Attachment 7

Pollution Source Maps
(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

POLLUTION SOURCE MAP

May 2013

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

The Project for Strengthening Capacity of Water Environmental Management in Vietnam

POLLUTION SOURCE MAP

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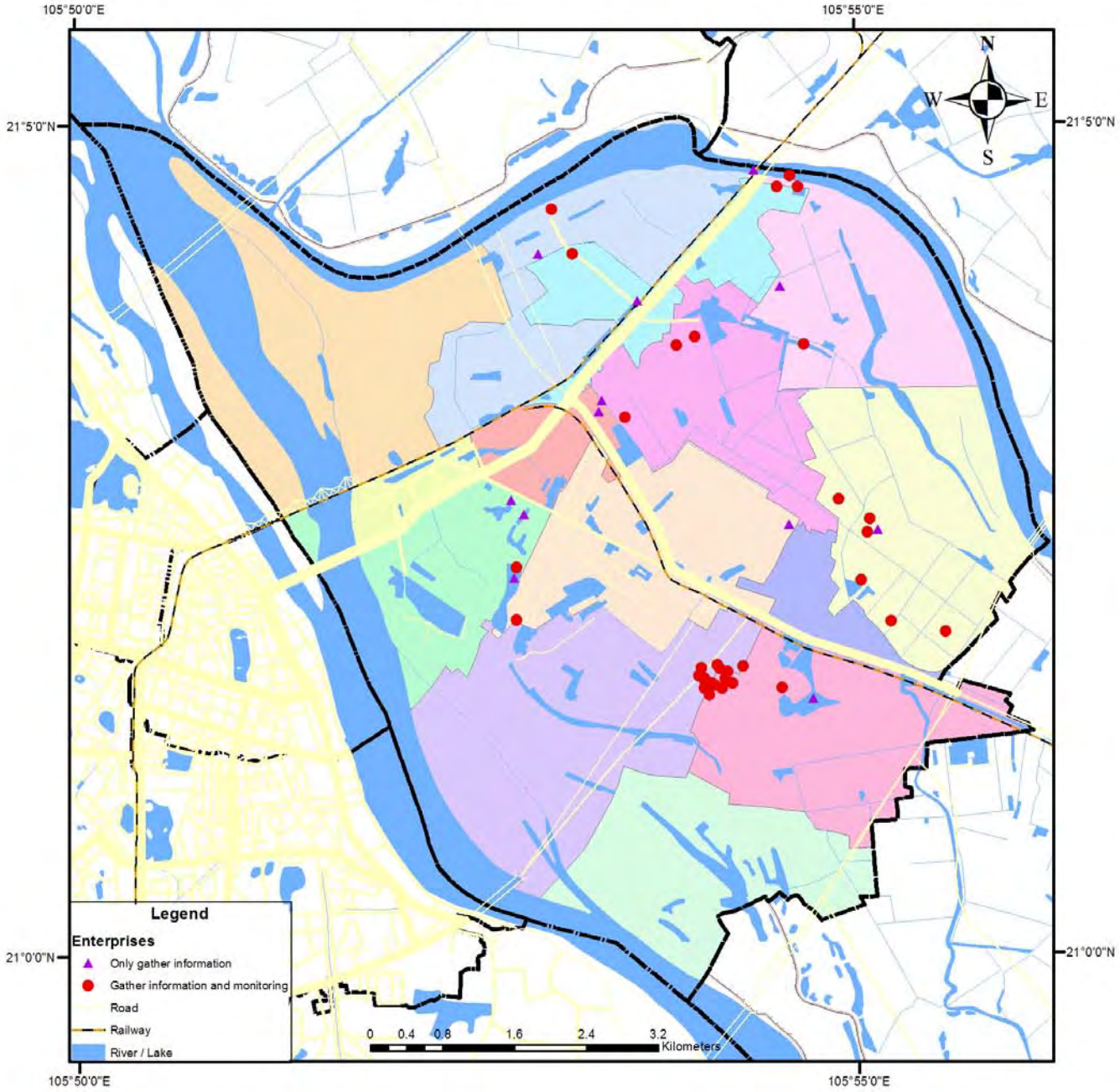
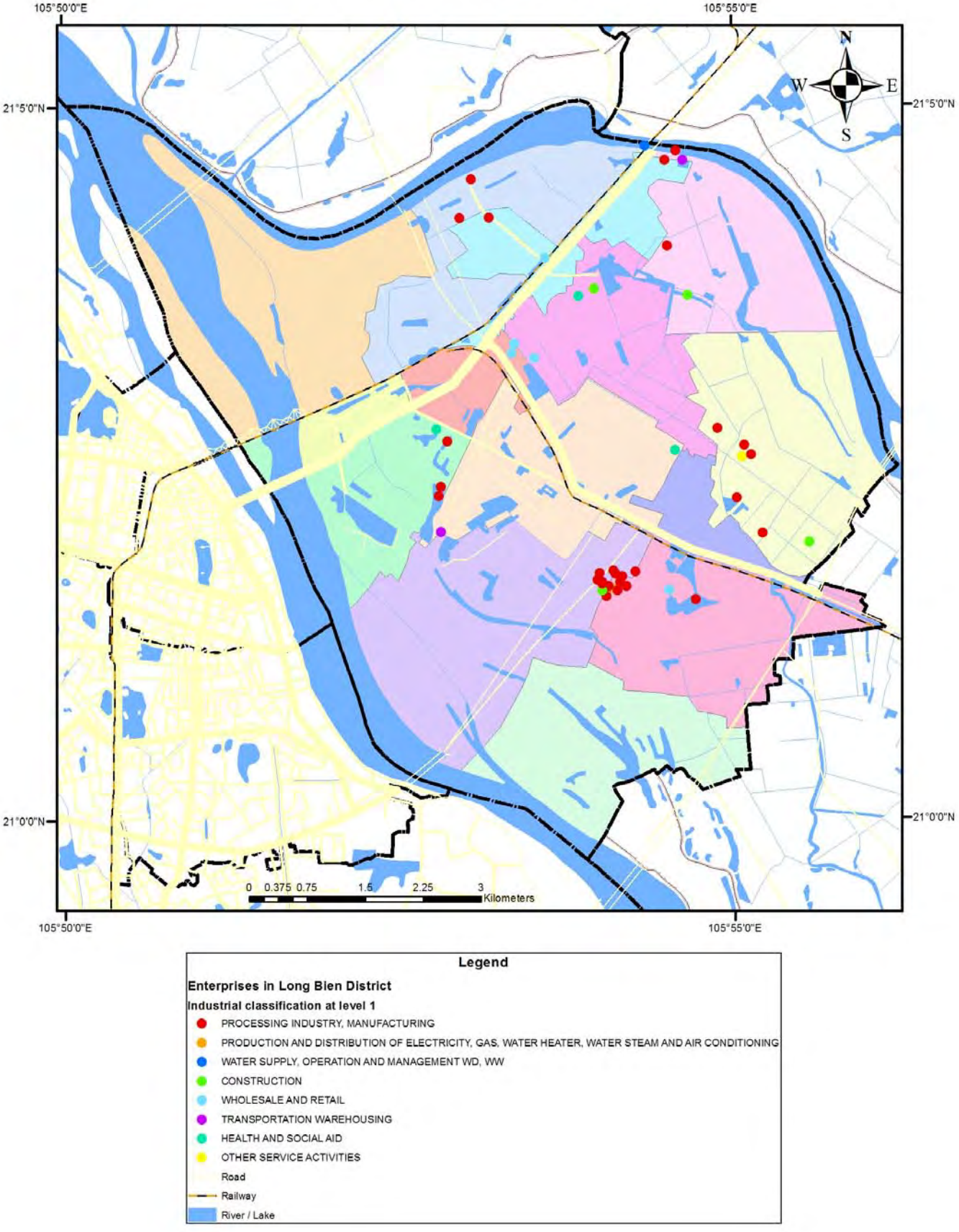


