (11) industrial sectors. This PLU system is useful and available for estimating the point-source pollution loads.

Besides the CTC's PLU system mentioned above, there are a few literature data which relate to pollution load unit to be referred. Following shows representative literatures of pollution load units:

- Assessment of Sources of Air, Water, and Land Pollution – A Guide to Rapid Source Inventory Techniques and their Use in Formulating Environmental Control Strategy (WHO, 1993)
- Guideline of Study for Planning Development of Sewerage System in River Basin (Japan Sewage Work Association, 1999)

3) PLU system of CTC

The system consists of methodologies to calculate and estimate volume of wastewaters, amount of pollutant discharged. Pollution parameters or pollutants dealt with in this system are chemical oxygen demand (COD)[(Note2)], biochemical oxygen demand (BOD), total suspended solids (TSS), total nitrogen (T-N), total phosphorous (T-P) and ammonia (NH^+_4).

The origin and source of data and information of the system are:

(a) Documents/materials on industrial discharge in other countries,
(b) Domestic (Vietnamese) documents on industrial discharge,
(c) EIA/Post EIA reports of factories, and
(d) Standard data

Data and information used in the system have been processed statistically to verify the reliabilities.

① Pollution source category

Pollution sources can be divided into two categories, namely point source and non-point source. As for the point source, the CTC takes up several industrial sectors, and classifies them into 11 groups. Table below shows the industrial sectors the CTC adopted.

[(Note1)] Decree No.67/2003/ND-CP on Environmental Protection Charges for Wastewater.
[(Note2)] Basically COD is calculated based on BOD using the specific value of BOD/COD ratio by industrial sector.

Table B-5 Classification of Pollution Source Category by CTC

Category	Group (SP)	Group No. (SP No.)	Sector	Vietnam Industrial Classification Code (Level2)
Point Source	1	1 - 130	Dye and Textile Industry	13, 14
	2	131 - 224	Paper and pulp	17
	3	225 – 269	Tanning	15
	4	270 – 439	Chemical, wash - cleaning , fertilizer, insecticide, rubber, plastic	13, 18, 19, 20, 21, 22, 23, 27, 28, 31, 37
	5	440 – 550	Mechanics, mechanical manufacture, Metallurgy	19, 23, 24, 26, 27, 28, 30, 37
	6	551 – 583	Mine ores, building materials, sift, coal, Ther-mo-electricity	05,09, 19, 37
	7	584 – 640	Fruit and vegetable, cooking oil	10
	8	641 – 696	Animal husbandry, meat processing, sea food	10
	9	697 – 813	Food product, alcohol, beer, soft drink, milk, sugar	10, 11, 12, 37
	10	814 - 868	Grain processing, starch, cultivation	10, 11, 37, 38
Other sources	11	869 – 962	School, Hospital, Waste dump, Industrial Zone, etc.	

Source: CTC

② Unit of PLU system

Pollution load unit is a ratio that relates discharge of pollutant to the activity level of the pollution source such as an amount of product produced, or an amount of wastewater discharged. Pollution load units are usually expressed as the weight of pollutant divided by the activity level of pollution source such as amount of product, number of employees, or duration of the activity discharging the pollutant. Considering the contents of pollution source activities in the area, CTC adopted various types of units to stand for pollution load unit. Following summarizes the types of pollution load units and their codes adopted in the CTC's pollution load unit system.

Table B-6 Unit Adopted in CTC's Pollution Load Unit

Code	Unit of Activity	Pollution Load Unit
M^3NT	Amount of wastewater [m^3]	[Kg /M^3NT]
CN/CA	Worker shift	[Kg /CN.CA]
T.SP	Products [ton]	[Kg/T.SP]
T.NL	Raw material [ton]	[Kg/T.NL]
CN/NGAY	Worker Day	[Kg/CN.NGAY]
HADAT	Production area [ha]	[Kg/HADAT]
VNUOI	Number of animal	[Kg/VNUOI]
10^3CH	Number of bottles [1,000 bottles]	[Kg/10^3CH]
BED	Number of beds	[Kg/BED]

Source: CTC

③ Definition of indicators of PLU used in the system

In order to evaluate pollution load discharged from a pollution source, some types of PLU indicators are adopted by industrial sector and by parameter. Definitions or meanings of PLU indicators are summarized below:

Table B-7 Definition/Meaning of Indicators in the System

Type of Indicator	Definition/Meaning	Unit	Parameter
Medium pollution load (Mx)	• Mean value (Mxa) • 65% Max. + 35% Min. • 65% Min. + 35% Max.	Kg/M^3NT, Kg/CN.CA, Kg/T.SP, Kg/T.NL, Kg/CN.NGAY, Kg/HADAT, Kg/VNUOI, $Kg/10^3CH$	COD_{Cr}, BOD_5, N-T, P-T, NH_4, SS
Max. pollution load	Mxa + 1 standard deviation	Kg/M^3NT, Kg/CN.CA, Kg/T.SP, Kg/T.NL, Kg/CN.NGAY, Kg/HADAT, Kg/VNUOI, $Kg/10^3CH$	COD_{Cr}, BOD_5, N-T, P-T, NH_4, SS
Min. pollution load	Mxa - 1 standard deviation	Kg/M^3NT, Kg/CN.CA, Kg/T.SP, Kg/T.NL, Kg/CN.NGAY, Kg/HADAT, Kg/VNUOI, $Kg/10^3CH$	COD_{Cr}, BOD_5, N-T, P-T, NH_4, SS
CODeq(Note1)	COD_{Cr} Plus nitrification oxygen	Kg/M^3NT, Kg/CN.CA, Kg/T.SP, Kg/T.NL, Kg/CN.NGAY, Kg/HADAT, Kg/VNUOI, $Kg/10^3CH$	CODeq
EP (NEP)(Note2)	Equivalent population, MAX(NEP_{CODCr}, NEP_{BOD}, NEP_{T-N}, NEP_{T-P}, NEP_{NH4}, NEP_{SS})	EP	COD_{Cr}, BOD_5, N-T, P-T, NH_4, SS

Source: CTC

Example of PLU of CTC is shown in the next page.

(Note1): COD_{eq}

As shown above, PLU (COD_{eq})[1] can be defined as "PLU (COD) plus nitrification oxygen of PLU (NH_4)". Considering the nitrification process of NH_4 that ends to nitrate (NO_3), PLU (COD_{eq}) can be calculated:

$$COD_{eq} = PLU\ (COD) + 5\ X\ PLU\ (NH_4)$$

Therefore, in case of SP No. 1 of CTC's database 1:

$PLU_{Max}(COD)$[2] = 16.95 kg/T.SP and $PLU_{Max}(NH_4)$ = 2.83 kg/T.SP,

$$CODeq = 16.95 + 5X\ 2.83 = \underline{\mathbf{31.10\ kg/T.SP}}$$

(Note2): Equivalent population

It is convenient to use an equivalent population (EP) to assess pollution loads. EP is a quantitative description to assess the level of pollution load in terms of population. EP can be obtained converting the pollution load of certain pollutant such as BOD into the equivalent population. One unit of EP (1 EP) is usually expressed as the weight of pollutant discharged per one person and per day. Some institutes or organizations have provided units of EP for representative pollutants. Table below shows the representative EP units.

Table B-8 Unit of Equivalent Population

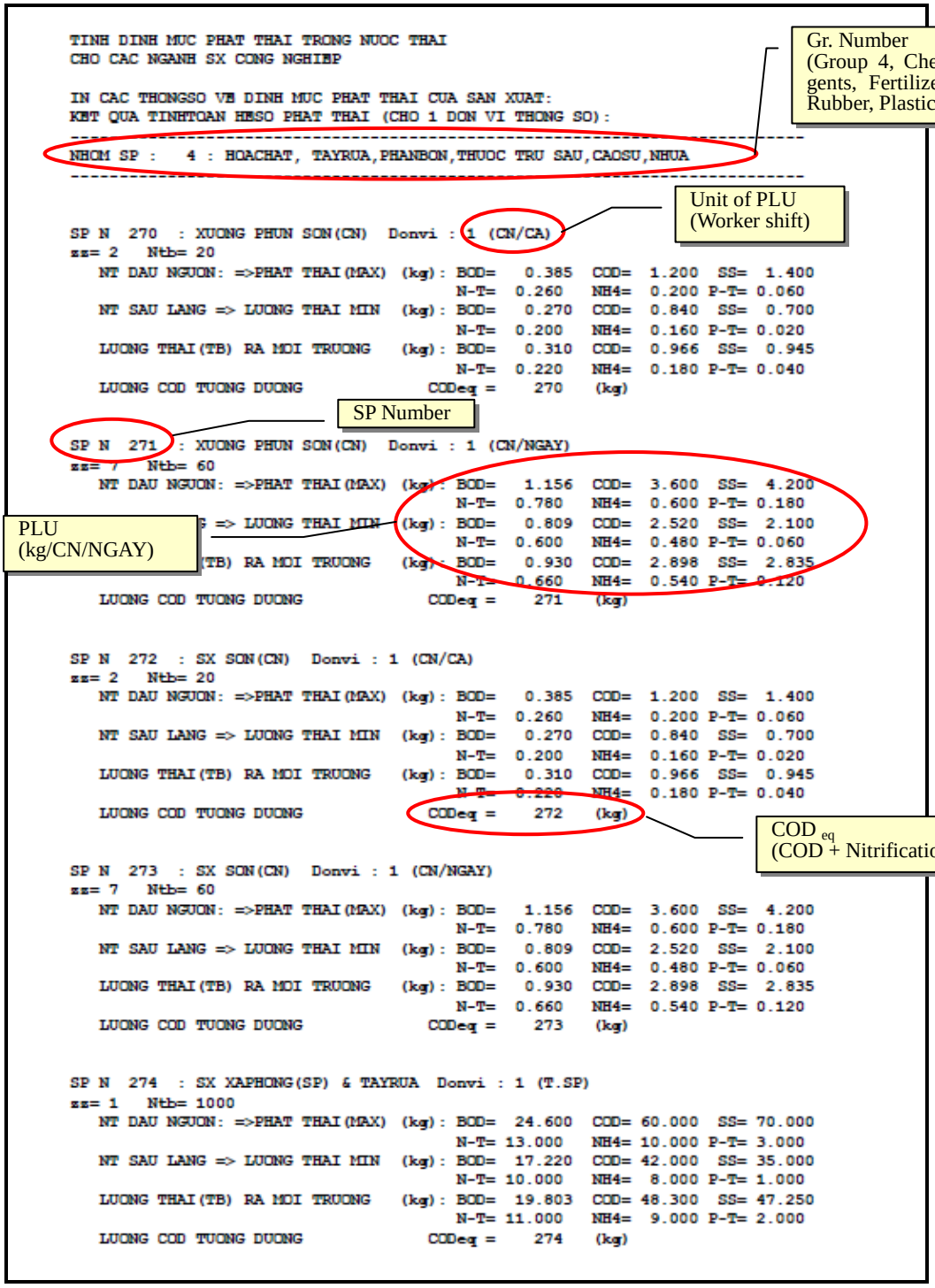
Source	EP Unit (g-pollutant/capita/day)					
	BOD	COD	TSS	T-N	T-P	NH_4^+-N
WHO(Note1)	45 - 54	1.6 to 1.9 X BOD	70 - 145	6 - 12	0.6 – 4.5	0.6 X T-N
WHO (Ave.)	50	109	108	9	2.2	
CTC(Note2)	65	150	130	15	3	12

(Note1): Rapid Inventory Techniques in Environmental Pollution, WHO, 1993
(Note2): Center for Environmental Chemistry (CTC), Vietnam
Source: Prepared by JET

[1] PLU(X) means the value of PLU in terms of pollutant X.
[2] In the CTC's PLU system, CODeq is calculated based on PLU_{Max}.

Example of CTC's PLU

(Group 4: Chemicals, Detergents, Fertilizers, Pesticides, Rubber, Plastic)



```
TINH DINH MUC PHAT THAI TRONG NUOC THAI
CHO CAC NGANH SX CONG NGHIEP

IN CAC THONGSO VE DINH MUC PHAT THAI CUA SAN XUAT:
KET QUA TINHTOAN HESO PHAT THAI (CHO 1 DON VI THONG SO):
-------------------------------------------------------------------------------
NHOM SP :   4 : HOACHAT, TAYRUA,PHANBON,THUOC TRU SAU,CAOSU,NHUA
-------------------------------------------------------------------------------

SP N  270  : XUONG PHUN SON(CN)  Donvi : 1 (CN/CA)
zz= 2   Ntb= 20
   NT DAU NGUON: =>PHAT THAI(MAX) (kg): BOD=   0.385  COD=  1.200  SS=  1.400
                                        N-T=  0.260   NH4=  0.200 P-T= 0.060
   NT SAU LANG => LUONG THAI MIN  (kg): BOD=   0.270  COD=  0.840  SS=  0.700
                                        N-T=  0.200   NH4=  0.160 P-T= 0.020
   LUONG THAI(TB) RA MOI TRUONG   (kg): BOD=   0.310  COD=  0.966  SS=  0.945
                                        N-T=  0.220   NH4=  0.180 P-T= 0.040
   LUONG COD TUONG DUONG             CODeq =    270   (kg)

SP N  271  : XUONG PHUN SON(CN)  Donvi : 1 (CN/NGAY)
zz= 7   Ntb= 60
   NT DAU NGUON: =>PHAT THAI(MAX) (kg): BOD=   1.156  COD=  3.600  SS=  4.200
                                        N-T=  0.780   NH4=  0.600 P-T= 0.180
   S => LUONG THAI MIN  (kg): BOD=   0.809  COD=  2.520  SS=  2.100
                                        N-T=  0.600   NH4=  0.480 P-T= 0.060
   (TB) RA MOI TRUONG   (kg): BOD=   0.930  COD=  2.898  SS=  2.835
                                        N-T=  0.660   NH4=  0.540 P-T= 0.120
   LUONG COD TUONG DUONG             CODeq =    271   (kg)

SP N  272  : SX SON(CN)  Donvi : 1 (CN/CA)
zz= 2   Ntb= 20
   NT DAU NGUON: =>PHAT THAI(MAX) (kg): BOD=   0.385  COD=  1.200  SS=  1.400
                                        N-T=  0.260   NH4=  0.200 P-T= 0.060
   NT SAU LANG => LUONG THAI MIN  (kg): BOD=   0.270  COD=  0.840  SS=  0.700
                                        N-T=  0.200   NH4=  0.160 P-T= 0.020
   LUONG THAI(TB) RA MOI TRUONG   (kg): BOD=   0.310  COD=  0.966  SS=  0.945
                                        N-T=  0.220   NH4=  0.180 P-T= 0.040
   LUONG COD TUONG DUONG             CODeq =    272   (kg)

SP N  273  : SX SON(CN)  Donvi : 1 (CN/NGAY)
zz= 7   Ntb= 60
   NT DAU NGUON: =>PHAT THAI(MAX) (kg): BOD=   1.156  COD=  3.600  SS=  4.200
                                        N-T=  0.780   NH4=  0.600 P-T= 0.180
   NT SAU LANG => LUONG THAI MIN  (kg): BOD=   0.809  COD=  2.520  SS=  2.100
                                        N-T=  0.600   NH4=  0.480 P-T= 0.060
   LUONG THAI(TB) RA MOI TRUONG   (kg): BOD=   0.930  COD=  2.898  SS=  2.835
                                        N-T=  0.660   NH4=  0.540 P-T= 0.120
   LUONG COD TUONG DUONG             CODeq =    273   (kg)

SP N  274  : SX XAPHONG(SP) & TAYRUA  Donvi : 1 (T.SP)
zz= 1   Ntb= 1000
   NT DAU NGUON: =>PHAT THAI(MAX) (kg): BOD=  24.600  COD= 60.000  SS= 70.000
                                        N-T= 13.000   NH4= 10.000 P-T= 3.000
   NT SAU LANG => LUONG THAI MIN  (kg): BOD=  17.220  COD= 42.000  SS= 35.000
                                        N-T= 10.000   NH4=  8.000 P-T= 1.000
   LUONG THAI(TB) RA MOI TRUONG   (kg): BOD=  19.803  COD= 48.300  SS= 47.250
                                        N-T= 11.000   NH4=  9.000 P-T= 2.000
   LUONG COD TUONG DUONG             CODeq =    274   (kg)
```

Gr. Number
(Group 4, Chemicals, Detergents, Fertilizers, Pesticides, Rubber, Plastics)

Unit of PLU
(Worker shift)

SP Number

PLU
(kg/CN/NGAY)

COD $_{eq}$
(COD + Nitrification oxygen)

Source: CTC

B-5 Calculation of Pollution Load Using PLU

The calculation of pollution load from a given source is based on the use of an appropriate pollution load unit, which reflects the experiences from the measured environmental performance of similar sources. Each pollution load unit is defined as the normalized released pollutant load expressed in kg per unit of activity of the particular source under consideration.

Here it should be noted again that pollution load unit is generally to be developed assuming no control device or no wastewater treatment facility is in place. These are referred to as "uncontrolled pollution load units". However, sometimes, pollution load units are derived from data obtained from facilities with a control device or a wastewater treatment facility in place. Where controls or treatment facilities are used, efficiency of the controls or treatment facilities should be taken into account. In addition to the performance of the control device or the wastewater treatment facility at pollution source, the regulatory agencies, such as MONRE or DONRE, are normally implementing discharge control programs such as imposing of wastewater discharge fee. Therefore, in order to estimate or calculate pollution loads to the environment, two concepts should be introduced. One is the efficiency of the control device or wastewater treatment facility. Another is the effectiveness of discharge control programs implemented by regulatory agencies, that is to say so called "rule effectiveness". "Rule effectiveness" is a generic term for the uncertainty in discharge estimates caused by imperfect discharge control programs. It is a measure of the extent to which a rule actually achieves its designed discharge reduction.

Taking into account the definition or meaning of the pollution load unit as well as those of the efficiency of the controls or treatment facilities and the rule effectiveness, pollution discharges can be calculated by multiplying the pollution load unit by the corresponding pollution source activity level as shown below.

The basic discharge estimation equation

$$D = A \times PLU \times (1 - R \times RE)$$

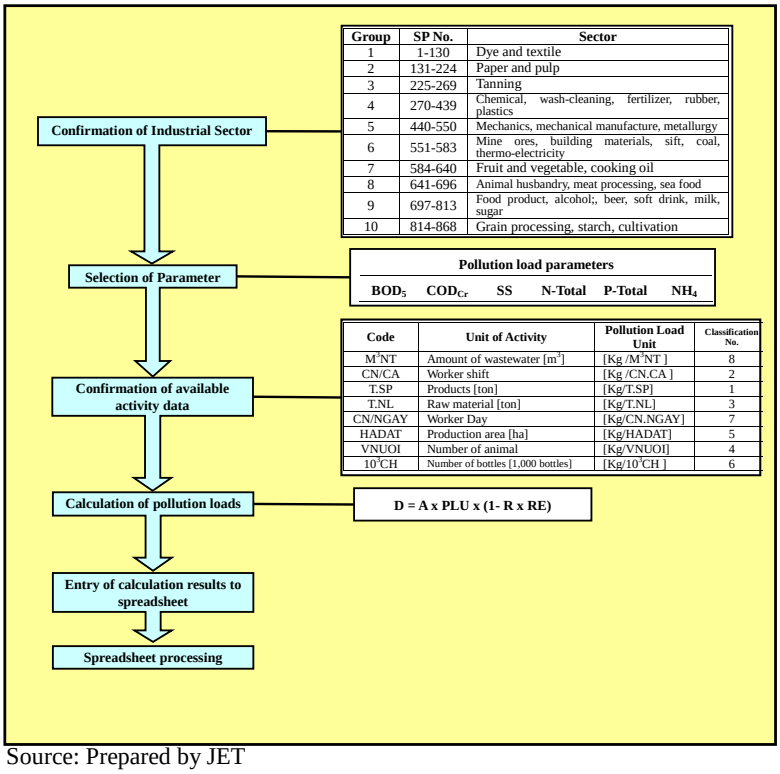
where:

D = discharge estimate for the process
A = activity level of pollution source
PLU = pollution load unit assuming no control
R = removal efficiency of control device
RE = rule effectiveness

As shown above, for the calculation of discharges using pollution load units, four basic inputs; (i) A, (ii) PLU, (iii) R and (iv) RE, to the estimation algorithm are required.

(i) A: Activity information for the process as specified by the relevant pollution load unit;
(ii) PLU: Pollution load unit assuming no control device or no wastewater treatment facility is in place (uncontrolled pollution load unit);
(iii) R: Removal efficiency of control device (expressed in percent), R equals zero if no control device is in place;
(iv) RE: Measure of ability of the regulatory program to achieve all discharge reductions possible, which reflects the assumption that regulations are typically not 100 percent effective. RE is used as adjustment to the control efficiency.

The overall procedure of calculation of pollution loads, in case of use of CTC's pollution load unit, is shown schematically below:



Source: Prepared by JET

Figure B-9 Overall Procedure of Pollution Load Using PLU

B-6 Data Quality Objectives (DQO)

As mentioned in the previous sections, collection of data plays key role in developing and use of PSIs. Collection of good quality data takes considerable planning to ensure accurate, consistent results. Planning before conducting surveys or experiments is now generally recognized as an emerging scientific discipline. Out of this emerging discipline, the Data Quality Objectives (DQO) process was developed as a planning tool. The DQO process helps determine when enough data of sufficient quality has been collected to enable accurate decision-making. In this meaning, DQO process is considered very important and applicable to developing PSIs. Considering the concept and the effectiveness of the DQO, the DQO process is useful and applicable in case of collection of data for evaluation of pollution loads using PSIs.

The U.S. Environmental Protection Agency (EPA) has developed the Data Quality Objectives (DQO)[1] process as an important tool for project managers and planners to determine the type, quantity, and quality of data needed to support Agency decisions. Following summarizes the outline of DQOs process developed by US EPA for the application to PSI development.

(1) Definition of DQOs

DQO can be defined as “Data Quality Objectives are qualitative and quantitative statements to identify the level of uncertainty that a decision maker is willing to accept (US EPA)”.

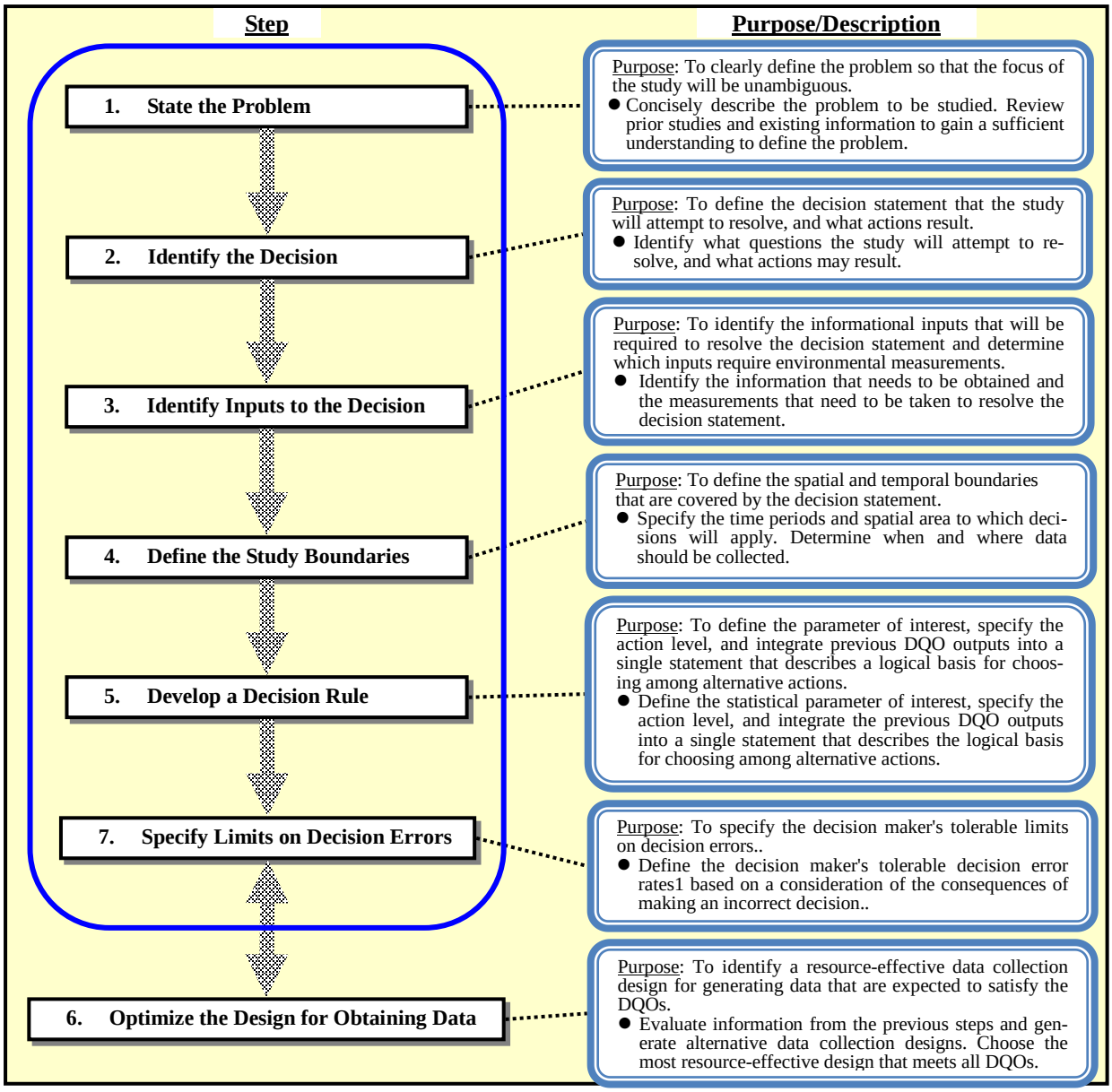
[1] Guidance for the Data Quality Objectives Process, EPA QA/G-4, EPA/600/-R-96/055, September 1994

(2) Purpose of DQOs

Purpose of DQOs is to ensure the final data will be sufficient for the intended use. (US EPA)

(3) Process of DQOs

The DQO Process is a strategic planning approach based on the Scientific Method that is used to prepare for a data collection activity. This process is often used for developing a sampling and analysis plan for each site. It provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, the tolerable level of decision errors for the study, and how many samples to collect. By using the DQO Process, the Agency, such as DONRE, will assure that the type, quantity, and quality of environmental data used in PSI developing will be appropriate for the intended application. The DQO Process consists of seven steps as shown below:



Source: US EPA

Figure B-10 DQO Process

The output from each step influences the choices that will be made later in the Process. As shown in the figure above, the DQO Process is illustrated as a linear sequence of steps, in practice it is iterative; the outputs from one step may lead to reconsideration of prior steps. This iteration should be encouraged since it will ultimately lead to a more efficient data collection design. During the first six steps of the DQO Process, the planning team will develop the decision performance criteria (DQOs) that will be used to develop the data collection design. The final step of the Process involves developing the data collection design based on the DQOs. The first six steps should be completed before the planning team attempts to develop the data collection design because this final step is dependent on a clear understanding of the first six steps taken as a whole. In Figure 2, the iterative link between the DQOs and the Optimize the Design step is illustrated by double arrows, which signify that it may be necessary to revisit any one or more of the first six steps to develop a feasible and appropriate data collection design. Above all, every step should be completed before data collection begins. Table below gives detailed description of each step.

Table B-9 Description of Each Step

Step		Description
Step 1	State the problem	The identification and delineation of the problem to be investigated is a critical first step. Too often this step is overlooked or taken too lightly. The desire to jump in and solve the problem can result in the initiation of a project without really understanding the problem(s). The first step includes developing and refining a map of the site that shows the locations of sources of contamination; the types and expected concentrations of contaminants; possible movement of the contaminants in the soil, water or air; and the location of humans, animals or sensitive ecological environments. This initial investigation should not be an intensive sampling project; it should include only enough sampling to establish the problem. For an abandoned mine site investigation, the initial sampling may include sampling of all areas suspected to be producing acid mine drainage. Budgets for sampling and analysis over the course of the project should be determined during this step as well as the various specialists that will be involved with the project (i.e. environmental scientists, hydrogeologists, toxicologists, lab technicians, etc).
Step 2	Identify the decision	After data collection, the problem can be stated and alternative actions can be proposed. Often, the problem will be stated in terms of a number of questions which must be answered. Different solutions to the problem are presented depending on the answers to the questions. This step allows investigators to organize their decision making process which can save time and money in the long run. *Example:* *An abandoned mine site is proposed for reclamation. From step 1 it was determined that numerous tailings piles on the site are producing acid mine drainage. Questions that may be asked include:* *1. Is the acid mine drainage leaving the site?* *2. Is it entering downstream waterbodies?* *3. What are the concentrations of heavy metals and the pH of the acid mine drainage leaving the site?* *4. What are the concentrations of heavy metals and the pH of the acid mine drainage downstream from the site?* *5. At any time are the concentrations above the action levels for protection of humans, animals and the environment?* Depending on the answers to these questions, different action alternatives will be taken. The level of remediation at the site will be based on the severity of its environmental impact.
Step 3	Identify input	The next step is to determine how the questions from step 2 will be answered. In other words, what sampling and analysis program must be conducted in order to determine which course of action will be taken to solve the problem. The sampling and analysis program will define what type of samples will be taken (i.e. tailings, waste rock, soil, water), how many samples will be taken, where the samples will be taken from, and the appropriate methods and techniques for collecting and analyzing the samples. The type, number, and location of the samples will depend on the nature of the problem under investigation. The number of samples necessary will also depend on the capability of the measurement program to provide data of adequate quality.
Step 4	Define boundaries	In this step, time and geographic boundaries are defined. How much time is available for reclamation of the given site? What is the area of influence that will be included in the reclamation solution? These boundaries are a reality of every project. Time and money is not of unlimited availability and usually has a considerable influence on the ultimate decision for the final design solution.
Step 5	Develop a Decision Rule	This step uses all the information gathered from the previous four steps in the DQO process in order to make good decisions. This step defines what environmental impacts may be caused

Step		Description
		by the problem and defines whether people, animals, or plants, etc. may be influenced. This step also defines the maximum contaminant concentrations that will be allowed for a given solution. If concentration levels exceed the given limit for a certain design solution, then a more intense design solution will be implemented. Detection limits for the analysis of different contaminants will also be defined in this step. Detection limits will always have to be lower than the maximum contaminant concentration levels defined in this step for the different design solutions
Step 6	Specify Limits on Decision Errors	Errors are inevitable when conducting a sampling and analysis project. Human error, to some degree, occurs throughout the process. Error in automated techniques for analyzing samples is also inevitable. It is extremely important to develop sampling and analysis protocols that minimize errors as much as possible in order to obtain quality data that accurately defines the problem at hand. The use of clean sampling gloves, sampling devices, and sampling containers are important in order to minimize contamination of the samples. Ensuring that the sampling plan is unbiased also minimizes error. Randomized sampling is used to minimize bias. Proper calibration of analytical instruments, proper handling of samples in the lab, and carefully following laboratory procedures are of vital importance. Duplicate samples should also be analyzed to verify that the analysis methods are accurate. The steps necessary to minimize errors and produce good quality data have evolved into quality assurance/quality control (QA/QC) programs that give guidelines for minimizing error in sampling and analysis projects. Each sampling and analysis project should implement a QA/QC program that includes the following guidelines. Quality assurance (QA) is a set of operating principles that are designed to produce data of know and defendable quality. A QA program includes the organization and procedures such as staff organization and responsibility, sample control and documentation procedures, training requirements, equipment maintenance procedures, calibration procedures, quality control activities of core staff (internal), validating and reporting. Quality control (QC) may be either internal and/or external (i.e. laboratory personnel, subcontractors). QC programs should include: certification of operator competence; analysis of externally supplied standards to ensure concentrations are what they should be; analysis of reagent blanks to determine if interferences are present because of glassware, reagents, or equipment; calibration with standards; and analysis of duplicates (commonly 10% replication of the total sample number). QA/QC is a vital component to any sampling and analysis program but can add 15% to 20% to lab analysis costs. Once all effort has been made to minimize error, all error has not eliminated, it has only been reduced as much as possible. From here, it is important to understand the error is still associated with the sampling and analysis plan. The science of statistics is often used as an important and necessary mathematical tool for the interpretation of measurement results. Statistics can be a powerful tool if the interpreter of the results thoroughly understands the basic principles upon which the science and practice of statistics are based. Many times, statistics are inappropriately applied and therefore, results are of little use. Based on the variability of the measurement process and of the samples to be investigated, statistics provide guidance on the number of measurements that should be made to obtain a desired level of confidence in the data. Statistics can be helpful in determining over what geographic area samples should be taken. They are also helpful in determining how many duplicate analytical tests should be conducted to ensure that test results are accurate enough for decision making. Statistics are also very helpful in determining the quality of the data which, in turn, allows the data interpreter to make correct decisions concerning reclamation plans. It should be remembered that statistical techniques are only tools and should be used for enlightened guidance and certainly not for blind direction when making decisions. When statistical results conflict with results that the interpreter would intuitively expect, one should stop and take careful consideration. Was one's intuition wrong or were wrong statistical tools used?
Step 7	Optimize the Design	This step combines all the information gathered in the previous six steps and uses this information to decide what design solution would be most effective while making the best use of time and money. The design solution should describe the methods that will be used for sampling and analysis, the type of samples that will be collected, the sample size, and the number of laboratory tests that will be for each sample. A description of the pros and cons of each different alternative action will be discussed and along with reasons for selection of the best possible design solution. By using the DQO process, specific steps help the reclamationist make streamlined decisions in a timely and cost effective manner..

Source: US EPA

B-7 Quality Control (QA/QC)

As a PSI contains a wide range and various kinds of data and information, data and information inventoried in a PSI are normally collected through vairous methods: by direct method and indirect method. One of the essential concerns is how to collect reliable and accurate data and information which satisfy the requirements of end use of PSI. In order to ensure the quality of data and information, Quality As-

surance (QA) and Quality Control (QC) are normally applied in the process of development of PSI as well as in the stage of data and information collection.

The QC is the overall system of routine technical activities that are designed to measure and control the quality of a PSI as it is being developed. Quality assurance (QA) is an integrated system or program of activities involving planning, QC, quality assessment, reporting, and quality improvements which are designed to help ensure that the inventory meets the data quality goals or objectives established prior to developing the PSI.

The main objective of any QA/QC for PSI development is to ensure data quality that is precise, accurate, adequate, useful and reliable. Therefore, the development of a reasonable and comprehensive pollution source inventory requires implementation of QA/QC procedures throughout the entire inventory development processes. These procedures should be applied consistently by the state or local agency in preparing or reviewing inventories. In this meaning, the DQOs process mentioned in the previous section is considered a typical QA activity.

Quality control activities include technical reviews, accuracy checks, and the use of approved standardized procedures for discharge calculations. These internal activities are designed to provide the first level of quality checking and should be included in inventory development planning, data collection, data analysis, discharges calculation, and reporting. In order to achieve the objectives of QC of PSI, the standardized QC checklists are commonly used. Procedures and tasks to be checked by the QC checklist are as follows:

- Data collection,
- Data calculation,
- Discharge estimations,
- Data validity,
- Data reasonableness,
- Data completeness,
- Data coding and recording, and
- Data tracking

The QC procedure includes questions concerning completeness (e.g., questions whether all the pollution sources are covered?); use of approved procedures (e.g., questions as to what pollution load units were used to estimate wastewater discharge loads); and reasonableness (e.g., data collected or estimated are considered to be representative one?). Figure and table below show the activities of QC and items/tasks included in each element activity and an example of QC checklist respectively.

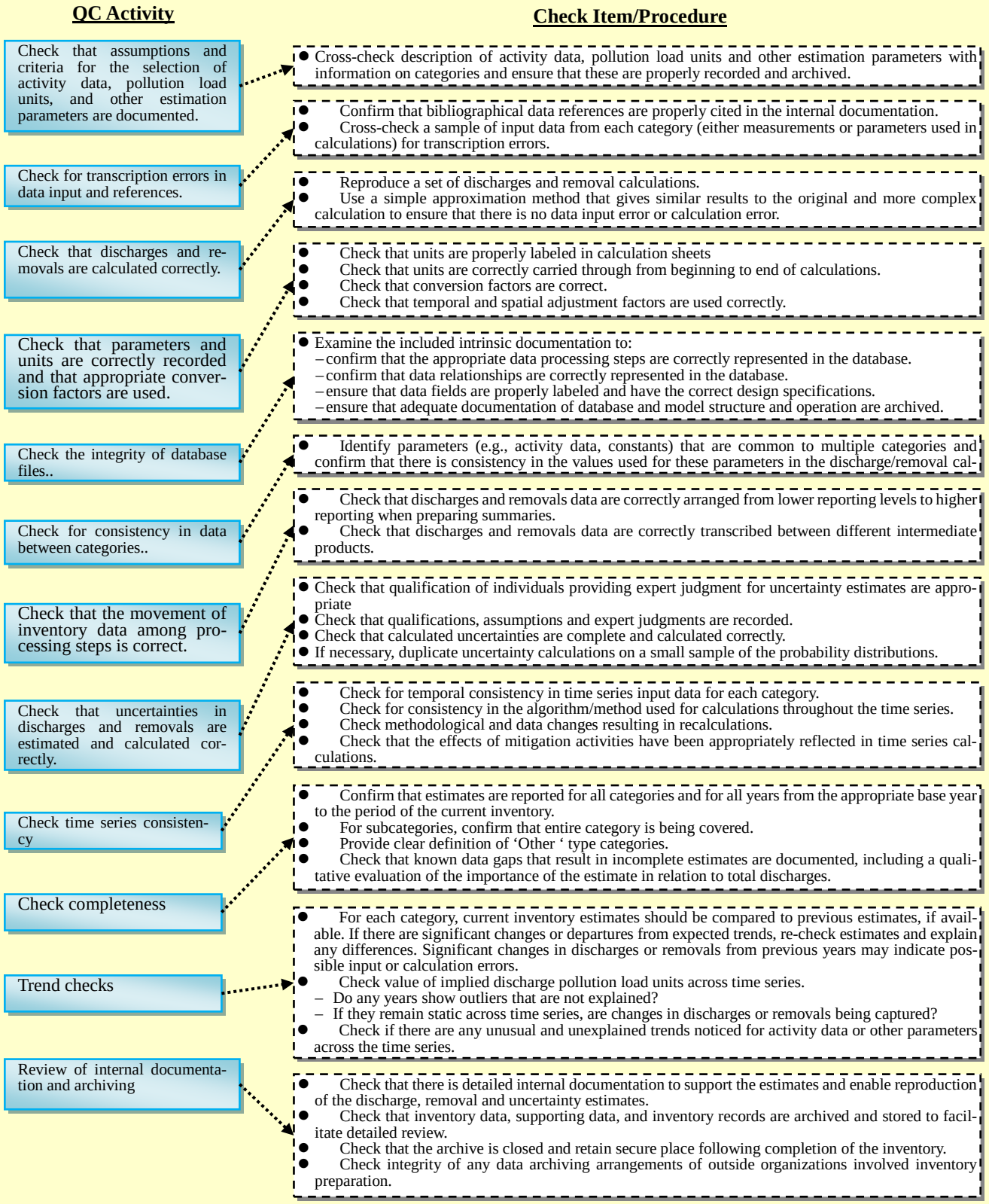


Figure B-11 General QC Procedures for PSI Develop-

(Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories)

SUMMARY OF QC CHECK

Instructions:
The first page of this form summarizes the results of the checks. After completion of other remaining pages of check forms, significant findings and actions to be take should be filled in this format.