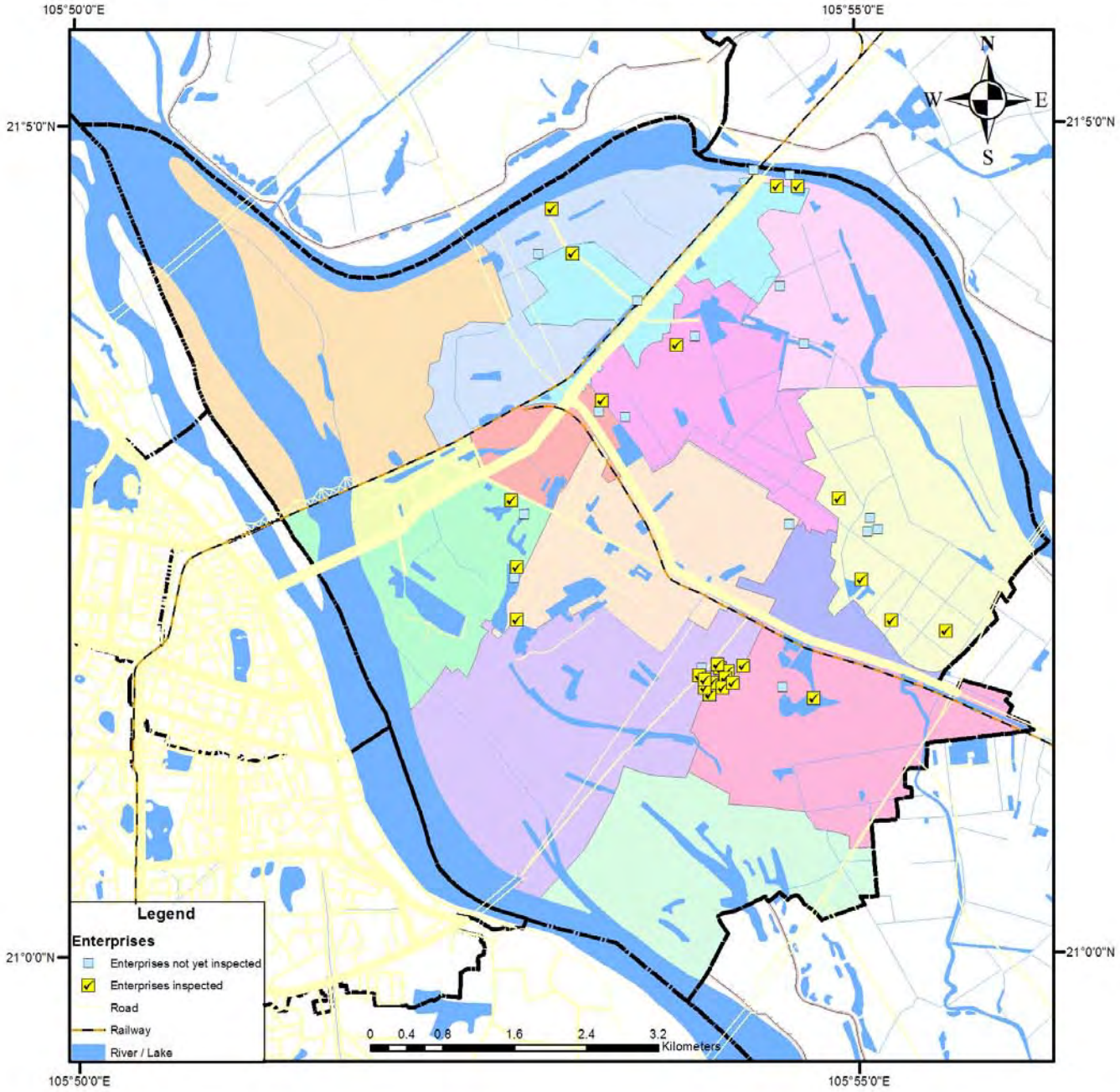
MAP 1

POLLUTION SOURCE MAP WITH CLASSIFIED ENTERPRISES IN LONG BIEN DISTRICT IN HANOI CITY



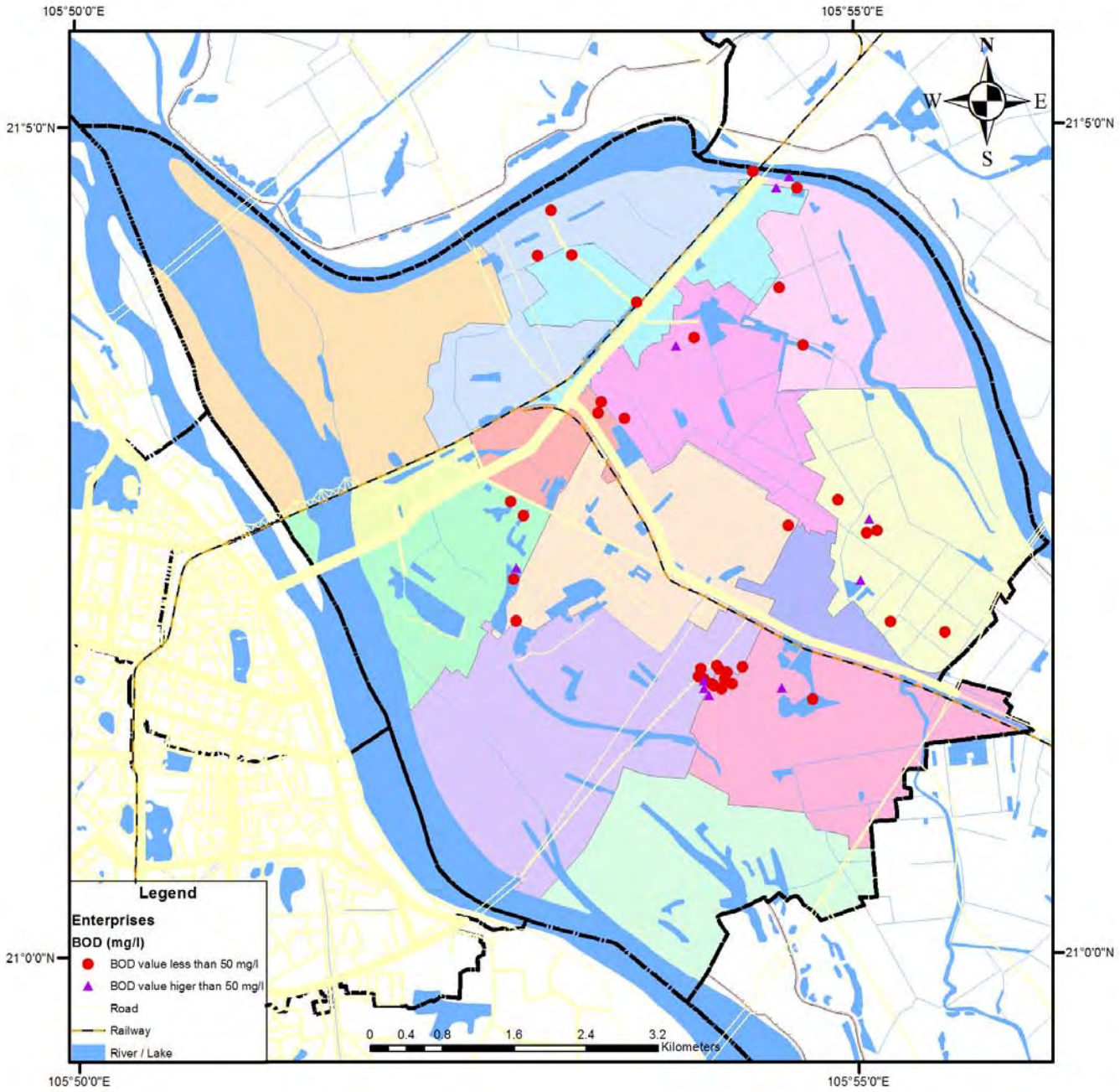
MAP 2

POLLUTION SOURCE MAP WITH ENTERPRISES HAVE BEEN INSPECTED OR CHECKED IN LONG BIEN DISTRICT IN HANOI CITY



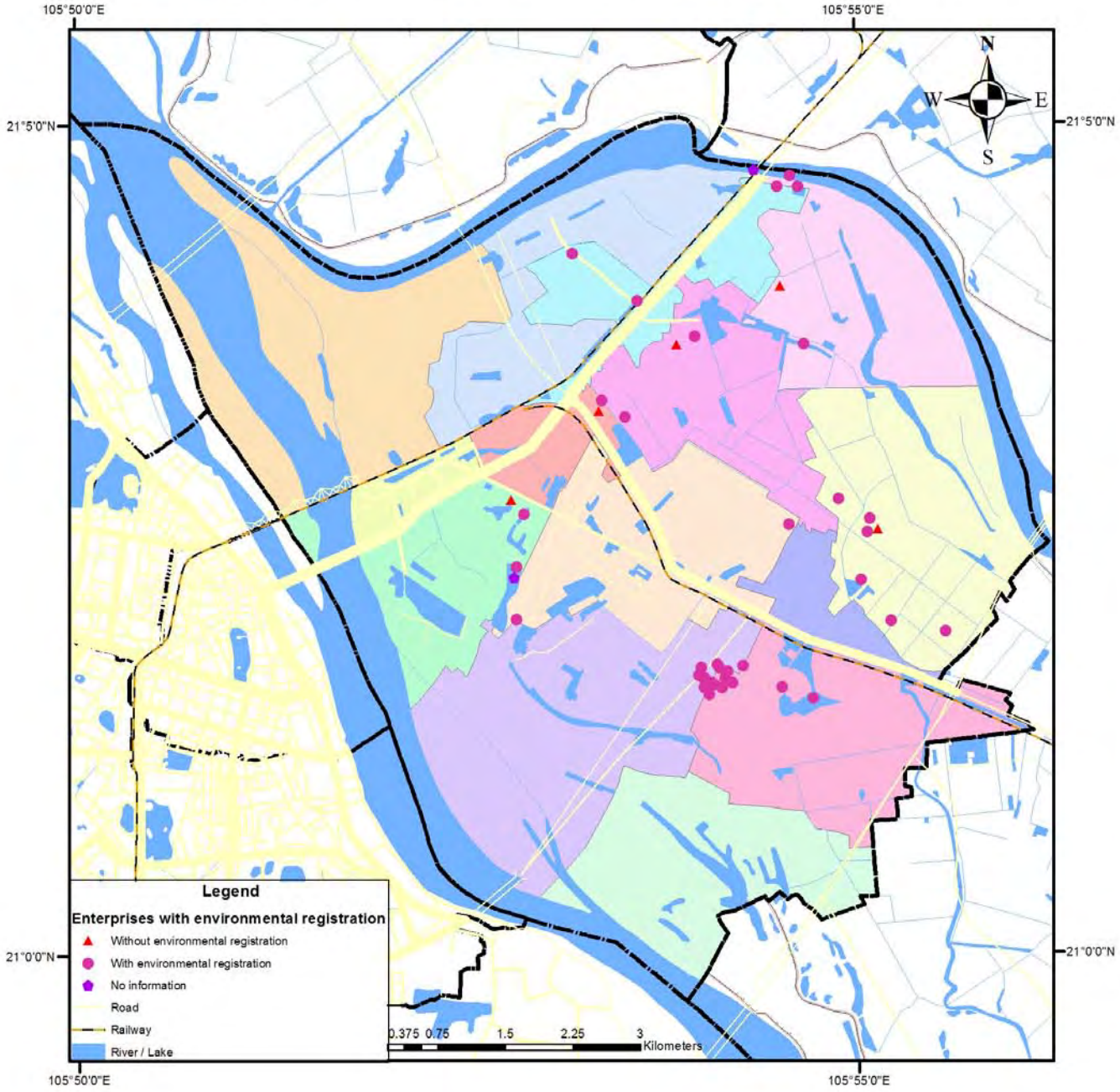
MAP 3

POLLUTION SOURCE MAP WITH BOD HIGER THAN 50 mg/l
IN LONG BIEN DISTRICT IN HANOI CITY



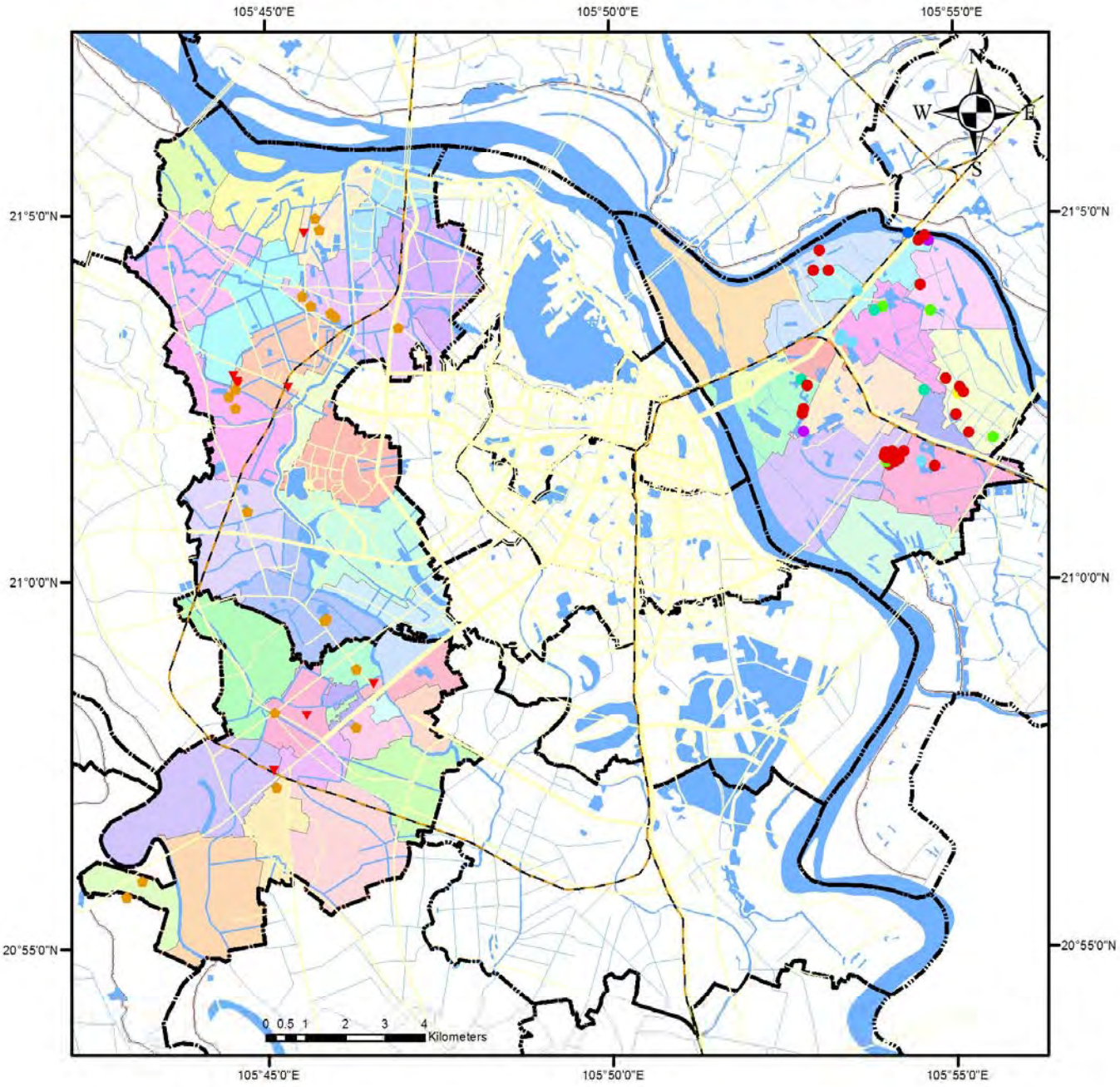
MAP 4

POLLUTION SOURCE MAP WITH ENTERPRISES HAVE ENVIRONMENTAL REGISTRATION IN LONG BIEN DISTRICT IN HANOI CITY



MAP 5

POLLUTION SOURCE MAP FOR TARGER ENTERPRISES
IN TU LIEM, HA DONG AND LONG BIEN DISTRICTS IN HANOI CITY



Legend

Enterprises in Tu Liem District and Ha Dong District

Classified by BOD/ or SS without the risk of oil and/or hazardous substanous

- Pollution source of BOD/ or SS without the risk of oil and/or hazardous substanous
- Pollution source of BOD/ or SS with the risk of oil and/or hazardous substanous

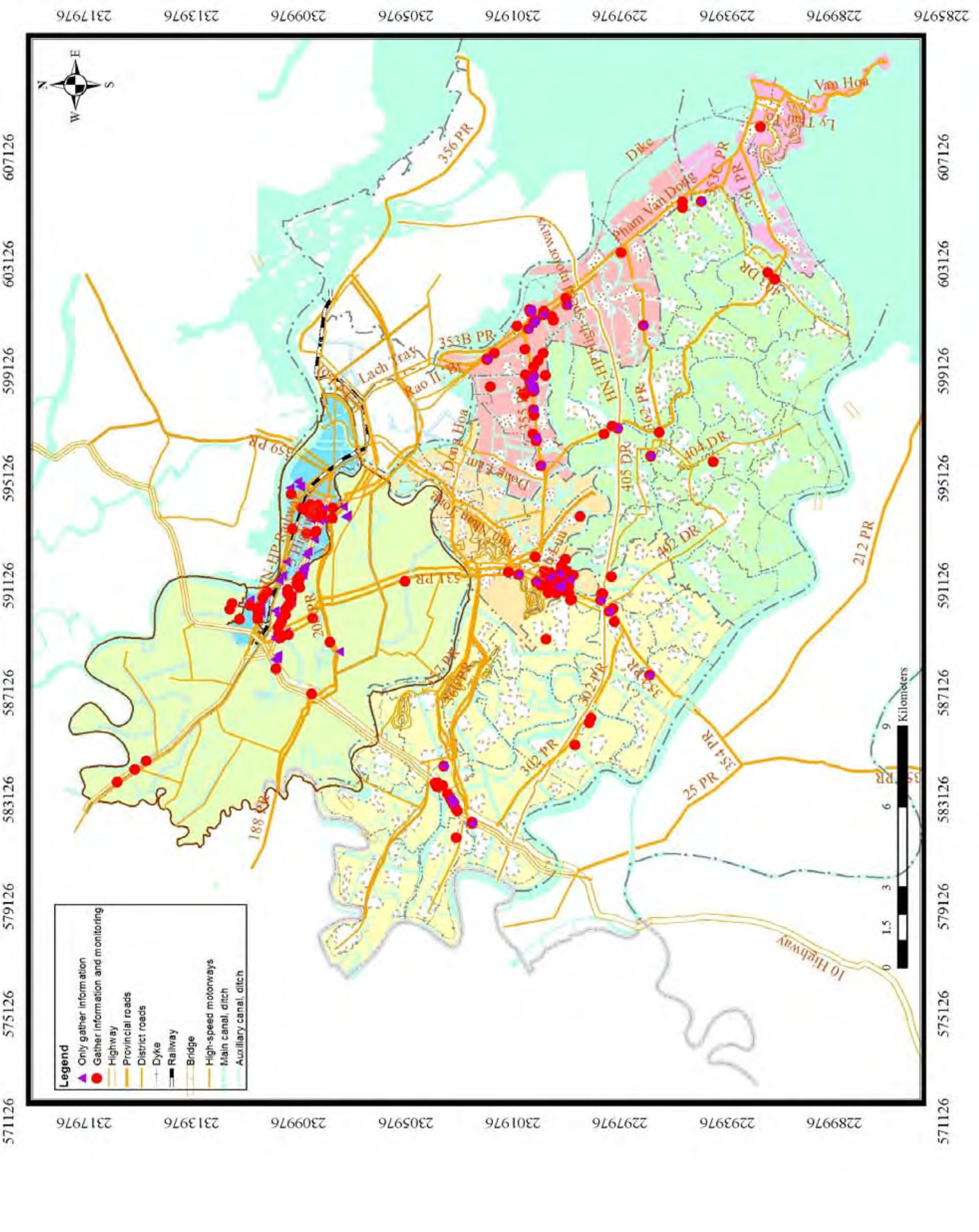
Enterprises in Long Bien District

Industrial classification at level 1

- PROCESSING INDUSTRY, MANUFACTURING
- PRODUCTION AND DISTRIBUTION OF ELECTRICITY, GAS, WATER HEATER, WATER STEAM AND AIR CONDITIONING
- WATER SUPPLY, OPERATION AND MANAGEMENT WD, WW
- CONSTRUCTION
- WHOLESALE AND RETAIL
- TRANSPORTATION WAREHOUSING
- HEALTH AND SOCIAL AID
- OTHER SERVICE ACTIVITIES
- Road
- Railway
- River / Lake

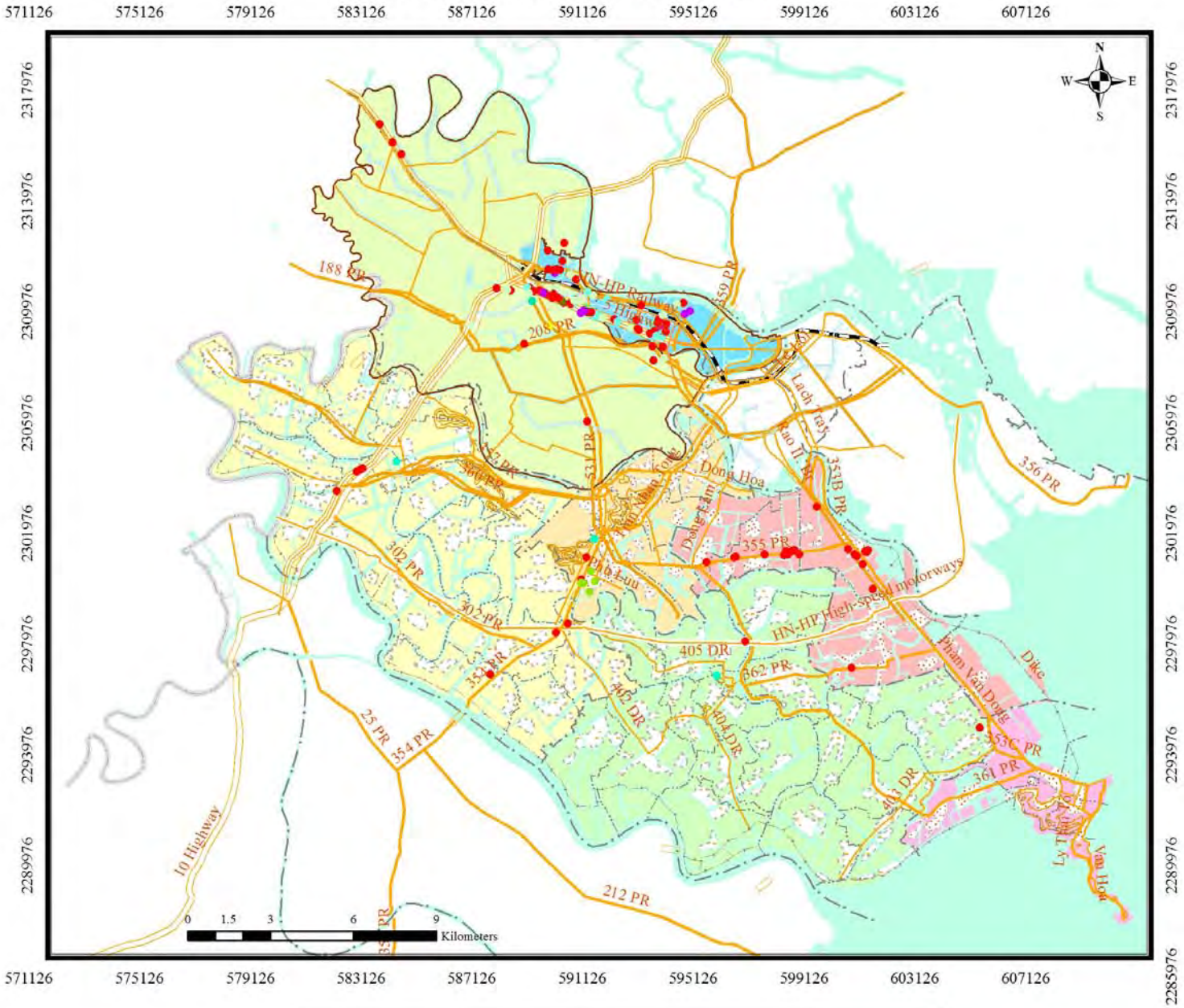
MAP 6

POLLUTION SOURCE MAP WITH MONITORING ENTERPRISES ALONG DA DO RIVER AND DE RIVER IN HAI PHONG CITY



MAP 7

POLLUTION SOURCE MAP WITH CLASSIFIED ENTERPRISES
ALONG DA DO RIVER AND DE RIVER IN HAI PHONG CITY



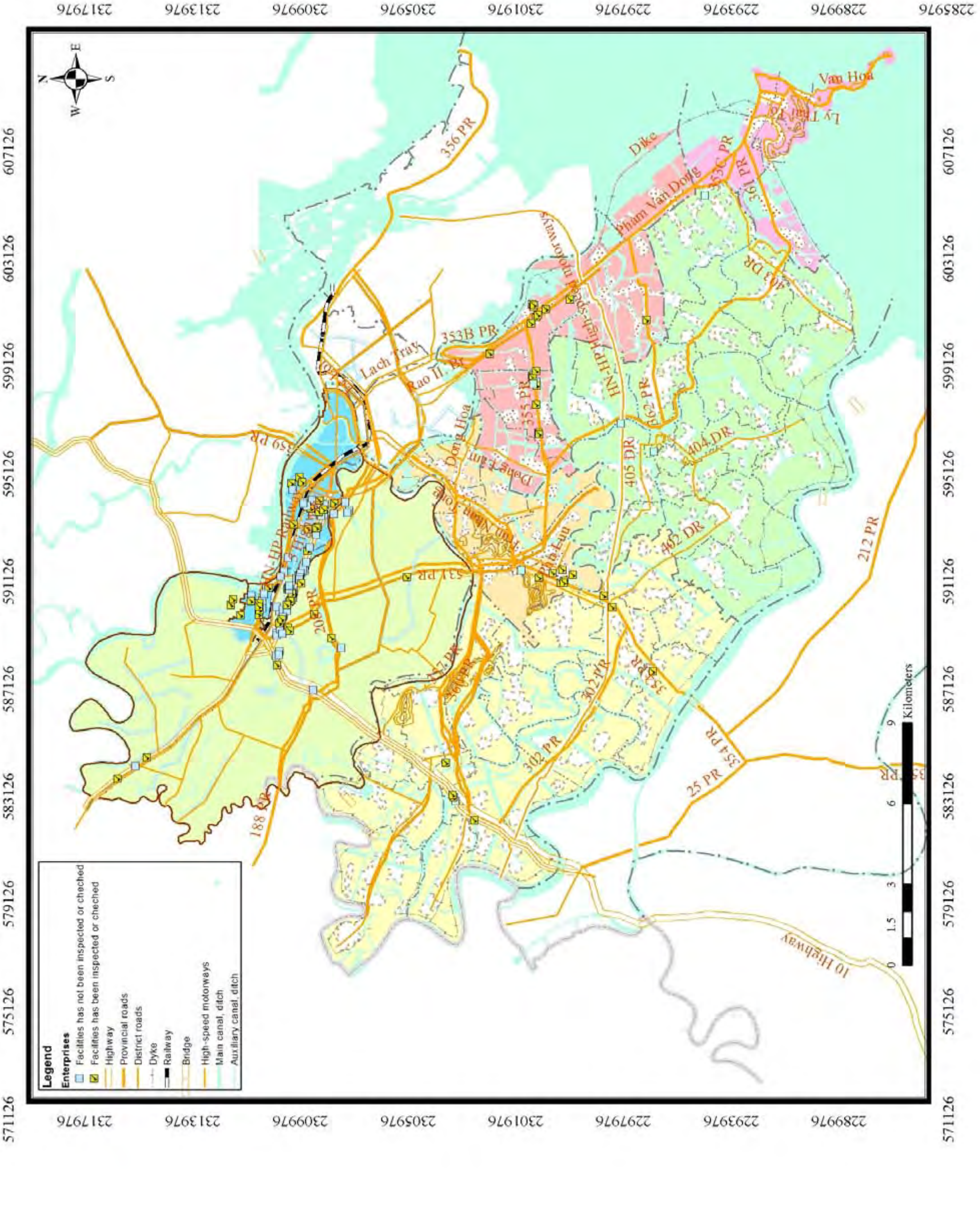
Legend

PSI-classification

- NO CLASSIFICATION
- MINING
- PROCESSING INDUSTRY, MANUFACTURING
- CONSTRUCTION
- WHOLESALE AND RETAIL; AUTO REPAIR, MOTOCYCLES, AND OTHE MOTOR
- WHOLESALE AND RETAIL, AUTO REPAIR, MOTOCYCLES, AND OTHE MOTOR /PROCESSING INDUSTRY, MANUFACTURING
- TRANSPORTATION WAREHOUSING
- FINANCE, BANKING, AND INSURANCE
- PROCESSINAL ACTIVITIES, SCIEM=NCE AND TECHNOLOGY
- HEALTH AND SOCIAL AID
- Highway
- Provincial roads
- District roads
- Dyke
- Railway
- Bridge
- High-speed motorways
- Main canal, ditch
- Auxiliary canal, ditch