Date of preparation: _____ Prepared by (Name/Affiliation): _____

Summary of results of checks and corrective actions taken:

Suggested checks to be performed in the future:

Any residual problems after corrective actions have been taken:

Checklist for PSI QC

Component/Item		Check completed			Corrective action		Supporting documents
		Date	Name checked	Errors (Y/N)	Date	Name checked	
Preparatory Work							
1.	Inventory use is identified?						
2.	Geographical area is defined?						
3.	DQOs are determined?						
4.	Time interval is specified?						
5.	Pollution source category is defined?						
6.	Discharge sources are identified?						
7.	Interest pollutants are identified?						
8.	Other (specify)						
Collection of Data and Information							
9.	Data/information collection methods are selected?						
10.	Questionnaires are prepared?						
11.	Cover letters are prepared, if necessary?						
12.	Pollution sources are categorized?						
13.	Facility list is drawn up?						
14.	Types of data/information are identified?						
15.	Questionnaires are mailed out to all target facilities?						
16.	Data/information sources are identified?						
17.	Pollution discharge estimation methodologies are specified?						
Compilation and Arrangement of Data							
18.	Inventory format is prepared?						
19.	Data and information needed for inventory are collected?						
20.	All necessary information is codified or digitized?						
21.	Codification or digitization system is suitable for the use of inventory?						
22.	All data/information sources are identified?						
23.	Transcription errors in data input and references are checked?						
24.	All reference information and published documents used for spreadsheet development are recorded?						
25.	Units are properly labeled in spreadsheets?						
26.	Units are correctly carried through from beginning to end of calculations?						
27.	Conversion factors are correct?						
28.	Temporal and spatial factors are used correctly?						
29.	Accuracy and precision of data gathered at site survey are checked?						
30.	Accuracy and precision of bibliographical data are checked?						
31.	Accuracy and precision of data used for estimates are checked?						
32.	Discharge data are correctly arranged from lower reporting levels to higher reporting?						
33.	Discharge data are correctly transcribed between different intermediate products?						
34.	Modification of estimate methodologies are implemented and documented as appropriate?						
35.	Estimates of pollution discharge and methodologies are validated periodically?						
36.	All data transcribe into the spreadsheet correctly?						
37.	All equations used to generate results entered correctly and used appropriately?						
38.	The sources of original data are referenced in the spreadsheet?						
39.	All variables within equations defined?						

Source: JET

PART C. EXAMPLE OF DEVELOPING WATER POLLUTION SOURCE INVENTORY

C-1 Development of PSI in Ho Chi Minh City DONRE

Here, two cases of examples of PSI development which had been implemented in HCMC are shown:

Case 1 (Example 1)

(1) Objectives of PSI development

To analyze and evaluate the environmental impacts caused by the effluents discharged from Tan Quy Industrial Cluster (Tan Qui IC) for the management and control of pollution sources by HCMC DONRE.

(2) Data and Information Collection Method

In order to collect the data and information required for the objectives above, a site survey was been implemented by HCMC DONRE and a sub-contractor[10]. Major contents of the site survey were:

- Questionnaire survey on target enterprises in Tan Quy IC in Cu Chi District in HCMC,
- Wastewater sampling and analysis of the target enterprises,
- Regional surface water sampling and analysis, and measurement of water conditions, and
- Estimation and evaluation of pollution loads caused by the effluents based on the above results.

The site survey was implemented by the sub-contractor, Sub-Institute of Hydrometeorlogy & Environment of South Vietnam (SIHYMETE), under the supervision of HCMC DONRE and JET.

1) Questionnaire survey

The sub-contractor implemented the questionnaire survey on the 20 target enterprises as shown in Table C-1 to confirm the status of wastewater discharge and pollution control activities. Questionnaire sheets and necessary documents to enter the target enterprises were prepared and sent to the enterprises prior to their visit by HCMC DONRE. Items in the questionnaire survey had been selected considering the objectives of PSI as shown below:

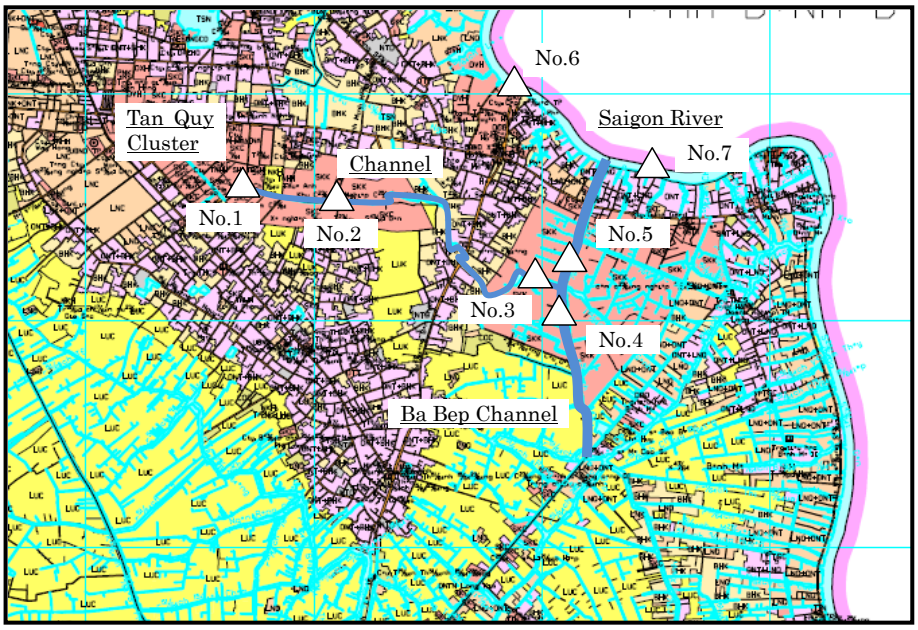
I. Enterprise information,

II. Wastewater and treatment methods information,

III. Operation information,

IV. Current issues for wastewater treatment and operation

[10] The site survey was implemented in the middle of October to the end of November, 2011



Source: JET

Figure C-1 Target Area of Survey

The form of questionnaire used in this survey is attached in page C-6.

2) Water sampling and measurement

i) Regional surface water sampling and measurement

In order to know effects of wastewaters discharged from Tan Quy IC, seven (7) surface water samples were taken at the small channel connected with Ba Bep Channel, Ba Bep channel and Saigon River around Tan Quy Industrial Cluster. Sampling points are shown in the figure above.

Table C-1 Survey Items and Analyzed Parameters

Item	Survey Item and Analytical Parameter
Survey Item	(1) Water depth (2) Water flow volume and direction (3) Water temperature
Analyzed Parameter (total 24 parameters)	(1) pH (2) DO (3) Suspended solid (SS) (4) COD (5) BOD_5 (6) Ammonia ($NH^{4+}N$) (7) Chloride (Cl^-) (8) Nitrite (NO_2-) (9) Nitrate (NO_3^-) (10) Phosphate (PO_4^{3-}) (11) Total Nitrogen (TN) (12) Total Phosphorous (TP) (13) Arsenic (As) (14) Cadmium (Cd) (15) Lead (Pb) (16) Chrome III Cr(III) (17) Chrome VI Cr(VI) (18) Copper (Cu) (19) Nickel (Ni) (20) Iron (Fe) (21) Oil and grease (22) Phenol (Total) (23) E.Coli (24) Coli form

Source: JET

Table C-2 Regional Surface Water Sampling Points

No	River / Channel	Sampling points
1-3	Channel (connecting with Ba Bep Channel)	1 point near wastewater discharge outlets from Tan Quy Industrial Cluster 2 point before flowing into the Ba Bep channel
4-5	Ba Bep Channel	1 point at upstream site from junction of the channel 1 point at downstream site from junction of the channel
6-7	Saigon River	1point at upstream site from intake of Tan Hiep Water Treatment Plant 1 point at downstream site from junction of the channel and Saigon River
Total		**7 points**

Source: JET

ii) Wastewater sampling

In order to investigate the quality and the quantity of wastewaters discharged from Tan Quy IC, wastewater samples were taken at the discharge points of the target enterprises given in Table C-3.

The survey items and determinants are shown in the table below.

Table C-3 Survey Items and Analyzed Parameters

Item	Survey Item and Analytical Parameter
Field Survey Item	(1) Wastewater discharge volume (2) Wastewater temperature
Analyzed Parameter(Note) (total 21 parameters)	(1) pH (2) Odor (3) Color (4) BOD_5 (5) COD (6) Suspended solids (SS) (7) Ammonia (NH_4^+N) (8) Total Nitrogen (TN) (9) Total Phosphorous (TP) (10) Coli form (11) Absorbable Organic Halogens (AOX) * (12) Oil and grease* (13) Chrome III (Cr(III)) * (14) Chrome VI (Cr(VI)) * (15) Iron (Fe)* (16) Cooper (Cu) * (17) Chlorine residual* (18) Mercury (Hg)* (19) Lead (Pb) *(20) Arsenic (As) * (21) Cadmium (Cd) *

(Note): All parameters mentioned in the table are not necessarily analyzed for all target enterprises. Parameters to be analyzed are selected considering the feature of the wastewaters by the enterprise.

Source: JET

(3) Target Enterprise

The target enterprises for the water PSI were selected by HCMC DONRE. Table below summarizes the target enterprises.

Table C-4 Target Enterprises in Tan Quy IC

No.	Name	Industrial Sector	Address
1	This portion is masked due to confidential reason	Paper production	Hamlet 4, Hoa Phu Commune
2		Paper production	Hamlet 12, Tan Thanh Dong Commune
3		Paper production	Hamlet 12, Tan Thanh Dong Commune
4		Garment	Hamlet 4, Hoa Phu Commune
5		Dyeing	Hamlet 12, Tan Thanh Dong Commune
		Garment	Hamlet 12, Tan Thanh Dong Commune
6		Garment	Hamlet 12, Tan Thanh Dong Commune
7		Confectionary	Hamlet 4, Hoa Phu Commune
8		Wood Production	Hamlet 12, Tan Thanh Dong Commune
9		Interior decoration	Hamlet 12, Tan Thanh Dong Commune
10		Plastic Production	Hamlet 12, Tan Thanh Dong Commune
11		Dairy Production	Hamlet 12, Tan Thanh Dong Commune
12		Rubber production	Hamlet 12, Tan Thanh Dong Commune
13		Elastic rope	Hamlet 12, Tan Thanh Dong Commune
14		Mechanics	Hamlet 12, Tan Thanh Dong Commune
15		Electrical cable	Hamlet 12, Tan Thanh Dong Commune
16		Mechanics	Hamlet 12, Tan Thanh Dong Commune
17		Mechanics	Hamlet 12, Tan Thanh Dong Commune
18		Tiles	Hamlet 12, Tan Thanh Dong Commune
19		Wood Production	Hamlet 12, Tan Thanh Dong Commune
20		Paper production and	Hamlet 12, Tan Thanh Dong Commune

Source: JET

The target enterprises itemized by business and industrial types are shown in Table C-5.

Table C-5 Target Enterprises by Type of Industry

No.	Name of Enterprise	Address	Business Type	Industrrial Type	Industrial Classification Code		
					Level 1	Level 2	Level 3
1		Hamlet 4, Hoa Phu Commune	Ltd.	Paper	C	17	170
2		Hamlet 12, Tan Thanh Dong	Pte.	Paper	C	17	170
3		Hamlet 12, Tan Thanh Dong	Ltd.	Paper	C	17	170
4		Hamlet 4, Hoa Phu Commune	Ltd.	Garment	C	14	141
5.A		Hamlet 12, Tan Thanh Dong	FDI	Dyeing	C	13	
5.B		Hamlet 12, Tan Thanh Dong	FDI	Garment	C	14	141
6		Hamlet 12, Tan Thanh Dong	FDI	Garment	C	14	141
7		Hamlet 4, Hoa Phu Commune	FDI	Confectionary	C	10	107
8		Hamlet 12, Tan Thanh Dong	FDI	Wood	C	31	310
9		Hamlet 12, Tan Thanh Dong	JSC	Interior	C	31	310
10		Hamlet 12, Tan Thanh Dong	JSC	Plastic	C	22	222
11		Hamlet 12, Tan Thanh Dong	FDI	Dairy	C	10	105
12		Hamlet 12, Tan Thanh Dong	SC	Rubber	C	22	221
13		Hamlet 12, Tan Thanh Dong	FDI	Elastic rope	C	22	222
14		Hamlet 12, Tan Thanh Dong	SC	Mechanics	C	29	291
15		Hamlet 12, Tan Thanh Dong	Ltd.	Electrical cable	C	27	273
16		Hamlet 12, Tan Thanh Dong	Ltd.	Mechanics	C	28	
17		Hamlet 12, Tan Thanh Dong	JSC	Mechanics	C	28	282
18		Hamlet 12, Tan Thanh Dong	Pte.	Tiles	C	23	239
19		Hamlet 12, Tan Thanh Dong	Ltd.	Wood	C	31	310
20		Hamlet 12, Tan Thanh Dong	Ltd.	Paper	C	17	170

Source: JET

The 3-digit figures in the table means the level-3 codes of Vietnamese industrial classification code. (See Part B, 2) Coding/Digitization of information.

(4) Scheme of PSI

Based on above, the scheme of PSI to be developed is summarized as follows:

Table C-6 Scope of PSI (HCMC DONRE)

Items to be inventoried	Source category	Discharge source	Geographical boundary
• Enterprise information including the compliance status of environmental requirements • Wastewater and treatment methods information, • Enterprise operation information, • Current issues for wastewater treatment and operation	• Point source	• Twenty (20) industries located in Tan Quy Industrial Cluster in Cu Chi District in HCMC	• Tan Quy Industrial Cluster • Small channel, Ba Bep C channel and Saigon River connected with Tan Quy Industrial Cluster
Inventory Use/Objectives			
• To analyze and evaluate the environmental impacts caused by the effluents discharged from Tan Quy Industrial Cluster for the management and control of pollution sources by HCMC DONRE.			

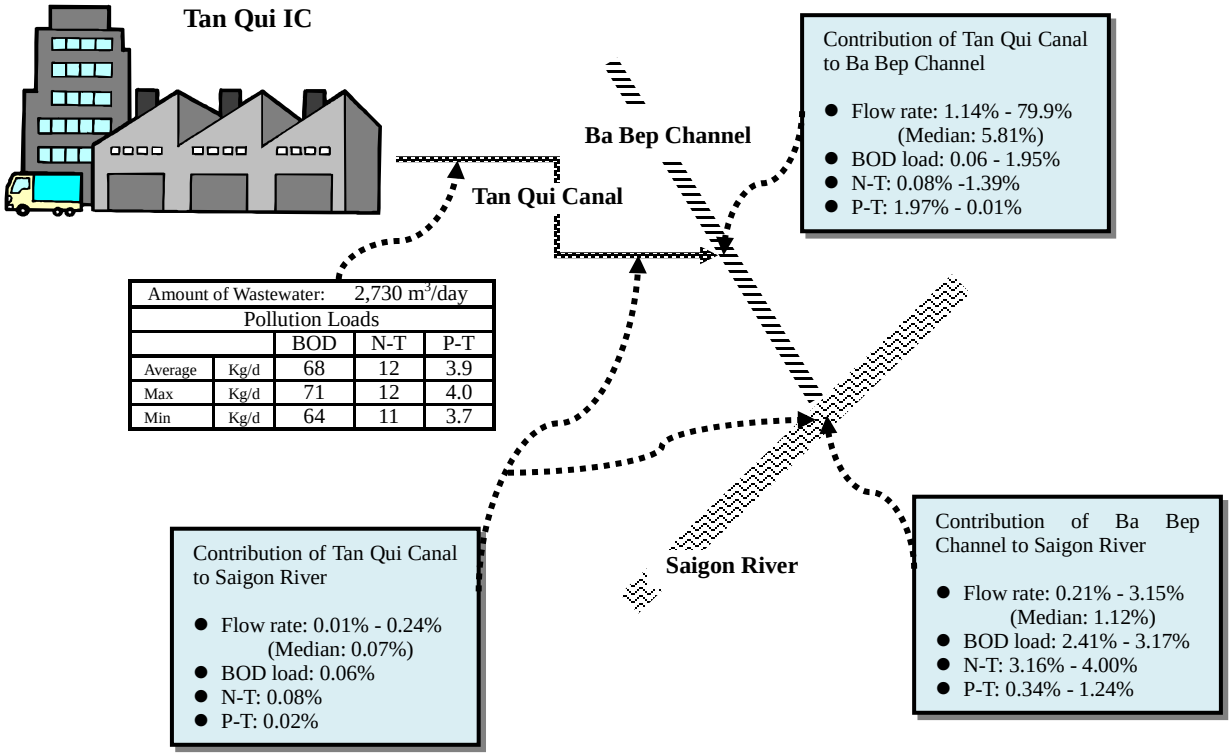
Source: JET

(5) Results of the survey

A PSI for Tan Qui IC has been prepared in a form of spreadsheet using data and information collected through the site surveys. The form of PSI is given in next page.

(6) Use of PSI

Using the PSI developed above, pollution loads discharged from Tan Qui IC have been calculated and evaluated. Results of the calculation and evaluation are summarized as follows:



Source: JET

Figure C-2 Result of Calculation and Evaluation on Pollution Loads

Form of PSI in Tan Qui IC

Pollution Source Inventory in Tan Qui Industrial Cluster

No.	Name of enterprises	Enterprise Information												
		Industrial Type	Industrial Classification Code			Address	Longitute	Latitude	Major Product		No. of Emploee	Environmental permit			W
			Level 1	Level 2	Level 3		X	Y	Name	Ton/year		EIA	EPP	EPC	
1		Dyeing	C	13		Hamlet 12, Tan Thanh Dong Commune	106°35'15.4"	10°58'48.0"	Dyed fabric						Tan
2		Garment	C	14	141	Hamlet 12, Tan Thanh Dong Commune	106°35'06.5"	10°58'42.6"	Clothes products						Tan
3		Garment	C	14	141	Hamlet 12, Tan Thanh Dong Commune	106°35'17.7"	10°58'39.3"	Clothes products						Inf
4		Dairy	C	10	105	Hamlet 12, Tan Thanh Dong Commune	106°35'07.8"	10°58'33.6"	Sterilized milk						
5		Confectionary	C	10	107	Hamlet 4, Hoa Phu Commune	106°35'43.2"	10°58'56.0"	Candy, Cookies						
6		Paper	C	17	170	Hamlet 4, Hoa Phu Commune	106°35'43.13"	10°58'49.17"	Roll carton paper						
7		Paper	C	17	170	Hamlet 12, Tan Thanh Dong Commune	106°35'11.2"	10°58'37.8"	Paper production						
8		Paper	C	17	170	Hamlet 12, Tan Thanh Dong Commune	106°35'07.2"	10°58'41.8"	Roll carton paper						
9		Wood production	C	31	310	Hamlet 12, Tan Thanh Dong Commune	106°34'50.9"	10°58'58.4"	Furniture						
10		Interior decoration	C	31	310	Hamlet 12, Tan Thanh Dong Commune	106°34'54.6"	10°58'55.4"	Wooden door						
11		Rubber	C	22	221	Hamlet 12, Tan Thanh Dong Commune	106°35'18.9"	10°58'37.0"							
12		Elastic rope	C	22	222	Hamlet 12, Tan Thanh Dong Commune	106°35'09.4"	10°58'37.9"							
13		Plastic Production	C	22	222	Hamlet 12, Tan Thanh Dong Commune	106°35'19.1"	10°58'36.6"							
14		Mechanics	C	28		Hamlet 12, Tan Thanh Dong Commune	106°34'57.5"	10°58'57.6"							
15		Electrical cable	C	27	273	Hamlet 12, Tan Thanh Dong Commune	106°35'12.8"	10°58'35.3"							
16		Mechanics	C	28	282	Hamlet 12, Tan Thanh Dong Commune	106°34'58.2"	10°58'49.0"							
17		Mechanics	C	29	291	Hamlet 12, Tan Thanh Dong Commune	106°35'22.9"	10°58'48.6"							

l Cluster (Average Case)

uit	Wastewater Information														
EPC	Wastewater receiving water body	WW flow rate	EC	Temp.	pH	DO	Color	BOD_5	COD_{Cr}	SS	NH_4^+-N	N-T	P-T	Coliform	Oil & Grease
		m^3/day	µS/cm	°C		mg/L	Pt-Co	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	mg/L
	Tan Qui canal	1,200						15	33	5	0.952	3.83	0.037		
	Tan Qui canal														
	Infiltration														

Calculation of pollution loads using PSI in Tan Qui IC.

Pollution Source Inventory in Tan Qui Industrial Cluster (Average Case)

No	Name of enterprises	Wastewater Information														Pollution Loads					
		WW flow rate	EC	Temp.	pH	DO	Color	BOD_5	COD_{Cr}	SS	NH_4^+-N	N-T	P-T	Coliform	Oil & Grease	BOD_5	COD_{Cr}	SS	NH_4^+-N	N-T	P-T
		m^3/day	µS/cm	°C		mg/L	Pt-Co	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	mg/L	g/day	g/day	g/day	g/day	g/day	g/day
1	This portion is masked due to confidential reason	1200	2,563	30.5	11.09	2.98	87	15	33	5	0.482	4.082	2.538	2,300	0.27	18,000	39,600	6,000	578	4,898	3,046
2		1200	287	30.0	6.94	2.37	27	29	66	88	0.788	3.933	0.070	240,000	2.19	34,800	79,200	105,000	946	4,719	84
3		20	120	30.3	6.89	2.91	26	41	56	27	0.712	5.963	0.159	46,000	0.72	820	1,120	530	14	119	3.18
4		100	1,415	39.2	7.77	2.38	36	42	85	39	0.842	3.475	5.801	7,500	0.65	4,200	8,450	3,850	84	348	580
5		15	237	30.5	4.78	0.15	45	180	374	20	0.632	37.169	1.513	360,000	10.56	2,693	5,610	293	9	558	23
6		15	431	30.2	6.67	0.21	67	49	97	40	1.474	17.938	0.552	240,000	ND	853	1,695	738	28	344	11
7		18	1,147	31.2	6.99	0.76	68	121	482	205	1.103	7.028	0.597	46,000	ND	2,178	8,676	3,681	20	126	10.75
8		3	324	29.3	5.71	1.36	110	32	53	60	0.529	5.470	0.074	230,000	0.34	95	159	179	1.59	16.41	0.22
9		60	273	29.5	6.87	2.67	63	26	50	22	1.411	4.078	0.899	39,000	0.82	1,560	2,970	1,290	85	295	54
10										94	0.894	3.332	0.174	2,900	0.09	35	70	48	1.79	6.66	0.35
11		3.2								94	1.517	4.364	0.214	750,000	0.94	89	178	237	4.90	14.10	0.69
12		3								97	0.262	1.061	0.860	930	ND	195	390	495	7.86	31.82	26
13		3	222	29.2	6.11	4.78	17	11	23	30	0.396	4.670	1.531	9,500	ND	32	68	90	1.19	14.01	4.59
14		12	151	39.3	5.87	4.36	17	14	35	36	0.697	3.907	0.280	29,000	0.07	168	420	432	8	47	3.36
15		5	1,955	31.0	11.15	2.18	37	44	91	47	0.794	6.102	0.420	460,000	0.12	222	453	233	3.97	30.51	2.10
16		5	211	27.6	6.55	4.28	14	19	36	31	0.207	3.768	0.254	360,000	ND	93	178	153	1.04	18.84	1.27
17		18	9,700	29.2	3.52	0.27	67	71	433	54	1.588	3.550	0.845	270	0.56	1,269	7,785	972	29	64	15
18		20	116	29.1	6.72	2.06	16	31	57	41	0.805	6.561	1.246	230,000	0.78	610	1,140	810	16	131	25

WW discharge rate (m^3/day) × Conc. of COD (mg/L)
= 15 (m^3/day) ×374 (g/m^3)
= 5,610 (g/day)

Calculation of pollution loads

Case 2 (Example 2)

(1) Objectives of PSI development

In order to manage and control pollution sources located in and around Phong Phu Industrial Cluster, HCMC DONRE HCMC DONRE implemented a pollution source survey. Data and information collected through the survey were utilized for the preparation of a PSI. Items conducted in the survey were:

1) To implement questionnaire survey on target enterprises,
2) To conduct the wastewater sampling and analysis on target enterprises,
3) To conduct water samplings at the drainage network and the Binh Tho Channel which receive the wastewaters discharged from Phong Phu Industrial Cluster and the surrounding areas,
4) To collect basic statistical figures related with the domestic wastewater discharge in Phong Phu Industrial Cluster and the surrounding areas such as population, number of households and small shops etc.,
5) To develop PSI and to analyze and evaluate the impacts on the Binh Tho Channel caused by the wastewaters generated by the entities located in Phong Phu Industrial Cluster and the surrounding areas,
6) Making up of pollution source map, and
7) To recommend countermeasures to improve water pollution of the Binh Tho Channel.

The Scope of the PSI is summarized below:

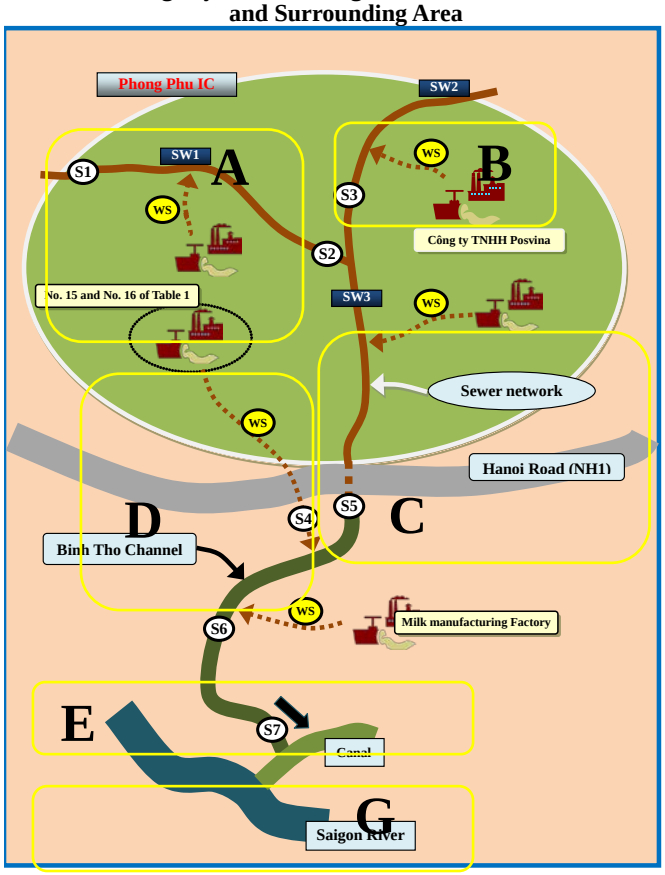
Table C-7 Scope of PSI (HCMC DONRE: Example 2)

Pollutant	Source category	Discharge source	Geographical boundary
(1) BOD_5 (2) COD (3) Total suspended solids (TSS) (4) Total Nitrogen (TN) (5) Total Phosphorous (TP) (6) Chloride (7) Oil and grease (8) Ammonia Nitrogen (NH_4^+N) (9) Coli form (10) Cyanide (11) Phenols (12) Chrome III (Cr(III)) (13) Chrome VI (Cr(VI)) (14) Iron (Fe) (15) Cooper (Cu) (16) Chlorine residual (17) Mercury (Hg) (18) Lead (Pb) (19) Arsenic (As) (20) Cadmium (Cd) (21) Zinc (22) Manganese (23) Nickel (24) Tin (25) Sulfide	• Point source	• Enterprises located in the target areas mentioned in the right column	• Phuoc Long B Ward of District 9 and Binh Tho Ward of Thu Duc District in Ho Chi Minh City which cover Phong Phu Industrial Cluster (IC) in Phuoc Long B Ward and Bin Tho Channel in Binh Tho Channel.
Inventory Use			
• Collect data/information regarding pollution sources located in the target areas for the preparation of PSI • Grasp of current situations of water pollution loads discharged from the enterprises located in the target areas • Development of a wastewater pollution source map based on the data and information collected			

Source: JET

Figure C-3 and Table C-8 show the target areas and the enterprises surveyed respectively.

Drainage System in Phong Phu Industrial Cluster and Surrounding Area



Source: JET

Figure C-3 Target Areas

Table C-8 Target enterprises in Phong Phu Industrial Cluster

No.	Name		Type of Industry	Industrial Classification Code(Note1)			Area Classification
	Vietnamese	English		Level1	Level2	Level3	
1	This portion is masked due to confidential reason		Textile, dyeing and garment	C	13	131	A
2			Textile & dyeing	C	13	131	A
3			Textile	C	13	131	A
4			Thread production &yarn-dyeing	C	13	131	A
5			Garment	C	13	131	A
6			Fabric textile	C	13	131	A
7			chemical	C	20	201	A
8			Production of soles and moulds for	C	22	222	A
9			Production of soles and moulds for	C	22	222	A
10			TV Assembly	C	27	271	C
11			Production of aluminium cans	C	24	241	D
12			Manufacturing, exporting Jeans –	C	13	131	D
13			zinc-plated sheet iron, colour	C	24	241	B
14			clinic	Q	86	862	D
15			Service	M	74	749	A
16			Pharma for live-stock, poultry	C	21	210	A
17			food	I	56	561	D
18			Garment	C	13	131	E
19			Garment	C	13	131	E
20			dairy production	C	10	105	E
21			dairy production	C	10	105	E
22			medical drugs	Q	21	210	E
23			House	I	55	559	E
24			Garment	C	13	131	E
25			Plating and processing	C	24	242	E

Source: JET

(2) Preparation of PSI based on the collected data/information

1) Results of the wastewater analysis are shown in a form of PSI in the table of next page

Table C-9 Results of Wastewater Analysis (Excluding Heavy Metals)

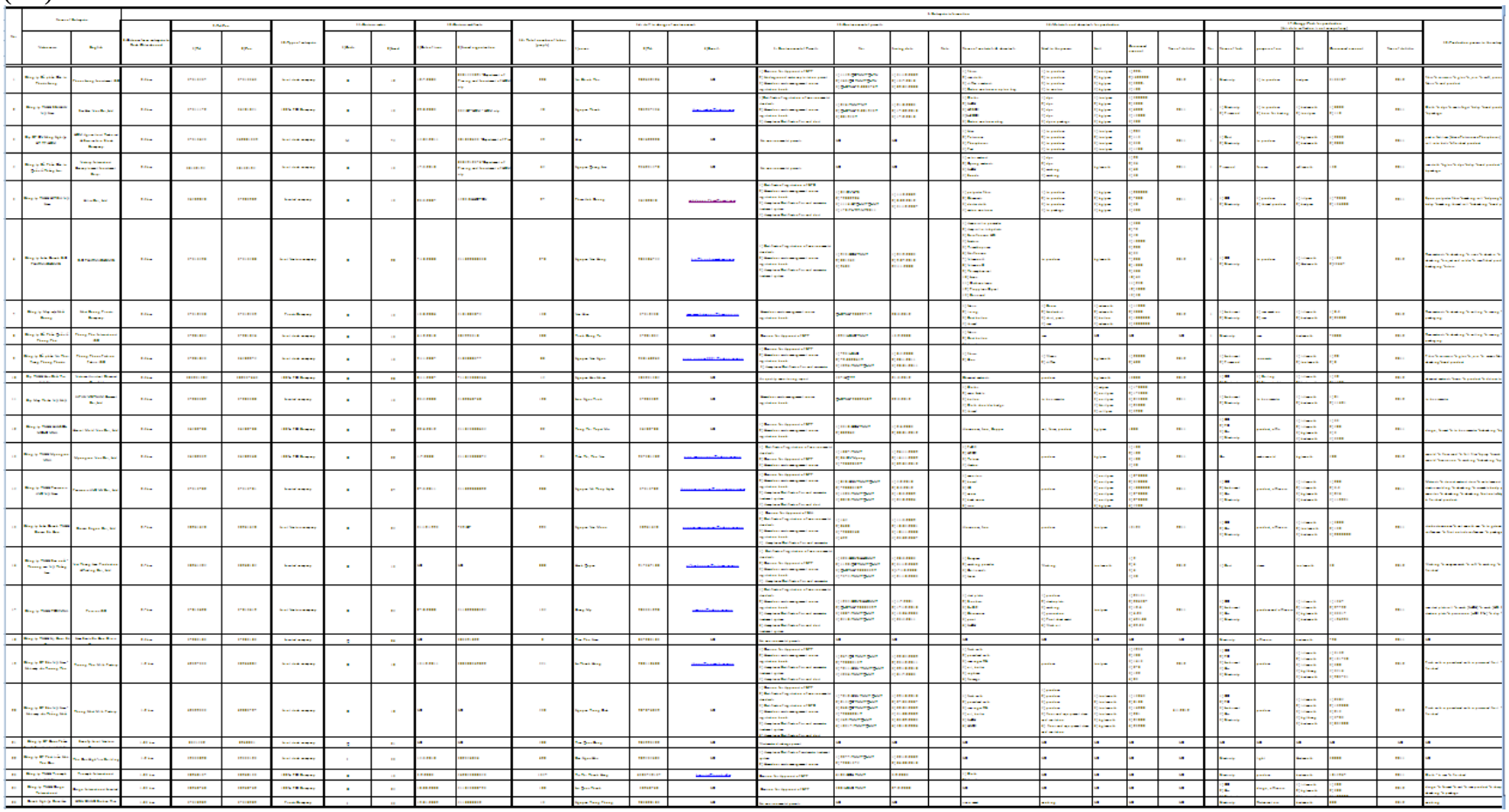
	Tên Công ty	Name of Enterprise	Area Code	Q	Temp	pH	EC	Cl^-	DO	Odor	Color	BOD_5	COD	TSS	T-N	T-P	Oil and grease	$N\text{-}NH_4^+$
				(m^3/day)	(℃)		(µS/cm)	(mg/L)	(mg/L)	(-)	Pt-Co	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
		QCVN40:2011_BTNMT/Cột A			40.0	6-9		500			50	30	57	50	20.00	4.00	5	5
		QCVN40:2011_BTNMT/Cột B			40.0	5.5-9		1,000			150	50	150	100	40.00	6.00	10	10
1	This portion is masked due to confi-dential reason		A	250	34.6	10.06	5,900	1,350	0.3	Bad	243	196	561	428	13.72	8.05	3.18	11.038
2			A	150	32.4	9.99	2,430	321	1.6	Bad	390	47	136	134	10.40	11.94	1.56	3.227
3			A	31.5	29.9	9.43	1,120	5	0.2	Bad	388	287	832	195	7.27	0.80	2.23	4.125
4			A	37	32.2	4.12	563	75	1.2	Bad	447	103	326	109	26.34	23.99	3.17	9.908
5			A	60	28.6	6.81	927	24	3.1	Not Bad	17	25	83	71	2.62	1.54	ND(<1)	1.651
6			E	10	29.5	6.80	816	67	3.2	Not Bad	19	76	208	193	7.30	5.52	3.98	2.113
7			A	25	29.4	9.89	5,070	1,194	3.1	Not Bad	317	59	112	400	4.82	11.22	1.87	3.546
8			A	20	29.2	6.98	725	95	3.4	Not Bad	28	12	35	175	22.22	2.42	1.03	18.480
9			A	2	29.5	7.18	496	241	1.3	Bad	85	47	169	157	12.39	1.93	ND(<1)	9.27
10			E	4	29.1	7.69	401	43	3.7	Not Bad	20	85	149	74	1.55	0.39	ND(<1)	0.202
11			A	1.3	30.1	5.88	619	65	2.6	Not Bad	48	52	137	250	3.42	0.13	1.45	1.388
12			A	2	31.5	1.19	63,200	14,837	0.2	Bad	1,430	79	291	381	25.11	4.84	ND(<1)	19.582
13			C	9.48	28.3	6.08	443	64	4.6	Not Bad	29	13	43	63	7.51	8.12	ND(<1)	6.066
14			D	480	30.4	8.46	1,049	139	3.7	Not Bad	11	26	79	130	10.73	0.29	ND(<1)	9.053
15			D	360	32.1	6.66	784	176	2.7	Not Bad	54	56	149	104	10.13	0.61	2.16	0.959
16			B	80	29.0	7.05	293	79	3.5	Not Bad	28	25	94	76	1.53	0.29	ND(<1)	0.972
17			E	900	29.5	7.92	1,830	154	4.2	Not Bad	5	15	42	72	2.10	4.57	ND(<1)	0.062
18			E	750	30.2	7.66	1,486	165	4.3	Not Bad	5	27	63	14	3.25	1.33	ND(<1)	1.839
19			E	103	29.6	6.77	494	53	1.2	Not Bad	31	98	299	152	18.35	0.25	2.98	15.179
20			E	64	30.3	7.49	1,001	173	0.4	Bad	121	227	852	120	28.18	12.28	10.24	20.610
21			E	20	29.2	5.49	629	85	1.2	Bad	97	483	1,224	2,897	57.06	23.18	35.27	34.849
22			E	72	29.2	7.41	283	28	3.2	Not Bad	13	28	91	69	24.30	3.36	4.28	15.269
23			D	8	28.9	7.12	197	31	3.7	Not Bad	11	21	75	76	15.07	2.18	3.12	4.172

Source: JET

2) Enterprise information

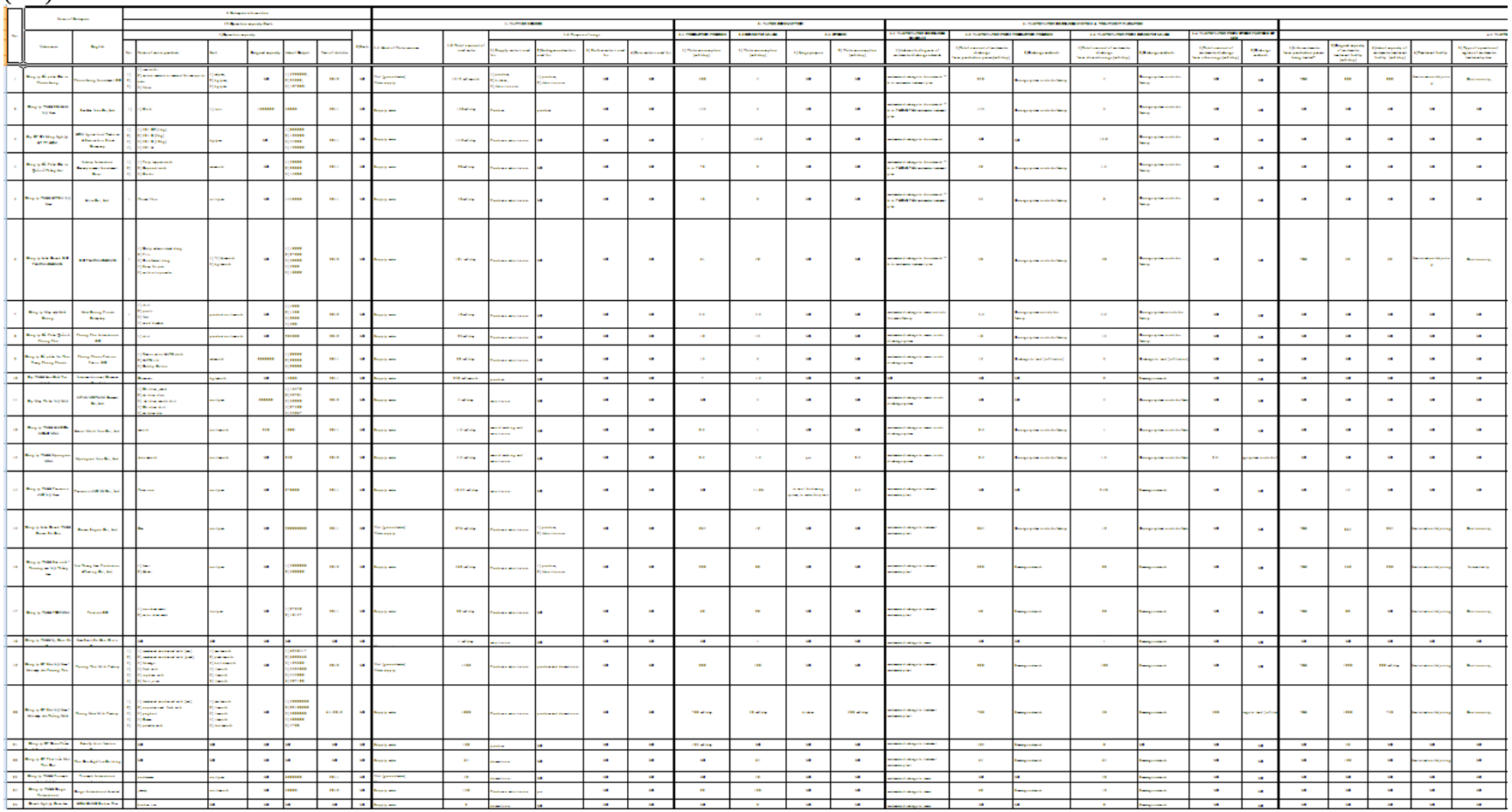
Information on enterprises surveyed was entered into PSI as shown below (images only, divided into 4 parts):

(1/4)



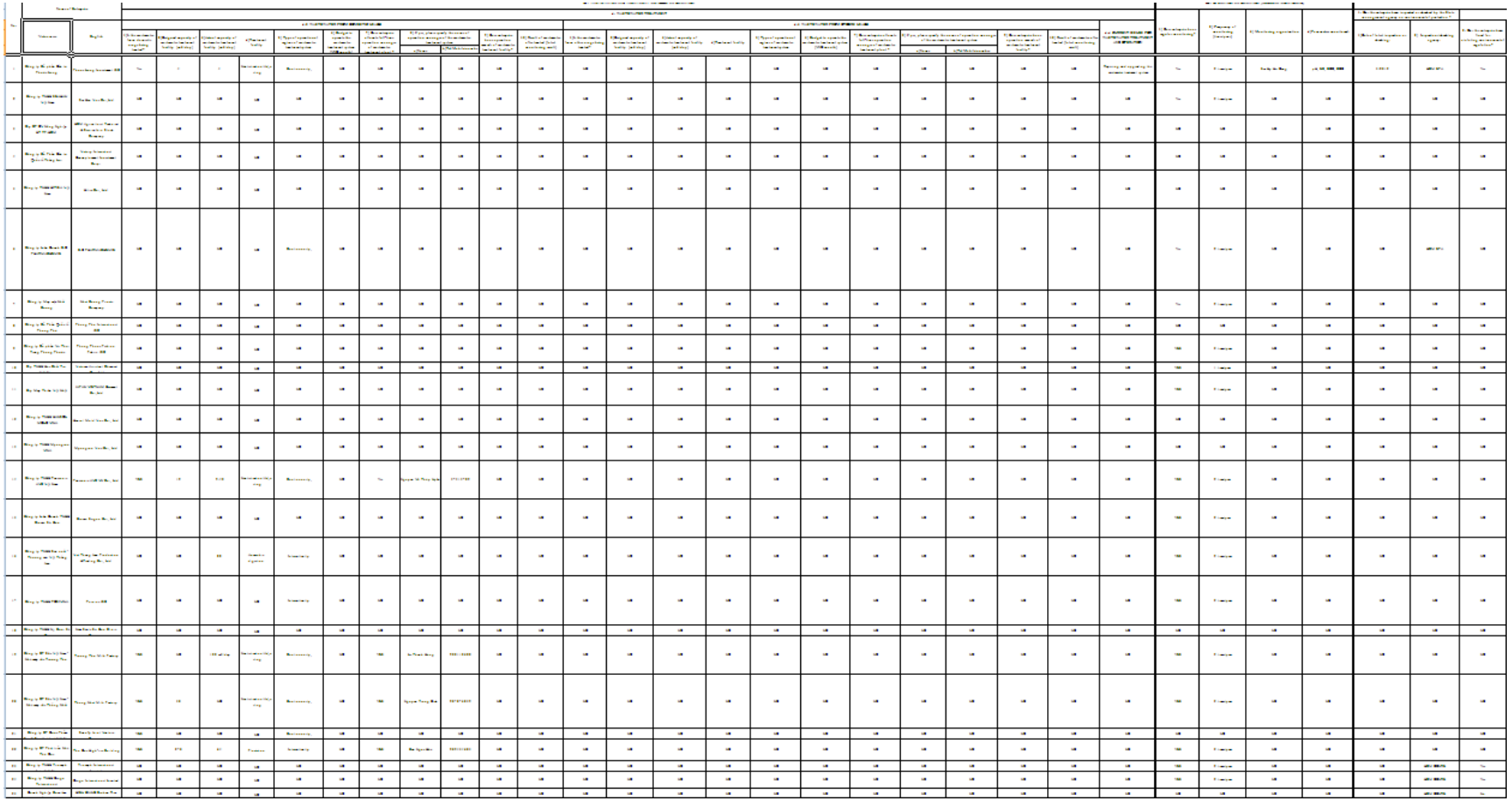
Source: JET

(2/4)



Source: JET

(3/4)



Source: JET

(4/4)

No.	Name of Company												
	Unknown	English											
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													

Source: JET

(3) Usage of PSI

1) Pollution load

The pollution loads discharged from the enterprises were calculated by using the PSI prepared

① Pollution loads of enterprises

Tên Công ty	Name of Enterprise	Area classify	Area Code	Q	BOD_5	COD	TSS	T-N	T-P	Oil and grease	$N\text{-}NH_{4+}$
				m3/day	(kg/day)	(kg/day)	(kg/day)	(kg/day)	(kg/day)	(kg/day)	(kg/day)
This portion is masked due to confi-dential reason		A	A	250	49	140	107	3.4	2.0	0.80	0.0
		A	A	150	7	20	20	1.6	1.8	0.23	0.5
		A	A	31.5	9	26	6	0.2	0.0	0.07	0.1
		A	A	37	4	12	4	1.0	0.9	0.12	0.4
		A	A	60	2	5	4	0.2	0.1	(<0.06)	0.1
		E	E	10	1	2	2	0.1	0.1	0.04	0.0
		A	A	25	1	3	10	0.1	0.3	0.05	0.1
		A	A	20	0.2	1	4	0.4	0.0	0.02	0.4
		A	A	2	0.1	0.3	0.3	0.0	0.0	(<0.06)	0.0
		E	E	4	0.3	0.6	0.3	0.0	0.0	(<0.06)	0.0
		A	A	1.3	0.1	0.2	0.3	0.0	0.0	0.00	0.0
		A	A	2	0.2	0.6	1	0.1	0.0	(<0.06)	0.0
		C	C	9.48	0.1	0.4	0.6	0.1	0.1	(<0.06)	0.1
		D	D	480	12	38	62	4.3	0.1	(<0.06)	3.6
		D	D	360	20	54	37	3.6	0.2	0.78	0.3
		B	B	80	2	8	6	0.1	0.0	(<0.06)	0.1
		E	E	900	14	38	65	1.9	4.1	(<0.06)	0.1
		E	E	750	20	47	11	2.4	1.0	(<0.06)	1.4
		E	E	103	10	31	16	1.9	0.0	0.31	1.6
		E	E	64	15	55	8	1.8	0.8	0.66	1.3
		E	E	20	10	24	58	1.1	0.5	0.71	0.7
		E	E	72	2	7	5	1.7	0.0	0.31	1.1
		E	D	8	0.2	0.6	1	0.1	0.0	0.02	0.0

Source: JET

② Pollution loads of enterprises by area

Area Code	WW Flow rate	Pollution Load by Area							No. of enterprise
	Q	BOD	COD	TSS	T-N	T-P	AmmoniaN	Oil & Grease	
	m3/day	kg/day	kg/day	kg/day	kg/day	kg/day	kg/day	kg/day	
A	579	72	208	156	7	5	2	1	10
B	80	2	8	6	0	0	0		1
C	9	0	0	1	0	0	0		1
D	848	33	92	100	8	0	4	1	3
E	1,923	71	204	164	11	6	6	2	8
Total	**3,439**	**179**	**513**	**427**	**26**	**12**	**12**	**4**	**23**

Source: JET

③ Pollution load in drainage network

S. Point	Name of points	Flow rate (Q)	pH	EC	Color	BOD_5	COD	TSS	T-N	T-P	$N\text{-}NH_4^+$
		(L/s)	(-)	(µS/cm)	Pt-Co	(kg/day)	(kg/day)	(kg/day)	(kg/day)	(kg/day)	(kg/day)
S1	Inflow of sewer network to Phong Phu IC	0.80	7.4	563	23	1.7	4.7	10	0.63	0.03	0.47
S2	Before confluence with sewer 2	2.70	9.7	2,745	185	20.5	66.4	47	1.97	1.77	1.49
S3	After influence of discharge from POSIVINA	1.35	7.4	615	71	7.5	21.9	22	1.38	0.77	0.71
S4	Sewer network from area D, before confluence with Binh Tho Channel	0.90	5.7	894	8	3.3	8.4	8	1.51	0.20	0.79
S5	Outflow of sewer network from Phuoc Long B Ward	8.55	7.8	1,044	71	162.9	480.5	105	9.69	1.29	2.41
S6	After discharge point of effluent from area E to Binh	3.85	7.0	443	45	13.3	39.2	12	4.76	0.89	1.39
S7	Before confluence with Binh Tho Channel which connect Sai Gon river	29.70	7.3	981	82	242.5	899.7	130	19.92	6.84	6.88

Source: JET

④ Estimation of pollution loads of domestic wastewater

Pollution loads generated in the Wards of Phuoc B and Binh Tho were estimated by using the unit of equivalent population, i.e. pollution load unit as follows:

Ward	Population	Polllution Load (Kg/day)				
		BOD	COD	TSS	T-N	T-P
Phuoc Long B	13,000	650	1,417	1,404	117	29
Binh Tho	8,600	430	937	929	77	19

Source: JET

Taking into account that just a part of the generated pollutants flow into the sewer network or the drainage system, it is assumed that the half of the amount of pollutants generated flow into the sewer network or the drainage system in the areas. Thus, the pollution loads which flow into the sewer network in Phuoc Long B Word and the Binh Tho Channel can be estimated as follows:

Ward	Polllution Load (Kg/day)				
	BOD	COD	TSS	T-N	T-P
Phuoc Long B	325	709	702	59	14
Binh Tho	215	469	464	39	9

Source: JET

2) Impact of pollution loads from enterprises to the area

Overall pollution loads generated in Phuoc Long B Ward and Binh Tho Ward are summarized below:

	Phuoc Long B Ward					Binh Tho Ward			Phuoc Long B + Binh Tho	
	Enterprise				Domestic	Enterprise		Domestic	Enterprise	Domestic
	A	B	C	D		E	G			
BOD	72	2	0	33	325	71	0	215	179	540
	107					71				
	432					286			719	
COD	208	8	0	92	709	204	0	469	513	1,177
	309					204				
	1,017					673			1,690	
TSS	156	6	1	100	702	164	0	464	427	1,166
	264					164				
	966					628			1,594	
T-N	7	0	0	8	59	11	0	39	26	97
	15					11				
	74					50			123	
T-P	5	0	0	0	14	6	0	9	12	24
	6					6				
	20					16			36	
NH_4^+	2	0	0	4	35	6	0	23	12	58
	6					6				
	41					29			70	

Source: JET

(4) Analysis and evaluation of pollution load impacts using PSI

Analysis of pollution loads by using the PSI shows:

- ☑ Wastewaters discharged from the enterprises located in the area "A" give large impact on the drainage system in Phuoc Long B Ward and Binh Tho Ward.
- ☑ Among the enterprises located in the area "A", five enterprises, i.e. No. 1 to No.4 and No.7 enterprises, account for majority of the impacts in the area "A".
- ☑ Among these 5 enterprises, Phuoc Long Investment JSC (No. 1 enterprise) has the largest impact.
- ☑ Wastewaters from these 5 enterprises have remarkable characteristics, especially that of Phuoc Long Investment JSC:
  - ➢ pH values do not meet the permissible range of the category B of QCVN 40:2011/BTNMT (No. 1 to No. 3:and No. 7 alkaline, No. 4 acidic)
  - ➢ Except No. 7 wastewater, all four wastewaters have bad smell, and all wastewaters are colored.
  - ➢ Considering above, wastewaters from these 5 enterprises appeared to be contaminated with non-organic substance(s).
  - ➢ Concentrations of organic substances and total phosphorous and ammonia exceed the category B of QCVN 40:2011/BTNMT.
  - ➢ Wastewaters discharged from the enterprises of No. 1, 2, 3, 4 and 7 need special attention for management and control of wastewaters.

C-2 Development of PSI in Ba Ria Vung Tau DONRE

(1) Objectives of PSI development

To develop a water PSI targeting serious pollution sources in Ba Ria Vung Tau Province for the management and control of those pollution sources by BRVT DONRE

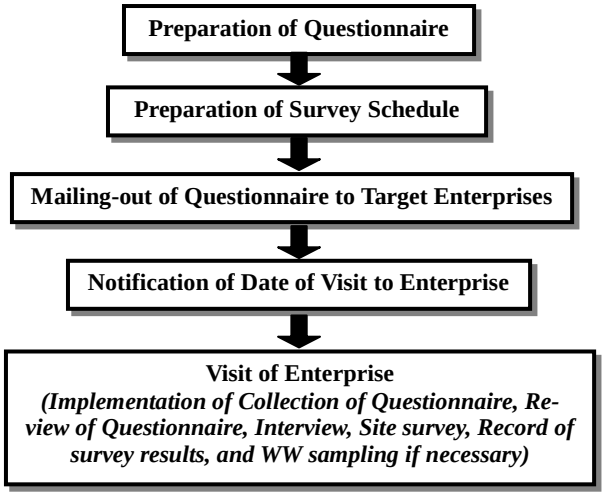
(2) Data and Information Collection Method

In order to collect the data and information required for the objectives above, a series of site surveys were implemented by BRVT DONRE and a sub-contractor[11]. Major contents of the site survey are:

- Implementation of the questionnaire survey and GPS survey of geographical coordinates of target enterprises,
- Implementation of the wastewater sampling and analysis on selected enterprises included in the target enterprises mentioned above,

The site surveys were implemented by the sub-contractor, Natural Resources and Environment Consulting (NREC), under the supervision of BRVT DONRE and JET.

The outline of processes and procedures of data/information collection is shown schematically below.



Source: JET

Figure C-4 Outline Process of Questionnaire Survey

1) Implementation of Questionnaire Survey and GPS Survey of Geographical Coordinates of Target Enterprises

In order to implement the questionnaire survey and the GPS survey, 100 enterprises, which are the potential serious pollution sources in the BRVT Province, were selected as the target enterprises by BRVT DONRE. The list of 100 target enterprises is shown in page C-25 and C-26.. The number of enterprises by the type of industrial sector and by area is shown below.

[11] The site survey was implemented in the end of November to the middle of December, 2011.

Table C-10 Number of Entities by Area and by Industrial Sector

City/Town /District	Classification of Industrial Sector (Decision No. 10/2007/QD-TTg) (Level 3)													Total
	Animal productions	Support activities to agriculture	Quarrying of stone, sand and clay	Support activities for petroleum and natural gas mining	Support activities for other mining and quarrying	Processing and preserving of fish, crustaceans and molluscs	Manufacture of other textiles	Manufacture of basic chemicals, fertilizer and nitrogen compounds, plastics and synthetic rubber	Manufacture of gas; distribution of gaseous fuels through mains	Waste collection	Waste treatment and disposal	Support activities for transportation	Short-term accommodation activities	
	014	016	081	091	099	102	132	201	352	381	382	522	551	
Vung Tau City	0	0	0	8	0	14	2	0	0	4	0	4	6	**38**
Ba Ria Town	0	0	0	0	0	2	1	0	0	0	0	1	0	**4**
Tan Thanh	7	1	4	0	1	5	0	0	0	1	4	9	0	**32**
Dat Do	0	0	2	0	0	3	0	1	0	0	0	0	0	**6**
Long Dien	1	0	0	0	0	1	0	0	2	0	0	0	2	**6**
Chau Duc	0	0	1	0	0	0	0	2	0	0	0	0	0	**3**
Xuyen Moc	4	0	0	0	0	0	0	3	0	0	0	0	4	**11**
Total	**12**	**1**	**7**	**8**	**1**	**25**	**3**	**6**	**2**	**5**	**4**	**14**	**12**	**100**

Source: JET

2) Implementation of Wastewater Sampling and Analysis on selected 44 enterprises

Wastewater samples were taken from selected 44 enterprises among the 100 enterprises mentioned above. The samples were collected twice from each enterprise. Wastewater sampling and analysis were carried out based on the VILAS standards. The industrial sectors and administrative areas of these 44 enterprises are summarized below.

Table C-11 Details of 44 Enterprises

City/Town /District	Classification of Industrial Sector (Decision No. 10/2007/QD-TTg) (Level 3)													Total
	Animal productions	Support activities to agriculture	Quarrying of stone, sand and clay	Support activities for petroleum and natural gas mining	Support activities for other mining and quarrying	Processing and preserving of fish, crustaceans and molluscs	Manufacture of other textiles	Manufacture of basic chemicals, fertilizer and nitrogen compounds, plastics and synthetic rubber	Manufacture of gas; distribution of gaseous fuels through mains	Waste collection	Waste treatment and disposal	Support activities for transportation	Short-term accommodation activities	
	014	016	081	091	099	102	132	201	352	381	382	522	551	
Vung Tau City	0	0	0	3	0	7	0	0	0	0	0	3	3	**16**
Ba Ria Town	0	0	0	0	0	0	1	0	0	0	0	1	0	**2**
Tan Thanh	2	1	0	0	0	4	0	0	0	0	3	2	0	**12**
Dat Do	0	0	0	0	0	3	0	0	0	0	0	0	0	**3**
Long Dien	0	0	0	0	0	0	0	0	2	0	0	0	1	**3**
Chau Duc	0	0	0	0	0	0	0	2	0	0	0	0	0	**2**
Xuyen Moc	2	0	0	0	0	0	0	2	0	0	0	0	2	**6**
Total	**4**	**1**	**0**	**3**	**0**	**14**	**1**	**4**	**2**	**0**	**3**	**6**	**6**	**44**

Source: JET

(3) Scheme of PSI

Based on above, the scheme of PSI is summarized in Table C-12.

Table C-12 Scope of PSI (BRVT DONRE)

Items to be inventoried	Source category	Discharge source	Geographical boundary
1. Enterprise information including the compliance status of environmental requirements, 2. Wastewater and treatment methods information, 3. Enterprise operation information, 4. Current issues for wastewater treatment and operation	• Point source	• Twenty (100) industries located in Ba Ria Vung Tau Province outside of Industrial Zone	• Within Ba Ria Vung Tau Province
Inventory Use/Objectives			
• To collect data and information regarding 100 potential water pollution sources for the management and control of pollution sources by BRVT DONRE. • To develop the wastewater pollution source map based on the data and information of 100 enterprises			

Source: JET

(4) Development of PSI

Based on the data and information collected by the site survey including the analyzed wastewater sampling data, a PSI has been developed as shown in page C-27, C-28 and C-29.

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness

Hochiminh City, (date)..... (month).....(year)

ENTERPRISES INFORMATION COLLECTION FORM

I. ENTERPRISE INFORMATION

1. Name of enterprise:
2. Name of owner:
3. Address of enterprise:
4. Tel:
5. Type of enterprise:
   - ☐ Joint stock company
   - ☐ State company
   - ☐ Limited company
   - ☐ Private Company
   - ☐ 100% FDI Company
   - ☐ Others:
6. Business sectors:
7. Business certificate:.....Issuing date:.....
8. Total number of labor:.....Area:.....
9. Staff in charge of environment.....Tel:.....Email:.....
10. Environmental Permits: (listing and enclosing a copy):

Environmental Permits	No.	Issuing date
1. ☐ Appraised Environmental Impact Evaluation (EIA) ☐ EPP ☐ Certificate of registration of environmental standards ☐ EPC		
2. Acceptance Certificate of wastewater treatment system		

11. Materials and chemicals for production

No.	Name of materials & chemicals	Used in the process	Unit	Consumed amount	Year of statistics

12. . Fuels for production

Storage Area for Fuels: .....

Method of storage: .....

13. Production process in the enterprise:

14. List of the main products (according to plan):

No.	Name of main products	Unit	Output	Year of statistics

II. WASTESWATER AND TREATMENT METHODS INFORMATION:

2.1 WATER RESOURCE AND USAGE

- Water resource to be used:
  - Kind of Water resource: Well(under-ground water) ☐ Water tank ☐
    supply water ☐ others ☐
  - Nos of well :………………….,Nos of well being used:……………..
  - Actual exploited flow: ………………..m^3/day / Exploited flow according to permit ……………m^3/day
  - Exploiting permits: Yes ☐ No ☐ /Nos. permits:………………..
  - Purpose of usage:………………..

2.2 AMOUNT OF CONSUMED WATER AND DISCHARGE

- Paying wastewater charge or not? Yes ☐ No ☐
  (*Enclosing a copy of the wastewater statement in the latest month*).
- Discharge permit: Yes ☐ No ☐ Discharge permit Number:………………
- Discharge Flow according to permit : ……………m^3/day
- Actual Discharge Flow ……………m^3/day
- Diagram of discharge position:

Type	Water usage amount (m^3/day)	Wastewater discharge amount (m^3/day)	Discharged to[(1)]	Type of Treatment facility[(2)]
Production process	Planned: Daily (date:): Daily average (from to):	Planned: Daily (date:): Daily average (from to):		
Domestic usage	Planned: Daily (date:): Daily average (from to):	Planned: Daily (date:): Daily average (from to):		
Cooling water	Planned: Daily (date:): Daily average (from to):	Planned: Daily (date:): Daily average (from to):		
Others	Ave Max	Ave Max		
Total	(m^3/day) (m^3/month)	(m^3/day) (m^3/month)		

(1): Select one of the codes listed below to describe the wastewater discharging destination.
SW – [illegible] DC – [illegible] LI – [illegible] Others [illegible]

(2): Select the wastewater treatment facilities applied.

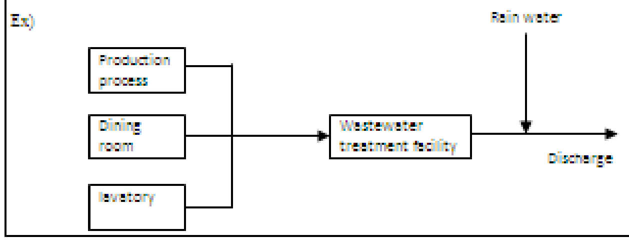
A – Neutralization/Adjusting
B – Sedimentation
C – Floatation
D – Sand filtration
E – Absorption by activated carbon
F – Oil separator
G – Activated sludge
H – Other biological treatment
I – Trickling filtration
J – Aeration pond
K – Anaerobic digestion
L – Other, please describe clearly

2.3 WASTEWATER DISCHARGE NETWORK SYSTEM

A schematic diagram of wastewater discharge network (Please attach the diagrams or as build drawing if enterprise have.)

(Describe the wastewater treatment plant if there are no detailed drawings)

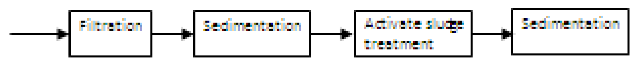
Ex)



2.4 WASTEWATER TREATMENT FACILITIES

A schematic diagram of wastewater treatment facility (Please attach the diagrams or as build drawing if enterprise have)

Ex)



Designed capacity : ( ) m3/day

III. OPERATION INFORMATION:

3.1 REGULAR MONITORING

1. Does enterprise have regular monitoring? Yes ☐ No ☐
2. Frequency of monitoring (times/year):.....
3. Monitoring methods: (Please clasify, what is the question for?).....
4. Parameters monitored

Please enter the analytical results in latest self-monitoring report and attach the monitoring results from the report.

Date monitored (Month/Year): (/)

pH	mg/L	Odor		Color		BOD_5	mg/L
COD_{Cr}	mg/L	SS	mg/L	NH_4+	mg/L	TN	mg/L
TP	mg/L	Sulfure	mg/L	AOX	mg/L	Oil & Grease	mg/L
Cr(III)	mg/L	Cr(VI)	mg/L	Fe	mg/L	Cu	mg/L
Chlorine residual	mg/L	Hg	mg/L	Pb	mg/L	As	mg/L
Cd	mg/L						

(Enclosing a copy of the results of regular monitoring times).

3.2 OPERATION OF WASTEWATER TREATMENT FACILITY

- Does enterprise allocate full-time operation manager of wastewater treatment plant?
  Yes ☐ No ☐
- Can enterprise show operation records of wastewater treatment plant?
  Yes ☐ No ☐

(Enclosing a copy of the operation records or diary of Wastewater Treatment Facility).

(This part should be updated with the current condition or not? Because in the meeting, it is possible that the enterprises have WWTP but they do not operate in accordance with the procedure. Please clarify the purpose of these questions in this part.)

IV. CURRENT ISSUES FOR WASTEWATER TREATNENT AND OPERATION:

- ☐ Lack of knowledge on wastewater treatment plant operation
- ☐ Lack of budget to construct suitable wastewater treatment facilities
- ☐ Lack of budget to maintain wastewater treatment facilities
- ☐ Lack of man-power to operate wastewater treatment plant adequately
- ☐ Fluctuation of inflowing wastewater characteristics
- ☐ Fluctuation of inflowing wastewater volume
- ☐ Others

Comments of enterprises about the wastewater management, wastewater treatment system, method for improvement of wastewater treatment)

Hochiminh, (date) (month) (year)

(signed and sealed)

DIRECTOR

Table C-13 List of Target Entities for Pollution Source Inventory Survey in BRVT (1/2)

No	Name of enterprises		Industrial sector (Level 1)	Industrial sub-sector (Original)	Vietnam Standard Industrial Classification				City/Town /District
	Vietnamese	English			Level	Level	Level	Level	
1	This portion is masked due to confidential reason.		Manufacturing	Fishmeal	C	10	102	1020	Tan Thanh
2			Manufacturing	Canned fish and	C	10	102	1020	Tan Thanh
3			Manufacturing	Surimi	C	10	102	1020	Tan Thanh
4			Manufacturing	Fishmeal	C	10	102	1020	Tan Thanh
5			Manufacturing	Fishmeal	C	10	102	1020	Tan Thanh
6			Manufacturing	Surimi	C	10	102	1020	Vung Tau City
7			Manufacturing	Surimi	C	10	102	1020	Vung Tau City
8			Manufacturing	Surimi	C	10	102	1020	Vung Tau City
9			Manufacturing	Surimi	C	10	102	1020	Ba Ria Town
10			Manufacturing	A kind of fish	C	10	102	1020	Ba Ria Town
11			Manufacturing	Surimi	C	10	102	1020	Dat Do
12			Manufacturing	Surimi	C	10	102	1020	Long Dien
13			Manufacturing	Fishmeal	C	10	102	1020	Dat Do
14			Manufacturing	Fishmeal	C	10	102	1020	Dat Do
15			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
16			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
17			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
18			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
19			Manufacturing	Surimi	C	10	102	1020	Vung Tau City
20			Manufacturing	Surimi	C	10	102	1020	Vung Tau City
21			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
22			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
23			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
24			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
25			Manufacturing	Seafood	C	10	102	1020	Vung Tau City
26			Manufacturing	Rubber latex	C	20	201	2013	Chau Duc
27			Manufacturing	Rubber latex	C	20	201	2013	Xuyen Moc
28			Manufacturing	Rubber latex	C	20	201	2013	Xuyen Moc
29			Manufacturing	Rubber latex	C	20	201	2013	Xuyen Moc
30			Manufacturing	Rubber latex	C	20	201	2013	Chau Duc
31			Manufacturing	Rubber latex	C	20	201	2013	Dat Do
32			Transportation and	Port Service	H	52	522		Tan Thanh
36			Transportation and	Port Service	H	52	522		Tan Thanh
37			Transportation and	Port Service	H	52	522		Tan Thanh
38			Transportation and	Port Service	H	52	522		Tan Thanh
39			Transportation and	Port Service	H	52	522		Tan Thanh
40			Transportation and	Port Service	H	52	522		Tan Thanh
41			Transportation and	Port Service	H	52	522		Tan Thanh
42			Transportation and	Port Service	H	52	522		Vung Tau City
43			Transportation and	Port Service	H	52	522		Vung Tau City
44			Transportation and	Port Service	H	52	522		Vung Tau City
45			Transportation and	Port Service	H	52	522		Vung Tau City
46			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Xuyen Moc
47			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Xuyen Moc
48			Agriculture, Forestry and	Chicken	A	01	014	0146	Xuyen Moc
49			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Xuyen Moc
50			Agriculture, Forestry and	Chicken	A	01	014	0146	Long Dien
51			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Tan Thanh
52			Agriculture, Forestry and	Slaughtering	A	01	016	0163	Tan Thanh
53			Agriculture, Forestry and	Chicken	A	01	014	0146	Tan Thanh
54			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Tan Thanh
55			Agriculture, Forestry and	Chicken	A	01	014	0146	Tan Thanh
56			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Tan Thanh
57			Agriculture, Forestry and	Pig Breeding	A	01	014	0145	Tan Thanh
58			Agriculture, Forestry and	Chicken	A	01	014	0146	Tan Thanh
59			Minig and Quarrying	Stone	B	08	081	0810	Tan Thanh
60			Minig and Quarrying	Puzolan	B	08	081	0810	Dat Do
61			Minig and Quarrying	Clay	B	08	081	0810	Tan Thanh
62			Minig and Quarrying	Clay	B	08	081	0810	Tan Thanh
63			Minig and Quarrying	Fill materials	B	09	099	0990	Tan Thanh
64			Minig and Quarrying	Stone	B	08	081	0810	Tan Thanh
65			Minig and Quarrying	Puzolan	B	08	081	0810	Dat Do
69			Accomodation and Food	Hotels and	I	55	551	5510	Vung Tau City
70			Accomodation and Food	Restaurants &	I	55	551	5510	Vung Tau City

Source: JET

Table C-13 List of Target Entities for Pollution Source Inventory Survey in BRVT (2/2)

No	Name of enterprises		Industrial sector (Level 1)	Industrial sub-sector (Original)	Vietnam Standard Industrial Classification				City/Town /District
	Vietnamese	English			Level	Level	Level	Level	
71			Accomodation and Food	Resort	I	55	551	5510	Vung Tau City
72			Accomodation and Food	Resort	I	55	551	5510	Vung Tau City
73			Accomodation and Food	Resort	I	55	551	5510	Long Dien
74			Accomodation and Food	Resort	I	55	551	5510	Long Dien
75			Accomodation and Food	Resort	I	55	551	5510	Xuyen Moc
76			Accomodation and Food	Resort	I	55	551	5510	Xuyen Moc
77			Accomodation and Food	Resort	I	55	551	5510	Xuyen Moc
78			Accomodation and Food	Resort	I	55	551	5510	Xuyen Moc
79			Water Supply, Sewerage,	Hazardous waste	E	38	382	3822	Tan Thanh
80			Water Supply, Sewerage,	Hazardous waste	E	38	382	3822	Tan Thanh
81			Water Supply, Sewerage,	Hazardous waste	E	38	382	3822	Tan Thanh
82			Water Supply, Sewerage,	Hazardous waste	E	38	382	3822	Tan Thanh
83			Water Supply, Sewerage,	Hazardous waste	E	38	381	3812	Tan Thanh
84			Water Supply, Sewerage,	Hazardous waste	E	38	381	3812	Vung Tau City
85			Water Supply, Sewerage,	Hazardous waste	E	38	381	3812	Vung Tau City
86			Water Supply, Sewerage,	Hazardous waste	E	38	381	3812	Vung Tau City
87			Water Supply, Sewerage,	Hazardous waste	E	38	381	3812	Vung Tau City
88			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
89			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
90			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
91			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
92			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
93			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
94			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
95			Minig and Quarrying	Oil & Gas	B	09	091	0910	Vung Tau City
96			Manufacturing	Garment &	C	13	132		Vung Tau City
97			Manufacturing	Garment &	C	13	132		Vung Tau City
98			Manufacturing	Garment &	C	13	132		Ba Ria Town
99			Electricity, Gas, Steam	Gas treatment	D	35	352	3520	Long Dien
100			Electricity, Gas, Steam	Gas treatment	D	35	352	3520	Long Dien
101			Manufacturing	Surimi	C	10	102	1020	Tan Thanh

Source: JET

Pollution Source Inventory in BRVT (1/3)