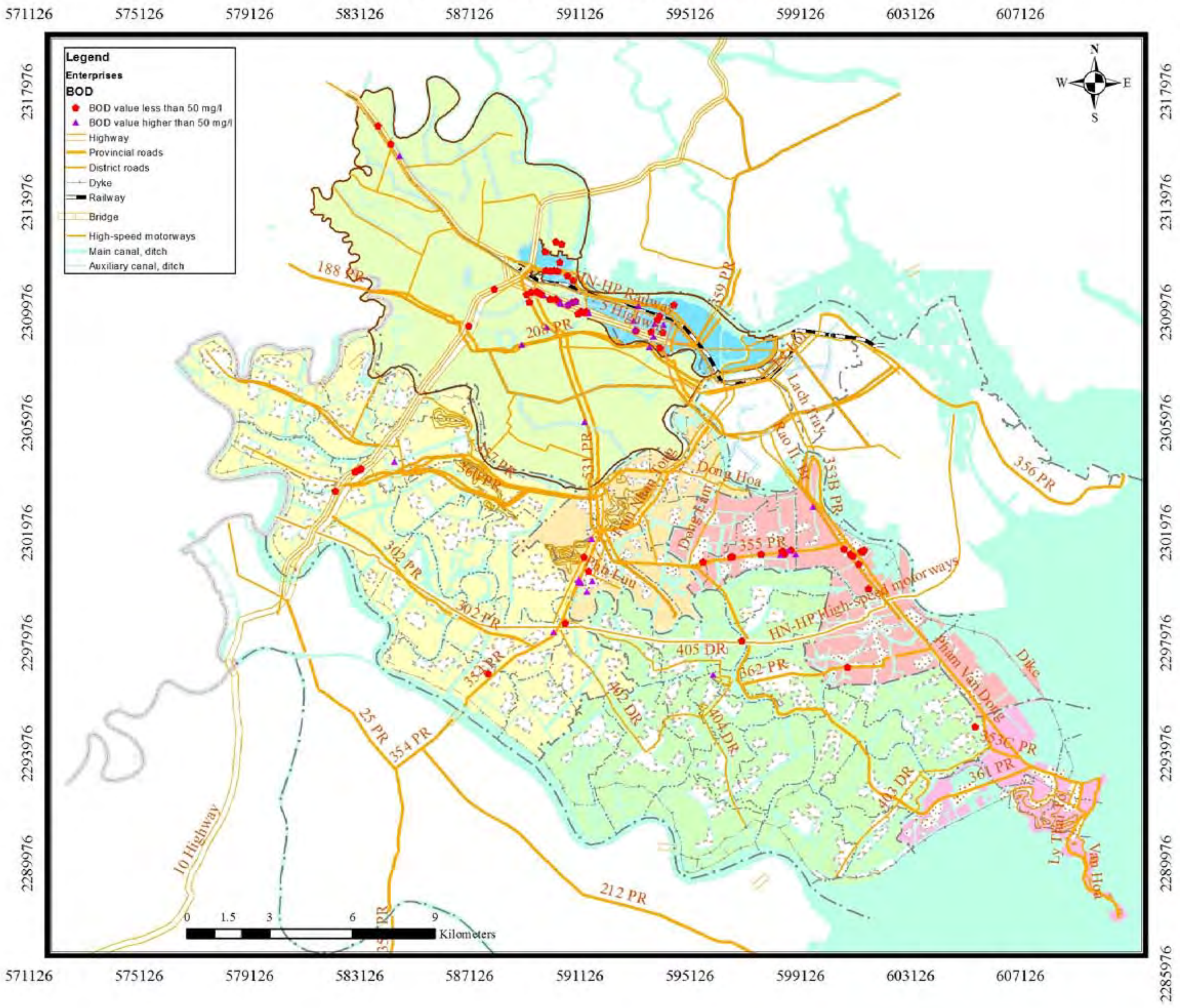
MAP 8

POLLUTION SOURCE MAP WITH ENTERPRISES HAVE BEEN CHECKED OR INSPECTED ALONG DA DO RIVER AND DE RIVER IN HAI PHONG CITY



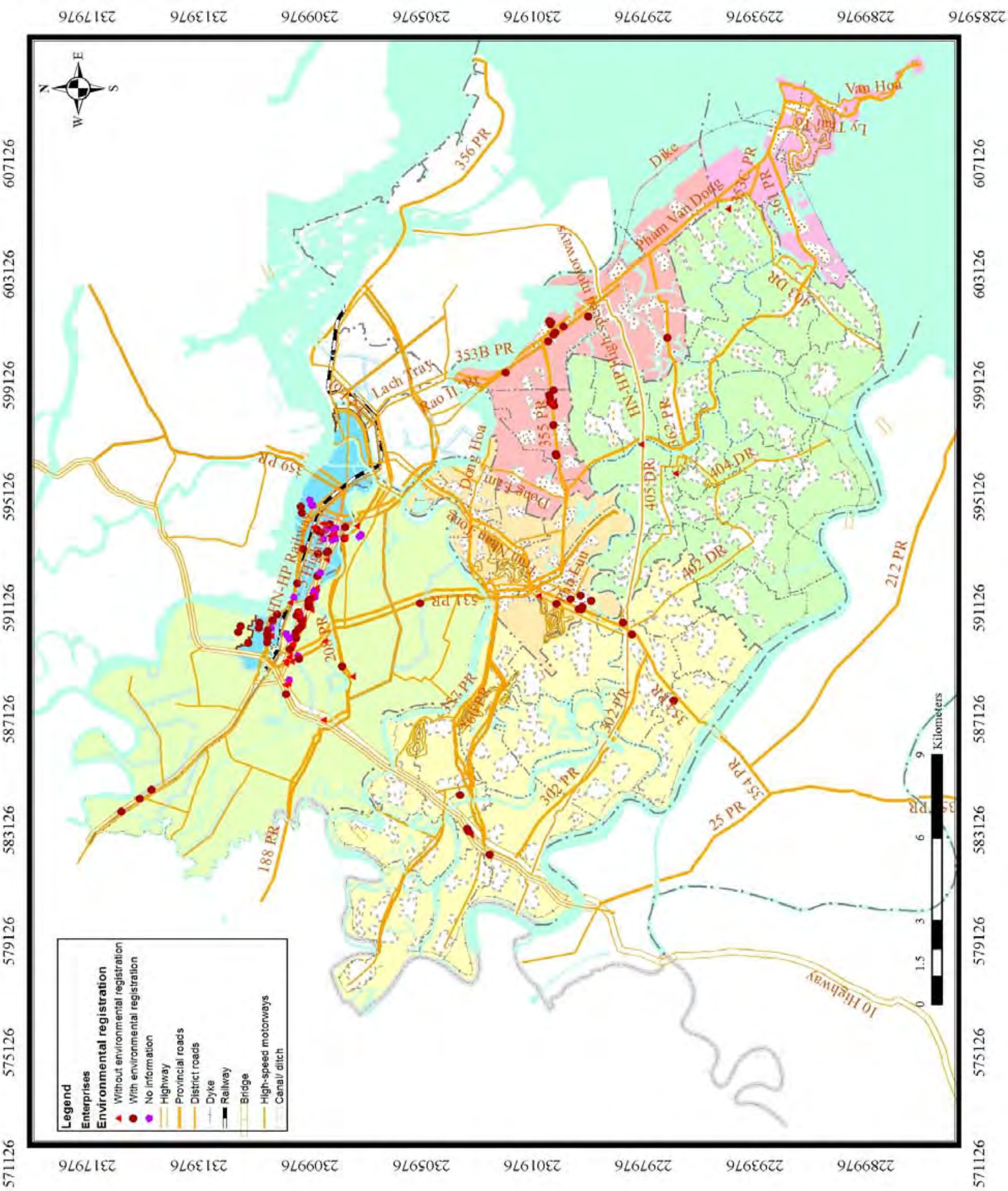
MAP 9

POLLUTION SOURCE MAP WITH BOD HIGHER THAN 50 mg/l
ALONG DA DO RIVER AND DE RIVER IN HAI PHONG CITY



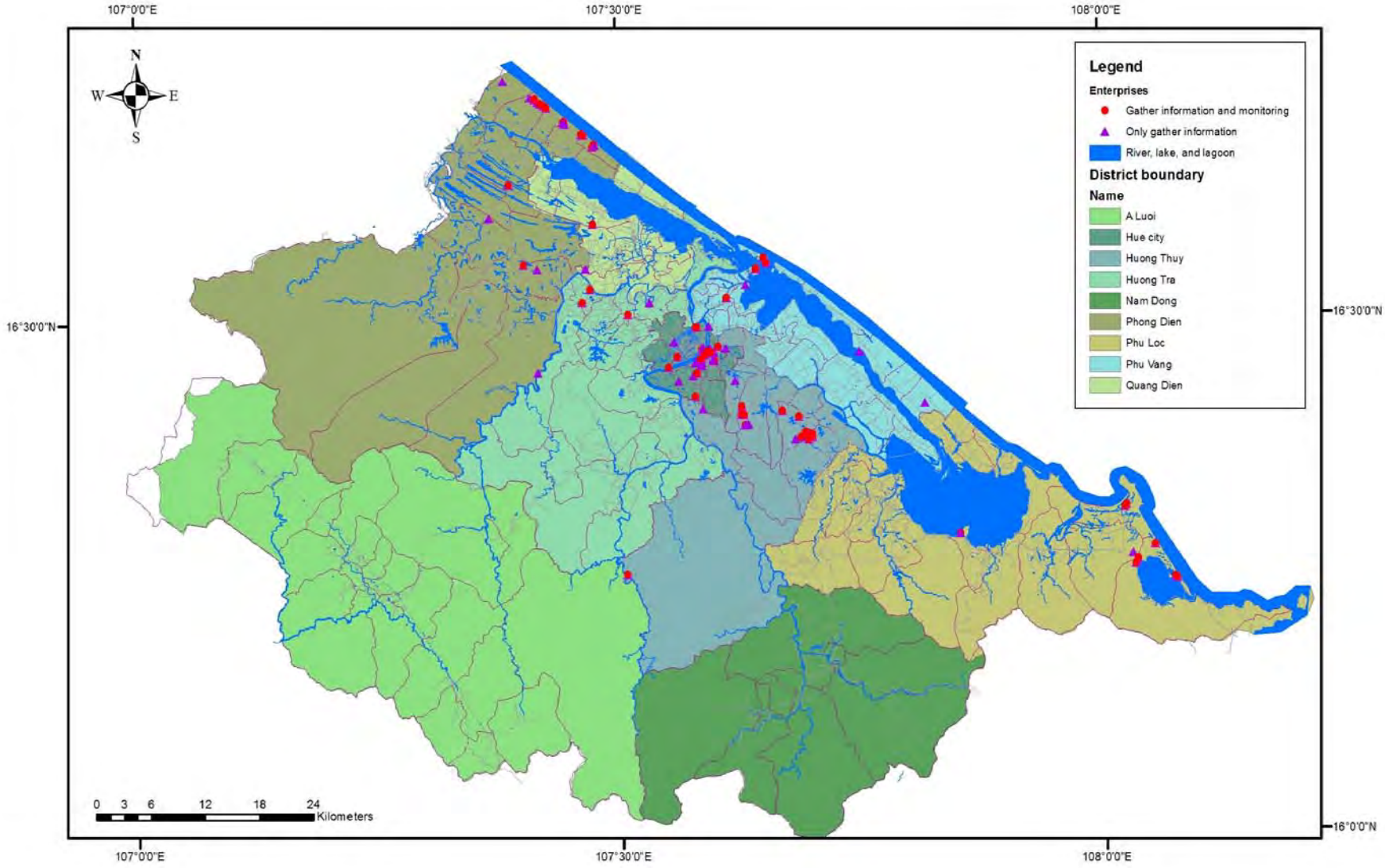
MAP 10

POLLUTION SOURCE MAP WITH ENTERPRISES HAVE ENVIRONMENTAL REGISTRATION ALONG DA DO RIVER AND DE RIVER IN HAI PHONG CITY



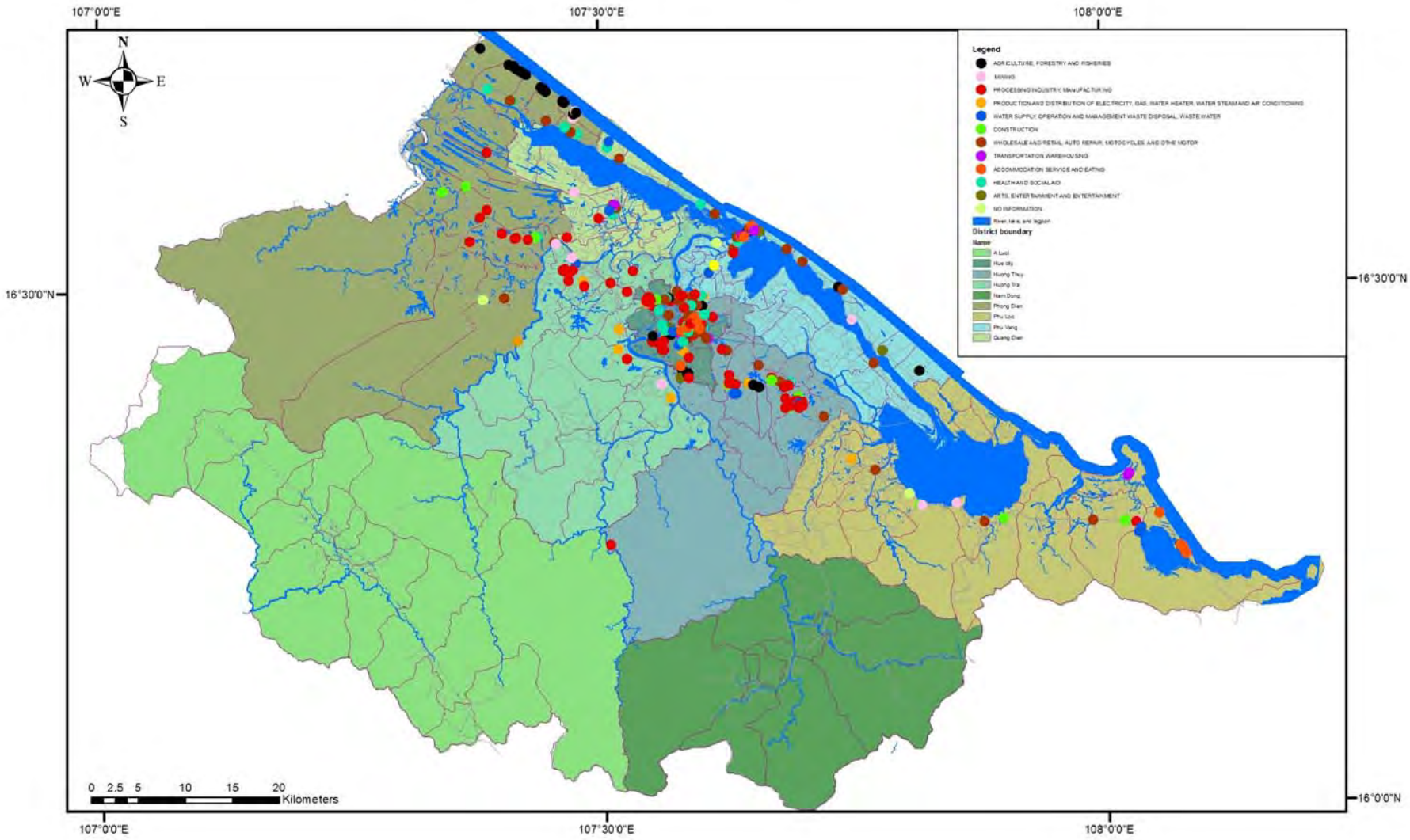
MAP 12

POLLUTION SOURCE MAP WITH MONITORING ENTERPRISES IN THUA THIEN HUE PROVINCE



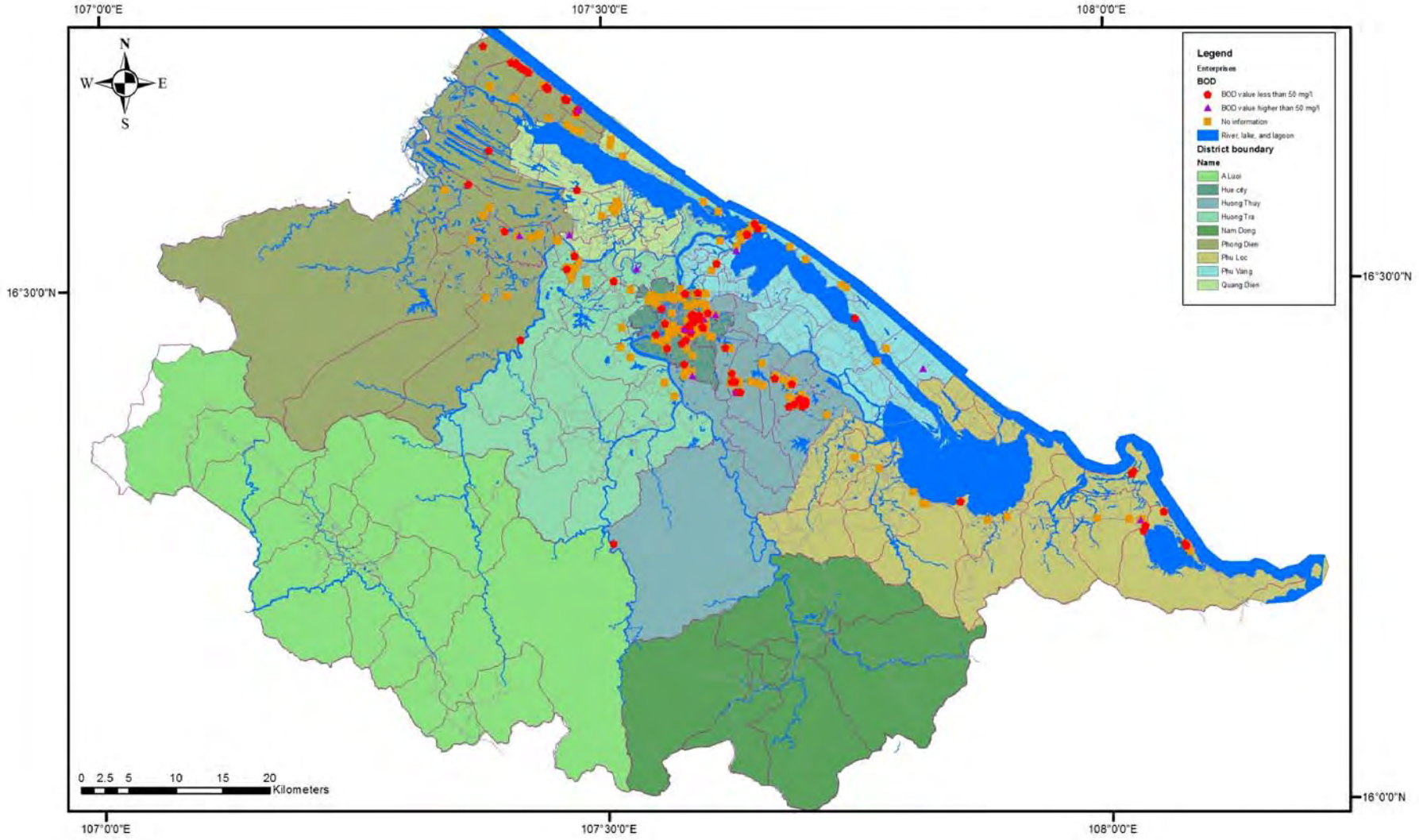
MAP 13

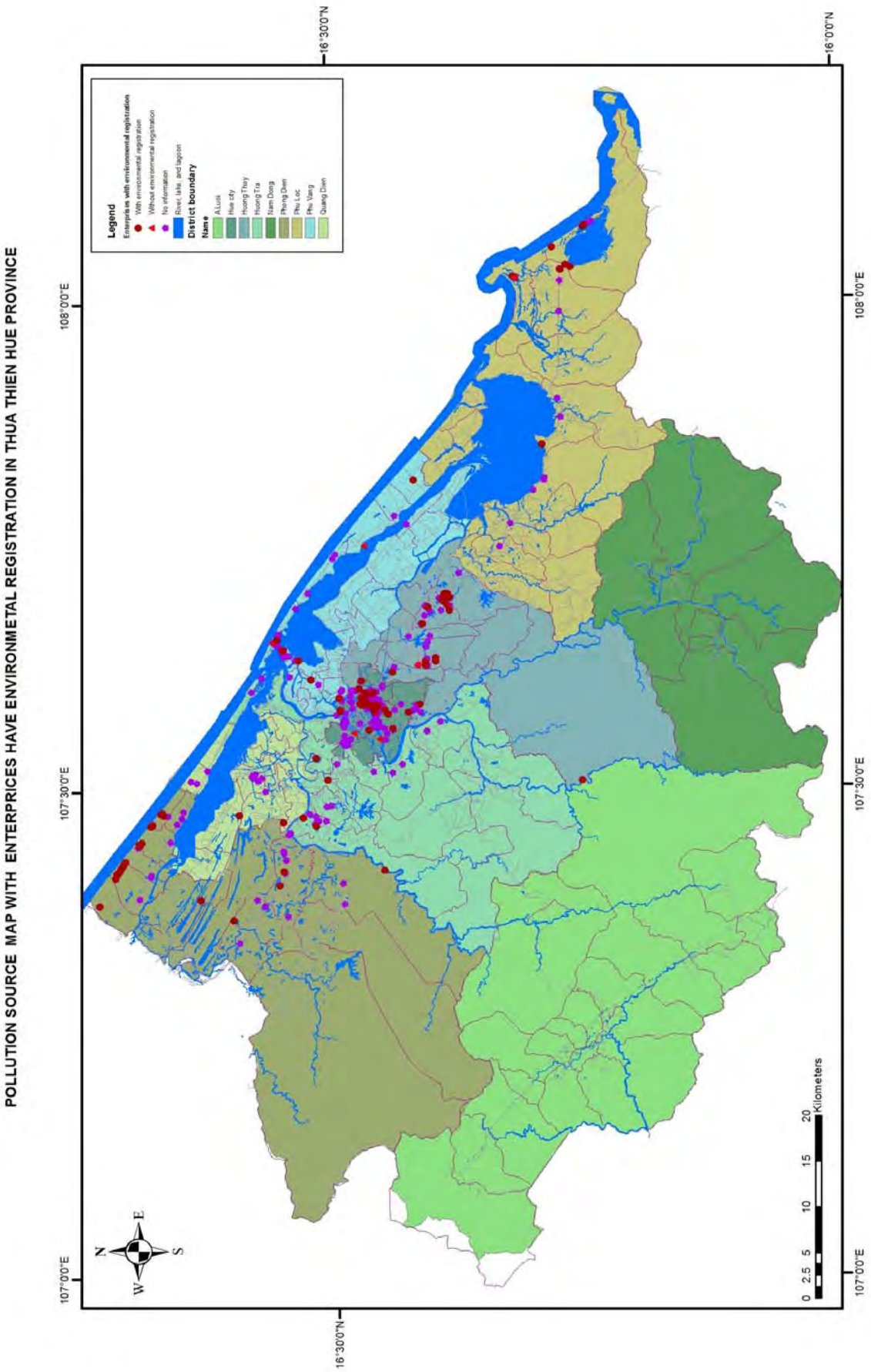
POLLUTION SOURCE MAP WITH CLASSIFIED ENTERPRICES IN THUA THIEN HUE PROVINCE



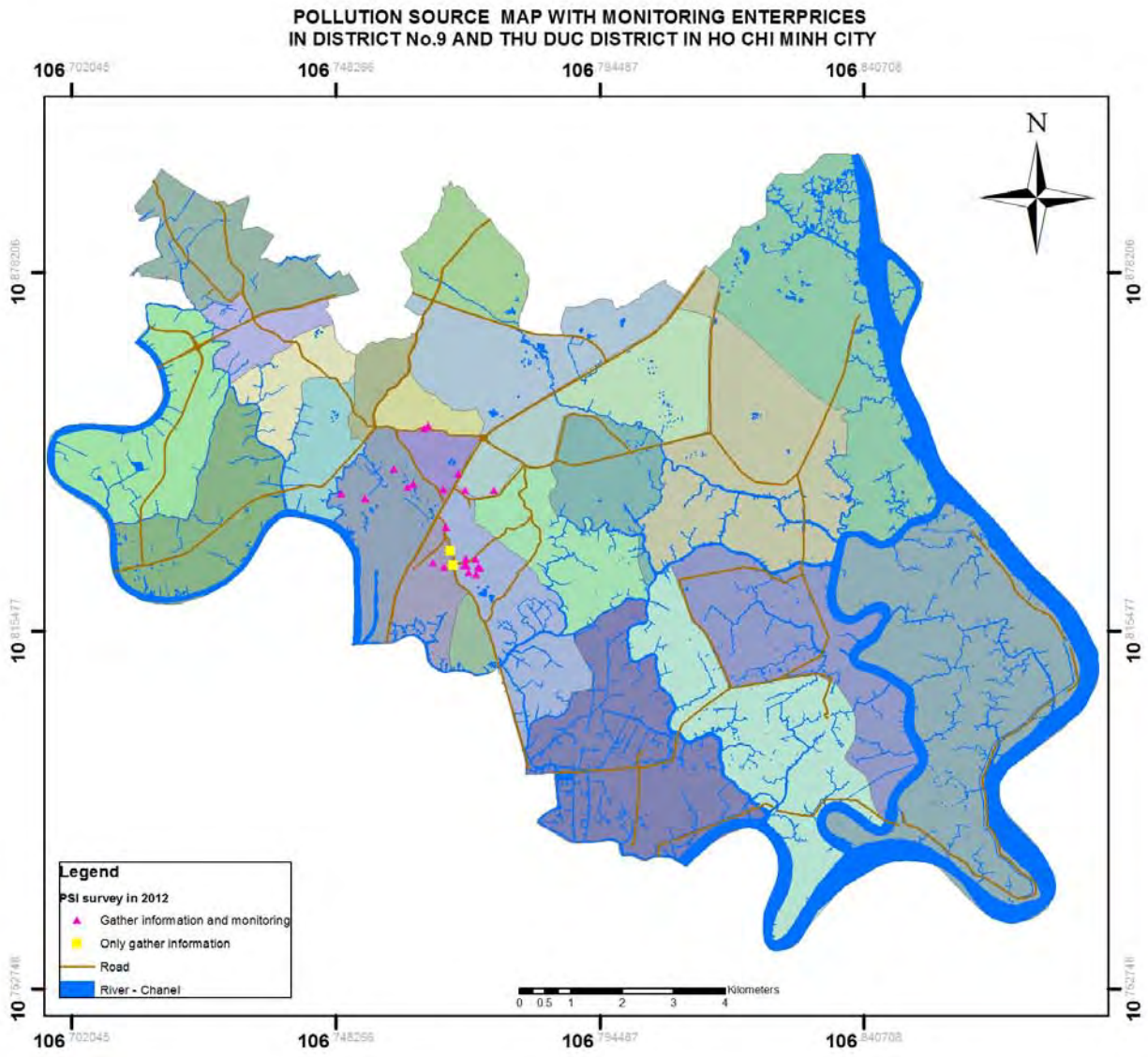
MAP 14