Pollution Source Facility / Pollution Source Location

No.	Industrial type: Name	Industrial type: Code (Level 1)	Facility Name	Industrial classification code: Level2	Level3	Level4	Level5	City/District /Town	Province	Code1 Province	Code2 City/District/Town	Code3 Ward/Commune	x Latitude	y Longitude
1	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
2	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10201	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
3	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
4	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
5	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau	BRVT	064	C	C	[redacted]	[redacted]
6	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
7	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau(Facility	BRVT	064	C	W	[redacted]	[redacted]
8	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
9	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Ba Ria	BRVT	064	T	W	[redacted]	[redacted]
10	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Ba Ria	BRVT	064	C	W	[redacted]	[redacted]
11	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Dat Do	BRVT	064	D	T	[redacted]	[redacted]
12	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Long Dien	BRVT	064	D	C	[redacted]	[redacted]
13	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
14	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Dat Do	BRVT	064	D	C	[redacted]	[redacted]
15	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
16	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
17	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
18	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
19	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
20	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10209	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
21	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
22	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
23	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
24	1. Enterprises in seafood processing	C	[redacted]	10	102	1020	10202	Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
25	2. Rubber Processing Facilities	C	[redacted]	20	201	2013	20132	Chau Duc	BRVT	064	D	C	[redacted]	[redacted]
26	2. Rubber Processing Facilities	C	[redacted]	20	201	2013	20132	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]
27	2. Rubber Processing Facilities	C	[redacted]	20	201	2013	20132	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]
28	2. Rubber Processing Facilities	C	[redacted]	20	201	2013	20132	Xuyen Moc	BRVT	064	T	W	[redacted]	[redacted]
29	2. Rubber Processing Facilities	C	[redacted]	20	201	2013	20132	Chau Duc	BRVT	064	T	W	[redacted]	[redacted]
30	2. Rubber Processing Facilities	C	[redacted]	20	201	2013	20132	Dat Do	BRVT	064	D	C	[redacted]	[redacted]
31	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D		[redacted]	[redacted]
32	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D	T	[redacted]	[redacted]
33	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D		[redacted]	[redacted]

Facility Information

No.	Major Product: Name 1	Quantity	Unit	Raw Material: Name 1	Quantity	Unit	Water consumption (m^3/day)	No. of employee	Number of operation days per year	Number of operation days per month	Area (m^2)	Business type	Source of data/info
1	Fish meal	25	ton/d	Fish, heads of fish	90	ton/m	37	90	180	15	10,000	Fishmeal Processing	Questionnaire survey
2	Fish meal	15	ton/d	Fish, heads of fish	50	ton/d	150	30	300	25	34,770	Canned fish and Fishmeal	Questionnaire survey
3	Surimi	2400	ton/y	Fish	200	ton/m	370	130	300	25	1,950	Surimi	Questionnaire survey
4	Surimi	500	ton/m	Fish of all kinds	1000	ton/m	300	200	300	25	6,980	Fishmeal Processing	Questionnaire survey
5	Fish meal	613900	kg/m	Fish scraps	2676700	kg/m	55	138	300	25	11,015	Fishmeal Processing	Questionnaire survey
6	Surimi	650	ton/y	Shrimp, squid, fish	750	ton/y	200	317	350	29	6,554	Surimi	Questionnaire survey
7	Surimi	6000	ton/y	Salt	575	kg/m	450	300	250	21	8,150	Surimi	Questionnaire survey
8	Octopus	550	ton/y	Squid, octopus	40	ton/m	70	159	360	30	12,900	Surimi	Questionnaire survey
9	Seafood of all types	250	ton/y	Squid, octopus	200	ton/m	180	373	295	25	11,500	Surimi	Questionnaire survey
10	Dried fish ofall	10000	kg	Soap	8	kg/m	10	100	300	25	4,500	Surimi	Questionnaire survey
11	Surimi	100	ton/m	Fress fish	200	ton/m	100	100	300	25	6,429	Surimi	Questionnaire survey
12	Dried fish ofall	20	ton	Chlorine	30	kg/m	18	70	300	25	3,999	Surimi	Questionnaire survey
13	Fish meal	6380000	kg/y	Fress fish	2000000	kg/m	24	60	260	22	9,525	Fishmeal	Questionnaire survey
14	Fish meal	5000	ton/y	Fish	1542	ton/m	25	29	288	24	18,225	Fishmeal	Questionnaire survey
15	Octopus	192	ton/m	Octopus	210	ton/m	65	150	250	21		Seafood	Questionnaire survey
16	Squid	110	ton/m	Salt	20	ton/m	60	100	250	21	2,000	Seafood	Questionnaire survey
17	Seafood cake	200	ton/m	Seafood	70	ton/m	233	230	280	23	4,500	Seafood	Questionnaire survey
18	Shrimp, squid	250	ton/m	Crab	100	ton/y	400	400	250	21	15,000	Seafood	Questionnaire survey
19	Seafood of all kinds	800	ton/m	Salt	10	ton/m	600	280	300	25	11,000	Surimi	Questionnaire survey
20	Surimi	208	ton/m	Javen, soap	30	kg/m	340	120	300	25	7,000	Surimi	Questionnaire survey
21	Fish fillet	8	ton/m	Salt	1	ton/m	50	100	240	20	5,000	Seafood	Questionnaire survey
22	Frozen seafood	70	ton/m	Chlorine	90	kg/m	300	70	250	21	15,000	Seafood	Questionnaire survey
23	Frozen seafood	2	ton/d	Chlorine	3	kg/d	70	40	290	24	14,000	Seafood	Questionnaire survey
24	Frozen seafood	6	ton/d	Ice	900	tree/m	60	45	250	21	3,000	Seafood	Questionnaire survey
25	Rubber latex	13000	ton	Latex	1080	ton/m	550	160	280	23	7,500	Rubber latex processing	Questionnaire survey
26	Rubber latex SVR	6048	ton	Latex	500	ton/m	446	140	280	23	50,000	Rubber latex processing	Questionnaire survey
27	Rubber latex	1500	ton/y	Latex	250	kg/m	12	54	214	18	20,000	Rubber latex processing	Questionnaire survey
28	Rubber latex SVR3L, SVR5	1395	ton/y	Latex	200	ton/m	130	33	231	19	25,400	Rubber latex processing	Questionnaire survey
29	Latex RSS	416.2	ton/y	Latex	55	ton/m	52	15	231	19	10,000	Rubber latex processing	Questionnaire survey
30	Rubber latex	82	ton	Latex	8200	kg/m	200	45	234	20	385,582	Rubber latex processing	Questionnaire survey
31	Cement	125000	ton/m	Clin - ker PC50	640000	ton/m	80	190	288	24	109087,8	Port Service	Questionnaire survey
32	Electrical energy	1.5E+09	kWh/y	Hydro	1800	m3/m	2175	602	365	30	965,665	Port Service	Questionnaire survey
33	Cement	400	ton/d	Clinker	680000	ton/m	55	140	300	25	200,000	Port Service	Questionnaire survey

Environmental Requirement/Environmental Authorization System

No.	EIA	Environmental protection schemes	Registration of environmental standards	EPC	EPP	Environmental procedures	Register of waste	Surface mining permit	Permits for groundwater extraction	WW Fee	The report about conducting the measures mentioned in the EIA report	Inspection	Sanction	Wastewater treatment facility
1	Yes									Yes		X		5
2	Yes													130
3		159/QĐ-STNMT					77.00026 3.T		12/GP-STNMT			X		380
4		358/QĐ-STNMT					77.00036 7.T					X		480
5	Yes											X		20
6	431/M Tg						77.00007 8.T		14/GP.ST NMT				X	300
7		362/QĐ-STNMT					77.00024 9.T					X		450
8							77000276							70
9	597/CC BVMT-		25/SKHC NMT	25/SKH CNMT			QLCTNH 77.00172.				597/CCB VMT-	X		600
10							77.00018 3.T					X		
11		334/Q Đ.STNM					QLCTNH :7700027					X		120
12		12/GXN-UBND					QLCTNH 77000270					X		20
13	480096						77000087 .T		36/GP-UB	480096		X		300
14							77.00029 5.T					X		50
15	Yes									Yes				80
16	480158	07/Q Đ.STNM					77.00039 5.T			480158		X	X	80
17							77.00035 9.T					X		200
18	Yes									Yes		X		400
19		349/STN MT.CCB					77.00019 5.T		07/GP-STNMT		02/FTST NMT-	X		800
20	1278						77.00016 3.T					X	X	500
21							77.00055 9.T						X	180
22	Yes	101208/T NMT-					77.00279. T			Yes			X	300
23	Yes	Yes								Yes				
24	Yes									Yes			X	50
25	Yes													1000
26	683/CC BVMT-										683/CCB VMT-	X		150
27	38/TN MT	03/TNM T									38/TNM T	X		250
28				01/TN MT			77.00033 8.T	18/GP.ST NMT				X		300
29			67/STNM T-MT				77.00033 88.T	19/GP.ST NMT	21/GP.ST NMT			X		100
30		02/GXN-TNMT					77.00040 6.T	29/GP.UB ND				X		40
31			1819/BT NMT-TĐ									X	X	
32	2731/Q Đ-											X		48
33	188/CC BVMT-									188/CCB VMT-		X		50

Wastewater Information

No.	WW Destination	Flow rate of WW (m^3/d): Production Line	Flow rate of WW (m^3/d): Domestic wastewater	Flow rate of WW (m^3/d)	Temp. (℃)	pH (-)	EC (μS/cm)	DO (mg/L)	Odor (-)	Colour Pt-Co	BOD_5 (mg/L)	COD (mg/L)	SS (mg/L)	Amonia (mg/L)	T-N (mg/L)	T-P (mg/L)	Coliforms MPN/100	Mineral Oil (mg/L)	Gease plant (mg/L)	Cr(VI) (μg/L)	Cr(III) (μg/L)	Fe (mg/L)	Cu (mg/L)	Pb (μg/L)	Cd (μg/L)	As (μg/L)	Hg (μg/L)
1	RV	5	25	30	29.5	7.9	1193	3.4	Bad	28	96	486	13	9.5	9.9	2	11000	0.2	4.6	N.D. (<10)	N.D. (<10)	0.038	N.D. (<	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
2	RV	80	5	120	28.3	7.6	3570	3.2	Not bad	100	160	634	13	11.5	14	20.8	4000	1	6.6	N.D. (<10)	N.D. (<10)	0.12	0.005	N.D. (<1)	N.D. (<0,5)	0.057	N.D. (<0,1)
3	RV	360	10	350	32	7	3030	3.6	Bad	190	70	301	61	26	33	21	1500	N.D.	9	N.D. (<10)	N.D. (<10)	0.036	0.003	N.D. (<1)	N.D. (<0,5)	0.12	N.D. (<0,1)
4	RV	168	16	300	29.3	7.5	735	0.7	Bad	32	210	755	9	8.8	9.5	5.2	2000	N.D.	2.2	N.D. (<10)	N.D. (<10)	0.061	N.D. (<	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
5	SW	50	5																								
6	RV	120	18.3	180	29.2	7.1	9170	3.2	Not bad	50	120	557	12	2.2	2.7	13.1	28000	N.D.	5.2	N.D. (<10)	N.D. (<10)	0.044	0.003	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
7	RV	200	12	400	28.7	7	1198	4.6	Bad	60	140	525	11	26	26.9	6.2	700	N.D.	4.6	N.D. (<10)	N.D. (<10)	0.104	0.009	N.D. (<1)	N.D. (<0,5)	90.2	N.D. (<0,1)
8	SW	40	5																								
9	SW	150	20	170	29.1	8.2	1032	3.4	Not bad	16.0	49.0	95	68	5.2	**27.5**	**5.9**	**4800**	N.D.	**4.3**	N.D. (<10)	N.D. (<10)	0.022	N.D. (<	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
10	RV	7	1																								
11	RV	80	10	100	29.2	7	3.55	0.6	Bad	100	220	768	15	**140**	**146**	**2.8**	**1500**	**0.8**	**10.6**	N.D. (<10)	N.D. (<10)	**0.049**	**0.005**	N.D. (<1)	N.D. (<0,5)	**11.8**	N.D. (<0,1)
12	DO	15	2																								
13	SW	12	6	20	28.9	7.2	3190	3.8	Not bad	120	30	190	9	57	62	3.2	900	0.2	0.8	N.D. (<10)	N.D. (<10)	0.077	N.D. (<	12.7	N.D. (<0,5)	424.4	N.D. (<0,1)
14	K	5	2	20	29.7	7.6	6250	0.1	Bad	270.0	350.0	1248	180	455	473	1.5	70000	N.D.	7.6	N.D. (<10)	N.D. (<10)	0.19	0.008	N.D. (<1)	N.D. (<0,5)	104.3	N.D. (<0,1)
15	RV	48	4																								
16	SW	40	4	55	29.2	7.5	28300	1.4	Bad	520.0	######	2304	440	550	557	39	93000	N.D.	7.4	N.D. (<10)	N.D. (<10)	0.142	0.02	N.D. (<1)	6.8	19.9	N.D. (<0,1)
17	RV	184	6																								
18	RV	240	13																								
19	RV	382	9	600	28.6	6.9	372	2.7	Bad	65.0	22.0	135	10	1.6	5.2	5.8	2000	N.D.	0.6	N.D. (<10)	N.D. (<10)	0.063	N.D. (<	N.D. (<1)	N.D. (<0,5)	1.14	N.D. (<0,1)
20	RV	240	2.5	300	28	6.8	1459	2.9	Bad	130.0	120.0	207	145	8.8	42	12	6500	0.3	8.8	N.D. (<10)	N.D. (<10)	0.078	0.03	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
21	RV	40	4	50	25.5	6.3	1857	1.9	Bad	420.0	######	3200	580	143	185	4.6	93000	1.2	2.2	N.D. (<10)	N.D. (<10)	0.063	N.D. (<	N.D. (<1)	N.D. (<0,5)	0.65	N.D. (<0,1)
22	RV	184	4																								
23	RV	54	2																								
24	RV	36	2	45	30.4	7.6	3480	3.2	Bad	95.0	144.0	728	12	51.4	57.1	4.4	2300	N.D.	1.2	N.D. (<10)	N.D. (<10)	0.032	N.D. (<	N.D. (<1)	N.D. (<0,5)	54.5	N.D. (<0,1)
25	K	350	20	500	28.6	8.7	901	4.1	Bad	470.0	11.0	112	45	2.1	4.6	1.7	1100	0.8	1.2	N.D. (<10)	N.D. (<10)	0.018	N.D. (<	N.D. (<1)	N.D. (<0,5)	0.28	N.D. (<0,1)
26	K	400	50	450	28.6	7.7	1668	3.7	Bad	130.0	36.0	110	19	0.64	10.4	3.8	1500	N.D.	0.4	N.D. (<10)	N.D. (<10)	0.049	N.D. (<	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
27	K	60	3	20	28.5	8	2070	0.4	Bad	120.0	132.0	320	166	90	115	2.6	2100	0.4	6.8	N.D. (<10)	N.D. (<10)	0.44	N.D. (<	N.D. (<1)	N.D. (<0,5)	2.26	N.D. (<0,1)
28	K	110	1.5	120	28.5	7.2	1785	3.4	Bad	134.0	185	227	94	17.3	60.5	19.2	4800	1.04	2.05	0.01	0.03	0.5	0.003	0.07	N.D. (<0,5)	1.21	N.D. (<0,1)
29	RV	52	0.8	60	28.8	7.3	1802	4.6	Not bad	210.0	104.0	256	198	3.4	3.8	4.5	4300	0.4	2.4	N.D. (<10)	N.D. (<10)	6.77	0.046	N.D. (<1)	1.6	N.D. (<0,1)	N.D. (<0,1)
30	K	150	5	200	28.5	6.7	2421	3.1	Bad	156.0	167	212	97	16.5	60	18.6	4900	0.96	2.1	N.D. (<10)	N.D. (<10)	0.3	0.002	0.05	N.D. (<0,5)	0.56	N.D. (<0,1)
31			50																								
32	RV		150																								
33	RV		20																								

Source: JET

Pollution Source Inventory in BRVT (2/3)

No.	Pollution Source Facility: Industrial type – Name	Code (Level 1)	Facility Name	Industrial classification code: Level2	Level3	Level4	Level5	Pollution Source Location: City/District /Town	Province	Code1 Province	Code2 City/District/ Town	Code3 Ward/Commune	x Latitude	y Longitude
34	3. Port exploitation entities	H	[redacted]	52	522			Ba Ria	BRVT	064	D		[redacted]	[redacted]
35	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D		[redacted]	[redacted]
36	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D		[redacted]	[redacted]
37	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D		[redacted]	[redacted]
38	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D	T	[redacted]	[redacted]
39	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
40	3. Port exploitation entities	H	[redacted]	52	522			Tan Thanh	BRVT	064	D	w	[redacted]	[redacted]
41	3. Port exploitation entities	H	[redacted]	52	522			Vung Tau	BRVT	064	D		[redacted]	[redacted]
42	3. Port exploitation entities	H	[redacted]	52	522			Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
43	3. Port exploitation entities	H	[redacted]	52	522			Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
44	3. Port exploitation entities	H	[redacted]	52	522			Vung Tau	BRVT	064	C	W	[redacted]	[redacted]
45	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]
46	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]
47	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0146	01462	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]
48	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]
49	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0146	01462	Long Dien	BRVT	064	D	C	[redacted]	[redacted]
50	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
51	4. Livestock & Poultry Facilities	A	[redacted]	01	016	0163	01630	Tan Thanh	BRVT	064		C	[redacted]	[redacted]
52	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0146	01462	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
53	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
54	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0146	01462	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
55	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
56	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0145	01450	Tan Thanh	BRVT	064	D	T	[redacted]	[redacted]
57	4. Livestock & Poultry Facilities	A	[redacted]	01	014	0146	01462	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
58	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08101	Tan Thanh	BRVT	064	T	W	[redacted]	[redacted]
59	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08101	Dat Do	BRVT	064	C	W	[redacted]	[redacted]
60	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08103	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]
61	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08103	Tan Thanh	BRVT	064	C	W	[redacted]	[redacted]
62	5. Mineral Exploitation and Processing Facilities	B	[redacted]	09	099	0990	09900	Tan Thanh	BRVT	064	C	W	[redacted]	[redacted]
63	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08101	Tan Thanh	BRVT	064	C	W	[redacted]	[redacted]
64	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08101	Dat Do	BRVT	064	D	C	[redacted]	[redacted]
65	5. Mineral Exploitation and Processing Facilities	B	[redacted]	08	081	0810	08101	Chau Duc	BRVT	064	D	C	[redacted]	[redacted]

No.	Facility Information: Major Product – Name 1	Quantity	Unit	Raw Material – Name 1	Quantity	Unit	Water consumption (m^3/day)	No. of employee	Number of operation days per year	Number of operation days per month	Area (m^2)	Business type	Source of data/info
34	No			No			50	500	312	26	238,000	Port Service	Questionnaire survey
35	Loading and	2500000	ton/y				58	108			264,900	Port Service	Questionnaire survey
36	Loading and	2500000	ton/y				1	51	200	17		Port Service	Questionnaire survey
37	Flour	9665	ton/m	Wheat	12000	ton/m	114	406	289	24	350,000	Port Service	Questionnaire survey
38	Loading and						60	150	365	30	540,000	Port Service	Questionnaire survey
39	Loading and	190000	TEU				100	222	345	29	200,000	Port Service	Questionnaire survey
40	LPG	7000	ton				70	130	365	30	120,000	Port Service	Questionnaire survey
41	Loading and	1000000	ton				500	631	365	30	277,000	Port Service	Questionnaire survey
42	Ice	64000	ton/y	NH3	120	kg/m	700	68	365	30	62,000	Port Service	Questionnaire survey
43	Loading and						500	610	317	26	687,000	Port Service	Questionnaire survey
44	Storage	150000	m3				1	199	365	30	97,000	Port Service	Questionnaire survey
45	Pig	5400	pig	Bran	180	ton/m	170	35	365	30	52,000	Pig Breeding	Questionnaire survey
46	Sow	3000	sow/y	Bran	210	ton/m	600	80	365	30	420,000	Pig Breeding	Questionnaire survey
47	Egg-laying	32000	hen	Bran	13	ton/m	6	14	365	30	100,000	Chicken Breeding	Questionnaire survey
48	Pig	6000	pig/y	Bran	80	ton/y	80	19	365	30	50,000	Pig Breeding	Questionnaire survey
49	Chicken	160000	chicken/y	Bran	200	ton/litter	15	14	240	20	43,000	Chicken Breeding	Questionnaire survey
50	Pig	25000	pig/y	Bran	350	ton	44	80	300	25	150,000	Pig Breeding	Questionnaire survey
51	Fowl	8000	head/y	Chicken	170000	kg/m	80	78	303	25	30,507	Slaughtering	Questionnaire survey
52	Chicken	275000	chicken/y	Bran	6600	ton/m	120	10	280	23	27,400	Chicken Breeding	Questionnaire survey
53	Pig	2500	pig/y	Bran Greem feed	100	ton/m	120	14	365	30	20,000	Pig Breeding	Questionnaire survey
54	Chicken	200000	chicken/y	Vaccine	160	jar/litter	60	10	330	28	14,700	Chicken Breeding	Questionnaire survey
55	Pig	750	pig	Bran	20	ton/m	13	5	360	30	30,000	Pig Breeding	Questionnaire survey
56	Pig	900	pig/y	Bran	20	ton/m	40	6	350	29	60,000	Pig Breeding	Questionnaire survey
57							0					Chicken Breeding	Questionnaire survey
58	Stone	700000	m3/y	Explosive DA1	7350	kg/m	18	100	240	20	246,634	Stone exploitation	Questionnaire survey
59	Stone materials	200000	ton/y	Explosive ADI	182275	kg/y	5	27	300	25	398,000	Puzolan exploitation	Questionnaire survey
60							15		280	23	97,056	Clay exploitation	Questionnaire survey
61	Clay materials	50000	m3/y				0				239,802	Clay exploitation	Questionnaire survey
62	Building stone	448000	m3/y				0					Fill materials exploitation	Questionnaire survey
63	Building stone	448000	m3/y	AD1, emulsion	12	ton/m	0	34	300	25	347,200	Stone exploitation	Questionnaire survey
64	Puzolan	2500000	ton/y				5	62	304	25	610,000	Puzolan exploitation	Questionnaire survey
65	Puzolan	500000	ton/y				15	96	304	25	401,000	Puzolan exploitation	Questionnaire survey

No.	Environmental Requirement/Environmental Authorization System: EIA	Environmental protection schemes	Registration of environmental standards	EPC	EPP	Environmental procedures	Register of waste	Surface mining permit	Permits for groundwater extraction	WW Fee	The report about conducting the measures mentioned in the EIA report	Inspection	Sanction	Wastewater treatment facility
34	235/CC BVMT-									235/CCB VMT-		X		55
35	346/CP M-						77.000.31 .T				346/CPM -KTKH	X		
36							77.00068 1.7					X		
37	2099/T CMT-			806/UB ND-			77.00008 8.T		15/GP-STNMT	480196	2099/TC MT-TĐ	X	X	38
38							77.00029 6.T					X		63
39						No						X		
40							77.00005 3.T					X		168
41	250/Q Đ-											X		10
42	6384/Q Đ-UB						77.00040 5.T		01/GP-STNMT			X	X	420
43	2536/Q Đ.UBT		10/STNM T-MT				77.00014 0.T		15/GP-UBND			X		360
44	Yes						Yes			Yes				80
45						No						X		
46	135/Q Đ-											X		200
47						No						X		
48						No						X		4000
49						No								
50	332/Q Đ-		02/STNM T-GXN				77.00053 7.T					X	X	500
51	191/Q Đ-						QLCTNH 77000407					X		300
52		482/TNM T-MT					77.00043 4.T					X		
53						No								
54	120/Q Đ-	402/TNM T-MT						06/GP-STNMT				X		
55						No						X	X	
56						No								
57						No								
58	1034/Q Đ-						77.00037 6.T							
59	553/CC BVMT-						77.00047 7.T	14/GP.ST NMT			553/CCB VMT-	X		
60				3035/U BND-								X		
61	854/UB ND-													
62	1978,Q Đ						77.00041 2T	09/GP-STNMT				X		
63	1978,Q Đ						77.00041 2T	09/GP-STNMT				X		
64	8158/Q Đ.UB				050720 /CV.MI		77.00035 6 T					X		
65	1821/Q Đ-				091105 /CV.MI		77.00035 6 T					X		

No.	Wastewater Information: WW Destination	Flow rate of WW (m^3/d): Production Line	Domestic wastewater	Flow rate of WW (m^3/d)	Temp. (℃)	pH (-)	EC (µS/cm)	DO (mg/L)	Odor (-)	Colour Pt-Co	BOD$_5$ (mg/L)	COD (mg/L)	SS (mg/L)	Amonia (mg/L)	T-N (mg/L)	T-P (mg/L)	Coliforms MPN/100	Mineral Oil (mg/L)	Gease plant (mg/L)	Cr(VI) (µg/L)	Cr(III) (µg/L)	Fe (mg/L)	Cu (mg/L)	Pb (µg/L)	Cd (µg/L)	As (µg/L)	Hg (µg/L)
34	RV	40		50	27.6	7.2	184	4.1	Not bad	60.0	30.0	116	4	0.2	3.6	N.D.	150	1	N.D.	N.D. (<10)	N.D. (<10)	0.021	N.D. (<	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
35	RV		8																								
36	RV		1																								
37	RV		15	25	31.4	7.4	2170	0.3	Not bad	28.0	27.0	139	11	30	35	1.2	400	0.4	KPH	N.D. (<10)	N.D. (<10)	0.082	N.D. (<	23.8	N.D. (<0,5)	0.91	N.D. (<0,1)
38	RV		30	50	30.6	7.2	756	1	Not bad	30.0	28.0	142	10	33	37	6.4	700	0.4	KPH	N.D. (<10)	N.D. (<10)	0.101	N.D. (<	12.4	N.D. (<0,5)	0.66	N.D. (<0,1)
39	RV		90	90	32	7.1	228	0.4	Not bad	24.0	29.0	181	16	0.6	2.1	N.D.	40	0.4	KPH	N.D. (<10)	N.D. (<10)	0.011	N.D. (<	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)
40	DO																										
41	DO	190	30	250	29	7.5	6230	0.2	Bad	120.0	136.0	602	66	135	189	7.4	4300	0.8	0.2	N.D. (<10)	N.D. (<10)	1.324	N.D. (<	12.5	N.D. (<0,5)	2.04	N.D. (<0,1)
42	RV	300	4	300	28.3	6.2	12870	3.8	Bad	130.0	90.0	207	36	59.4	70.6	6.2	2100	1.8	0.2	N.D. (<10)	N.D. (<10)	0.047	0.028	N.D. (<1)	21.6	413.8	N.D. (<0,1)
43	RV	200	100	300	29.2	7.4	130	4.1	Not bad	60.0	10.0	82	4	0.3	1.4	0.02	400	0.2	KPH	N.D. (<10)	N.D. (<10)	0.038	N.D. (<	N.D. (<1)	N.D. (<0,5)	0.97	N.D. (<0,1)
44	RV		1																								
45	K	150	10	150	28.8	7.6	4430	3.5	Not bad	250.0	740.0	1964	172	401	476	3.3	15000	N.D.	0.8								
46	K	500	10	500	29.3	7.1	4600	0.1	Bad	110.0	######	3263	3920	573	673	170	2E+06	N.D.	1.4								
47	LI																										
48	K	50	12																								
49	K	6	2																								
50	SW	36	7	45	29.5	7.6	3880	3.5	Bad	540.0	362.0	1024	155	351	357	52	1E+06	N.D.	6								
51	K	60	4	70	29	6.2	159	1.2	Bad	16	33	170	9	1.1	1.8	0.3	2000	N.D.	8.8								
52	LI	5	3																								
53	K																										
54	K		40																								
55	RV	10	2	12	33	7.7	6800	1.4	Bad	240.0	370.0	1216	552	176	182	42	35000	N.D.	9.2								
56	LI	38	1																								
57																											
58	LI	16	2																								
59	K		5																								
60	LI																										
61	LI																										
62	LI																										
63	LI																										
64	LI																										
65	LI																										

Source: JET

Pollution Source Inventory in BRVT (3/3)

No.	Pollution Source Facility: Industrial type – Name	Industrial type – Code (Level 1)	Facility Name	Industrial classification code – Level2	Level3	Level4	Level5	Pollution Source Location: City/District /Town	Province	Code1 (Province)	Code2 (City/District/Town)	Code3 (Ward/Commune)	x (Latitude)	y (Longitude)	Facility Information: Major Product – Name 1	Major Product – Quantity	Major Product – Unit	Raw Material – Name 1	Raw Material – Quantity	Raw Material – Unit
66	6. Tourism industries	I	[redacted]	55	551	5510		Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Restaurant	25	table	Food	30	kg/m
67	6. Tourism industries	I	[redacted]	55	551	5510		Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Restaurant	10	table	Soap	1	kg/d
68	6. Tourism industries	I	[redacted]	55	551	5510		Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Relaxation room	120	room	Food	455	kg/m
69	6. Tourism industries	I	[redacted]	55	551	5510		Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Bedroom	144	room	Food	270	kg/m
70	6. Tourism industries	I	[redacted]	55	551	5510	55102	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Table	20	table	Food	20	kg/m
71	6. Tourism industries	I	[redacted]	55	551	5510	55102	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Bedroom	1500	room	Food	50	kg/d
72	6. Tourism industries	I	[redacted]	55	551	5510	55102	Long Dien	BRVT	064	D	T	[redacted]	[redacted]	Room	50	room			
73	6. Tourism industries	I	[redacted]	55	551	5510	55102	Long Dien	BRVT	064	D	T	[redacted]	[redacted]	Room	75	room			
74	6. Tourism industries	I	[redacted]	55	551	5510	55102	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]	Room	117	room			
75	6. Tourism industries	I	[redacted]	55	551	5510	55102	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]	Room	42	room			
76	6. Tourism industries	I	[redacted]	55	551	5510	55102	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]	Room	45	room			
77	6. Tourism industries	I	[redacted]	55	551	5510	55102	Xuyen Moc	BRVT	064	D	C	[redacted]	[redacted]	Room	10	room			
78	7. Hazardous waste treatment industries	E	[redacted]	38	382	3822	38229	Tan Thanh	BRVT	064	C	W	[redacted]	[redacted]	Incinerator	25	ton/d	Waste	80	ton/m
79	7. Hazardous waste treatment industries	E	[redacted]	38	382	3822	38229	Tan Thanh	BRVT	064	C	W	[redacted]	[redacted]	Incinerator	200	kg/h	oil, sewage sludge	200	ton/m
80	7. Hazardous waste treatment industries	E	[redacted]	38	382	3822	38229	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]	Lead	800	ton/m	Soda	2	ton/m
81	8. Hazardous waste transport industries	E	[redacted]	38	381	3812	38129	Tan Thanh	BRVT	064	D	C	[redacted]	[redacted]						
82	8. Hazardous waste transport industries	E	[redacted]	38	381	3812	38129	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Transport of waste DO	25	m3/m			
83	8. Hazardous waste transport industries	E	[redacted]	38	381	3812	38129	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]						
84	8. Hazardous waste transport industries	E	[redacted]	38	381	3812	38129	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Ship reparing	1	ship/m	Steel	100	ton/y
85	9. Oil & gas Exploitation Industries	B	[redacted]	09	091	0910	09100	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]				Substances used in	2277.3	ton/y
86	9. Oil & gas Exploitation Industries	B	[redacted]	09	091	0910	09100	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Crude oil	20054	bbl/d	PPD	10987	lít/ m
87	9. Oil & gas Exploitation Industries	B	[redacted]	09	091	0910	09100	Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Crude oil	42000	barrels / day	Heating antifreeze	not statisticall	
88	9. Oil & gas Exploitation Industries	B	[redacted]	09	091	0910	09100	Vung Tau City	BRVT	064			[redacted]	[redacted]	Crude oil	69763	barrels / day	Neoflo 1-58	462	ton/y
89	10. Garment & Textile Company	C	[redacted]	13	132			Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Processing details	200000	pairs/m	Leather	242433	met/m
90	10. Garment & Textile Company	C	[redacted]	13	132			Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Trousers	1500000	pcs / year	Clothes	150000	met/m
91	10. Garment & Textile Company	C	[redacted]	13	132			Ba Ria Town	BRVT	064	T	C	[redacted]	[redacted]	Bags of all kinds	100000	pcs / year	no raw material		
92	11. Gas treatment Companies	D	[redacted]	35	352	3520	35200	Long Dien	BRVT	064	C	W	[redacted]	[redacted]	Fight petrol	200	ton/d	Moist air	1285	mil. m3/m
93	11. Gas treatment Companies	D	[redacted]	35	352	3520	35200	Long Dien	BRVT	064	D	C	[redacted]	[redacted]	Natural gas	4783	stand. Mil. m3	Hydrochloride	120	lit/m
94	Manufacturing	C	[redacted]	10	102	1020		Tan Thanh	BRVT	064	D		[redacted]	[redacted]	Surimi	220	ton/m	Fish of all kinds	330	ton/m
95	1. Enterprises in seafood processing	C	[redacted]					Vung Tau City	BRVT	064	C	W	[redacted]	[redacted]	Frozen squid	40	ton/m	Frozen squid	40	ton/m

No.	Water consumption (m³/day)	No. of employee	Number of operation days per year	Number of operation days per month	Area (m²)	Business type	Source of data/info	EIA	Environmental protection schemes	Registration of environmental standards	EPC	EPP	Environmental procedures	Register of waste	Surface mining permit	Permits for groundwater extraction	WW Fee	The report about conducting the measures mentioned in the EIA report	Inspection	Sanction
66	80	169	264	22	4,440	Restaurants & Hotels	Questionnaire survey							77.000323.T		10/GP-STNMT				X
67	50	45	365	30	4,677	Restaurants & Hotels	Questionnaire survey	983/CCBVMT-						77.000679.T					X	
68	60	143	365	30	8,189	Hotels and health care	Questionnaire survey	28/SKHCNMT		815/STNMT-MT				77.000055.T				07/CVĐDDL	X	
69	200	442	365	30	17,558	Restaurants & Hotels	Questionnaire survey			07/STNMT-MT				77.000520.T					X	X
70	20	30	321	27	120,000	Resort	Questionnaire survey						No							
71	69	470	313	26	2,200,000	Resort	Questionnaire survey	714/CCBVMT-						77.000401.T						X
72	40	106	365	30	130,000	Resort	Questionnaire survey	2578/QĐ.UB						77.000539.T						X
73	80	120	365	30	100,000	Resort	Questionnaire survey						No						X	
74	100	300	365	30	330,000	Resort	Questionnaire survey	Yes											X	
75	100	156	365	30	300,000	Resort	Questionnaire survey	Yes											X	
76	30	143	365	30	80,000	Resort	Questionnaire survey		40/TNMT		898/UBND-VP			77.000343.T					X	
77	80	100	365	30	166,677	Resort	Questionnaire survey	158/QĐ-											X	
78	2	33	300	25	9,900	Hazardous waste	Questionnaire survey				753/UBND-			77.001.X					X	
79	12	20	290	24	11,000	Hazardous waste	Questionnaire survey	15/QĐ-BTNM						1-2-3-4-5-6-7-					X	
80	50	40	350	29	50,000	Hazardous waste	Questionnaire survey	Yes												
81	15	20	300	25	150,000	Hazardous waste	Questionnaire survey												X	
82	1	292	365	30		Hazardous waste	Questionnaire survey							Yes						
83	500	610	317	26	687,000	Hazardous waste	Questionnaire survey	2536/QĐ.UBT		10/STNMT-MT				77.000140.T		15/GP-UBND			X	
84	18	150	200	17	37,000	Hazardous waste	Questionnaire survey							77.000336.T		07/GP-STNMT				X
85	2957	7217	365	30		Oil & Gas exploitation	Questionnaire survey						No							
86	4500	139	365	30		Oil & Gas exploitation	Questionnaire survey	1344/QĐ-						77.000001.T				973/TCMT	X	
87	7000	320	365	30		Oil & Gas exploitation	Questionnaire survey	2357BTNMT						77.000036.T						
88	17200	361	183	15		Oil & Gas exploitation	Questionnaire survey	494/QĐ-						77.000005.T						
89	85	1283	303	25	20,000	Garment & Textile	Questionnaire survey							77.000092.T						
90	60	395	300	25	42,740	Garment & Textile	Questionnaire survey	2162/QĐ-UB		6304/QĐ-UB				77.000463.T						
91	30	758	300	25	15,000	Garment & Textile	Questionnaire survey		987/UBND-VP					77.000314.T					X	
92	7	72	355	30	169,000	Gas treatment	Questionnaire survey	2305/QĐ-						77.000053.T					X	
93	300	122	365	30	634,335	Gas treatment	Questionnaire survey							77.000013.T		02/GP-STNMT			X	
94	434		300	25		Surimi	Questionnaire survey	Yes												
95	150		180	15		Seafood	Questionnaire survey						No							

No.	Wastewater treatment facility	WW Destination	Flow rate of WW (m³/d) – Production Line	Flow rate of WW (m³/d) – Domestic wastewater	Flow rate of WW (m³/d)	Temp. (℃)	pH (-)	EC (μS/cm)	DO (mg/L)	Odor (-)	Colour Pt-Co	BOD_5 (mg/L)	COD (mg/L)	SS (mg/L)	Amonia (mg/L)	T-N (mg/L)	T-P (mg/L)	Coliforms MPN/100	Mineral Oil (mg/L)	Gease plant (mg/L)	Cr(VI) (μg/L)	Cr(III) (μg/L)	Fe (mg/L)	Cu (mg/L)	Pb (μg/L)	Cd (μg/L)	As (μg/L)	Hg (μg/L)
66	100	RV		70	75	29.9	7.3	1246	0.2	Bad	30.0	73.0	272	19	102	119	5.3	700	N.D.	0.8								
67		SW		40																								
68	80	SW	20	8	40	29.9	7.3	1246	0.2	Bad	30.0	73.0	272	19	102	119	5.3	700	N.D.	0.8								
69	200	SW		150																								
70	80	LI		10																								
71	50	SW		30	70	29.9	6.8	688	0.5	Not bad	32.0	27.0	127	5	1.4	2.9	3.3	40	0.2	1.4								
72	60	LI		20																								
73		SW		50	60	30	7.3	455	0.1	Bad	65.0	180.0	531	15	18.8	19.9	1.1	2100	0.4	6.2								
74	400	SW		100																								
75	400	SW		100	100	28.9	6.7	4890	3.9	Not bad	130.0	12.0	44	4	0.42	2.6	0.74	230	N.D.	0.2								
76	18	K		20	20	28	7	1621	3.8	Not bad	120.0	32.0	157	14	13.4	19.1	5.6	2100	N.D.	0.8								
77	120	K		10																								
78		LI		15																								
79	100	SW	10	2																								
80		LI		45																								
81	20	LI		15																								
82		SW		1																								
83	360	K	150																									
84	24	RV	14	1																								
85	60	K	8664	25																								
86	7950	K	4389	70																								
87	7000	RV	6700	10																								
88	20000	RV	17100	100																								
89		DO	19	41																								
90		SW	27	13																								
91	30	DI		28	25	29.5	7.3	505	0.4	Bad	50.0	300.0	960	26	16	17.4	4.4	900	0.4	0.6	N.D. (<10)	N.D. (<10)	0.43	0.003	N.D. (<1)	N.D. (<0,5)	0.35	N.D. (<0,1)
92	40	SW		5	5	31	7.7	168	2.8	Bad	110.0	165.0	525	13	5.2	6	0.02	2300	3.8	N.D.								
93	1440	DO	259	18	280	29.9	7.5	123	1.7	Bad	18.0	100	461	9	0.6	1.1	N.D.	1500	8	N.D.								
94	960	SW	280	70																								
95	250	RV	120	5	130	27.1	6.5	5820	3.6	Bad	130.0	######	3040	307	184	291	18.1	15000	0.2	1.4	N.D. (<10)	N.D. (<10)	0.052	0.03	N.D. (<1)	N.D. (<0,5)	N.D. (<0,1)	N.D. (<0,1)

Source: JET

C-3 Development of PSI in Hai Phong DONRE

(1) Objectives of PSI development

Several objectives have been set up by HPG DONRE for the use of the PSI including . Among those, evaluation of "the compliance status of polluters with the environmental requirements in Hai Phong Province" by using the PSI is an example.

(2) Target area

Two PSIs have been developed during the period from the end of December 2011 to the end of November 2012 targeting the pollution sources located in the areas shown as below:

- First year (December 12 to February 2012): Re River basin
- Second year (August 2012 to November 2012): Da Do River basin

(3) Data and information collection method

Data and information have been collected by direct site visits of pollution sources using a questionnaire form. Wastewater samples have been also taken at the discharge points of major pollution sources.

(4) Number of target pollution sources

Following number of pollution sources were surveyed in the target areas mentioned above:

- First year: Questionnaire survey:109/109 enterprises,
  Sampling and analysis of wastewaters: 35/109 enterprises
- Second year: Questionnaire survey:148/148 enterprises,
  Sampling and analysis of wastewaters: 40/148 enterprises

(5) PSIs developed

PSIs developed are shown in the next pages.

● PSI (1st Year, Portion of the environmental-compliance-related items)

No.				X. Operation of wastewater treatment facility			XI. Operation Information	XIII. Inspection, checking results	XIV. Sanction
	Name of enterprises	5. Business sectors	Approval/Certificate of EIA/EPP/EPC	1. Type of operation regim of wastewater treatment system	5. Payment of wastewater discharge fee (Yes/No)	WW discharge permit	1. Does enterprise conduct regular monitoring?	1. Has the enterprise been inspected or checked by the State management agency on environmental protection? (/Yes/No)	1. Has the enterprise been fined for violating environmental regulations? (Yes/No)
1		Testing and inspection of equipment and oil water separator			NO INFO.	NO	NO	NO	NO
2		Manufacturing wooden funitures			NO INFO.	NO	Yes	YES	NO
3		Design, fabrication and installation of steel frames	EPC		NO INFO.	NO	NO	YES	NO
4		Producing ship equipment			NO INFO.	NO	NO	NO	NO
5		Producing ship equipment	EPC		NO INFO.	NO	NO	YES	NO
6		Mechanical processing, fabricating and installing stone crusher			NO INFO.	NO	NO	NO	NO
7		Dredging of rivers, seas…			NO INFO.	NO	NO	NO	NO
8		Gas and petroleum business			NO INFO.	NO	NO	NO	NO
9		Steel industry			NO INFO.	NO	NO	NO	NO
10		Auto Repair service			NO INFO.	NO	NO	NO	NO
11		Garage			NO INFO.	NO	NO	NO	NO
12		Trading of Corrugated iron and steel sheets			NO INFO.	NO	NO	NO	NO
13		Import of steel iron scraps, trading of corrugated iron and steel			NO INFO.	NO	NO	NO	NO
14		Trading of engine oil			NO INFO.	NO	NO	NO	NO
15		Mechanical industry			NO INFO.	NO	NO	NO	NO
16		Mechanical casting and processing			NO INFO.	NO	YES	NO	NO
17		Asphalt business			NO INFO.	NO	NO	YES	NO
18		Steel	EPC		NO INFO.	NO	YES	NO	NO
19		Mechanical			NO INFO.	NO	NO	NO	NO
20		Gas filling stations			NO INFO.	NO	NO	YES	NO
21		Solvent chemicals business			NO INFO.	NO	YES	YES	NO
22		Process and steel business			NO INFO.	NO	NO	NO	NO
23		Process and steel business			NO INFO.	NO	NO	NO	NO
24		Lubricant business			NO INFO.	NO	YES	YES	NO
25		Petroleum business	EIA		NO INFO.	NO	YES	NO	NO
26		Construction transportation			NO INFO.	NO	NO	NO	NO
27		Auto/Car Repair service			NO INFO.	NO	NO	NO	NO
28		Casting and trading of Steel pipes	EPC		NO INFO.	NO	YES	NO	NO
29		Manufacture of footwear and garment processing			NO INFO.	NO	NO	NO	NO
30		Production Of Adhesive Tape, PE foil			NO INFO.	NO	NO	NO	NO
31		Repair of constrtuction machines			NO INFO.	NO	NO	NO	NO
32		Steel business (storage/depot)			NO INFO.	NO	NO	NO	NO
33		Mechanical	EPC		NO INFO.	NO	YES	YES	NO
34		Manufacture of furniture	EPC	continuous	NO INFO.	NO	YES	YES	NO
35		Trading in steel and construction			NO INFO.	NO	NO	NO	NO
36		Trading of iron and steel trash			NO INFO.	NO	NO	NO	NO
37		Repair of hydraulic , mechanical			NO INFO.	NO	NO	NO	NO
38		Production of glass			NO INFO.	NO	NO	NO	NO
39		Warehousing scrap iron	EPC		NO INFO.	NO	YES	NO	NO
40		Production and printing of label			NO INFO.	NO	NO	NO	NO
41		Purchasing and processing of steel	EPC		NO INFO.	NO	NO	NO	NO
42		rescue, Auto repair			NO INFO.	NO	NO	NO	NO
43		Manufacture of precast concrete			NO INFO.	NO	NO	NO	NO
44		transport, Auto Repair			NO INFO.	NO	NO	NO	NO
45		Sales of food , consumer goods , confectionery			NO INFO.	NO	YES	NO	NO
46		Stainless steel business			NO INFO.	NO	NO	NO	NO
47		Manufacturing , processing of steel structures			NO INFO.	NO	YES	NO	NO
48		Process of steel construction			NO INFO.	NO	NO	NO	NO
49		Manufacturing process of garments			NO INFO.	NO	NO	NO	NO
50		Business school equipment			NO INFO.	NO	NO	NO	NO
51		Steel structure processing			NO INFO.	NO	NO	NO	NO
52		Production of household and industrial plastic products		continuous	NO	NO	NO	NO	NO
53		PVC product (battery case, PET botle)	EPC	continuous	NO	NO	YES	YES	NO
54		Production of bicycle wheel rim	EPC	continuous	NO	NO	NO	NO	NO
55		Steel business		continuous	NO	NO	NO	NO	NO

Source: JET

No.	Name of enterprises	5. Business sectors	Approval/Certificate of EIA/EPP/EPC	X. Operation of wastewater treatment facility			XI. Operation Information	XIII. Inspection, checking results	XIV. Sanction
				1. Type of operation regim of wastewater treatment system	5. Payment of wastewater discharge fee (Yes/No)	WW discharge permit	1. Does enterprise conduct regular monitoring?	1. Has the enterprise been inspected or checked by the State management agency on environmental protection? (/Yes/No)	1. Has the enterprise been fined for violating environmental regulations? (Yes/No)
51		Steel structure processing			NO INFO.	NO	NO	NO	NO
52		Production of household and industrial plastic products		continuous	NO	NO	NO	NO	NO
53		PVC product (battery case, PET botle)	EPC	continuous	NO	NO	YES	YES	NO
54		Production of bicycle wheel rim	EPC	continuous	NO	NO	NO	NO	NO
55		Steel business		continuous	NO	NO	NO	NO	NO
56		Production of steel structure lifting equipment	No record	continuous	NO	NO	YES	YES	NO
57		electric wire production	EPP	continuous	NO	NO	YES	NO	NO
58		Steel rolling, producing machine equipments	EPC	continuous	YES	NO	YES	YES	NO
59		Production and trading of steel and Ferro alloys	EIA	continuous	NO	NO	YES	YES	NO
60		Production of steel billets, fabricated steel, building steel,	EIA	continuous	YES	NO	YES	YES	NO
61		Production of steel billets	EPP	continuous	NO	NO	YES	YES	NO
62		Trading, producing and processing of steel products	EPC	continuous	NO	NO	YES	NO	NO
63		Shape steel production	EPC	continuous	NO	NO	NO	NO	NO
64		Port service, dock warehouse	EPC	continuous	NO	NO	NO	NO	NO
65		Steel business (storage/depot)	EPC	continuous	NO	NO	YES	YES	NO
66		Production of scales		continuous	NO	NO	NO	NO	NO
67		Processing of Sports shoes	EPC	continuous	NO	NO	YES	YES	NO
68		Footwear	EPC	continuous	NO	NO	YES	YES	NO
69		Trading of materials and metals		continuous	NO	NO	NO	NO	NO
70		Production and trading in mechanical and indutrial		continuous	NO	NO	YES	YES	NO
71		Prodcution of steel core plastic doors, processing and installation		continuous	NO	NO	NO	NO	NO
72		Production of ships and boats	EPC	continuous	NO	NO	NO	NO	NO
73		Production of building materials		continuous	NO	NO	NO	NO	NO
74		Production, trading and assembly of motorbikes, trucks.	EPP	continuous	YES	NO	YES	YES	NO
75		production of steel structuresand training		continuous	NO	NO	NO	NO	NO
76		Steel business (storage/depot)	EPP	continuous	NO	NO	NO	NO	NO
77		Storage of agricultural materials		continuous	NO	NO	NO	NO	NO
78		Gasoline storage		continuous	YES	NO	YES	NO	NO
79		Steel business			NO INFO.	NO	NO	NO	NO
80		Manufacturing Electrical protection equipments	EPC	continuous	NO	NO	YES	YES	NO
81		Making clothes for export			NO	NO	YES	YES	NO
82		Kho vật liệu xây dựng. kho nông sản	EPC		NO	NO	NO	YES	NO
83		Production of candles	EPC		NO	NO	YES	YES	NO
84		Cơ khí-Cơ điện-Điện lạnh			NO	NO	YES	YES	NO
85		Production of press molds and other plastic products , toys	EPC		YES	NO	YES	YES	NO
86		Garment industry			NO	NO	NO	NO	NO
87		Production plastic products			NO	NO	NO	YES	NO
88		Manufacturing steel	EIA		YES	Submit documents	YES	YES	NO
89		Black steel pipes, Zinc galvanized steel pipes	EPC		YES	Submit documents	YES	YES	NO
90		Manufacturing steel	EPC		YES	NO	YES	YES	YES
91		manufacturing plastic products to essembly for motorbike			NO	NO	NO	YES	NO
92		Steely embryo production	EIA		YES	Submit documents	YES	YES	NO
93		Trading of fertilizers and chemicals (Storage)			NO	NO	YES	YES	NO
94		Manufacturing steel	EIA	continuous	YES	NO	YES	YES	YES
95		Manufacturing ready-mixed concrete, concrete piles	EPP		NO	NO	YES	YES	NO
96		Manufacturing steel	EIA		NO	NO	YES	YES	NO
97		Manufacturing and doing business Black welded tube steel, sheet	EPC		YES	NO	YES	YES	YES
98		Manufacturing heat insulating porus			NO	NO	NO	NO	NO INFO.
99		Manufacturing casting products	EIA		YES	NO	YES	YES	NO
100		Packaging production	EPP		NO	NO	YES	YES	NO
101		Manufacturing cast products, processing the parts	EPC		NO	NO	NO	NO	NO INFO.
102		Manufacturing cast products, processing the parts	EPC		NO	NO	NO	NO	NO INFO.
103		Manufacturing lumber and lumer products			NO	NO	NO	NO	NO INFO.
104		Production and trading of pharmaceutical	EPC		YES	NO	YES	YES	NO
105		Manufacturing industrial gases such as: Oxygen, Argon, Xenon,			NO	NO	NO	YES	NO
106		Production of paper and packaging	EIA	continuous	YES	YES	YES	YES	YES
107		Treatment of hazardous wastes, environmental treatment	EPC		NO INFO.	NO	YES	YES	NO
108		Repair, building of ships, boats	EIA	Intermittently	NO	NO	YES	NO	NO INFO.
109		Production of foam mattress and spring mattress			NO INFO.	NO	NO	NO	NO INFO.

Source: JET

● PSI (2nd Year, Portion of the environmental-compliance-related items)

No	Name of Enterprise		Industrial Classification		I. Enterprise information						Ⅲ.	Ⅳ. INSPECTION/CHECKING	
							15.Environmental permits			19.Operation		2. Has the enterprise been	
	Vietnamese	English	Level1	Level2	6. Area (m^2)	13. Total number of labor (people)	Approval/Certificate of EIA/EPP/EPC	WW discharge license	WW discharge fee	1)Operation capacity / Name of main products	1) Does enterprise have regular monitoring?	1. Has the Inspection or environment checking	2. Has the enterprise been fined for violating environmental regulation?
1	[redacted]		C	14	30,000	800	EPP	○		(1). Garment	YES	YES	NO
2			G	45	300	15				(1). Car	NO	NO	NO
3			C	22	20,169	8	EPC			(1). Plastic pipe	NO	NO	NO
4			C	14	40,135	540	EPC			teddy Bear	YES	NO	NO
5			C	14	22,500	1,400				(1). Garment	YES	NO	NO
6			C	14	400	130				(1). Garment	NO	NO	NO
7			G	46	400	5	EPP			Gasoline, petroleum	NO	NO	NO
8			Q	86	13,107	178				No	NO	NO	NO
9			E	38	48	4				1) plastic jar 2) Plastic has sorted	NO	YES	NO
10			C	13	16,000	78				(1). Carpet	NO	NO	NO
11			C	23	6,000	15				(1). Block brick	NO	NO	NO
12			C	23	700	70				(1). Sand	NO	NO	NO
13			G	46	250	5				Gasoline, petroleum	NO	NO	NO
14			G	46	300	3				Gasoline, petroleum	NO	NO	NO
15			A	3	82,000	15				No	NO	NO	NO
16			E	38	150	4				1) Plastic jar 2) compression	NO	YES	NO
17			E	38	180	7				plastic jar	NO	YES	NO
18			C	17	27,000	60				Joss paper	NO	NO	NO
19			C	24	31,088	260	EPP			(1). sponge iron	NO	NO	YES
20			C	16	10,000	40				(1). Wood products	YES	NO	NO
21			Q	86	10,657	150				No	NO	YES	NO
22			G	46	150	3				Gasoline, petroleum	NO	NO	NO
23			Q	86	29,118	443				No	NO	NO	NO
24			C	29	35,000	246	EnStd			(1). Truck	YES	YES	NO
25			E	38	360	20				Plastic jar	NO	NO	NO
26			E	38	200	5				Plastic jar	NO	YES	NO
27			C	23	2,000	17				(1). steel sheet pile	YES	NO	NO
28			C	14	29,091	420	EPC			(1). shirst	YES	YES	NO
29			C	29	23,642	8	EPC			(1). Accessories	NO	NO	NO
30			G	46	50	5				Gasoline, petroleum	NO	NO	NO
31			C	25	3,000	17				soldering stick	NO	NO	NO
32			C	29	4,000	4				Accessories of agricultural machine	NO	NO	NO
33			E	38	200	5				1)Plastic jar 2)garbage plastic after	NO	NO	NO
34			E	38	400	4				Plastic jar	NO	NO	NO
35			C	15	18,000	550				(1). Shoes soles	NO	YES	NO
36			C	17	1,500	130				(1). Joss paper	YES	YES	NO
37			C	25	22,500	40	EPC		○	(1). Bearing steel cable; (2). welding	YES	YES	NO
38			Q	86	57,973	230	EPC			No	YES	YES	NO
39			A	3	30,000	46				No	NO	NO	NO
40			E	38	200	5				1)Plastic jar 2)garbage plastic after	NO	NO	NO
41			C	32	7,296	911				(1). Childrent toys	YES	NO	YES
42			C	18	1,044	40				(1). VAT invoice, (2). books, (3). Calendar	NO	NO	NO
43			C	15	28,000	450	EIA		○	(1). Shoes soles; (2). foambacking	YES	YES	YES
44			C	29	27,412	253	EnStd	○	○	(1). Truck	YES	YES	NO
45			C	24	50,000	70	EPC			(1). Fish-hook., (2). Wood	NO	NO	NO
46			C	14	50,000	500	EPC			(1). Garment	YES	NO	NO
47			G	46	360	4	EPC			gasoline, petroleum	NO	NO	NO
48			G	46	184	4	EPC			gasoline, petroleum	NO	NO	NO
49			C	14	957	105	EPC			(1). Shirt	YES	YES	NO
50			E	38	330	2				garbage plastic	NO	NO	NO

Source: JET

No	Name of Enterprise		Industrial Classification		I. Enterprise information						III.	IV. INSPECTION/CHECKING	
							15.Environmental permits			19.Operation		2. Has the enterprise been	
	Vietnamese	English	Level1	Level2	6. Area (m^2)	13. Total number of labor (people)	Approval/Certificate of EIA/EPP/EPC	WW discharge license	WW discharge fee	1)Operation capacity / Name of main products	1) Does enterprise have regular monitoring?	1. Has the Inspection or environment checking	2. Has the enterprise been fined for violating environmental regulation?
51	CÔ		C	22	600,000	319	EIA			(1). Plastic products	YES	YES	YES
52			C	15	100,000	5,000	EIA		○	(1). Shoes	YES	YES	NO
53			C	22	25,705	200	EIA		○	(1). Placed plastic ceiling; (2). Plastic	YES	YES	NO
54			C	16	1,000	19				furnitures	NO	NO	NO
55			C	14	1,000	43				Thread	NO	NO	NO
56			E	38	350	5				1) Plastic jar 2) Garbage plastic	NO	NO	NO
57			C	15	9,455	345	EPC			(1). Kraft paper; (2). Shoes	YES	YES	NO
58			C	15	800	30				vamp	NO	NO	NO
59			G	46	1,000	4				gasoline, petroleum	NO	NO	NO
60			C	10	8,030	35				(1). Carder; (2). Emoka	NO	YES	NO
61			C	15	1,000	200				(1). Shoes	NO	YES	NO
62			G	46	1,500	10				(1) Rice seed (2) fertilizer	NO	NO	NO
63			E	38	400	2				Plastic compressing	NO	YES	NO
64			E	38	300	4				1) Plastic jar 2) Garbage plastic	NO	NO	NO
65			C	17	27,000	200	EPC			(1). Carton box; (2). Duplex box	YES	YES	YES
66			C	15	12,000	150				vamp	NO	NO	NO
67			C	15	17,972	850	EPC			sport shoes	NO	NO	NO
68			C	25	175,500	2,600	EIA			products	NO	NO	NO
69			C	15	3,600	120				(1) shoes	NO	NO	NO
70			E	38	300	8				(1). Plastic jar	NO	YES	NO
71			E	38	150	3				brick of garbage plastic	NO	NO	NO
72			E	38	540	4				plastic jar	NO	NO	NO
73			E	38	260	2				plastic compressing	NO	YES	NO
74			C	32	30,000	900	EPC			(1). scented candles	YES	YES	NO
75			C	25	10,000	29	EPP			(1). Zamil steel; (2). Steel flooring	YES	NO	NO
76			C	32	10,000	1,300				(1). Children toys	YES	YES	NO
77			C	22	92,000	50				(1) Plastic pellets	NO	NO	NO
78			C	25	2,500	30				iron construction	NO	NO	NO
79			E	38	310	20				plastic jar	NO	NO	NO
80			E	38	400	4				plastic jar	NO	NO	NO
81			E	38	1,000	6				(1). Plastic jar	NO	YES	NO
82			E	38	200	4				1) Plastic jar 2) Garbage plastic	NO	NO	NO
83			E	38	200	6				1) Plastic jar 2) Garbage plastic	NO	YES	NO
84			C	14	49,900	460	EPP		○	(1). Garment	YES	YES	NO
85			G	45	44,730	120	EnStd			(1). Truck (0.7 - 5 ton), (2). Automobile	NO	NO	YES
86			G	46	250	4				Gasoline, petroleum	NO	NO	NO
87			G	46	300	4				Gasoline, petroleum	NO	NO	NO
88			E	38	600	5				1) Plastic 2)Plastic brick	NO	YES	NO
89			E	38	800	10				Plastic jar	NO	NO	NO
90			E	38	200	8				Plastic jar	NO	NO	NO
91			E	38	100	2				Plastic after sorting	NO	NO	NO
92			C	22	3,200	39	EPC			1). plastic sheet	YES	NO	NO
93			C	27	650	100				(1). Lamplight	NO	NO	NO
94			C	15	14,742	850	EnStd			(1). Sport shoes	YES	YES	NO
95			C	15	2,500	100				vamp	NO	NO	NO
96			G	46	300	5				gasoline, petroleum	NO	NO	NO
97			C	14	6,000	450				(1). Medical Clothing	YES	NO	NO
98			E	38	300	5				Plastic jar	NO	NO	NO
99			E	38	210	4				1) Plastic jar 2) Plastic	NO	YES	NO
100			E	38	400	7				Plastic jar	NO	YES	NO

Source: JET

No	Name of Enterprise		Industrial Classification		I. Enterprise information						III.	IV. INSPECTION/CHECKING	
							15.Environmental permits			19.Operation		2. Has the enterprise been	
	Vietnamese	English	Level1	Level2	6. Area (m^2)	13. Total number of labor (people)	Approval/Certificate of EIA/EPP/EPC	WW discharge license	WW discharge fee	1)Operation capacity / Name of main products	1) Does enterprise have regular monitoring?	1. Has the Inspection or environment checking	2. Has the enterprise been fined for violating environmental regulation?
101	[redacted]		E	38	500	5				VBC plastic jar	NO	NO	NO
102			C	27	9,831	57	EPC		○	(1). telecommunication	YES	YES	NO
103			C	17	43,000	490	EPC			(1). books; (2). Portfolio	YES	YES	NO
104			C	32	5,400	50	EPC		○	(1). Glove	YES	YES	YES
105			Q	86	350	10				vaccination	NO	NO	NO
106			C	14	14,400	300	EPC			(1). Garment	YES	YES	YES
107			G	46	270	4				Gasoline, petroleum	NO	NO	NO
108			E	38	300	8				Plastic jar	NO	YES	NO
109			E	38	200	5				Plastic jar	NO	NO	NO
110			E	38	350	5				Plastic jar	NO	YES	NO
111			E	38	150	4				Plastic after sorting	NO	NO	NO
112			E	38	600	10				(1). Plastic jar; (2). Compressing plastic	NO	YES	NO
113			C	16	30,000	130	EPC			(1). household goods	YES	NO	NO
114			Q	86	4,000	20				Medical Treatment	NO	NO	NO
115			E	38	400	5				plastic crusher	NO	NO	NO
116			E	38	197	5				Plastic jar	NO	NO	NO
117			E	38	80	4				1) Plastic jar 2) Plastic after sorting	NO	NO	NO
118			C	15	36,000	3,000	EnStd			(1). Shoes	YES	NO	NO
119			E	38	200	3				(1). Plastic jar	NO	YES	NO
120			E	38	500	10				(1). Plastic jar	NO	YES	NO
121			C	15	40,000	800	EIA		○	(1). Shoes	YES	YES	NO
122			C	23	8,000	35				(1). commercial concrete	YES	YES	NO
123			C	22	25,000	320	EIA		○	(1). Găng tay cao su	YES	YES	NO
124			C	25	54,759	120	EPC			(1). dust filter	NO	NO	NO
125			C	20	20,000	14	EPP		○	(1). Rubber glove	YES	YES	NO
126			E	38	278	6				(1). Garbage plastic after sorting	NO	YES	NO
127			C	22	13,060	446	EIA			(1). PEHD pipe; (2). PP-R heat pipe	YES	NO	NO
128			E	38	150	3				nhựa sau phân loại	NO	YES	NO
129			E	38	400	3				1) Nhựa xay 2) Bao nhựa	NO	YES	NO
130			E	38	250	2				Garbage plastic after sorting	NO	NO	NO
131			E	38	400	4				Plastic jar	NO	NO	NO
132			G	46	300	3				Gasoline, petroleum	NO	NO	NO
133			G	46	260	10				Gasoline, petroleum	NO	YES	NO
134			E	38	300	6				Plastic jar	NO	NO	NO
135			E	38	600	5				Plastic brick	NO	YES	NO
136			E	38	250	3				Garbage	NO	NO	NO
137			C	24	400	25				(1). blister steel	NO	NO	NO
138			G	46	500	10				(1). Gasoline, petroleum	NO	NO	NO
139			G	45	650	13					NO	NO	NO
140			C	15	2,000	48				(1). shoes, (2). Sandal	NO	NO	NO
141			G	46	2,219	27				(1). Gasoline, petroleum	NO	NO	NO
142			H	49	400	13				No	NO	NO	NO
143			E	38	280	4				(1). Garbage plastic after sorting	NO	NO	NO
144			E	38	310	4				(1). Garbage plastic after sorting	NO	NO	NO
145			E	38	290	5				(1). Garbage plastic after sorting	NO	YES	NO
146			E	38	248	4				(1). Garbage plastic after sorting	NO	YES	NO
147			E	38	270	3				(1). Garbage plastic after sorting	NO	YES	NO
148			E	38	180	4				(1). Garbage plastic after sorting	NO	NO	NO

Source: JET

(6) Statuses of the Environmental Compliance with Environmental Requirements

By utilizing the PSIs developed above, the environmental compliance statuses with the environmental requirements with the target pollution sources in Hai Phong DONRE have been confirmed as shown below:

1) Approval/Registration of EIA/EPP/EPC

	1st year		2nd year	
	No.	%	No.	%
EIA approval	10	9.2	8	5.4
EPP approval	6	5.5	6	4.1
EPC registration	29	26.6	27	18.3
Total no. of pollution sources	109	100	148	100

Source: JET

2) Wastewater discharge fee

	1st year		2nd year	
	No.	%	No.	%
Paid	14	12.8	11	7.4
Unpaid	41	37.6		
No information	54	49.5	137	92.6
Total no. of pollution sources	109	100	148	100

Source: JET

3) Wastewater discharge permit

	1st year		2nd year	
	No.	%	No.	%
Acquired permit	1	0.9	2	1.4
Submitted documents	3	2.8		
Not acquired	105	96.3	146	98.6
Total no. of pollution sources	109	100	148	100

Source: JET

4) Environmental monitoring

	1st year		2nd year	
	No.	%	No.	%
Environmental monitoring	46	42.2	38	25.7
No monitoring	63	57.8	110	74.3
Total no. of pollution sources	109	100	148	100

Source: JET

5) Environmental checking and environmental inspection

	1st year		2nd year	
	No.	%	No.	%
Environmental checking/inspection	43	39.4	55	37.2
No checking/inspection	66	60.6	93	62.8
Total no. of pollution sources	109	100	148	100

Source: JET

6) Fine for violation of environmental regulations

	1st year		2nd year	
	No.	%	No.	%
Paid fine	4	3.7	8	5.4
No fine	99	90.8	140	94.6
No information	6	5.5		
Total no. of pollution sources	109	100	148	100

Source: JET

C-4 Development of PSI in TT-Hue DONRE

As mentioned in Part B, B-2 Developing Water PSI, (2) Collection of data/information, there are several methods for gathering pollution source data/information in the course of developing a PSI. The methods can be categorized into two, namely the Direct Collection and the Indirect Collection. In the first year, TT-Hue DONRE compiled available data and information on 160 enterprises located in the whole area of province within DONRE as the Indirect Collection. As results of compilation works, it appeared that most of information related to pollution control activities by TT-HUE DONRE was not available, summarized and digitized. In addition, it should be noted that only 56 of 160 enterprises are listed as primary pollution sources related to water pollution because some enterprises had already stopped operation and the others do not discharge much wastewater relatively. Hence in the second year, DONRE and JET implemented a renewed PSI survey by sub-contractor to collect data from enterprises as the Direct Collection.

(1) Objectives of PSI development

Objectives of PSI development for 1st year and 2nd year are same as follows;

1) To acquire data and information for basic water pollution control activity
2) To confirm environmental registration such as EIA and wastewater discharge permit
3) To grasp status of environmental protection charge, self-monitoring by enterprises, and
4) To grasp feature of wastewater discharge condition by enterprises

(2) Target area

Whole province in TT Hue

(3) Data and information collection method

- First year: Indirect Collection (The detail methods are described in page B-4)
  C/Ps tried to collect and enter into PSI by their staff to use available data within DONRE
- Second year: Direct Collection (The detail methods are described in page B-4)
  Questionnaire survey:104/104 enterprises,
  Sampling and analysis of wastewaters: 40/104 enterprises

(4) Number of target pollution sources

Following number of pollution sources were surveyed in the target areas mentioned above:

- First year: 160 enterprises belonged to 100 owners
- Second year: 104 enterprises

(5) PSIs developed

PSIs developed are shown in the next pages.

● PSI (1st Year, Indirect Collection)(1/2)

<General Information> At first, TT-HUE DONRE tried to check data and information availability within DONRE.

<Current Condition on TT-HUE DONRE (EPA), Indirect Collection>

			total	**154**	**123**	**2**	**2**	**0**	**0**	**0**	**5**	**0**	**9**	**8**	**9**	**7**	**6**	**1**	**19**	**21**	**5**	**0**	**0**
	Name of Owner (Vietnamese)	Name of target project	EIA	Registration date & Decision number EIA	Storage of EIA H: hardware S: software	EPP	Registration date & Decision number EPP	Storage of EPP H: hardware S: software	EPC	Amount of wastewater	Wastewater discharge permit	Total payment of 2005 (VND)	Total payment of 2006 (VND)	Total payment of 2007 (VND)	Total payment of 2008 (VND)	Total payment of 2009 (VND)	Total payment of 2010 (VND)	Total payment of 2011 (VND)	Self-monitoring	Environmental Check report	Inspection report	Amount of pollution loads(COD)	Amount of pollution loads(other)
			x: exsit o: not exsit	Checked by TT-HUE DONRE		x: exsit o: not exsit	Checked by TT-HUE DONRE					**Wastewater discharge fee**											
1			x	08/Mtg ngày 22/5/1995	H														x				
2			o																				
3			x	15/Mtg ngày 28/6/1995	H																		
			o	168/QĐ-TNMT-MT ngày																x			
4			x	19/Mtg ngày 03/8/1995	H																		
5			x	21/Mtg-TĐ ngày 10/8/1995	H																		
6			x	23/Mtg-TĐ ngày 20/9/1995	H																		
-			x	63/TĐ-MTg ngày 6/7/1996	H																		
-			o																				
-			o	27/2002/XN-MTg ngày																			
			o	01/2004/XN-MTg ngày																			
-			o	32/2002/XN-MTg ngày															x				
			o	33/2002/XN-MTg ngày															x				
-			o	06/2003/QĐ-MTg ngày																			
96			o	03/2003/XN-MTg ngày 03/9/2003									10,348,000	3150000	3150000	0	0			x			
97			o	03/2004/XN-MTg ngày									5160000	3520000	3520000	0	0						
			o	14/2004/XN-MTg ngày 12/7/2004																			
98			o	04/2004/XN-MTg ngày																			
99			o	07/2004/XN-MTg ngày 17/5/2004																			
100			o	13/2004/XN-MTg ngày 18/6/2004															x	x			

Source: JET

● PSI (1st Year, Indirect Collection)(2/2)

<Specific Information> TT-HUE DONRE tried to make several sheets for inputting detailed information from Environment Registrations, Wastewater Permit, Wastewater fee, Self-monitoring Report Environmental Check/Inspection, Pollution Load calculation.