POLLUTION SOURCE MAP WITH BOD VALUE HIGHER THAN 50 mg/l IN THUA THIEN HUE PROVINCE

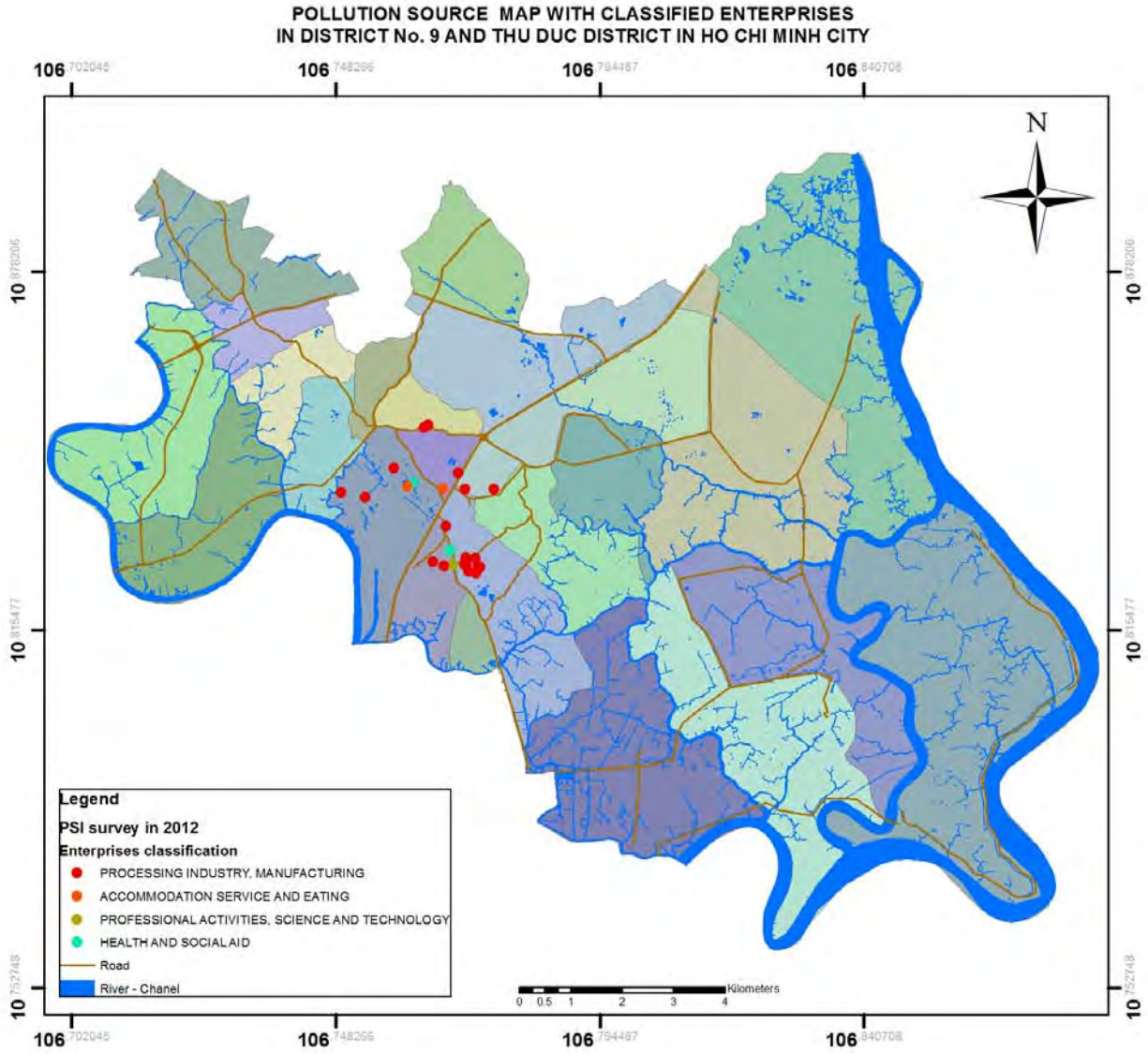



POLLUTION SOURCE MAP WITH ENTERPRICES HAVE ENVIRONMETAL REGISTRATION IN THUA THIEN HUE PROVINCE
Legend
Enterprises with environmental registration
With environmental registration
Without environmental registration
No information
Rivers, lake, and lagoon
District boundary
Name
A Luoi
Hue city
Huong Thuy
Huong Tra
Nam Dong
Phong Dien
Phu Loc
Phu Vang
Quang Dien
16°30'0"N
16°0'0"N
107°0'0"E
107°30'0"E
108°0'0"E
N
E
S
W
0 2.5 5 10 15 20
Kilometers

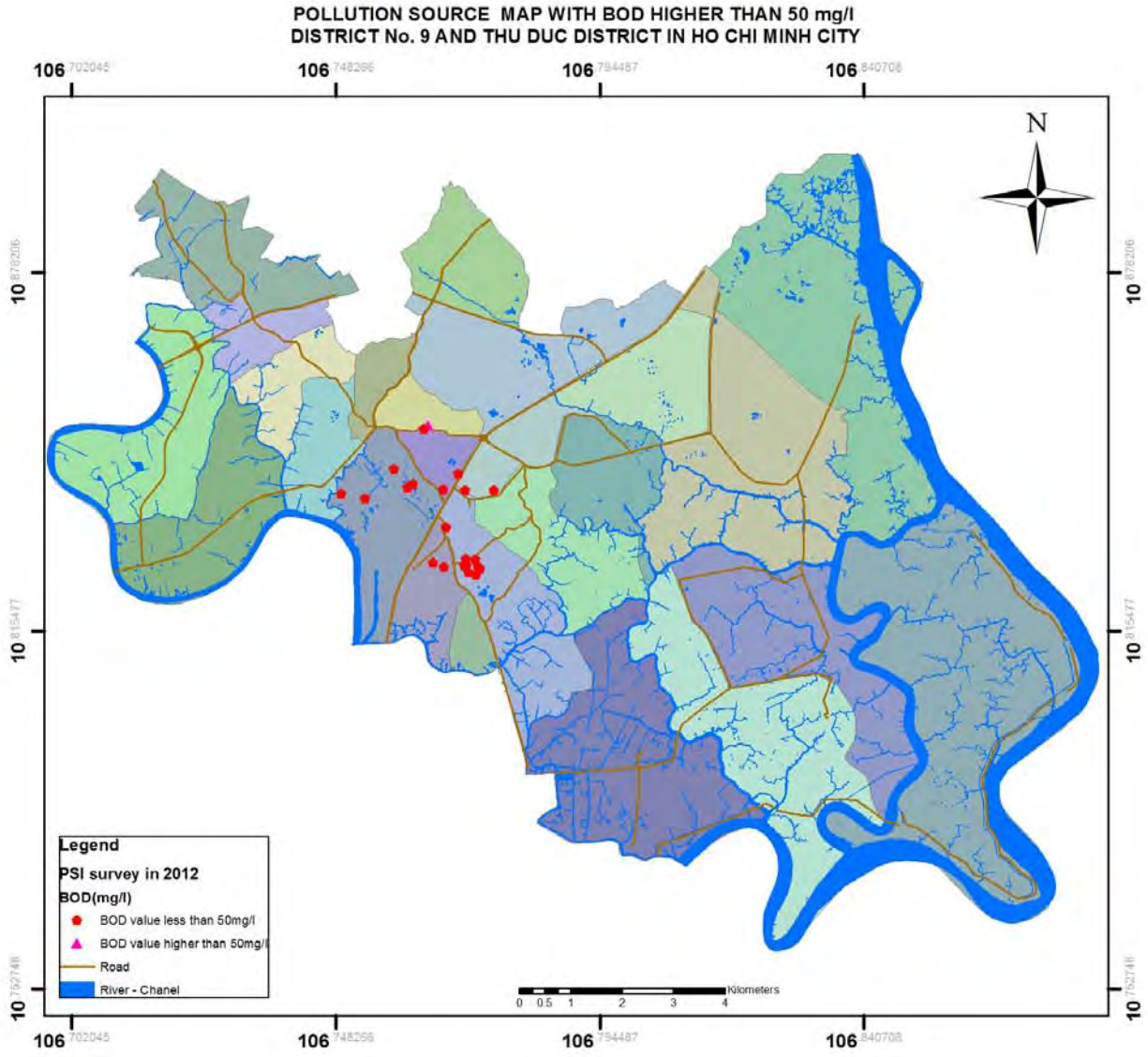
MAP 15


POLLUTION SOURCE MAP WITH MONITORING ENTERPRICES
IN DISTRICT No.9 AND THU DUC DISTRICT IN HO CHI MINH CITY
106 702045
106 748266
106 794487
106 840708
10 878206
10 815477
10 752748
N
Legend
PSI survey in 2012
Gather information and monitoring