Ex) Environmental Registration, EIA, EPP, EPC sheet

a) Registration of EIA/EPP/EPC

			1. Necessity of EIA/EPP/EPC Submission (DONRE)*										1. Necessity of EIA Submission (DONRE)*				2. Necessity of "2.1.Post EIA/EPC/EPP submission" (DONI		
			1.1. Basic information of target enterpirses (EIA/EPP/EPC report)												1.2. Decision approving EIA/ EPP/ EPC report (Approved by DONRE)		2.1. Post EIA submission	2.2. Letters or others after inspection and certification related post EIA	2.3. Hazardous waste (including or not)
No	Name of Owner (vietnamese)	Name of project	Name of owner	Address	District	Coordinate (X,Y)	Tel / Fax	Year of operation	Type of enterprises	Business sector	Business certificate (No, date, no information)	Main products (per year)	Number of labor (Person)	Staff in charge of environment	Date	Registration number	Exist or not		
0	Example	OOO projec	Mr. OOO	ooo - Hue City	Hue City	(oooo,oooo)	oooo, oooo	1970	Joint stock company	Hotel	No. oooo, date 1970/	ooo, 300 t/year	230	Mr. oooo	27/3/2003	03/2003/QĐ-MTg ngày	Exist	Letter is issued	not
1				Công viên 3/2 - Huế	Hue City										08/Mtg ngày 22/5/1995				
2				KCN Chân Mây	Hue City										03/2003/QĐ-MTg ngày 27/3/2003				
3				Phong An - Phong Điền	Phong Dien										15/Mtg ngày 28/6/1995				
				Phong Điền - Phong Điền	Phong Điền										168/QĐ-TNMT-MT				
4				Thuỷ Phương - Hương Thuỷ	Huong Thuy										19/Mtg ngày 03/8/1995				
5				Phong Thu - Phong Điền	Phong Dien										21/Mtg-TĐ ngày 10/8/1995				
6				Phong Chương - Phong Điền	Phong Dien										23/Mtg-TĐ ngày 20/9/1995				
-				Thuỷ An - Huế	Hue City										63/TĐ-MTg ngày 6/7/1996				
-				Lộc Điền - Phú Lộc	Phu Loc														
-					Hương Thủy										32/2002/XN-MTg ngày 18/11/2002				
-					Phong Điền										33/2002/XN-MTg ngày 26/11/2002				
-					Hue city										44/2003/XN-MTg ngày 10/7/2003				
96					Phú Vang										03/2003/XN-MTg ngày 03/9/2003				
97					Phong Điền										03/2004/XN-MTg ngày 23/03/2004				
					Phong Điền										14/2004/XN-MTg ngày 12/7/2004				
98					Quảng Điền										04/2004/XN-MTg ngày 23/03/2004				
99					Quảng Điền										07/2004/XN-MTg ngày 17/5/2004				
100					Phú Lộc										13/2004/XN-MTg ngày 18/6/2004				

Source: JET

● PSI (2nd Year, Direct Collection) (1/3)

Nhập thông tin từ Sở TNMT TT-Huế

I. THÔNG TIN DOANH NGHIỆP

STT	Tên Doanh nghiệp		Phân loại ngành công nghiệp		1.Tên doanh nghiệp	2.Thông tin của chủ doanh nghiệp					3. Thông tin địa chỉ doanh nghiệp			4. Năm hoạt động	5. Loại hình doanh nghiệp	6.Thông tin về ngành nghề			7. Giấy phép kinh doanh		8. Thông tin về lực lượng lao động				9. Diện tích (m2)	10. Cán bộ phụ trách môi trường				11. Khoảng cách từ doanh nghiệp đến hộ dân gần nhất (m)	12. Giấy phép môi trường				
	Tiếng Việt	Tiếng Anh	Cấp 1	Cấp 2		1) Tên chủ doanh nghiệp	2) Điện thoai	3)Fax	4) Điện thoại di động	5)E-mail	1) Địa chỉ doanh nghiệ	2) Vĩ độ X	3) Kinh độ Y			1) Tên ngành ngh	2) Mã ngành nghề (cấp 1)	3) Mã ngành nghề (cấp 2)	1) Có hay không có	2) Ngày cấp	1) Tổng số lao động (người)	2) Kỹ thuật (người)	3) Thủ công (người)	4) Thu nhập bình quân của người lao động (đồng/tháng)		1) Có hay không có	2) Tên cán bộ	3) Điện thoại	4)Email		1)Giấy phép môi trường	1)Số	1)Ngày ban hành	1)Ngày hết hạn	2)Giấy chứng nhận hệ thống xử lý nước thải đạt tiêu
1		1	A	3			543.557445	543.56736	0903059355	anhbao82@g	Điền Hương			1995	Công ty cổ phần	chế biến đá xây	321	810	Có	16/1/2012	284	77	207	3,500,000	377.559	Có	Nguyễn Thị Tha	0935987045	hanhts	3000	Quyết định phê duyệt	190/QĐ-	2009/03/11		
2		2	A	3			543.557445	543.56736	0903059355	anhbao82@g	Điền Môn			1995	Công ty cổ phần	sản	321	810	Có	16/1/2012	284	77	207	3,500,000	686345	Có	Nguyễn Thị Tha	0935987045	hanhts	3000	Quyết định phê duyệt	45/QĐ-T	2012/04/03		
3		3	A	3			543.557445	543.56736	0903059355	anhbao82@g	Điền Hoà			1995	Công ty cổ phần	sản	321	810	Có	16/1/2012	284	77	207	3,500,000	329213.5	Có	Nguyễn Thị Tha	0935987045	hanhts	3000	Quyết định phê duyệt	23/QĐ-	14/9/2007		
5		4	A	3					0986959189		Thôn 11 - Điền Hòa			2009	Công ty cổ phần	cát	321	810	Không		16	1	15	3,000,000	40000	Không				600	Quyết định phê duyệt	169/QĐ-	2009/12/10		
6		5	A	3					914125539	giatruyenub@	Trung Đồng Tây -			2009	Doanh nghiệp tư nh	cát	321	810	Không		7	1	2	3,500,000	47500	Không				500	Quyết định phê duyệt b	42/QĐ-T	16/3/2010		
7		6	A	3			543.538494		0903585201		Điền Môn			2007	Hộ cá thể	cát	321	810	Không		17	2	15	3,000,000	29000	Không				400	Quyết định phê duyệt	10/QĐ-T	2007/05/04		
8		7	A	3							Điền Hương			2008	Hộ cá thể	cát	321	810	Không		10				18694	Không				500	Quyết định phê duyệt	46/QĐ/T	2008/03/04		
9		8	A	3							Tân Hội			2007	Hộ cá thể	cát	321	810	Không		12					Không				600	Quyết định phê duyệt	199/QĐ-	2010/11/23		
10		9	A	3										2009	Hộ cá thể	cát	321	810	Không		15			3,000,000	50000	Không				500	Quyết định phê duyệt	119/QĐ-	2009/08/04		
11		10	A	3										2007	Hộ cá thể	cát	321	810	Không		17	2	15			Không				500	Quyết định phê duyệt	172/QĐ-	2009/10/16		
12		11	A	3										2007	Hộ cá thể	cát	321	810	Không		9					Không				500	Quyết định phê duyệt	173/QĐ-	2009/10/16		
13		12	A	3			543.553666		982999910		Trung Đồng Đông -			2011	Hộ cá thể	cát	321	810	Không		5	1	4	2,500,000	36000	Không				1000	Quyết định phê duyệt	41/QĐ/T	2010/03/16		
14		13	A	3			543.885454				23 Bảo Quốc -			2010	Hộ cá thể	cát	321	810	Không		20	2	18		15000	Không				200	Quyết định phê duyệt	128/QĐ-	2010/08/05		
15		14	A	3					0988160566		Trung Dong Tay -			2009	Doanh nghiệp tư nh	cát	321	810	Không		6	1	5	4,000,000	15000	Không				700	Quyết định phê duyệt	184/QĐ/	2010/12/11		
16		15	A	3					01694527978		Thôn Trung Đồng			2010	Khác	cát	321	810	Không		17	2	15	3,000,000	60000	Không				1000	Quyết định phê duyệt	185/QĐ-	2010/12/11		
17		16	A	3							Trung Đồng Tây -			2009		cát	321	810	Không		14					Không				1000	Quyết định phê duyệt	199/QĐ-	2010/11/23		
18		17	A	3					01686768278		Trung Đồng Tây -			2009	Hộ cá thể	cát	321	810	Không		16	1	15	3,000,000	12000	Không				1000	Quyết định phê duyệt	258/QĐ-	2009/12/25		
20		18	A	3							Vinh An, Phú Vang			2006	Hộ cá thể	cát	321	810	Không		20	2	18	3,000,000	98000	Không				1000	Quyết định phê duyệt	95/QĐ-T	2009/01/14		
22		19	B	7			543.523695	543.52793		Humexco@	Tp Huế				Doanh nghiệp Nhà	biến, kinh doanh			Có	2005/11/28	70	13	57	3,500,000	63677	Có	Lê Văn Hiệp	0914114680	.	300	Quyết định phê duyệt b	27/QĐ-T	29/10/2007		
23		20	B	7			54.3523695	54.352793		Hmexco@d	Tp Huế				Doanh nghiệp nhà	biến, kinh doanh			Có	2005/11/28	240	23	217	3,500,000	1,090,000	Có	Phan Bảng	0983052635		500	Quyết định phê duyệt	223/QĐ-	2010/12/29		
24		21	B	7			54.3523695	54.352793		Hmexco@d	Tp Huế				Doanh nghiệp nhà	biến, kinh doanh			Có	2005/11/28	149	21	128	3,500,000	877,000	Có	Lê Hà	0905100023		500	Quyết định phê duyệt	54/QĐ-T	2011/03/09		
25		22	B	7			543.523695	543.52793		Humexco@	Tp Huế				Doanh nghiệp Nhà	biến, kinh doanh			Có	2005/11/28	40	5	35	3,500,000	59,242	Có	Nguyễn Hữu Th	0986.871.104		1,000					
26		23	B	7			543.523695	543.52793		Humexco@	Tp Huế				Doanh nghiệp Nhà	biến, kinh doanh			Có	2005/11/28	137	11	126	3,500,000	80,000	có	Lưu Hải Sơn	0905.140.979		1,000	Quyết định phê duyệt b	41/QĐ-T	2007/12/28		
27		24	C	10			543.517064	543.52258			Tp Huế			1994	Công ty cổ phần	sản, Dịch vụ	10	1	Có	2004/08/01	520	30	450	3,000,000		Có	Nguyễn Thị Điệ	0935669301	iep@hu	100	Quyết định phê duyệt	04/2000/	2000/09/15		
28		25	C	11			543.981999	543.98156			Cung			2012	Công ty cổ phần	nông lâm thủy	46322	46102	Có	2011/10/24	200			2,500,000	5000	Có	Cao Thị Mỹ Dung			20	Giấy chứng nhận đăng	280	2011/04/26		
29		26	C	10			543.956304	543.95631	0916.761.266	quocthanh@p	phú Vang, TT Huế			2005	Công ty cổ phần	Chế biến thủy	DL225		Có	2011/06/07	100	7	80	2,000,000	2044	Có	Nguyễn Ngọc Q	0986619249	gocqua	30	Quyết định phê duyệt	74/QĐ-T	2008/05/08		
31		27	C	10							Xã Hương Toàn			1995	Hộ gia đình cá thể	Sản xuất bún			Không		2	0	2	2,000,000	300	Không				0	Chưa có giấy phép				
32		28	C	10			054 3551787	054 3551787			Phong An, Phong			2004	Công ty TNHH	bột sắn			Có	2011/02/09	104				40000	Có				50	Quyết định phê duyệt	165/QĐ-	2004/02/12		
33		29	C	10			543.813156		0914.190.487		Hương Sơ,				Công ty cổ phần	tập trung			Có	2011/01/25	16			2,000,000	80000	Không				10	Chưa có giấy phép				
34		30	C	10			543.813156		0914.190.487		170 Nguyễn Lộ			2005	Công ty cổ phần	tập trung	162	322	Có	2011/01/25	16	2	14	2,000,000	86000	Không				100	Chưa có giấy phép				
35		31	C	11			54.3850164	54.385017	0913425530	mauchi@hu	243 Nguyễn Sinh			1990	Công ty 100% vốn n	doanh và xuất	1103	1104	Có	2011/11/23	336	71	48	7,200,000	13	Có	Nguyễn Quốc E	0913426419	nh@hu	2	Quyết định phê duyệt	97/QĐ-T	2009/03/12		
36		32	C	11			54.3850165	54.385017	0913425530	huda@huda	KCN Phú Bài			2008	Công ty 100% vốn n	doanh, xuất	1103	1104	Có	2011/11/23	248	138	42	7,200,000	117	Có	Vĩnh Khương	054,3961111	g74@g	2,000	Quyết định phê duyệt	274/QĐ-	2009/12/31		
37		33	C	11			54.3821776	54.382178			4/114 Lê Ngô Cát -			1998	Công ty 100% vốn n	doanh, xuất khẩu			Có	2008/07/02	70	20	50	3,000,000	9,900	Có	Trần Quốc Thắ	0905181368	ang@h	300	Quyết định phê duyệt	259/QĐ-	2009/12/25		
38		34	C	11			543.551581	543.55166	0905393626		Km25 - Phong An -			1998	Công ty cổ phần	khoáng và nước			Có	1998/11/04	55	4		2,000,000	6000	Có	Hồ Hoàng	0914561215		200	Quyết định phê duyệt	01/2003/	2003/03/24		
39		35	C	13			3864338	3864338		huegatex@v	122 Dương Thiệu				Công ty cổ phần	xuất phẩm sợi,	1311	6810	Có	2012/05/21	2690	2650	40	3,800,000	144,409	Có	Nguyễn Thị Vân	0543864393	uynh@	100	Quyết định phê duyệt	164/MTg	1996/11/17		
40		36	C	16			54.3865569	54.386365	0914126972	kythuat.huwoc	Lô A1, KCN Phú Bài			2003	Công ty cổ phần	Chế biến gỗ			Có		209	34	158	2,510,000	40,000	Có	Nguyễn Định	0914126972	huwoco	2,000	Quyết định phê duyệt				
41		37	C	17			543.872628	543.87263		huepp2006@	thôn Phú Gia, Lộc			2003	Cty Liên Doanh	dăm gỗ			Có	2003/03/04	160	40	70	3,500,000	54,000	có	Nguyễn Trung T	0908290191	epp198	50	Quyết định phê duyệt				
42		38	C	17			54212835		0912127473		Thủy Phương			1997	Công ty TNHH	doanh giấy			Có	2011/09/12	9			1,500,000	5720	Có	Nguyễn Ngọc U	54212835		400	Giấy chứng nhận	32MT			
43		39	C	17			543.854179		0914313225		Ấp 5, Tổ 12, phường			2003	Công ty TNHH	sản xuất giấy	1701		Có	2011/04/13	30	2	28	3,000,000	1400	Có	Dương Trọng Long			1000	Giấy chứng nhận				
44		40	C	17			543.865916				Thông Cư Chánh 2,			2003	Doanh nghiệp tư nh	vàng mã			Có	2003/04/16	15			2,000,000	2000	Có	Lê Văn Anh	0914.480.666		200	Giấy chứng nhận	24/UBND	27/11/2008		
45		41	C	17			543.777272	543.77728	0932461585	phungphatpa	16 Đào Duy Từ - Tp			2010	Công ty TNHH	sinh và khăn	16,17,47		Có	2010/01/15	50	7	35	2,500,000	10000	Không				500	Giấy chứng nhận	79/UBND	2009/08/09		
47		42	C	18			543.814218	543.81013	0913.425490		57 Bà Triệu, TP Huế			1988	Công ty cổ phần	In ấn			Có	2009/04/24	134			2,400,000	1240.5	Có	Nguyễn Thắng	01689916734		0	Quyết định phê duyệt	08/QĐ-T	16/3/2007		06/QĐ-T
48		43	C	18					0913468425	taiphathue@	Đường số 3 - Lô K3			2007	Công ty cổ phần	Bao bì Carton			Có	2011/04/04	80	4		3,000,000	4,000	Có	Lê Nguyễn Tuấ	0914002256	antong	2,000	Quyết định phê duyệt				
49		44	C	20			543.863637	543.85225			Lô A2, KCN Phú Bài			1999	Công ty TNHH	các loại			Có	1999/04/01	80	6	60		7000	có	Nguyễn Hữu Đ	0914.202.42	uyen@r	500	Quyết định phê duyệt	242/QĐ-	2009/10/12		
50		45	C	20			543.935379	543.93538			22 Nguyễn Thị Minh			1992	Công ty cổ phần	thực vật	4,669	2,012	Có	2012/07/05	76	51	25		13500	Có	Trần Bá Long	0543,935361		700	Quyết định phê duyệt	1282/QĐ	1996/04/07		
52		46	C	21			543.936272	543.93627	0914.066.021	dangvankhanh2009@gmail.com				1991	Khác	dược phẩm			Không		31				568	Không				100	Quyết định phê duyệt	538/CV-T	2007/05/09		36/KT-MT
54		47	C	22			543.875339	543.87534	01688157999	thanh_cpcs_n	Xã Hương Hòa - Nam			2005	Công ty cổ phần	biến mủ, gỗ cao			Có	2010/11/08	30	3	20	2,500,000	25000	có	Hồ Xuân Hải	1682559302		700	Quyết định phê duyệt	03/QĐ-M	20/7/2005		
55		48	C	23			543.626282	543.75229			Phong Điền. TT Huế			2007	Công ty cổ phần	tầng KCN	6810		có	2007/10/25	10	2	5	3,500,000	1470000	Không				200	Quyết định phê duyệt b	116/QĐ-	2009/08/07		
56		49	C	23			543.751007	543.75101		Vicosilica@	Phong Bình, Phong			2008	Công ty cổ phần	biến cát	810		Có	2007/10/16	26	19	7	3,000,000	54000	Có	Lê Văn Ba	0905.187.07	@gmail.	2000	Quyết định phê duyệt b	24/QQD-	19/9/2007		
57		50	D	35			54.6270006	54.627001	0989192197	duynn@hdp	Hương Vân, Hương			2010	Công ty cổ phần	phân phối điện			Có	2007/10/30	53	51	2	4,000,000	457534	Có	Võ NHư Thu	0982439676	@gmail.	5000	Quyết định phê duyệt b	1758/QĐ	20/7/2005		
59		51	E	36			054. 383371(	543826280	0913425555		Thuỷ Xuân			1990	Doanh nghiệp nhà n	Xử lý nước cấp			Có	2005/02/27	638	200	36	5,760,000	46,449	Có	Trần Thị Minh T	0914091432	inhtam	50	Quyết định phê duyệt b	65	2008/05/14		
60		52	E	37			54.3848242	54.384808			TT Lăng Cô			Chưa	Doanh nghiệp nhà n	Xử lý nước thải			Không							Có	Dương Nhật Q	0935569561		300	báo cáo Đánh giá tác	58/QĐ-T	2008/04/11		
62		53	E	38			54.3848242	54.384808		mtdt-hue@dn	46 Trần Phú, Huế			1975	Doanh nghiệp nhà n	Chôn lấp rác thải			Có	2005/12/28	730	352	378	3,000,000		Có	Trần Trung Khá	0913439113		100	báo cáo Đánh giá tác				
63		54	E	38			543,864,200	3,864,200			Thủy Phương			1999	Doanh nghiệp nhà n	Chôn lấp rác thải			Không		12	6	6	3,000,000	80,000	Có	Hoàng Hải	0905261679		300	báo cáo Đánh giá tác				
64		55	E	38			543,854,421	3,854,421	0913458171		Thủy Phương			2007	Công ty cổ phần	hoạt			Có	2006/06/20	144	30	75	3,600,000	40,000	Có	Phạm Thị Bích	0905746449		2,500	Quyết định phê duyệt b	16/QĐ-T	2007/06/12		
65		56	NA	NA			543.961357	543.96136	0913425767		KCN Phú Bài			2007	Công ty TNHH	Xử lý nước thải	6810	3700	Có	2006/11/23	46	22	24	3,400,000	5000	Có	Trần Vũ Mẫn	0946.889.335		700	Quyết định phê duyệt báo cáo Đánh giá tác động Môi trường				
66		57	G	46			543.524663	543.57166			2 Trần Hưng Đạo. Tp			1986	Khác	Quản lý chợ			Có	2012/04/25	91			3,500,000	22749	Có	Hồ Dũng	0543,523991		0	Quyết định phê duyệt b	01/QĐ-M	2004/05/04		183/QĐ r
67		58	G	46			543.936902	543.93693			Vương, Tp Huế			2009	Công ty cổ phần	Kinh doanh			Có	2009/12/03	284			3,294,805		Không				0	Quyết định phê duyệt báo cáo Đánh giá tác động Môi trường				
68		59	G	46			543.572003	543.572		cmhue@saigo	06 Trần Hưng Đạo			2008	Công ty TNHH	Kinh doanh	4719		Có	2008/03/20	135			4,000,000	6400	có	Hồ Thủy Tiên	0127687863	saigonc	0	Giấy chứng nhận đăng	2325/UB	15/09		
69		60	I	55			543.936666	543.93656		info@bwp.ind	105A Hùng Vương,			2009	Công ty TNHH	vụ lưu trú			Có		246			4,900,000	42000	Không				150	Quyết định phê duyệt b	13/QĐ-T	2007/03/05		
70		61	I	55			543.837382	543.83738			09 Ngô Quyền			2007	Công ty TNHH	Dịch vụ lưu trú			Có	2011/04/28	140	11		2,400,000	4460	Có	Nguyễn Hữu Lộc			10	Quyết định phê duyệt báo cáo Đánh giá tác động Môi trường				

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																						Ⅱ . THÔNG TIN VỀ NƯỚC THẢI VÀ PHƯƠNG PHÁP XỬ LÝ NƯỚC THẢI																												
13. Nguyên vật liệu và hóa chất cho sản xuất							14. Năng lượng / Nhiên liệu cho sản xuất (Thông tin không bắt buộc)						15.	16. Công suất hoạt động:								1. NƯỚC CẤP																				2. TIÊU THỤ NƯỚC				3. HỆ THỐNG THOÁT NƯỚC VÀ XỬ LÝ NƯỚC THẢI				
																						1.1 Nguồn nước sử dụng																1.2 Mục đích sử dụng									3.2 NƯỚC			
																													8) Danh sách các giếng hoặc máy bơm khai thác nước ngầm (thu thập thông tin nào phù hợp)																			2)Dung lượng nước thải xả ra		
TT.	Tên nguyên vật liệu & hóa chất	Hóa chất	Công đoạn sử dụng	Đơn vị tính	Lượng tiêu thụ	Năm thống kê	TT	Tên nhiên liệu/năng lượng	Mục đích sử dụng	Đơn vị tính	Lượng tiêu thụ	Năm thống kê	Quy trình sản xuất trong doanh nghiệp:	STT	Thiết kế/Thực tế	Thực tế	Tên sản phẩm	Đơn vị tính	Sản lượng thiết kế	Sản lượng thực tế	Năm thống kê	1) Loại nguồn nước	2) Số lượng giếng hoặc máy bơm dùng để	3) Số lượng giếng hoặc máy bơm đang sử	4) Lưu lượng khai thác thực tế (m^3/ngày)	5) Giấy phép khai thác (Có/Không)	6) Số giấy phép	7) Tổng lượng nước sử dụng (nước máy + nước	STT	Tên	Tọa độ X	Tọa độ Y	Đường kính	Đường kính	Độ sâu (m)	Công suất	Chế độ khai	1) Nước máy	2) Nước mưa	3) Nước ngầm	4) Khác	1) Mục đích sử dụng	2) Lượng nước tiêu thụ theo thiết kế	Hàng ngày (m3/ngày) (ngày:……….)	Trung bình hàng ngày (m3/ngày) (từ ……. đến ……..)	3.1 SƠ ĐỒ HỆ THỐNG THOÁT NƯỚC THẢI	1) Nguồn nước thải phát sinh từ đâu	a) Thiết kế (m3/ngày)	b) Hàng ngày (m3/ngày	c) Trung bình ngày
1	Tôm giống	Clorin, Virk	Đưa vào	tấn	1014	2011							Đính kè	1	Thiết kế		Tôm th	tấn	1382	1014	2011	Khác				Không															Sử dụng	Quá trình sản xuất			1900	Đính kèm	Quá trình sản xuất			
1	Tôm giống	Clorin, Virk	Đưa vào	tấn	1014	2011							Đính kè	1	Thiết kế		Tôm th	tấn	1382	1014	2011	Khác				Không															Sử dụng	Quá trình sản xuất			1900	Đính kèm	Quá trình sản xuất			
1	Tôm giống	Clorin, Virk	Đưa vào	tấn	1014	2011							Đính kè	1	Thiết kế		Tôm th	tấn	1382	1014	2011	Khác				Có															Sử dụng	Quá trình sản xuất			1900	Đính kèm	Quá trình sản xuất			
1	suporine	Clorin, thu	diệt tạp a	kg	31	2012	1	Dầu nhớt	vận hành máy	lít/thá	240	2012										Giếng (nư	4	4	90	Không		518												sản xuất	Nước bi	Quá trình sản xuất	518	500	450-500		Quá trình	518	500	450-500
													Nuôi tôm thẻ chân trắng trên cát									Khác	1	1		Không														dùng để	sinh hoạt ăn uống cho con người						Nước thải sinh hoạt			10 - 20
1	suporine	Clorin, thu	diệt tạp a	kg	3	2012	1	Dầu nhớt	vận hành máy	lít/thá	150	2012										Khác	2	2	60	Không														sản xuất	nuôi tôm	Quá trình sản xuất	350	280	280-300		Quá trình	400	280	280-300
																						Khác	2	2	30	Không		90														Quá trình sản xuất		200				200	150	
																						Khác	2	2	60	Không		250														Quá trình sản xuất	300	250					250	
	suporine	Clorin, thu	diệt tạp a	kg	3	2012	1	Dầu nhớt	vận hành máy	lít/thá	150	2012										Khác	4	4	90	Không		350														Quá trình sản xuất	430	350				430	350	
	suporine	Clorin, thu	diệt tạp a	kg	3	2012																Khác	4	4	120	Không		200														Quá trình sản xuất						250	150	
																						Khác	2	2	30	Không		60														Quá trình sản xuất		300				300		
																						Khác				Không																Quá trình sản xuất								
1	Suporine	Clorine, Th	Diệt tạo a	kg	3		1	Dầu nhớt	Vận hành máy	lít/thá	750	2012										Khác	8	8	240	Không		1140												Sản xuất	Nuôi tôm	Quá trình sản xuất	1140	1000	900-1100		Quá trình	1140	1000	900-1100
1	Thức ăn tôm, Tôm giố		Thả tôm -	kg	60000	2009-201	1	Dầu nhớt	Máy sục khí	lít/thá	10	2009-2012						Ao	6		2009	Khác	1	1	1	Không		1	1	Giếng bơm tay			49	50	8	0,001				Nước sir	Nước bi	Quá trình sản xuất	200		50 - 70	Đính kèm	Quá trình	100		50 - 70
1	Iodine com	Saporine, (	Xử lý nước cấp cho ao			2012	1	Dầu nhớt	Vận hành máy	lít/thá	400	2012			Thực tế		Tôm th	Tấn/h	18		2009-	Giếng (nư	6	6	120	Không		600												Nuôi tôm	Nuôi tôm	Quá trình sản xuất	600	600	600	Đính kèm	Quá trình	655	570	450-570
																						Khác				Không																Quá trình sản xuất								
1	suporine	Clorin, thu	diệt tạp a	kg	3	2012	1	Dầu nhớt	vận hành máy	lít/thá	80	2012										Giếng (nư	1	1	30	Không		150												Nuôi tôm	Nuôi tôm	Quá trình sản xuất	200	150	150		Quá trình	200	150	150-170
1	Clorine	BKC	Đầu tiên,	kg	2500	2011	1	DO	Chạy máy phá	lít/thá	200	2011										Khác	3	3	5000	Không		5000													Nước bi	Quá trình sản xuất					Quá trình	3000	2800	2500
							1	DO	Sấy quặng	lít/thá	5500	2012		1	Thiết kế		Zincon	Tấn	600	500	2012	Nước máy				Không		30										Dùng trong sinh hoạt và sản xuất				Nước sinh hoạt		33	30		Quá trình sản xuất			23
								DO	Vận tải	lít/thá	7957	2012			Thiết kế		Quặng	tấn/th	4302	4380	2012	Giếng (nư	15		195	Có	823/QĐ-UBND ngày 11/5/2012													Dùng trc	Dùng trong sản xu		Quá trình sản xuất	195				Quá trình	2750		
								DO	Máy ủi	lít/thá	2300	2012			Thiết kế		Quặng	tấn/th	900	910	2012	Giếng (nư	18		180	Có	697/QĐ-UBND ngày 23/4/2012													Dùng trc	Dùng trong sản xu		Quá trình sản xuất	180				Quá trình sản xuất			
							1	DO	Xe ủi	lít/thá	800	2012			Thiết kế		Quặng	Tấn/t	560	560	2012	Nước mưa				Không														Dùng để	Dùng để ăn uống		Quá trình sản xuất								
							1	DO		lít/thá	2000	2012			Thiết kế		Xỉ titan	tấn/th	900		2012	Giếng (nước ngầm)				Không														Dùng trc	Dùng trong sinh h		Nước sinh hoạt								
1	Javen	Clorin, Oxy	Vệ sinh d	kg	2000								Nguyên	1	Thiết kế		Thủy s	tấn/n	1000		2012	Nước mưa				Không		230														Quá trình sản xuất	300	230	200 - 250	Đính kèm	Quá trình sản xuất			150
1	Clorine		Vệ sinh	kg/ng	5								Tôm ng	1	Thiết kế		Tôm	tấn/ngày		2.5		Nước máy				Không		150										Phục vụ	Phục vụ	Không	Không	Quá trình sản xuất	150				Quá trình sản xuất		135	120-150
1	Chlorine	Nước Jave	Khử trùng	kg	160	2011							Nguyên	1	Thiết kế		Tôm th	Tấn	600	400	2011	Nước máy				Không		30										Sử dụng nước máy từ nhà máy nư				Quá trình sản xuất	50	30	30		Quá trình	50	30	30
															Thực tế		Bún	tạ/ng	1.2			Nước máy				Không												Làm bún, sinh hoạt				Quá trình sản xuất		4.5	4-5		Quá trình sản xuất		3	3-3,5
	Sắn tươi, Than đá, Khí sinh học																Tinh bộ	Tấn/r	15000	13000		Khác				Không		840														Quá trình sản xuất	840	840			Quá trình sản xuất		840	
													Giết mổ	1	Thiết kế		Trâu b	con	61000	18000	2010	Giếng (nư	3	3	30	Không		20										Nước máy		Nước ngầm		Quá trình sản xuất	50	20	20		Quá trình	20	20	18
													Giết mổ	1	Thiết kế		Trâu b	con	61000	18000	2010	Giếng (nư	3	3	30	Không		20										Nước máy		Nước ngầm		Quá trình sản xuất	50	20	20		Quá trình	20	20	18
	Malt		Nấu	Tấn	4589	2011	1	DO	Chạy máy phá	lít/thá	2855	2011	Đính kèm ch		Thiết kế		Bia các	Hl	700000		2011	Nước máy				Không																Quá trình sản xuất	1400	600	300-1200	Đính kèm	Quá trình	1400	400	300-1000
	Malt, Gạo	NaOH, Chấ	Nấu bia, L	Tấn	10,500	2011							Đính kèm		Thiết kế		Bia các	triệu	180	140	2011	Nước máy				Không		4500										Nấu bia và sinh hoạt				Quá trình sản xuất	4500	2,200	2.200	Đính kèm	Quá trình	3500	2000	2.000
								DO	Đốt lò hơi	lít/thá	4000	2012	Đính kèm		Thiết kế		Shochu	lít	250000	250,000	2012	Nước mưa			50	Không		50										Sản xuất và vệ sinh				Quá trình sản xuất		50	35	Đính kèm	Quá trình	80	35	35
1	Nước khoáng		sản xuất	kg	3E+06	2012																Nước máy				Không												Nước sinh hoạt và súc rửa chai				Quá trình sản xuất						10	10	
	Bông, Xơ, Sợi		Sản xuất	kg/th	67038	2012							Bông, xơ -> xe sợi ->Sợi - > Dệt kim -> vải mộc - > Tẩy -> nhu									Khác				Không															Sử dụng	Quá trình sản xuất					Quá trình	1000	300	270-300
	Keo ghép g	Dầu màu		kg				FO		lít/thá	3				Thiết kế			m3/n	10000	5000	Từng	Nước máy				Không												Sinh hoạt và sản xuất				Nước sinh hoạt				Đính kèm	Nước thả	12	3	
							1	Dầu nhớt	Vận hành máy	lít/thá	11000	2011	Gỗ cây	1	Thiết kế		Dăm g	tấn/h	50	70	2011	Nước máy				Có		2													Cty đang	Quá trình sản xuất		60		Không có	Quá trình sản xuất	20		
1	Giấy bìa két		Xay thành	kg/nă	1E+05								Cho giấ	1	Thực tế		Giấy bì	kg	50000			Giếng (nước ngầm)		1	10	Không		10										Chưa c	Sử dụng	Sử dụng lọc lắng		Quá trình sản xuất	10	10	5 - 10	Đính kèm	Quá trình	2		1-2
1	Giấy phế liệ	Phẩm màu	Nghiền, P	tấn/th	30	2012	1	Điện	sản xuất	kWh/	45000	2012	Giấy phế liệu -> (Nghiền máy) -> Bột giấy -> (Sấy - máy xeo) ->									Giếng (nư	2	2	5	Không		5											Dùng ch	Dùng cho sinh ho		Quá trình sản xuất	5				Quá trình	tuần hoàn lại		0,1-0,2
1				kg/th	100		1	Gỗ		m3/th	80		Giấy trộn nư		Thực tế		Giấy v	kg	10000			Nước má	1		10	Không		20										Sinh hoạt			Nước sở	Quá trình sản xuất			15 - 20	Đính kèm	Quá trình sản xuất			3 - 4
1				tấn/n	400	2012							Nhập kh	1	Thiết kế		Giấy v	tấn	390	340	2011	Giếng (nư	1	1	2	Không		2	1	Giếng tròn			###		~10					Dùng để sinh hoạ		Nước sinh hoạt	2				Nước thả	1		
1	Giấy, mực,	Dầu hỏa, d	Dùng để	tấn/th	45	2012	1	Điện	sản xuất	kWh/	20000	2012		1	Thực tế		Sách b	tỉ tran	1		2012	Nước máy				Không												Dùng để xuất phim, hiện bản, rửa				Quá trình sản xuất	8	6.5	6 - 7	Đính kèm	Quá trình	4	1.2	1 -1,5
	Giấy cuộn			tấn/n	420			Điện		kWh/	12000				Thiết kế		Bao bì	m2	3000000	3,000,000	2011	Nước mưa				Không												Sản xuất và sinh hoạt				Quá trình sản xuất					Quá trình	6	8	7-8
1	Nhựa thông	Dung môi, Hóa chất		tấn	200; 200; 1000		1	Điện		kWh/	11000			1	Thiết kế			tấn/năm		3000	2012	Nước máy				Không												sản xuất & sinh hoạt				Quá trình sản xuất	15				Quá trình	7		5 đến 7
1	TopSol A100		Phối liệu	Tấn	40	2011	1	Điện	Sản xuất	kWh/	2500	2011	Nguyên	1	Thiết kế		Carbar	Tấn	30	14	2011	Giếng (nư	1	1	2	Không		2	1	Xưởng sản xuất				60	50					Mục đích sử dụng		Quá trình sản xuất	2		1-2		Quá trình	2	1.5	1-2
T ngày 02/8/2011																						Nước máy				Không		6										Sử dụng cho phòng thí nghiệm và				Quá trình sản xuất		6	5-7		Quá trình sản xuất		6	5-7
1	Mủ cao su	Acid acitic,	Nguyên li	kg	6E+05	2011	1	DO	Chế biến	lít/thá	2750	2011	1. Mua r	1	Thiết kế		Cao su	kg	1500			Nước máy				Không																Nước sinh hoạt								
																						Khác	0	0	0	Không															Mua nướ	Nước sinh hoạt		0.5	0,4-0,5		Quá trình	4250		
							1	DO	Sấy + Xe cơ g	lít/thá	12000	2012	Đính kè	1	Thiết kế		Cát kh	Tấn	185	90	2011	Giếng (nư	2	2	4	Không		4	1						6	0.2	Gián đoạn			Nước ph	b\Nước Bàu Bàng phục vụ tuyển		300	100	100	Đính kèm	Quá trình	300	300	300
1	Nước mặt			m3/n	7E+06								Nước đ	1	Thiết kế		Điện n	Triệu	305			Khác			6.68	Có	1033/GP-BTNMT ngày 03/6/2009																	Mục đích khác					Quá trình sản xuất			
	PAC	Soda, Poly	Tạo bông	kg	1E+05	2011		Điện		kWh/	31400	1-12	Đính kèm		Thiết kế		Nước	m3	19030085	20,462,780	2011	Khác		8	65,000	Có	Đang tiến	65000										Cấp nước sạch đến khách hành s				Quá trình sản xuất	82500	65,000	65.000	Không có	Quá trình	2310	2000	2000
													Nước thải ->		Thiết kế		Nước	m3/n	4200		2012	Nước má	1	1		Không			1					80	39	0				Rửa xe, sinh hoạt		Quá trình sản xuất				Không có	Nước thả	4200		
															Thực tế		Rác si	Tấn	15		2012	Nước máy				Không																Nước sinh hoạt					Nước thải sinh hoạt			
	Chế phẩm vi sinh EM		Xử lý rác	lít/thá	15	2011		DO	San ủi rác	lít/thá	1000	2011	Tiếp nhận rá		Thực tế		Rác si	tấn	140		2011	Nước máy				Không		20										Rửa xe, sinh hoạt				Quá trình sản xuất	20	20		Không có	Quá trình	209		
	Rác thải sinh hoạt		Xử lý	tấn/n	50000	2011		Dầu nhớt		lít/thá	17	2011	Rác thải sinh		Thực tế		Rác th	tấn/n	200			Nước mưa				Không		21														Quá trình sản xuất	30	21.4	20-30	Đính kèm				
1	HCl	Phèn, Chlo	Hóa - Lý,	kg/nă	18600	2011								1	Thiết kế		Nước	m3/n	4000	2000	2010	Nước má	0	0		Không												Vệ sinh, pha hóa chất, tưới cây, si				Quá trình sản xuất		5	5			4000	2200	2000
ngày 9/11/2010																						Giếng (nư	1	1	45	Không		50	1	WC F			34	60	6		Thư	Cung cấp cho h		Sử dụng	Nước sở	Quá trình sản xuất			40				45	40
																						Nước mưa				Không																Quá trình sản xuất								
							1	DO	Máy phát điện	lít/thá	100	2012										Nước máy				Không												Dùng trong sinh hoạt				Nước sinh hoạt	70	40	40		Nước thả	70	40	40
							1	DO	Vận hành lò hơ	lít/thá	11000	2012										Nước máy				Không												Dùng cho sinh hoạt hằng ngày và				Nước sinh hoạt		120	70-120		Nước thả	150	75	70-80
1	Giặt là						1	DO	Chạy máy phá	lít/thá	100		Giặt là, chùi rửa tổng hợp; Chạy máy phát điện dự phòng									Giếng (nư	1	1	10	Không		60										sử dụn	tưới cây			Nước sinh hoạt		50		Đính kèm	Nước thả	80	50	

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3) Nước thải từ quá trình sản xuất có	3-1) Công suất Trung bình ngày (m3/ngà	b) Hàng ngày (lớn	c) Thiết kế bởi (nhà thầu)	3-2) Hệ thống xử lý nước thải	3-3) Công suất thực tế của hệ thống xử lý nước a) Trung bình ngày	b) Lớn nhất (m3/ngày)	3-4) Lượng nước thực tế xả thải sau khi được a) Hàng ngày (m3/ngày)	b) Trung bình ngày	3-5) Kết quả xử lý	3-6) Nguồn tiếp nhận xả thải	3.3 VẬN HÀNH HỆ THỐNG XỬ LÝ NƯỚC THẢI 1) Kiểu vận hành hệ thống xử lý nước thải	2) Chi phí vận hành hệ thống xử lý nước thải	3) Doanh nghiệp có cử cán bộ làm việc	4) Nếu Có, vui lòng cho biết thông tin liên hệ a) Tên	b) Số ĐT/Di động	5) Doanh nghiệp của ông/bà có thể cho	6) Doanh nghiệp Nếu có, tổng số phí phải đóng	Nếu có, tổng số phí phải đóng trong vòng 5 năm	7) Doanh nghiệp Nếu có, vui lòng cung cấp số	3.4 CÁC ĐIỂM HẠN CHẾ TRONG VẬN HÀNH VÀ XỬ	III. THÔNG TIN HOẠT ĐỘNG CỦA DOANH NGHIỆP (QUAN TRẮC ĐỊNH K 1) Doanh nghiệp của ông/bà có quan trắc định kỳ không? (Có/Khô	2) Tần suất quan trắc (lần/năm)	3) Ngày nộp báo cáo quan trắc định kì gần đây nhất	4) Đơn vị thực hiện lấy mẫu	5) Vui lòng liệt kê toàn bộ các thông số được quan trắc ở mỗi lĩnh vực: Nước thải	Khí thải	Chất thải rắn	Chất thải nguy hại	IV. KẾT QUẢ THANH TRA/KIỂM TRA 1) Doanh nghiệp đã được thanh tra hoặc kiểm tra bởi Cơ	1-1) 1-1) Lý do doanh nghiệp được tiến hành thanh tra hoặc kiểm tra	1-2)Tổng số lần doanh nghiệp được thanh tra/kiểm tra trong	1-3) Ngày thanh tra/kiểm tra gần đây nhất	1-4) Kết quả thanh tra/kiểm tra gần đây nhất	1-5) Cơ quan kiểm tra/thanh tra Thanh tra viên	2) Doanh nghiệp đã bị phạt vi phạm pháp luật bảo vệ môi trường	2-1) Số quyết định xử phạt mới nhất	2-2) Nội dung quyết định xử phạt	2-3) Cơ quan ra quyết định xử phạt	2-4) Lý d	2-5) Tiền	2-6) Phạt bổ sung khắc phục hậu quả	2-7) Thời hạn khắc phục hậu quả
				Xử lý sinh học khác				1300	chưa có		Gián đoạn		Không			Không	Phải trả	9.4E+07	Không	ngân	Không	0							Kiểm tra	Thanh tra	9	2012/06/06	Không vi	Phòng C	No					0		
				Xử lý sinh học khác				1300	chưa có		Gián đoạn		Không			Không	Phải trả	9.4E+07	Không	ngân	Không	0							Kiểm tra	Thanh tra	9	2012/06/06	Không vi	Phòng C	No					0		
				Xử lý sinh học khác				1300	chưa có		Gián đoạn		Không			Không	Phải trả	9.4E+07	Không	ngân	Không	0							Kiểm tra	Thanh tra	9	2012/06/06	Không vi	Phòng C	No					0		
Có	500-600	500		Xử lý sin	500-600	500	500		Đạt QCV	Xả ra ao,	Gián đoạn		Không			Không	Không phải trả		Không	kiến	Không	0							Chưa	-----					No					0		
Có									lắng đọng qua ao x		Gián đoạn		Không				NA		Không		Không	0							Kiểm tra	Theo kế	2	2011/08/23	Ổn định	Chi cục B	No					0		
Có				Xử lý sin	500-600	300	280	250-280	Đạt QCV	Xả ra ao,	Gián đoạn					Không	Không phải trả		Không	kiến	Không	0							Chưa	-----					No					0		
Không											Không					Không	Phải trả phí		Không		Không	0							Chưa	-----					No					0		
Không											Không						NA		Không		Không	0							Chưa	-----					No					0		
Không											Không						NA		Không		Không	0							Chưa	-----					No					0		
Không											Không						NA		Không		Không	0							Chưa	-----					No					0		
											NA						NA		Không		Không	0							Chưa	-----					No					0		
											NA						NA		Không		Không	0							Chưa	-----					No					0		
Có	900-1000			Xử lý sin	900-1100	1100	1000	900-1100	Đạt QCV	Xả ra ao,	Gián đoạn		Không			Không	Không phải trả		Không	kiến	Không	0							Chưa	-----					No					0		
Có	100	150		Xử lý sin	90 - 110	150		50 - 70			Gián đoạn						NA		Không		Không	0							Chưa	-----					No					0		
Có	500			Xử lý sin	500				Nước thả	Xả ra ao,	Gián đoạn		Không			Không	NA		Không	kiến	Không	0							Chưa	-----					No					0		
											NA						NA		Không		Không	0							Chưa	-----					No					0		
Có	150			Xử lý sin	150		150	Đạt QCNV		Xả ra ao,	Gián đoạn		Không			Không	Không phải trả		Không	kiến	Không	0							Chưa	-----					No					0		
Có	2500	3500		Phân hủy	2500	3500	2500	3500			Liên tục						NA		Không		Có	0		Doanh nghiệp tự quan trắc, kiểm tra các thông					Kiểm tra	Theo kế	1	1905/07/02			No					0		
				Lắng đọng							NA						NA		NA		Có	2	2012/06/30	Trạm quan trắc & phân tích MT TT Huế					Thanh tra	Theo kế	12	2012/03/13		Chi cục B	No					0		
											NA						NA		2309/QĐ-UBND n		Có	2	2012/06/30	Trạm quan trắc và phân tích môi trường TT Hu					Thanh tra	Thanh tra	2	2012/06/28		CA huyện	No					0		
											NA						NA		NA		Có	2	2012/06/30	Trạm Quan trắc và phân tích môi trường tỉnh T					Thanh tra	Theo kế	5	2012/03/14		Chi cục B	No					0		
											NA						NA		NA		Có	2	2012/06/30	Trạm Quan trắc và phân tích môi trường tỉnh T					Thanh tra	Theo kế	12	2012/03/15		Chi cục B	No					0		
											NA						NA		NA		Có	2	2012/06/30	Trạm quan trắc và phân tích môi trường					Thanh tra	Theo kế	6	2012/03/13		Chi cục B	No					0		
Có	300			Xử lý sinh học khác				150	Đạt tiêu c	Xả thẳng	Liên tục		Không			Không	Phải trả phí		Đang làm	ngân	Có	2	2012/07/01	Sở KH&C	Đính kèm	Đính kèm	Đính kèm		Thanh tra	Theo kế	4	2012/05/30		Sở TN&M	Yes	29/QĐ-X	Xử phạt V	Chánh T	VPHC	#######	Không	31/12/20
				Xử lý sinh học khác							Gián đoạn		Có				NA		NA		Có	1		Cty CP Toàn Thịnh Phát					Kiểm tra	Theo kế	4	2012/07/31			No					0		
Có	50	42		Trung hò	30	42	30	23 - 28	Đạt	Xả thẳng	Liên tục		Có	Bùi Văn C	9.8E+08	Không	Phải trả phí		Không	ngân	Có	2	25/6/2012	Trung tâm Ứng dụng Tiến bộ KH&CN TT Huế					Kiểm tra	Theo kế	5	2012/07/23	Đạt	Phòng C	No					0		
Không										Thải xuố	Không		Không				Không phải trả		Không	ngân	Không	0							Chưa	Theo kế hoạch và thông báo của Sở TNMT					No					0		
Có	840			Phân hủy kỵ khí							Gián đoạn						NA		NA		Có	2							Kiểm tra	Theo kế	4				No					0		
Có	18	20		Xử lý sin	18	20	15	10	lắng đọng	Hệ thống	Gián đoạn						NA		NA	ngân		0							Kiểm tra	Theo kế	0				No					0		
Có	18	20		Xử lý sin	18	20	15	10	lắng đọng	Hệ thống	Gián đoạn						NA		NA	ngân		0							Kiểm tra	Theo kế	0				No					0		
Có	1400	136	Enviroas	Trung hò	400	800	400	400			Liên tục	75,000,0	Có	Nguyễn C	9.1E+08	Có	Phải trả phí		1157/QĐ	động	Có	2	2012/06/01	Trung tâm	pH, màu	Bụi lơ lửng, Co, No2, So2, d			Thanh tra	Thanh tra	2	2012/06/07	bị phạt	Phòng cả	Yes	1089/QĐ	Vi phạm	UBND tỉn	Xả thải vư	#######		
Có	3,500	4,000	Trung Qu	Trung hò	3.500	4,000	2,000	2,000		Hệ thống	Gián đoạ	######	Có	Nguyễn T	9.8E+08	Có	Phải trả phí		Hợp đồng xả thải		Có	2	2012/06/01	Trung tâm	pH, màu	Bụi lơ lửng, CO, NO2, SO2			Thanh tra	Theo kế	2	2011/06/08		Tổng cục	No					0		
Có	80	35	Công ty S	Trung hò	80	35	40	35		Hệ thống	Liên tục	######	Có	Nguyễn Văn Tú		Có	NA		NA		Có	2		Trung tâm	Đính kèm	Đính kèm			Kiểm tra	Theo kế	10	2012/05/09	Chấp hàn	Phòng cả	Yes		Chưa xây	Sở Tài n	Chưa xây	#######		
Có	10		Bộ phận	Trung hò	8	9				Xả ra ao,	Gián đoạn		Có	Hồ Hoàng	9.1E+08	Có	NA		NA		Có	1							Thanh tra	Theo kế	5				No					0		
Có	400	600		Trung hòa/ điều hòa					Đạt, các	Hệ thống	Liên tục	######	Có	Trần Văn	1.7E+09	Có	Phải trả phí		375/QĐ-	kiến	Có	4	2012/06/15	Trung tâm	Nhiệt độ,	Độ ồn, So2, No2, Co2, Cx, H			Thanh tra	Theo kế	10	2012/06/18	Bình thư	Phòng cả	Yes	30/QĐ-XPHC ngày		Tổng cục	Vi phạm	#######	Không	#######
Không											Không						NA		NA		Có	2							Thanh tra	Theo kế	1		Thanh tra	Sở Tài n	No					0		
Có	3			Lắng đọng							Gián đoạn		Không				Không phải trả		Không	lượng	Có	2	2012/06/01	Trung tâm Tư vấn & Phát triển Khoa học và Cô					Kiểm tra	Theo kế	4	2012/05/25	Chưa đă	Phòng C	Yes	28/QĐ-X	Không cô	Bộ Tài ng	Không cô	#######		Đã hoàn
Có	1 - 3			Trung hò	10 - 15					Hệ thống	Gián đoạ	1.000.00	Có	Nguyễn Ngọc Ưa		Có	NA		NA		Có	0							Kiểm tra	Thanh tra/Kiểm tra		2012/05/13		Chi cục B	Yes	18/XPHC		UBND thị xã Hươn		#######		
Có				Trung hò	tuần hoàn lại						Liên tục		Không			Không	Không phải trả		Không	kiến	Có	2		Sở Khoa học Công nghệ					Kiểm tra	Theo kế	10	2012/05/14		Chi cục B	Yes	1	Xây dựng không đ		Vi phạm	#######		
	4		Tự thiết k	Khác, vu	3-4						Liên tục		Không				NA		Không		Không	0							Thanh tra	Thanh tra/Kiểm tra		2012/04/17		Phòng C	Yes			Phòng C	Xả thải vư	#######		
											NA						NA		NA		Không	0							Chưa	-----					No					0		
Có	4		Cty CP P	Trung hò	1,5 - 2	2	1,2	1 - 1,5	Đạt yêu cầu		Liên tục	1.500.00	Có	Nguyễn T	1.7E+09	Có	Phải trả phí		Không		Có	2	2012/07/23	Chi cục BVMT TT Huế					Kiểm tra	Theo kế	8	2012/09/04	Đạt yêu c	Chi cục B	No					0		
Có	5	5	7	Lọc qua	7-8	8	5	05-6	Đạt tiêu chuẩn chó		Liên tục		Không				Không phải trả		Có	ngân	Có	1		Công ty CP Toàn Thịnh Phát					Chưa	-----					No					0		
Có	5 đến 7	7	Tự thiết k	Trung hò	5 đến 7	7		5 đến 7	Chuẩn C		Liên tục		Không				Không phải trả		Không		Có	2	2012/08/15	Trung tâm ứng dụng tiến bộ KHCN (Sở KHCN)					Thanh tra	Theo kế	8	2012/06/14		Chi cục B	Yes	26/QĐ-XPHC		Bộ TNMT	Vi phạm	#######		
Có	2		Viện nghi	Trung hò	2		0,02-0,03	0,025	Đạt chất	Hệ thống	Gián đoạn		Có	Nguyễn V	543.861	Có	Không phải trả		Không		Có	3	2012/07/24	Trạm Qu	3 mẫu nư	Dưới hạn	Các phi c	Chuyển C	Thanh tra	Theo kế	4	2011/12/09	Thực hiệ	Đoàn KT	No					0		
Có	0,1		Cty TNHH	Trung hò	0,08 - 0,1	0,12	0,1	0,08 - 0,1	Tốt	Hệ thống	Liên tục	200	Có	Trần Nhấ	9.8E+08	Có	Không phải trả		NA	ngân	Có	1	2011/02/08	Chi cục BVMT					Kiểm tra	Theo kế	5	2011/02/08	#######	Chi cục B	No					0		
											NA						NA		NA			1	2012/12/07	Chi cục B	pH:9,02; TSS:172; BOD5:155; COD:307; Amoni;16,2; T						4	2012/07/13		Chi cục B	No					0		
											NA						NA		NA		Có	2			pH:6,6; T	CO:2500	Không c	Chưa ph	Thanh tra	Theo kế	1	2010/08/20	Khí, nướ	Bộ TNMT	No					0		
				Lắng đọn	300	300	Không			Thải xuố	Liên tục		Không			Không	Không phải trả		Không		Có	2	2011/11/01	Chi cục B	Đạt chuẩ	Đạt chuẩ	Không	Không	Kiểm tra	Theo kế	1				No					0		
Không											Không						NA		NA		Có	2		Chi cục BVMT TT Huế					Thanh tra	Thanh tra/Kiểm tra đột xuất			Văn bản	Tổng cục	No					0		
Có	2000	2310	Công ty C	Lắng đọn	2000	2130	Không (tá	Không (tá	Đính kèm	Hệ thống	Liên tục	######	Có	Lê Văn Q	9.1E+08	Có	Phải trả phí		NA	ngân	Có	1	2012/08/01	Phòng Q	Màu, độ c	Các loại	Kẽm, crô	Xây dựng	Kiểm tra	Theo kế	2	2012/03/21	Đề nghị t	Phòng cả	No					0		
Có	4200		Dự án Ca	Trung hòa/ điều hòa							Liên tục		Có	Dương N	9.4E+08		Không phải trả		NA		Có	2							Chưa	-----					No					0		
				Phân hủy kỵ khí							NA						NA		NA		Không	0							Thanh tra	Theo kế	1	2011/06/15	#######	Bộ Tài ng	Yes	21/QĐ-X	Xử phạt H	Thanh tra	Không cô	#######		
	290		Dự án Vi	Trung hò	50-150				Chưa đạt quy chuẩ		Liên tục		Có	Hoàng H	9.1E+08		Không phải trả		Có	ngân	Có	2		Trung tâm phân tích Trường DHKH - Đại Học H					Thanh tra	Theo kế	1	2011/06/15	#######	Bộ tài ng	No					0		
	20-30	50	Công ty t	Xử lý sin	20-30	30	Chủ yếu hoàn lưu		Đạt yêu c	Hoàn lưu	NA		Có	Phạm Th	6.1E+08	Có	NA		NA		Có	2	2012/07/27	Trung tâm	BOD_5; C	Bụi, Co, NO, SO_2,		Dầu nhớ	Kiểm tra	Theo kế	8	2012/05/01	5-12	Sở tài ng	No					0		
	4000	4000	4000	Trung hò	2000	2200	2000	2000	Đạt cột B theo QC		Liên tục		Có	Lê Văn M	9.2E+08	Có	NA		Có	động	Có	2		Trung tâm	Nhiệt độ,	Nhiệt độ, Độ ẩm, V		phân tích	Thanh tra	Theo kế	6	2012/06/19	Đạt	Cục Kiểm	No					0		
Có	100		Cty CP P	Trung hòa/ điều hòa			20-30	20-30	Đạt chuẩ	Hệ thống	Liên tục	8-10 triệu	Có	Hồ Dũng	9.1E+08	Có	Không phải trả		Không	động	Có	2	2012/04/07	TT Tư vấ	pH;DO;T	Chưa qu	Chưa qu	bóng đèn	Kiểm tra	Theo kế	5	2011/09/08	Đảm bảo	Chi cục B	No					0		

Source: JET

(6) Statuses of the Environmental Compliance with Environmental Requirements

By utilizing the PSI developed above, the environmental compliance statuses with the environmental requirements with the target pollution sources in TT-Hue DONRE have been confirmed as shown below:

1) Approval/Registration of EIA/EPP/EPC

	1st year		2nd year	
	No.	%	No.	%
EIA approval	153	96	77	74
EPP approval	-	-	3	3
EPC registration	-	-	13	13
Total no. of pollution sources	160	100	104	100

Source: JET

2) Wastewater discharge fee

	1st year		2nd year	
	No.	%	No.	%
Paid	10	6	19	18
Unpaid	0	0	25	24
No information	150	94	60	58
Total no. of pollution sources	160	100	104	100

Source: JET

3) Wastewater discharge permit

	1st year		2nd year	
	No.	%	No.	%
Acquired permit	5	3	5	5
Submitted documents	0	0	18	17
Not acquired	155	97	81	78
Total no. of pollution sources	160	100	104	100

Source: JET

4) Environmental monitoring

	1st year		2nd year	
	No.	%	No.	%
Environmental monitoring	21	13	61	59
No monitoring	139	87	43	41
Total no. of pollution sources	160	100	104	100

Source: JET

5) Environmental checking and environmental inspection

	1st year		2nd year	
	No.	%	No.	%
Environmental checking/inspection	26	15	81	78
No checking/inspection	134	85	23	22
Total no. of pollution sources	160	100	104	100

Source: JET

C-5 Development of PSI in Hanoi DONRE

(1) Objectives of PSI development

A PSI was developed to evaluate the status of pollution sources located in Cau Bay River basin in Long Bien District in Hanoi City including following items:

- ✧ To check/find/search the environmental compliances of the target enterprises with the environmental requirements such as EIA approval,
- ✧ To grasp the conditions of wastewaters qualitatively and quantitatively discharged from enterprises in the target area,
- ✧ To develop pollution source map in the target area.

(2) Target enterprise

Forty eight (48) enterprises located in the basin of Cau Bay River in Long Bien District in Hanoi City were selected for pollution sources to be inventoried by HNI DONRE.

(3) Formulation of PSI format

A PSI format was formulated through discussions between HNI DONRE and JET. Considering the objectives of PSI above, the format of PSI contained the following data and information:

- ➢ Enterprise information (name, address, type of industrial sector, number of employee, etc.),
- ➢ Environmental permit (EIA approval, EPC registration, etc.),
- ➢ Water supply,
- ➢ Water use (production process and domestic use),
- ➢ Production process (major products, raw materials, etc.),
- ➢ Wastewaters (from production process and domestic usage, concentrations of pollutants, flow rates, etc.),
- ➢ Results of environmental inspection and checking,
- ➢ Sanction,
- ➢ Others if necessary.

(4) Data and information collection method

Data and information for the target enterprises were collected during the inspection activity of HNI DONRE by visiting each target enterprise. At the site, a questionnaire survey was conducted using the questionnaire form prepared for the survey for all 48 enterprises, and 34 wastewater samples discharged from the selected enterprises were taken for analysis of wastewater qualities. Besides the questionnaire survey and the wastewater sample collection, geographical coordinate of each enterprise was collected for development of pollution source maps.

Data and information collection method mentioned above is so called “direct collection method”. Although data and information obtained through a direct collection method normally has the highest reliability, the direct collection method is usually a one-time survey and requires substantial resources, especially if wastewater samples are to be collected and analyzed. Therefore, Hanoi DONRE adopted both the direct and the indirect methods. For indirect method, Hanoi DONRE utilized “monitoring report” submitted by the enterprises as a supplementary source of data/info, such as wastewater qualities of some enterprises.

(5) Data/Info entering in PSI

Data and information collected by the direct and indirect methods were entered in the form of PSI as shown in the next pages.

◆ PSI (I) (Portion of Enterprise Information)

	I. Enterprise information																			
	Name of enterprises (EN)	Note	2. Address of enterprise	3. Coordinates		4. Location				5. Industrial-sector[3]			6. Type of enterprise	7. Business certificate (No, date)	8. Investment license (Number, by)	9. Year of operation	10. Contact person in charge of environment	11. Tel/fax/email	12. Area (m2)	13. Total number of labor (people)
				(X)	(Y)	District	Ward	Commune	IP/IZ/IC	Level 1	Level 2	Level 3								
1		no data	No. 192 Đức Giang, Thượng Thanh ward	21°04'03"	105°52'59"	Long Biên	Duc Giang	192 Đức Giang	no data	C	21	210	Joint stock company	0103007195 & 3/7/2008	no data	2005	Nguyễn Thị Thúy Hằn/ 0988272526/thuyhan1486@gmail.com	0436557830/04365578	17,600	250
2		no data	144 Đức Giang, Đức Giang ward	21°04'05"	105°52'58"	Long Biên	Duc Giang	144 Đức Giang	no data	C	25	251	Limited company	0102001480 & 06/06/2008	no data	2000	Nguyễn Thị Ngọc/ 0438770906	0438770906/04365586	1,557	40
3		no data	No. 7-9 Nguyễn Văn Linh, Gia Thụy ward	21°03'08"	105°53'31"	Long Biên	Gia Thuy	Số 7-9 Nguyễn Văn Linh P. Gia Thụy	no data	G	46	469	Joint stock company	0102305191 & 19/5/2007	no data	2011	Nguyễn Ngọc Thủy /0987897563	0462888555/04362888 56	46,399	33
4		no data	No. 7-9 Nguyễn Văn Linh, Gia Thụy ward	21°03'00"	105°53'36"	Long Biên	Gia Thuy	Số 7-9 Nguyễn Văn Linh, Gia Thụy	no data	G	45	451	Limited company	0104069006 & 21/10/2010	no data	2010	Vũ Hồng Đăng/0916095868	0462777999/04627779 98	10,000	160
5		Stop operation	No. 1 of 196 alley, Nguyễn Sơn, Bồ Đề ward, Long Biên	21°02'38"	105°52'48"	Long Biên	Bo De	196 Nguyễn Sơn	no data	C	17	170	Cooperation group	no data	no data	no data	no data	no data	no data	no data
6		no data	No. 200 Nguyễn Sơn, Bồ Đề	21°02'27"	105°52'49"	Long Biên	Bo De	Số 200 phố Nguyễn Sơn	no data	C	18	181	Joint stock company	100108014	no data	1985	no data	0438272851/04387253 72	5,103	188
7		no data	670 Ngô Gia Tự, Đức Giang ward	21°04'23"	105°54'31"	Long Biên	Duc Giang	670 Ngô Gia Tự	no data	C	17	170	Limited company	0102002805 & 14/5/2001	no data	2006	Nguyễn Thanh Tú sơn0984110660/thanh	0438776946/04336522 593	3,000	55
8		no data	Vũ Xuân Thiều, group no. 19, Phúc Lợi ward, Head office: 164 Tôn Đức	21°02'06"	105°55'04"	Long Biên	Phuc Loi	301 Vũ Xuân Thiều	no data	S	96	962	Joint stock company	0110320000106 & 30/9/2011	no data	2003	no data	0437321298/04382335 54	3,000	47
9		Going to stop operation	No. 122 Vũ Xuân Thiều, Phúc Lợi ward	21°02'07"	105°55'13"	Long Biên	Phuc Loi	122 Vũ Xuân Thiều	no data	C	10	107	Limited company	044960 & 10/9/1993	no data	1996	Đinh Văn Thanh/0168654426 8	0438276047/04387509 23	15,391	42
10		no data	301-303 Vũ Xuân Thiều, Long Biên	21°02'07"	105°55'08"	Long Biên	Phuc Loi	301 Vũ Xuân Thiều	no data	C	14	141	Limited company	053150 & 10/10/1997	no data	2003	no data	0438750856/04387547 70	2,700	120
11		Waste transportation only, no industrial	No. 666 Ngô Gia Tự, Đức Giang	21°04'13"	105°54'21"	Long Biên	Duc Giang	666 Ngô Gia Tự	no data	E	38	381	Joint stock company	no data	no data	no data	no data	no data	no data	no data
12		no data	672 Ngô Gia Tự, Đức Giang	21°04'23"	105°54'38"	Long Biên	Duc Giang	672 Ngô Gia Tự	no data	H	52	521	Joint stock company	0100100216 & 25/05/2012	no data	2004	Nguyễn văn Khoa/0904652010	0422103911/04365242 47	10,480	577
13		no data	672 Ngô Gia Tự, P.Đức Giang	21°04'31"	105°54'35"	Long Biên	Duc Giang	672 Ngô Gia Tự	no data	C	17	170	State company	no data	no data	1957	Đinh Thanh Tú sơn0989125545/thanhtrunq@yaoo.com	0438271440/04382716 07	70,000	500
14		no data	No. 670, Ngô Gia tự, Đức Giang	21°4'28"	105°54'30"	Long Biên	Duc Giang	670 Ngô Gia Tự	no data	C	16	162	Joint stock company	0103000719 & 2/1/2002	no data	Before 1999	Nguyễn Văn Tuấn/62610028	0462610026/04382715 21	40,000	400
15		no data	Việt Hưng New Town	21°03'46"	105°53'58"	Long Biên	Viet Hung	Viet Hung new town	no data	F	41	410	Limited company	0100106144 & 2/6/2011	Prime Minister granted 25/3/2004	2004	no data	0438778388/04387752 90	185,8 ha	6000 resident population
16		no wastewater, maybe need to be interviewed	Group no. 1 Lâm Du, Bồ Đề	no data	no data	Long Biên	Bo De	group 1, Lâm Du	no data	C	20	202	Joint stock company	no data	no data	no data	no data	no data	no data	no data
17		Stop operation since 2008	Lâm Du village, Bồ Đề ward	no data	no data	Long Biên	Bo De	Lâm Du	no data	C	15	151	Limited company	no data	no data	no data	no data	no data	no data	no data
18		no data	467 Nguyễn Văn Linh, Phúc Đồng, Phúc Đồng ward	21°01'58"	105°54'31"	Long Biên	Phuc Dong	467 Nguyễn Văn Linh	no data	G	45	451	Limited company	0105525484 & 23/5/2011	no data	2012	no data	04-3671002/04-3671003	1,800	26
19		no data	alley 467, Nguyễn Văn Linh road, Sài Đồng ward, Long Biên, Hà Nội	21°02'05"	105°54'34"	Long Biên	Sai Dong	467, đường Nguyễn Văn Linh	no data	Q	86	861	State Health Care Unit	no data	no data	1963	no data	04.38750268/04.38750 268	28,762	348
20		no data	Sài Đồng street – Sài Đồng ward	21°02'10"	105°55'05"	Long Biên	Sai Dong	Sai Dong	no data	C	25	251	Joint stock company	0103028237 & 14/10/2011	no data	1969	Phạm Văn Phong/0989731611	04.38759304/04.38276 670	25,000	2100
21		no data	No. 7 Bằng Lăng 1 road, Vincom Village, Phúc Lợi ward	21°03'04"	105°54'40"	Long Biên	Phuc Loi	Số 7 đường Bằng Lă ng 1, Khu đô thị sinh	no data	F	41	410	Joint stock company	0104179545 & 17/5/2009	no data	2011	Nguyễn Duy Trường/01698139456	01698139456	191 ha	700
22		no data	Nguyễn Văn Linh road, Sài Đồng ward (Sài Đồng A)	21°02'18"	105°54'53"	Long Biên	Sai Dong	Nguyễn Văn Linh	no data	C	29	293	Limited company	no data	01102200014 6 UBND TP Hà	1997	Đỗ Hoàng Hải/0966366868	38750859/ 38750864	41,500	1300
23		no data	23 alley no. 200, Nguyễn Sơn road, Bồ Đề ward	21°02'25"	105°52'47"	Long Biên	Bo De	200 Nguyen Son	no data	Q	86	no data	State Health Care Unit	no data	no data	2001	no data	38730218/38723948	11,324	50
24		NO industrial wastewater	Gia Lâm airport - Nguyễn Sơn road, Bồ Đề ward	21°02'30"	105°52'52"	Long Biên	Bo De	Gia Lam Aiport, Nguyen Son	no data	C	22	222	Joint stock company	no data	no data	1989	no data	38733179/38730769	13,000	300
25		no data	No. 54 Trường Lâm St., Đức Giang ward	21°03'40"	105°53'51"	Long Biên	Duc Giang	54 Trường Lâm	no data	Q	86	861	State Hospital	no data	no data	1963	no data	3827 2075	34,550	389
26		no data	18/44 - Đức Giang St. Đức Giang ward	21°04'13"	105°53'11"	Long Biên	Duc Giang	18/44 - Phố Đức Giang	no data	C	20	201	Joint stock company	0103003850 & 05/11/2008	no data	1996	Trần Minh Tuấn/09044373748	38271620/38271068	4,850	240
27		no data	Vũ Xuân Thiều St., Group 19, Phúc Lợi	21°02'14.75"	105°55'1.75"	Long Biên	Phuc loi	Vu Xuan Thieu	no data	C	22	222	Joint stock company	0103027615 & 31/10/2008	no data	1972	Nguyễn Việt Hương/ 0438756890	38756889/38756884	19,880	946
28		no data	Hà Nội- Đài Tư IP, 386 Nguyễn Văn Linh, Phúc Lợi, Quận Long Biên	21°1'56"	105°55'54"	Long Biên	Phuc loi	386 Nguyễn Văn Linh	no data	F	41	410	PMU	no data	1538/GP-DC2, MPI, 10/5/2005	2005	Bùi thọ Khang/0982096725	0438757965/ 0982096725	400,000	26
29		no data	No. 1 Nguyễn Văn Linh Gia Thụy ward	21°03'16"	105°53'21"	Long Biên	Gia Thuy	1 Nguyễn Văn Linh	no data	G	45	451	Joint stock company	0102817023 & 12/7/2008	no data	2011	no data	38736097/38736097	1,000	60
30		no data	No. 2A Ngô Gia Tự Gia Thụy ward	21°03'20"	105°53'22"	Long Biên	Gia Thuy	2A Ngô Gia Tự	no data	G	45	451	Joint stock company	3600252847 & 21/11/2011	no data	2007	no data	38773989/38271902	2,057	74
31		no data	551 Nguyễn Văn Cừ Gia Thụy ward	21°02'01"	105°52'49"	Long Biên	Gia Thuy	551 Nguyễn Văn Cừ	no data	H	52	521	State company	011600139 & 30/6/2009	no data	1905	no data	3650/3336/38771370	203,861	352
32		no data	Group 4, Thạch Bàn ward	21°01'32"	105°54'43"	Long Biên	Thach Ban	4th Group of Thach Ban	no data	C	23	239	Joint stock company	0100107444 & 26/12/2011	no data	1996	Trần Huy Nam/ 0912307333/namthachban.com.vn	36756653/36756654	10,000	260
33		no data	No. 211 Ngọc Lâm, Ngọc Lâm ward	20°59'00"	105°56'34"	Long Biên	Ngoc Lam	211 Ngọc Lam	no data	E	38	381	State company	1547/QĐ-UB & 04/8/1994	no data	1994	no data	38273643/38766917	140,000	25
34		8h30 & 02/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01' 33.6"	105°54'03.4"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	26	261	Joint stock company	no data	103017397, Hanoi Department of	no data	Nguyễn Thái Chiến/ 09262628	38754046/ 36752220	7,000	58
35		10h30 & 02/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'43.1"	105°54'07.6"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	20	2023	Limited company	0101048047 & 17/8/2010	no data	2008	no	3776 1445/37761448	2,090	25
36		14h00 & 02/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'37.2"	105°54'05.6"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	D	35	352	Limited company	0100963798 & 18/11/2010	no data	2001	no	38752674/36756666	9,800	150
37		15h30 & 02/10/2012	B3-CN4, Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'41.9"	105°54'10.3"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	21	210	Limited company	no data	08/GP-KCN-HN, Hanoi	2001	Đỗ Lệ Vân/ 38752066	38752066/38750262	3,040	100
38		8h30 & 03/10/2012	B15-CN6, Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'37.7"	105°54'04.4"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	22	222	Joint stock company	0100738312 & 29/6/2010	no data	2000	Biện Hồng Nhung/ 0904817779	38753213/38752436	not available	not available
39		10h30 & 03/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'43.3"	105°54'00"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	27	273	Limited company	no data	1588/GP Bộ kế hoạch và đầu tư &	1997	Phan Văn Thắng/ 0903461918	38750511/38751617	28,023	4112
40		14h00 & 03/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'39.5"	105°54'01.9"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	14	141	Joint Venture Co.	no data	18/GP-KCN-HN Hanoi	2001	Võ Trọng Hùng/ 0983317858	36750218/38750429	not available	600
41		15h30 & 03/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'39.5"	105°54'09.2"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	10	108	Limited company	no data	0120230001 17 Hanoi	2001	Nguyễn Thị Hải/ 0912482037	38752972/38752972	not available	not available
42		8h30 & 04/10/2012	Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'36"	105°54'01.2"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	F	41	410	Joint stock company	0103003228 & 07/5/2004	no data	2003	Nguyễn Tiến Đoàn/ 0978697657	36752663/36756092	not available	25
43		10h30 & 04/10/2012	Lot 6, Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'35.9"	105°54'08.4"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	17	170	Company with 100% foreign capital	no data	0120430000 83 Hanoi	2007	no data	8751792/38751786	20,016	350
44		14h00 & 04/10/2012	Lot B7, Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'37.7"	105°54'12.7"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	11	110	Limited company	no data	0120220000 10 Hanoi	2000	no data	38752326/ 38752327	not available	6
45		15h30 & 04/10/2012	B17-CN6-Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'40.4"	105°53'59.0"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	22	222	Company with 100% foreign capital	38/GPDC2-KCNHN 22/8/2005	no data	2003	Mai Tùng Lâm/ 0919637289	36750915/36750890	3,998	90
46		8h30 & 05/10/2012	lot 7- Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'44.0"	105°54'16.0"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	26	267	Limited company	no data	0120430001 28 Hanoi	1996	Bùi Thị Huyền/ 0972216276	38750418/38750421	35,000	1200
47		10h30 & 05/10/2012	Lot A6-CN4-Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'44.3"	105°54'06.5"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	24	243	Limited company	no data	1204300012 0 Hanoi	no data	Vũ Đức Thành	38759759/38759889	600	350
48		14h00 & 05/10/2012	Lot 18-CN6-Sai Dong B Industrial Park, Long Bien district, Ha Noi	21°01'39"	105°54'01.7"	Long Biên	Sai Dong	Sai Dong	Sai Dong IP	C	10	107	Joint stock company	0113000055 & 04/8/2009	no data	2002	Vũ Văn Tuyển/38754091	38754091	8,000	120

Source: JET

◆ PSI (II) (Portion of Environmental Permits, Water Supply, Water Use, and Production Process)