Only gather information
Road
River - Chanel
0 0.5 1 2 3 4
Kilometers

MAP 16

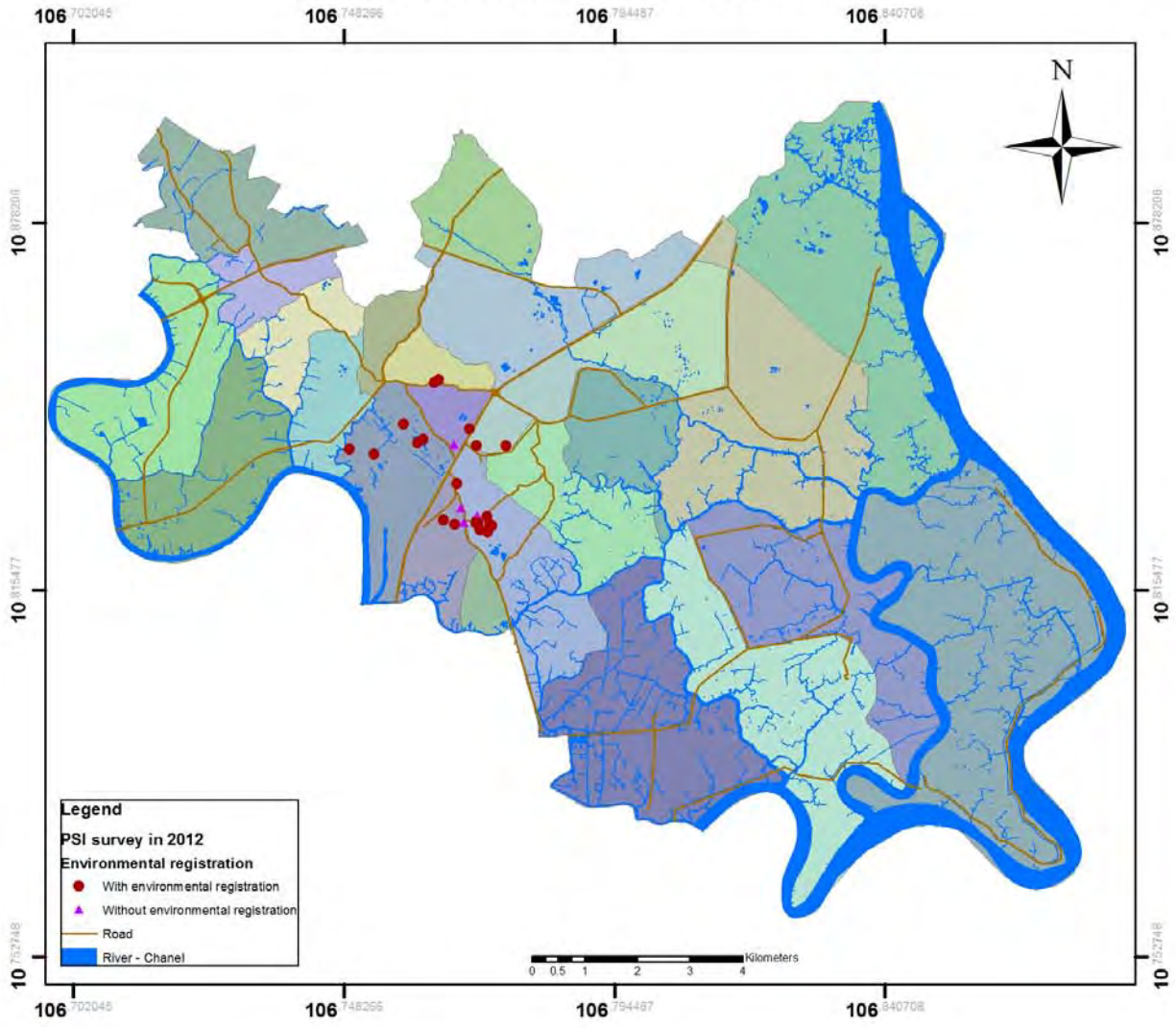

POLLUTION SOURCE MAP WITH CLASSIFIED ENTERPRISES
IN DISTRICT No. 9 AND THU DUC DISTRICT IN HO CHI MINH CITY
106 702045
106 748296
106 794487
106 840708
10 876206
10 815477
10 752748
N
Legend
PSI survey in 2012
Enterprises classification
PROCESSING INDUSTRY, MANUFACTURING
ACCOMMODATION SERVICE AND EATING
PROFESSIONAL ACTIVITIES, SCIENCE AND TECHNOLOGY
HEALTH AND SOCIAL AID
Road
River - Chanel
0 0.5 1 2 3 4
Kilometers

MAP 17


POLLUTION SOURCE MAP WITH BOD HIGHER THAN 50 mg/l
DISTRICT No. 9 AND THU DUC DISTRICT IN HO CHI MINH CITY
106 702045
106 748266
106 794487
106 840708
10 878206
10 815477
10 752748
N
Legend
PSI survey in 2012
BOD(mg/l)
BOD value less than 50mg/l
BOD value higher than 50mg/l
Road
River - Chanel
0 0.5 1 2 3 4
Kilometers

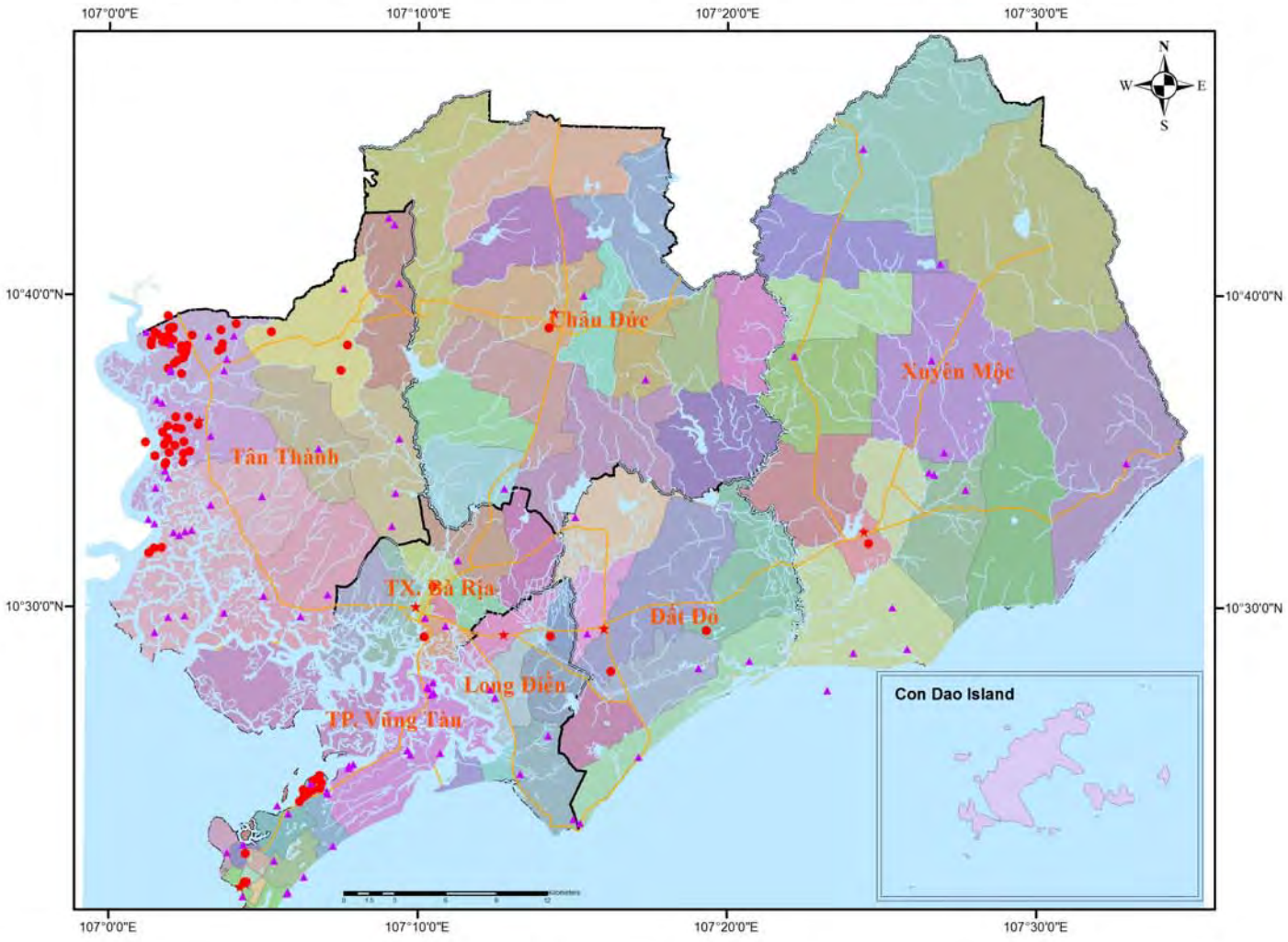
MAP 18

POLLUTION SOURCE MAP WITH ENTERPRICES HAVE ENVIRONMENTAL REGISTRATION
IN DISTRICT No.9 AND THU DIC DISTRICT IN HO CHI MINH CITY



MAP 19

POLLUTION SOURCE MAP WITH MONITORING ENTERPRISES IN BA RIA - VUNG TAU PROVINCE



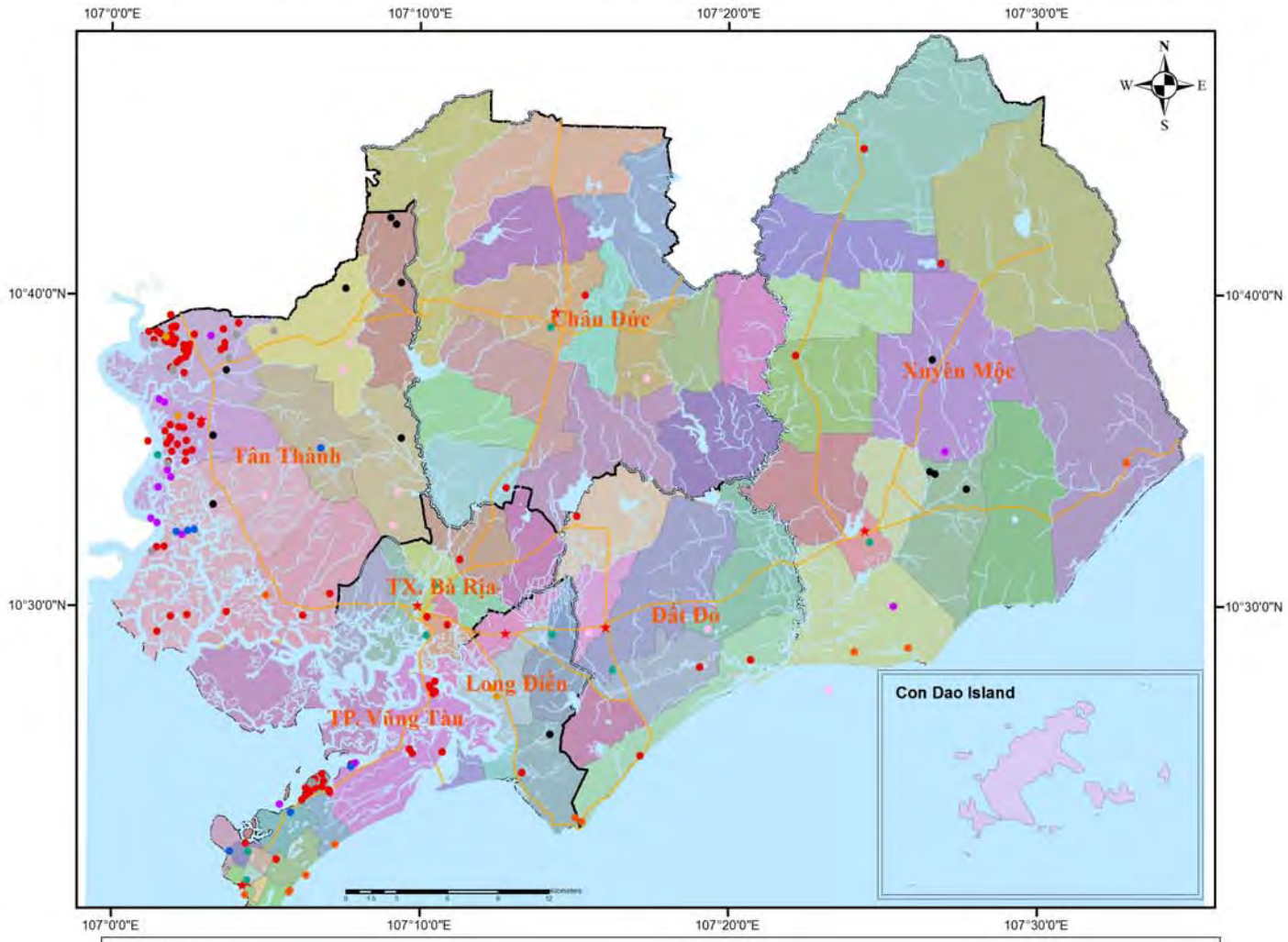
Legend

Enterprises

- Only gather information
- Gather information and monitoring
- Road
- River and lake