	I. Enterprise information	II. Environmental permits		III. Water supply				IV. Water use (Production	V. Water use (Domestic use)	VI. Others (m3/day)		VII. Production process				
	Name of enterprises (EN)	1. Type of environmental permits (EIA, EPP, certificate of registration of environmental standards, certificate of registration of EPC, No environmental permits)	2. Acceptance certificate of wastewater treatment system	1. Major water resources (well, rain water, supply water, others)	2. Water consumption			1. Water consumption for production process actual (m^3/day)	1. Water consumption for domestic use actual (m^3/day)	1. Water consumption for other uses (Purpose of use)	2. Amount of use (m^3/day)	1. Major products	2. Amount of products	3. Operation days (day/year)	4. Major raw materials/chemicals (1) Kinds of raw materials/ (2) Consumption of major raw materials/chemicals (Kg/day)	5. Energy/Fuels for production 1) Kinds of energy/fuels/ 2) Consumption of energy/fuels
					1) Public water supply	2) Groundwater (m3/day)	3) Others	4. Total amount of used water								
1		EIA	no	supply water and groundwater	100	20	0	120	117	3	no data	no data	Chemico - Pharmaceutical manufacturing	pharmaceutical and drugs: Bary sulfate, Magnesi	no data	Pharmaceuticals / input / 5 ton/month/2012; Salt / input / 2 ton/month/2012; turpentine / input / 6	Coal / boiler / 40 ton/month/2012
2		EPC	no	Supply water	1.2	0	0	1.2	0	1/1.2	no data	no data	Mechanical and Electrical Equipment manufacturing	Mechanical product unit/20 unit/year/2011	no data	Steel/200 ton/year/2011; rods welding / 2 ton/year/2011; paint/500kg/year/2011	Gas / cut slightly / 780 kg/month/2011; Electrical / Welding / 30000 kWh/month/2011
3		EIA	no	Supply water	148	0	0	148	no data	no data	business services	148	Supermarket, general business, trade	no data	no data	no data	Electric/400000kWh/month/2012
4		EIA	no	Supply water	9	0	0	9	7	2	no data	no data	Business, automobile maintenance and repair	maintenance and repairs / 500 vehicles / year/2011	no data	Paint/painting cars/200 l/month; Paint solvent/100 l/month; oil/ 1600 l/month/2012	20000/30000 kWh/month/2012
5		no data	no data	no data	0	0	0	0	no data	no data	no data	no data	no data	no data	no data	no data	no data
6		EPP	no	Supply water	14	0	0	14	no data	14	no data	no data	Ticket printing, package printing, business printing	garbage bags / 1003393 pcs / year; labels / label 7673400 /	no data	Paper/530 ton/year/2011; ink/5,6 ton/year/2011	FO/2119 l/year/2011; industrial alcohol / 2200 l/year/2011; gasoline 240 l/year/2011 /electric/ 37
7		no	no	Supply water	25	0	0	25	no data	25	no data	no data	paper manufacturing	no data	no data	waste paper/300 ton/month/2012	boiler/ 500 ton/month
8		registration of environmental standar	no	Well (groundwater)	0	8	0	8	8	8	no data	no data	washing	no data	no data	Soft glue 270 kg/month/2012; dyes/5kg/month/2012; Alumi/45 kg/month	FO/8,4 ton/month/2012
9		registration of environmental standar	no	Well (groundwater)	0	80	0	80	74	6	no data	no data	beer manufacturing	10000000 l beer / year/2011	no data	Houblon /manufacturing beer; Malt / rice manufacturing beer	Enzyme, H3PO4, CaCl2, Coal/beer manufacture
10		no	no	Others: Bottled water	0	0	0	0	no data	1	no data	no data	garment industry	no data	no data	fabric, yarn, buttons, buckles / Garment processing according to customer requirements	no data
11		no data	no data	no data	0	0	0	0	no data	no data	no data	no data	no data	no data	no data	no data	no data
12		EPC	no	supply water and groundwater	15	25	0	40	15	25	no data	no data	manufacturing notebooks, pens, paper, stationery	no data	no data	toner, paint, oil, glue	DO/667 l/month; electric/110731 kWh/month/2012
13		EIA	no	Well (groundwater)	0	750	0	750	no data	no data	no data	no data	plywood, tissue paper	no data	no data	thin plywood,230 m3/month; Pulp /350 ton/month; tissue paper /600 ton/month/2012	Coal/8000000kg/month/2012
14		EIA	no	supply water and groundwater	0	100	0	over 100	no data	no data	no data	no data	matches and corrugated cardboard packaging	no data	no data	Wood/Matches manufacture/2500 m3/year; KClO3/60 ton/year; S/5 ton/year; H3PO4/3	no data
15		EIA	no	Well (groundwater)	3000	0	0	3000	no data	1990	no data	no data	Building construction	no data	no data	no data	no data
16		no data	no data	no data	0	0	0	0	no data	no data	no data	no data	no data	no data	no data	no data	no data
17		no data	no data	no data	0	0	0	0	no data	no data	no data	no data	no data	no data	no data	no data	no data
18		EPC	no	supply water	9	0	0	9	1 (month 6/2012)	2 (6/2012)	no data	no data	automobile maintenance and repair	vehicle repair and maintenance / 90 cars /	no data	Paint/20 kg/month; soap powder/2 kg/month	lubricants / 100 l / month; gasoline / 15 l / month;
19		EIA	no	supply water	95	0	0	95	no data	no data	no data	no data	Health and mental health care	examination / 1100 people / month/2012; treated / 600	no data	Water filter/130 l/year/2012; Chloramin B/disinfection/20 kg/month/2012	Gas/1200 kg/month/2012
20		EIA	no	supply water	0	0	0	928 - 1074	no data	no data	no data	no data	Mechanical Manufacture	no data	no data	Steel /285000 kg/month; H2SO4/460 kg/month; PAC/600 kg/month; Zn/ 1258 kg/month;	DO/3000 l/month; Gas/36000 kg/month
21		EIA	no	supply water	3000	0	0	3000	no data	no data	no data	no data	Construction, real estate business	no data	no data	no data	no data
22		EIA	no	supply water	460	0	0	460	400	110	no data	no data	Mechanical Manufacture	motorcycle parts / 40,000 / day; cars exhaust / 5400 sets	no data	Steel /50800 kg/day ; Nikasi/ 0.59 ton/day; H2SO4/5.675 kg/month; NaOH/8.150 kg/month,	electric/57,000kWh/day / 2011; LPG 2.3 ton/day
23		no	no	supply water	14	0	0	14	no data	14	no data	no data	aviation medical	25 patients/day/2011	no data	Water film; Chloramin B/disinfection	no data
24		EPP	no	supply water	0	0	0	0	no data	no data	no data	no data	High quality plastic manufacturing and business	no data	no data	Plastic PS/300000 kg/month; membrane PVC/3000 kg/month/2012	lubricants/ 300 l/month /2012
25		no	no	supply water	135	0	0	135	60	75	no data	no data	Public health care	examination / 19000 people / month/2011; treated /2400	no data	Chloramin/ disinfection/100 kg/month/2011; NaCO 170 l/month/2011	DO/100 l/month /2011
26		EIA	no	Well (groundwater)	0	100-120	0	120-160	90-120	30	no data	no data	Chemical manufacture	Detergent / 3600 ton / year; fuaming / 3600 ton / year	no data	SB40 ton/year; Na2CO3/ 216 ton/year; Na2SO4/2952 ton/year/2012	DO/200-250 l/month /2012
27		EIA	no	Well (groundwater)	0	698	0	698	no data	no data	sanitary water systems	no data	Manufacturing and trading of industrial plastic products	auto parts & motorcycle / 43500000 pcs / year;	no data	Plastic PP/280000 kg/month; Plastic ABS/ 66000 kg/month; Plastic khác/ 60000 kg/month/2011	DO & FO/ 4000 l/month; Gas/ 1056 kg/month; electric/ 1047900 kWh/month
28		EIA	no data	supply water	170	0	0	170	no data	no data	no data	no data	industrial infrastructure development	no data	no data	no data	no data
29		no	no	Well (groundwater)	0	4	0	4	1	3	no data	no data	Business, automobile maintenance and repair	10 cars/month/2011	no data	Paint and solvent/car washing/ 2-5 kg/month/2012	DO, FO…
30		EPP	no	supply water	15	0	0	15	1	13	no data	no data	Business, automobile maintenance and repair	no data	no data	Paint/car repair/20 l/month;fuel/ car repair/ 20 l/month/2012	lubricant 600-1000 l/month /2012
31		EIA	no	supply water and groundwater	220	0	0	220	no data	no data	no data	no data	building design and repair of train cars	no data	no data	Steel/30592 kg/month; cast iron/2197 kg/month; paint 250 kg/month	DO/810 l/month; Gas/ 320 l/month; Coal/ 6660 kg/month; wood/ 1.66 m3/month
32		EIA	no	supply water and groundwater,	0	500	0	750 to 900	450	50	reused ww for manufacture	no data	Building material manufacture	ceramic tiles/1500000 m2/ year/2012	no data	clay / 14074 ton / year; kaolin / 7771 ton / year / 2011	Electric/ 10000000 kwh/year; DO/ 18305 l/year; gas/2181 ton/year
33		EIA	no	Well (groundwater)	0	70	0	70	60-70	no data	no data	no data	Domestic solid waste treatment	Domestic solid waste treatment/200-300	no data	Waste / landfill / 120 ton / day ; composting/50 ton/day/2012	no data
34		EIA	no	supply water	20	0	0	20	0	20	no	no	high-tech electronics manufacturing	STB/12000/unit/year/2011; TV	no data	electronic detail/254000 unit/year of 2011	no data
35		EPC	no	supply water	20	0	0	20	6	14	no	no	Cosmetic	Cosmetics 10 ton/month	no data	surface-active substances / 150 kg-month/2011; zoline/300 kg-month/2011	DO/25 lit/month
36		EPP	no	supply water	30	0	0	30	0	30	no	no	Gas	no data	no data	LPG/ 2500 ton / month; painted foam 500 kg / month	no data
37		Certificate of registration of environmental standards	no	supply water	6	0	0	6	0	6	no	no	Chemico - Pharmaceutical manufacturing	no data	no data	Stationery / no data	no data
38		EPP	no	supply water	150	0	0	150	30	120	no	no	plastic foam	Foam 574000 kg/year; Plastic 595000 kg/year;	no data	Foam particle 611 000 kg / year; Plastic particle 480 000 kg / year, PET membrane /1256	Lubricating oil 2100 l / 6 months; Coal burning boiler 2,759.230 kg / 6 months
39		EIA & Certificate of registration of environmental standards	no	supply water	230	0	0	230	0	230	no	no data	electric wiring system	Electrical wiring for the motor 2 KMH; automotive	no data	plastic connector 7518000 units / year; wire 34235500 m / year; plate PVC 916 rolls / year	no data
40		EPC	no	supply water	70	0	0	70	0	70	no	no data	garment industry	Clothes product 600000 product unit/year	no data	not available	no data
41		Certificate of registration of environmental standards	no	supply water	70	0	0	70	no data	70	no	no data	animal feed	no data	no data	Corn 20000 ton / year; Cassava 8000 ton / year; rice bran 3000 ton / year/ 2011	FO/1000 ton/month ; gas 250 kg/year 2011
42		EPP	no	Well (groundwater)	0	2000	0	2000	2000	no data	no	no data	Water supply	no data	no data	Alum, chlorine	no data
43		EPC	no	supply water	135	0	0	135	80	55	no	no data	paper manufacturing	carton 7800 ton / year (2011); Paper Tray 6 ton /	no data	Paper roll 27 ton/day; NaOH 1 ton/month; PAC 590 kg/month; H2O2/ 87 kg/month ; year 2011	DO 37 932 liter / month; FO / boiler / 59,973 liter / month; Lubricant 40 liter / month
44		Certificate of registration of environmental standards	no	supply water	0	0	0	1,5 m3/month	no data	no data	no	no data	Production of pure water and water filter assembly	no data	no data	fresh water 1,5 m3/month (2011)	no data
45		EPC	no	supply water	43	0	0	43	30	13	no	no data	Manufacture of plastic injection mold, processing	no data	no data	Plastic 17000 kg / month (2011); Iron 300 kg / month; Carton 300 kg / month; nylon 50 kg /	no data
		EIA & Certificate of registration of											Assembly and production of			Absorbin 19000 kg/year; PAA 85 200 kg/year;	

Source: JET

◆ PSI (III) (Portion of Wastewater from Production Process and Wastewater from Domestic Use)

	I. Enterprise information	VIII. Waste water (WW) from production process												IX. Wastewater from domestic usage						
	Name of enterprises (EN)	1. Generation rate of WW from production process (m^3/day)	2. WW treatment (Treated, Not-treated)	3. Amount of WW treated (m^3/day)	4. Treatment facility								5. Discharging to	1. Generation rate of domestic WW (m^3/day)	2. WW treatment (Treated, Not-treated)	3. Amount of WW treated (m^3/day)	4. Treatment facility (note 2)			5. Destination of wastewater
					1) Type of the facility	2) Designed capacity of wastewater facility:	3) Condition of treatment facility	4) Budget to operate the WW treatment facility	5) Does enterprise allocate full-time operation manager of WW treatment	6) Certificate of registration of WW discharge permit (Yes/No)	7) Payment of WW discharge fee (Yes/No)	8) Record of operation of WW treatment facility (Yes/No)					1) Type of the facility	2) Designed capacity of wastewater facility	3) Condition of treatment facility	
1		40/50	Treated	40/50	A, J, SE, D, E	50/90	Batch treatment	no data	yes	yes (200/GP-STNMT Sc.TNMT	yes	yes	Sewerage network	3	yes	no data	Sand filtration	no data	Batch treatment	Sewerage network
2		5	no data	no data	K- Anaerobic digestion	no data	Continuously	no data	no	no	no data	no data	Sewerage network	no data	yes	no data	K- Anaerobic digestion	0.8/1.0	Continuously	Sewerage network
3		no data	no data	no data	A, J, G, SE, K, F, C	no data	Continuously	no data	yes; Phạm Việt Long/0904136985	yes (43/GP-STNMT-	yes	yes	Sewerage network/ditch of	145	yes	no data	A, J, G, SE, K, F, C	145	Continuously	Sewerage network/ditch of
4			Treated	no data	A, J, G, SE, K, F, C	WWTP of SAVICO	Continuously	no data	no	no	yes	yes	Sewerage network, and WWTP of	1.5	yes	no data	WWTP of SAVICO	WWTP of SAVICO	Continuously	Sewerage network, and WWTP of
5		no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
6		5	Not-trusted	no data	no	no data	Batch treatment	no data	no	no	yes	no	Sewerage network	14	yes	14	K- Anaerobic digestion	14	Batch treatment	Sewerage network
7		no data	no data	no data	no	WWTP of Thong Nhat Match JSC	no data	no data	no data	no	no	no data	no data	7	yes	no data	no data	WWTP of Thống Nhất matches JSC	no data	no data
8			Treated	8	A, GR, A, J, L, SE,	no data	Batch treatment	no data	no data	yes (license No. 2218/QD-UBND)	no	no data	Cầu bậy river	no data	no data	no data	no data	no data	no data	Cầu bậy river
9		36	Treated	36	SE	no data	Batch treatment	no data	Đoàn Văn Thanh/01686544268	yes (license No. 2578/QD-UBND)	no data	no data	Sewerage network	5	yes	5	K- Anaerobic digestion	no data	Batch treatment	Sewerage network
10		no data	no data	no data	no	no data	no data	no data	no data	no	no	no data	Cầu bậy river	no data	no data	no data	K- Anaerobic digestion	no data	no data	Cầu bậy river
11		no data	no data	no data	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
12		15	Treated	15	A, SE, D	15	Batch treatment	no data	no data	yes (4185/QD-UBND)	yes	no data	Sewerage network/ditch of	10	yes	no data	A, SE	40	Batch treatment	Sewerage network/ditch of
13		700	Treated	700	A, J (1, 2), SE (1, 2),	700	Batch treatment	no data	no	yes (116/QD-STNMT)	yes	no data	Sewerage network/ditch of	12	yes	no data	mixed for treating in IWWTF	mixed for treating in IWWTF	Batch treatment	Sewerage network/ditch of
14		300	Not-trusted	no data	No	no data	no data	no data	no data	yes	yes	no data	Sewerage network/ditch of	no data	no	no data	no data	no data	no data	Sewerage network/ditch of
15		no data	no data	no data	no	no data	no data	no data	no data	yes (114/GP-TNMT-	yes	no data	Sewerage network/ditch of	1990	yes	no data	K- Anaerobic digestion	7660 (preparing for building construction	no data	Sewerage network/ditch of
16		no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
17		no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
18		0.5 (month 6/2012)	Treated	0,5 (9-30/6/2012); 1	SE, F	2	Continuously	no data	no	no	no	no data	Sewerage network	no data	yes	2,4 (09/6/2012); 1,6 (9-30/6/2012;	K- Anaerobic digestion	6 - 7 m3/ng	Continuously	Sewerage network
19		no data	no data	no data	no	no data	Continuously	no data	no	no	no	no data	no data	no data	yes	no data	Chloramin B	no data	Continuously	no data
20		no data	Treated	no data	A, SE, GR, H, L	40 m3/h	Continuously	no data	no data	yes (31/GP-STNMT-	yes	no data	Sewerage network/ditch of	80-100	yes	no data	no data	no data	no data	Sewerage network/ditch of
21		no data	no data	no data	no	no data	no data	no data	no data	no	no	no data	Sewerage network/ditch of	no data	no	no data	no data	no data	no data	Sewerage network/ditch of
22		150	Treated	no data	A, L	no data	Batch treatment	no data	Đỗ Hoàng Hải/0966366868	yes (46/GP-STNMT-	yes	no data	Sewerage network/ditch of	110	yes	no data	G, J	no data	Batch treatment	Sewerage network/ditch of
23		no data	no data	no data	no	no data	no data	no data	no	no	no	no	no data	10	yes	no data	K-SE	no data	Continuously	no data
24		no data	no data	no data	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
25		no data	Treated	no data	L	no data	Continuously	no data	no	no	no	no	Sewerage network/ditch of	70	yes	no data	K, SE	no data	Continuously	Sewerage network/ditch of
26		10 to 20	Treated	30	A, D, SE	30	Batch treatment	no data	yes, Trần Minh Tuấn/0904127248	yes (1939/QD-UBND)	yes	no	Sewerage network/ditch of	20	yes	no data	A, D, SE, K	no data	Batch treatment	Sewerage network/ditch of
27		no data	Not-trusted	no data	no data	no data	no data	no data	yes, Nguyễn Việt Hương	yes (89/GP-STNMT-TNN)	yes	no data	Sewerage network/ditch of	no data	yes	no data	K, SE	no data	Continuously	Sewerage network/ditch of
28		no data	no data	no data	no data	no data	no data	no data	yes, Nguyễn thị Thiều/ 0165205144	yes (214/GP-STNMT-TNN)	yes	no data	Sewerage network/ditch of	no data	yes	no data	no data	no data	no data	Sewerage network/ditch of
29		18	Not-trusted	no data	no	no data	no data	no data	no	no	no	no data	Sewerage network	no data	yes	no data	septic tank	no data	Continuously	Sewerage network
30		no data	Treated	no data	SE, E	1 to 3	Batch treatment	no data	no	no	no	no data	Sewerage network	12	yes	no data	septic tank	no data	Continuously	Sewerage network
31		no data	Treated	no data	A, D, SE	160	Continuously	no data	no	yes (62/GP-STNMT-TNN)	yes	no data	Gia Thụy pond	no data	no data	no data	no data	no data	no data	Gia Thụy pond
32		450 to 500	Treated	450-500	GR, SE	no data	Continuously	no data	yes, Trần Huy Nam 0912507233/namthe	no data	no	no data	Sewerage network	20 - 30	yes	no data	SE, K	no data	Continuously	Sewerage network
33		no data	Treated	0-150	A, H, K, G, SE	0 to 150	Continuously	no data	yes, Nguyễn Thị Ngọ y/ 0123689287	yes (96/GP-TNMT-TNN)	no	no data	Cầu bậy river	no data	yes	no data	SE, K	no data	Continuously	Cầu bậy river
34		no	Not-trusted	no data	no data	no	no	no	no	yes (2891/QD-UBND Long Bien	yes	no	no data	20	yes	no data	SE	no data	no	Sewerage network
35		4	Treated	4	F- Oil separator	5 m3/h	Batch treatment	no data	no	no	no	no	drainage system outside the plant	12	no	no	no	no data	Batch treatment	drainage system outside the plant
36		no data	Not-trusted	no	no	no	no	no	no	no	yes	no	no	24	no	no data	no data	no data	no	drainage system outside the plant
37		no	Not-trusted	no	no	no	no	no	no	no	no	no	no	4	no	no	no	no data	no	drainage system outside the plant
38		80	Treated	20	A	20/80	Continuously	no data	Trần Anh Tuấn/ 0936552858	yes	yes	no	drainage system outside the plant	120	no	no data	no	no	no data	drainage system outside the plant
39		no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	drainage system outside the plant
40		no data	no data	no data	no data	no data	no	no data	no	409/QD-UBND Long Bien District &	no	no	no data	40	no	no data	no data	no data	no	drainage system outside the plant
41		no	no data	no data	no data	no data	no data	no data	no	423/QD-UBND Long Bien District	no	no data	no data	9	no	no data	no data	no data	no data	drainage system outside the plant
42		no data	Treated	no data	L (pre-treated with oilsep,preliminary	not available	Batch treatment	no data	no data	no	no	no data	drainage system outside the plant	no data	no	no data	no data	no data	no data	drainage system outside the plant
43		80	Treated	no data	A; SE	80/90	Batch treatment	no data	no	124/QD-UBND Long Bien District	no data	no	drainage system outside the plant	55	yes	no data	H; SE	no data	Batch treatment	drainage system outside the plant
44		no data	no data	no data	no data	no data	no data	no data	no data	no	no	no data	no data	no data	no	no data	no data	no data	no data	drainage system outside the plant
45		19	Not-trusted	no data	no data	no data	no	no data	no data	no data	no data	no data	drainage system outside the plant	13	yes	no data	H; SE	20	no	drainage system outside the plant
46		no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	drainage system outside the plant
47		not available	Treated	no data	H	no data	no data	no data	no data	no data	no data	no data	drainage system outside the plant	no data	no data	no data	no data	no data	no data	drainage system outside the plant
48		19	Treated	40	A	40	Continuously	no data	Ngọ Văn Long	124/QD-UBND Long Bien District	yes	yes	drainage system outside the plant	10	no data	no data	no data	no data	no data	drainage system outside the plant

Source: JET

◆ PSI (IV) (Portion of Wastewater Monitoring, Results of Inspection/Checking, Sanction, and Concentration of Pollutants in Wastewater)

	I. Enterprise information	X. WW monitoring				XI. Inspection, checking results			XII. Sanction					XIII. Concentration of WW																
	Name of enterprises (EN)	1. Monitoring of WW (Regular/Irregular/ Non-monitoring)	2. Frequency of monitoring	3. Monitoring Report		1. Has the enterprise been inspected or (Yes/No)	2. Date of latest inspection or checking	3. Inspection/checking agency	1. Has the enterprise been fined (Yes/No)	2. Number of latest Decision on sanctions	3.Decision-issuing agency	4. Reason of sanction	5. Fines (VND)	1. Concentration of pollution parameters																2. Data source
				1) Frequency of preparation of the Report	2) Submission/report to:									1. pH	2. BOD (mg/l)	3. COD (mg/l)	4.TSS (mg/l)	5. Cu (mg/l)	6. Zn (mg/l)	7. Ni (mg/l)	8. Mn (mg/l)	9. Fe (mg/l)	10. Oil & Grease total	11. N-NH4 (mg/l)	12. N-total (mg/l)	13. P-total (mg/l)	14. Coliform total (MPN	15. Colour (Co-Pt)	
1		as	2 time/year	2 time/year	Hanoi DONRE	yes	12/6/2012	Hanoi DONRE	no	no	no	no	no	7.6	37	95	24	no data	0.45	no data	0.323	1.18	no data	3.27	12.5	3.27	21000	43	Sampling WW
2		as	no data	no data	no data	no	no	no	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
3		as	4 time/year	4 time/year	Hanoi DONRE	no	no	no	no	no	no	no	no	7.7	47.3	98.2	25	no data	0.67	no data	0.08	4.04	2.6	9.3	25	5.12	$6.2x10^3$	no data	Sampling WW
4		as	2 time/year	2 time/year	Hanoi DONRE	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
5		as data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
6		as	1 time/year	1 time/year	Hanoi DONRE	yes	no data	Hanoi DONRE	yes	1139/QD-XPHC dated	Inspectorates of Hanoi	Article 7, paragraph 2 of	12000000	7,2	198	725	no data	no data	no data	no data	no data	no data	2,36	12,3	no data	no data	$1,1x10^7$	191	Sampling WW
7		as	2 time/year	2 time/year	Hanoi DONRE	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
8		as	2 time/year	2 time/year	Hanoi DONRE	no	no	no	no	no	no	no	no	7,5	44	106	16	0,019	0,050	0,226	0,414	3,52	1,7	16,9	32,8	1,45	$4,6x10^3$	8	Sampling WW
9		as data	no data	no data	no data	yes	no data	Hanoi DONRE	no data	no data	no data	no data	no data	7,2	43	115	no data	no data	no data	no data	no data	no data	no data	1.7	11.6	1.25	23000	no data	Sampling WW
10		as	no data	no data	no data	no	no	no	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
11		as data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
12		as	2	2	Hanoi DONRE	yes	29/11/2011	Hanoi DONRE	no	no	no	no	no	7,5	19	48	17	0,028	0,188	0,0057	0,533	2,5	0,4	6,4	11,3	1,7	$1,1x10^4$	no data	Sampling WW
13		as	2	2	Hanoi DONRE	no data	no data	no data	no data	no data	no data	no data	no data	7,5	67	221	52	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	45	Sampling WW
14		as	no data	no data	Hanoi DONRE	yes	no data	no data	no data	no data	no data	no data	no data	7,2	59	145	122	no data	no data	no data	no data	no data	no data	4,8	16.5	7,1	$1,5x10^4$	32	Sampling WW
15		as	2	2	Hanoi DONRE	no	no	no	no	no	no	no	no	7,5	26	no data	12	no data	no data	no data	no data	no data	1,5	6,8	no data	1,44	$4,1x10^3$	no data	Sampling WW
16		as data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
17		as data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
18		as	2	2	Hanoi DONRE	no	no data	no data	no	no	no	no	no	7,5	116	390	no data	no data	no data	no data	no data	no data	no data	1,6	26.5	1,6	$4,3x10^3$	no data	Sampling WW
19		as	no data	no data	no data	no data	no data	no data	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
20		as	2	2	Hanoi DONRE	no	no data	no data	no	no	no	no	no	6,8	81	216	32	0,034	0,213	0,0112	0,107	2,95	0,7	21,5	41,2	4,8	$3,8x10^4$	63	Sampling WW
21		as	2	2	Hanoi DONRE	no	no data	no data	no	no	no	no	no	7,9	42	no data	50	no data	no data	no data	no data	no data	3,6	10,1	no data	1,5	$1,4x10^4$	no data	Sampling WW
22		as	3	3	Hanoi DONRE	yes	no data	no data	no	no	no	no	no	7,7	28	71	19	<0,005	0,032	0,0149	0,036	0,28	<0,2	3,2	16.5	2,54	$1,1x10^4$	10	Sampling WW
23		as	no data	no data	no data	yes	no data	no data	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
24		as	2	2	Hanoi DONRE	no	no data	no data	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
25		as	2	2	Hanoi DONRE	yes	no data	no data	no	no	no	no	no	7,8	121	278	323	no data	no data	no data	no data	no data	11,5	12,8	no data	0,84	$4,2x10^4$	no data	Sampling WW
26		as	2	2	Hanoi DONRE	yes	no data	no data	no	no	no	no	no	6.8	25	63	37	0,007	no data	no data	0.071	5.4	no data	4.1	no data	5,2	11000	no data	no data
27		as	2	2	Hanoi DONRE	yes	no data	Hanoi DONRE	no	no	no	no	no	6,9	53	117	46	no data	no data	no data	no data	no data	no data	11,3	no data	no data	$2,2x10^4$	no data	Sampling WW
28		as	4	4	Hanoi DONRE	yes	no data	Hanoi DONRE	no	no	no	no	no	8,1	32	76	13	no data	no data	no data	no data	no data	no data	0,4	13.5	1,3	$4,8x10^3$	no data	Sampling WW
29		as	no data	no data	no data	no	no data	no data	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
30		as	2	2	Hanoi DONRE	yes	no data	no data	no	no	no	no	no	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
31		as	2	2	Hanoi DONRE	yes	no data	no data	no	no	no	no	no	7,4	44	109	39	no data	no data	no data	no data	no data	no data	9,4	no data	no data	$7,5x10^3$	no data	Sampling WW
32		as	2	2	Hanoi DONRE	yes	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
33		as	4	4	Hanoi DONRE	yes	no data	Hanoi DONRE	no	no	no	no	no	7,4	109	269	35	0,031	0,053	0,024	1,225	1,15	no data	19,2	48.5	no data	$4,6x10^3$	no data	Sampling WW
34		as	2	2	Hanoi DONRE	Yes	14/9/2011	Ha Noi DONRE	No	No	No	No	No	7.1	106	no data	220	no data	no data	no data	no data	no data	0.8	no data	no data	no data	280000	no data	Monitoring report, sampled on 18 August
35		as	2	2	Hanoi DONRE	Yes	21/9/2011	Ha Noi DONRE	No	No	No	No	No	7.3	47	93	91	no data	no data	no data	no data	no data	5.7	3.9	6.2	1.6	4340	no data	Monitoring report, sampled on 28 June 2011
36		as	2	2	Hanoi DONRE	Yes	8/9/2011	Ha Noi DONRE	No	No	No	No	No	7.3	no data	no data	no data	no data	no data	no data	no data	0.08	6.86	no data	0.54	no data	no data	11000000	no data	Monitoring report, sampled on 20 May
37		as	2	2	Hanoi DONRE	Yes	15/9/2011	Ha Noi EPA	Yes	no data	no data	no data	no data	7.2	25	39.1	19	no data	no data	no data	no data	no data	4.4	no data	3.92	0.2	1200	no data	Monitoring report, sampled on 11 May
38		as	2	2	Hanoi DONRE	Yes	21/9/2011	Ha Noi DONRE	Yes	79/QD-XP & 31/3/2008	Inspectorate of the	no data	21000000	7.6	5	15	7	no data	no data	no data	no data	no data	1.2	no data	1.85	no data	900	no data	Monitoring report, sampled on 31 August
39		as data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	6.34	47	98.6	58	<0.001	0.106	<0.001	0.034	4.25	18.8	9.74	25.75	3.76	3350	no data	Monitoring report, sampled on21 June 2011
40		as	2	2	Hanoi DONRE	Yes	21/9/2011	Ha Noi DONRE	Yes	no	no data	no data	no data	6.75	27.5	46.2	42.3	no data	no data	no data	no data	no data	5.68	no data	no data	no data	4650	no data	Monitoring report, sampled on 23 June 2011
41		as	1	1	Hanoi DONRE	Yes	8/9/2011	Ha Noi DONRE	Yes	not available	not available	not available	not available	6.9	35.2	70.7	70.2	no data	no data	no data	no data	no data	4.6	no data	no data	no data	1870	no data	Monitoring report, sampled on 25 November
42		as	2	2	Hanoi DONRE	Yes	21/9/2011	Ha Noi DONRE	no	no	no	no	no	7.5	89.5	147.2	271.3	0.424	0.081	no data	no data	no data	no data	20.6	no data	no data	4200	no data	Monitoring report, sampled on 04 May
43		as	2	2	Hanoi DONRE	Yes	15/9/2011	Ha Noi DONRE	Yes	17/QD-XPHC	Police Environmental	exhaust gas	not build	87 500 000	7.2	42	91.1	84	no data	1.7	0.19	0.03	4.7	4.7	2.6	no data	5.6	3400	no data	Monitoring report, sampled on 11 July 2011
44		as	1	1	Hanoi DONRE	Yes	19/9/2011	Ha Noi EPA	Yes	not available	not available	not available	not available	7.68	43	no data	82	no data	no data	no data	no data	no data	2.32	1.13	no data	no data	5000	no data	Monitoring report, sampled on 10 September
45		as	2	2	Hanoi DONRE	Yes	8/9/2011	Ha Noi DONRE	no	no	no	no	no	6.7	49	92	48	no data	no data	no data	no data	no data	12.1	6.25	no data	6.7	4025	no data	Monitoring report, sampled on 24 June 2011
46		as	not available	not available	no data	Yes	13/9/2011	Ha Noi EPA	Yes	not available	not available	not available	not available	7.1	16.5	32	48	<0.01	no data	no data	no data	no data	<0.01	no data	no data	no data	6	no data	Monitoring report, sampled June 2011
47		as	2	2	Hanoi DONRE	Yes	7/9/2011	Ha Noi DONRE	Yes	not available	not available	not available	not available	7.3	44.8	70.1	82.1	0.14	0.87	0.3	0.03	0.36	3.3	no data	8.4	1.38	3500	no data	Monitoring report, sampled on 25 May
48		as	2	2	Hanoi DONRE	Yes	20/4/2011	Environmental Police	Yes	67/QD-XPHC & 13/7/2011	Police Environmental	discharge in excess of the	47 500 000	7.3	96	125	230	no data	1.52	0.31	0.54	2.6	4.86	18	51	11.7	4500	no data	Monitoring report, sampled on 16 May

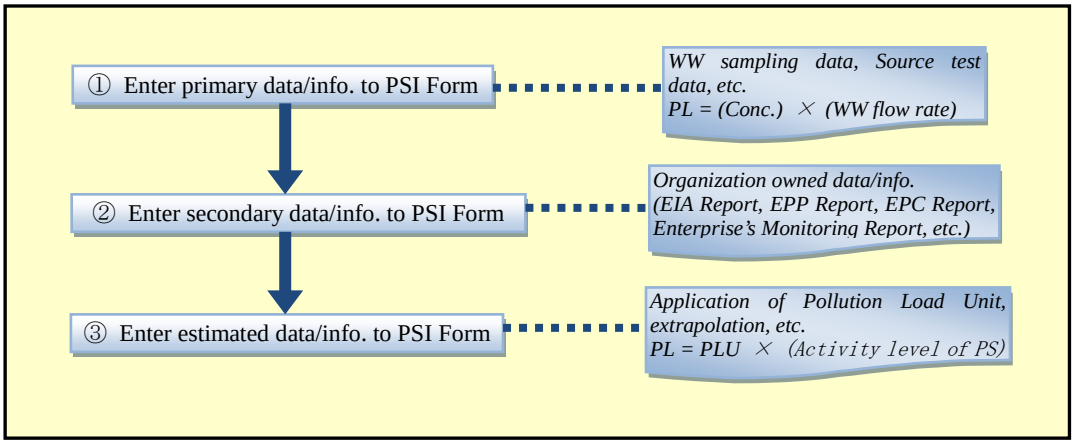
Wastewater data was obtained by WW sampling and analysis.

Wastewater data was obtained from Monitoring report.

Source: JET

(6) Calculating/Estimating Pollution Loads (PL)

The outline of the procedure for calculating and estimating pollution loads is shown below:



The PSI (IV) shown in the previous page is the PSI after entering primary data and secondary data. In case, both data of the wastewater flow rate and concentration of pollutant are available, the pollution load can be easily calculated by multiplying the wastewater flow rate by the concentration of pollutant in the wastewater. The result of COD calculation is shown below.

	I. Enterprise information				VIII. Waste water (WW) from	IX. Wastewater from domestic	XIII. Concentration of WW		PL
	Name of enterprises (EN)	5. Industrial-sector[1]			1. Generation rate of WW from production process (m^3/day)	1. Generation rate of domestic WW (m^3/day)	1. Concentration of pollution	2. Data source	WW (m^3/day) X Conc. (mg/L)
		Level 1	Level 2	Level 3			3. COD (mg/l)		COD (Kg/day)
1		C	21	210	40/50	3	95	Sampling WW	4.8
2		C	25	251	0	no data	no data	no data	0.0
3		G	46	469	no data	145	98.2	Sampling WW	14.2
4		G	45	451	6	1,5	no data	no data	
5		C	17	170	no data	no data	no data	no data	
6		C	18	181	0	14	725	Sampling WW	10.2
7		C	17	170	no data	7	no data	no data	
8				962	7	no data	106	Sampling WW	0.8
9				107	36	5	115	Sampling WW	4.1
10		C	14	141	no data	no data	no data	no data	
11		E	38	381	no data	no data	no data	no data	
12		H	52	521	15	10	48	Sampling WW	0.7
13		C	17	170	700	12	221	Sampling WW	154.7
14		C	16	162	100	no data	145	Sampling WW	14.5
15		F	41	410	no data	1990	no data	Sampling WW	
16		C	20	202	no data	no data	no data	no data	
17		C	15	151	no data	no data	no data	no data	
18		G	45	451	0,5 (month 6/2012)	no data	390	Sampling WW	0.0
19		Q	86	861	no data	no data	no data	no data	
20		C	25	251	no data	80-100	216	Sampling WW	21.6
21		F	41	410	no data	no data	no data	Sampling WW	
22		C	29	293	350	110	71	Sampling WW	32.7
23		Q	86	no data	no data	10	no data	no data	
24		C	22	222	no data	no data	no data	no data	
25		Q	86	861	no data	70	278	Sampling WW	19.5
26		C	20	201	10 to 20	20	63	no data	2.5
27		C	22	222	no data	no data	117	Sampling WW	
28		F	41	410	no data	no data	76	Sampling WW	
29		G	45	451	0.8	no data	no data	no data	
30		G	45	451	no data	12	no data	no data	
31		H	52	521	no data	no data	109	Sampling WW	
32		C	23	239	450 to 500	20 - 30	no data	no data	
33		E	38	381	no data	no data	269	Sampling WW	
34		C	26	261	no	20	no data	Monitoring report, sampled on 18 August	
35		C	20	2023	4	12	93	Monitoring report, sampled on 28 June 2011	1.5
36		D	35	352	no data	24	no data	Monitoring report, sampled on 20 May	
37		C	21	210	no	4	39.1	Monitoring report, sampled on 11 May	0.2
38		C	22	222	20	120	15	Monitoring report, sampled on 31 August	2.1
39		C	27	273	no	no data	98.6	Monitoring report, sampled on21 June 2011	
40		C	14	141	no data	40	46.2	Monitoring report, sampled on 23 June 2011	1.8
41		C	10	108	no	9	70.7	Monitoring report, sampled on 25 November	0.6
42		F	41	410	no data	no data	147.2	Monitoring report, sampled on 04 March	
43		C	17	170	80	55	91.1	Monitoring report, sampled on 11 July 2011	12.3
44		C	11	110	no data	no data	no data	Monitoring report, sampled on 10 September	
45		C	22	222	30	13	92	Monitoring report, sampled on 24 June 2011	4.0
46		C	26	267	no data	no data	32	Monitoring report, sampled June 2011	
47		C	24	243	not available	no data	70.1	Monitoring report, sampled on 25 May	
48		C	10	107	20	10	125	Monitoring report, sampled on 16 May	3.8

700 m^3/day X 221 mg/L X 1/1,000 = 154.7 Kg/day

Source: JET

(7) Estimate of Pollution Loads

As shown in the previous page, pollution loads were calculated using data and information collected through both direct and indirect methods. The result of the calculations shows that pollution loads for some enterprises could not be calculated by using the data and information collected through the direct and indirect methods. For the next step, remaining pollution loads were estimated using “Pollution load unit of CTC”. Details of the pollution load unit of CTC is given in “B-4 Estimation of Pollution Loads” of Part B of this manual.

◆ PSI form for estimate of pollution loads using PLUs

	I. Enterprise information			III. Water supply	XIII. Concentration of WW		PL	Estimate of COD load using PLU			
No.	1. Name of enterprise in Vietnamese (VN)	12. Area (m2)	13. Total number of labor (people)	2. Water consumption 4. Total amount of used water (supply water and groundwater) (m^3/day)	1. Concentration of pollution 3. COD (mg/l)	2. Data source	WW (m3/day) X Conc. (mg/L) COD (Kg/day)	SP No.	PLU (kg/Unit)	Unit	COD Load (kg/day)
1		17,600	250				4.75				
2		1,557	40				0				
3		46,399	33				14.239				
4		10,000	160	9	no data	no data					
5		no data	no data	0	no data	no data					
6		5,103	188				10.15				
7		3,000	55	25	no data	no data					
8		3,000	47				0.848				
9		15,391	42				4.14				
10		2,700	120	0	no data	no data		97	0.676	CN/NGAY	81
11		no data	no data	0	no data	no data					
12		10,480	577				0.72				
13		70,000	500				154.7				
14		40,000	400				14.5				
15		185,8 ha	6000 resident population								
16		no data	no data	0	no data	no data					
17		no data	no data	0	no data	no data					
18		1,800	26				0.0065				
19		28,762	348								
20		25,000	2,100	95	no data	no data	21.6	904	0.28	M^3NT	34
21		191 ha	700	3000	no data	Sampling WW					
22		41,500	1,300				32.66				
23		11,324	50	14	no data	no data		904	0.28	M^3NT	3
24		13,000	300	0	no data	no data		319	0.135	CN/NGAY	41
25		34,550	389				19.46				
26		4,850	240				2.52				
27		19,880	946	698	117	Sampling WW					
28		400,000	26	170	76	Sampling WW					
29		1,000	60	4	no data	no data					
30		2,057	74	15	no data	no data					
31		203,861	352	220	109	Sampling WW					
32		10,000	260	750 to 900	no data	no data		319	7.58	HADai	8
33		140,000	25	70	269	Sampling WW		383	4	HADai	51
34											
35							1.488				
36		9,800	150	30	no data	Monitoring report,					
37							0.1564				
38							2.1				
39		28,023	4,112	230	98.6	Monitoring report,		50	11.0	HAIlat	31
40							1.848				
41							0.6363				
42		not available	25	2000	147.2	Monitoring report,					
43							12.2985				
44		not available	6	1,5 m3/month	no data	Monitoring report,					
45							3.956				
46		35,000	1,200	0	32	Monitoring report,					
47		600	350	240	70.1	Monitoring report,					
48							3.75				

Source: JET