MAP 20

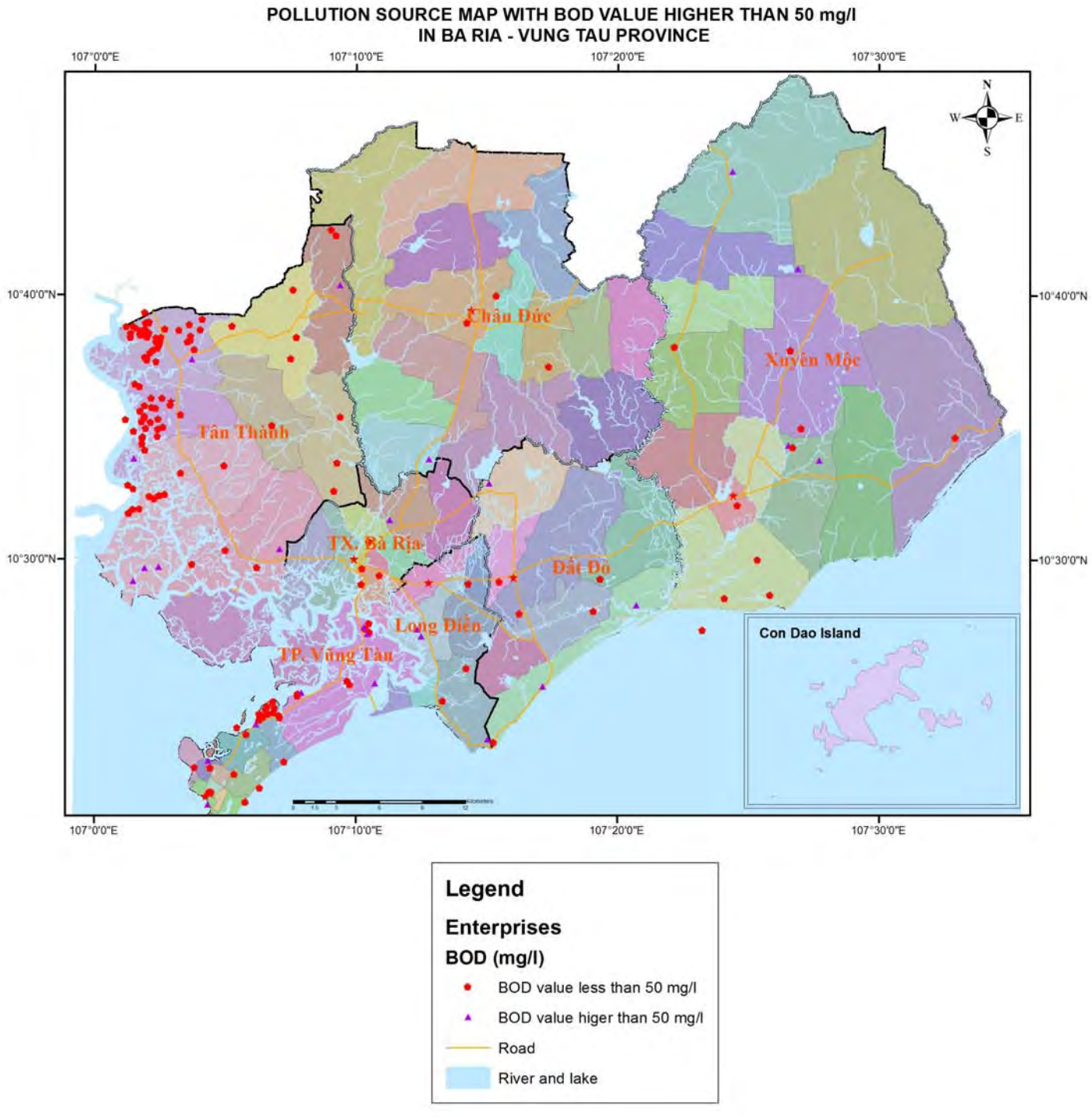
POLLUTION SOURCE MAP WITH CLASSIFIED ENTERPRISES IN BA RIA - VUNG TAU PROVINCE



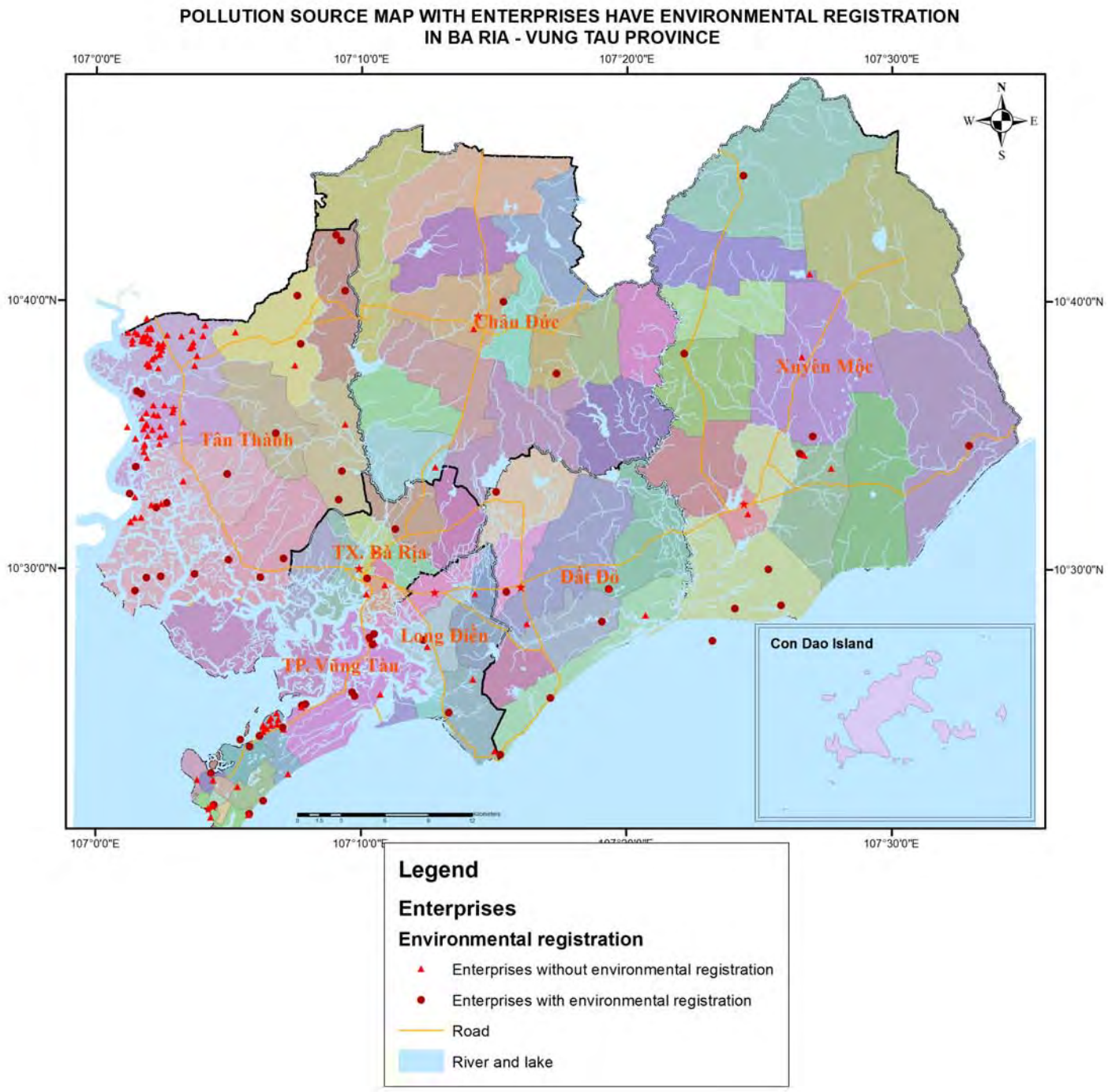
Legend

Enterprises

- NOT CLASSIFICATION
- AGRICULTURE, FORESTRY AND FISHERIES
- MINING
- PROCESSING INDUSTRY, MANUFACTURING
- PRODUCTION AND DISTRIBUTION OF ELECTRICITY, GAS, WATER HEATER, WATER STEAM AND AIR CONDITIONING
- WATER SUPPLY, OPERATION AND MANAGEMENT WASTE DISPOSAL, WASTE WATER
- TRANSPORTATION WAREHOUSING
- ACCOMMODATION SERVICE AND EATING
- HEALTH AND SOCIAL AID
- Road
- River and lake


POLLUTION SOURCE MAP WITH BOD VALUE HIGHER THAN 50 mg/l
IN BA RIA - VUNG TAU PROVINCE
107°0'0"E
107°10'0"E
107°20'0"E
107°30'0"E
10°40'0"N
10°30'0"N
N
W
E
S
Châu Đức
Xuyên Mộc
Tân Thành
TX. Bà Rịa
Đất Đỏ
Long Điền
TP. Vũng Tàu
Con Dao Island
Legend
Enterprises
BOD (mg/l)
BOD value less than 50 mg/l
BOD value higer than 50 mg/l
Road
River and lake

MAP 22


POLLUTION SOURCE MAP WITH ENTERPRISES HAVE ENVIRONMENTAL REGISTRATION
IN BA RIA - VUNG TAU PROVINCE
107°0'0"E
107°10'0"E
107°20'0"E
107°30'0"E
10°40'0"N
10°30'0"N
N
W
E
S
Châu Đức
Xuyên Mộc
Tân Thành
TX. Bà Rịa
Đất Đỏ
Long Điền
TP. Vũng Tàu
Con Dao Island
Legend
Enterprises
Environmental registration
Enterprises without environmental registration
Enterprises with environmental registration
Road
River and lake

MAP 23

Attachment 8

Outline of Improvement Plan for Water Pollution Control in Hanoi City

(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

OUTLINE OF IMPROVEMENT PLAN FOR

WATER POLLUTION CONTROL IN HANOI CITY

May 2013

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

(Final Version: 2013/3/28)

THE PROJECT FOR STRENGTHENING CAPACITY OF
WATER ENVIRONMENTAL MANAGEMENT IN VIETNAM (SCOWEM)

DRAFTING OUTLINE OF WATER POLLUTION CONTROL MEASURES (OUTPUT 3)

OUTLINE OF IMPROVEMENT PLAN
FOR
WATER POLLUTION CONTROL IN HANOI CITY




MARCH 2013

WORKING GROUP 3 (WG-3)
JICA EXPERT TEAM

2013/03/28	Final	Minor editorial changes were made.
2013/02/26	E	Small changes have been made.
2013/02/07	D	Small changes have been made.
2013/01/31	C	All contents were reviewed and corrected, based on the final data from 2nd site survey.
2012/10/7	B	All contents were reviewed and corrected.
2012/10/1	A	To be used for the first WG- 3 discussion (Oct. 16, 2012)
Date	Version	Description

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Abbreviation

CENMA	Center for Natural Resources and Environment Monitoring and Analysis
CP	Cleaner Production
DOIT	Department of Industry and Trade
DONRE	Department of Natural Resources and Environment
DWRHM	Department of Water Resources and Meteoro-Hydrology
EFR	Economic Focal Region
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPC	Environmental Protection Commitment
EPF	Environmental Protection Fund
GDP	Gross Domestic Product
IDC	Infrastructure Development Company
IET	Institute of Environment Technology
IZA	Industrial Zone Authority
IWCR	Industrial Wastewater Compliance Rating
IWTP	Industrial Wastewater Treatment Plant
IWW	Industrial Wastewater
LEP	Law on Environmental Protection
MARD	Ministry of Agriculture and Rural Development
MOI	Ministry of Industry
MONRE	Ministry of Natural Resources and Environment
MOSTE	Ministry of Science, Technology and Environment
PC	Peoples' Committee
PDM	Project Design Matrix
PLC	Pollution Load Calculation
PLT	Pollution Load Table
PPC	Provincial Peoples' Committee
PPP	Polluters-Pay-Principle
PSD	Pollution Source Database
PSM	Pollution Source Map
PST	Pollution Source Table
QCVN	Vietnam National Technical Regulation
VAST	Vietnamese Academy of Science and Technology
VEA	Vietnam Environmental Administration
VEPF	Vietnam Environmental Protection Fund
VND	Vietnamese Dong

Summary

1. Introduction

1.1 This plan is a tangible outcome of Output 3 (water pollution control measures) as defined in the PDM. The PDM of the Project defines that the objective of Output 3 is to strengthen the capacity of making water pollution control measures. As the pre-condition of Output 3 activities, manufacturing industry has been specified as the target group industry. Therefore, industrial wastewater discharged from manufacturing industries has been defined to be the specific target of the water pollution control to be studied by Output 3.

1.2 The objective of this plan is to propose an outline for strategic approaches for improving water pollution control being enforced by DONRE in Hanoi City. DONREs in Vietnam have the responsibility of enforcing water pollution control by employing management systems in their administrative territories, receiving guiding and instruction from MONRE. Thus, approaches for improving water pollution control to be aimed in Output 3 focus on just the enforcement of management systems, excluding the setup of national policies and management system.

1.3 Tu Liem and Ha Dong District have been chosen as the model area for the study of Output 3. They are located along the upstream of the Nhue and Day River, which is one of the major water courses in the region, and accommodate diverse and major manufacturing industries in Hanoi City. In light of such importance in the water pollution control of Hanoi City, Tu Liem and Ha Dong District have been chosen as the model area.

1.4 Through a series of Output 3 activities, various data/ information have been collected to clarify present situations of wastewater measures by entities and water pollution control by DONRE. These results have been compiled in the following intermediate reports and have been used for this study:

- Field Note of 1st Site Survey in the Model Area
- Field Note of Additional Site Survey in the Model Area
- Field Note of 2nd Site Survey in the Model Area
- Pollution Source Database (PSD) and Pollution Source Table (PST) for Hanoi City.

2. Description of Study Area

2.1 Hanoi City has the industrial GDP, producing some 118 billion VND, with 9 - 14 % of annual growth rate (constant price in 1994) in the past seven (7) years. According to the statistical book, it has around 6,400 registered manufacturing enterprises with close to 255,000 workers. Industrial activities take place mainly in industrial zones and industrial clusters in/around the urban center. Besides, many craft villages (about 260 sites) are located in Hanoi City.

2.2 The Nhue and Day River flowing through the model area is seriously polluted far beyond the national environment standards over the year, by inflowing pollution loads discharged from anthropogenic activities in the surrounding area.

2.3 Different pollution sources are responsible for water pollution in the model area. Major source is domestic wastewater discharged from households, commercial and institutional facilities without treatment, accounting for some 90 % of the total pollution load. It is reported that industrial wastewater accounts for about 7 to 11 % in Tu Liem and Ha Dong District, respectively.

2.4 A total number of manufacturing entities discharging industrial wastewater surveyed by WG-3 are 724 and 155 in Hanoi City and the model area, respectively. In addition, some small-scale industries registered with EPC exist. Besides this, craft villages of 260 and nine (9) locations are operating in Hanoi City and the model area, respectively. In Hanoi City, Me Linh District accommodates the largest numbers of pollution source projects, and Tu Liem and Ha Dong District are placed at the second and the third ranking.

2.5 As for industrial locations, 51 % of manufacturing industries are sited in industrial parks or industrial clusters in Hanoi City and the model area. Remaining entities are located, independently outside industrial parks and clusters.

2.6 The majority of manufacturing firms located in Hanoi City and the model area belong to the light industry category, like electrical and machinery parts, textile, food processing and so forth. Heavy industries are not located in Hanoi City and the model area.

2.7 Production scales of industries located in Hanoi City and the model area are relatively small. In terms of employee numbers (employee/entity), averages are 270 in Hanoi City and 128 in the model area. In terms of discharged wastewater flow, averages are 154 m^3/day in Hanoi City and 35 m^3/day in the model area.

3. Water Pollution Control by DONRE

3.1 DONRE has the responsibility for supervising environment protection measures taken by business owners, and enforces in the frontline water pollution control for industrial wastewater by means of environment management systems.

3.2 Major management systems being employed by DONRE are aiming to promote and encourage appropriate environment protection measures, specifically:

- Environmental authorization and compliance for provision of IWTP, the national effluent standard of industrial wastewater and self-monitoring of environmental protection measures (by Decree 80/2006/ND-CP and others)
- Industrial wastewater fee (environment protection fee for wastewater) (by Decree 67 /2003/ND-CP, amended later on)
- Wastewater discharge license (by Decree 149/2004 /ND-CP, grounded on Law on Water Resources)

3.3 The management purpose of authorization and compliance (including EIA approval, self-monitoring and so forth) is yet to be attained, as seen from many and repeated violations against environmental requirements. Functions of this management system are constrained by different reasons, like low environment awareness of entity operators, immature enforcement of administrative process, ineffective check and inspection by DONRE and so forth.

3.4 The system of industrial wastewater fee is not functioning as expected and the amount of collected fee is very limited, due to vulnerable implementation setup, lack of dissemination to entities and so forth.

3.5 The purpose of wastewater discharge license is overlapped with the management system of environmental authorization and compliance grounded on the amended LEP. For the moment, the system of wastewater discharge license is not active and only limited licenses to industrial entities have been issued.

3.6 Because the provision of setting a minimum scale is not in place in many management systems (such as the application of the national standard of discharged industrial wastewater quality, wastewater fee, etc.), DONRE is forced to do a lot of inefficient administrative works.

3.7 As governmental supporting measures for the environmental protection, Hanoi PC has pushed forward with relocation and agglomeration of industries, and the environmental protection fund. In this scheme, it is important that the relocation with industrial clusters be pursued more, along with the construction of a centralized IWTP.

3.8 Although the environmental check and inspection is a main management system for enforcement of water pollution control, its effect is limited for the moment. Major causes are considered to be: lack of appropriate information system on pollution sources, lack of specialized ability associated with water pollution technologies and generous administrative sanctions against violations.

3.9 Concerning the management resources, DONRE lacks enough human resources, budget and equipment, as compared to large numbers of pollution sources. As one of necessary measures to consolidate the environmental check and inspection, DONRE has to build effective and secure information system.

4. Industrial Wastewater Measures by Entities

4.1 Along the "Polluters-Pay-Principle (PPP)", the amended LEP states a number of entities' duties to take necessary measures for industrial wastewater, setting specific provisions by promulgation of different regulations. Nevertheless, majority of industrial entities do not take appropriate industrial wastewater measures on the whole.

4.2 There are some entities operating without any environmental authorization (EIA, EPP, EPC, etc.). Of all the entities discharging industrial wastewater, 14 and 20 % of the entities do not have any type of authorization in Hanoi City and the model area, respectively. This is one of basic issues to be solved in the environmental compliance in Hanoi City.

4.3 Some 44 and 58 % of the entities in Hanoi City and the model area respectively are operating with different types of IWTP. Meanwhile, some 28 and 25 % of entities in Hanoi City and the model area respectively are discharging wastewater without treatment. In terms of wastewater volume, 67 and 90 % of discharged wastewater in Hanoi City and the model area respectively are treated with different types of IWTP. It has been found that the larger scale projects (in terms of wastewater flow-rate) tend to be equipped with IWTP at the higher rate.

4.4 In terms of projects located in industrial parks and clusters, 51 % of discharged wastewater volume are treated with central IWTPs in Hanoi City. In addition, central IWTPs with the capacity of another 29 % of discharged wastewater volume are under construction now.

4.5 Of all entities, 38 and 42 % discharge wastewater meeting the national effluent standards in Hanoi City and in the model area, respectively. In terms of wastewater volume, 64 and 63 % of total wastewater are discharged treated wastewater meeting the national standards, in Hanoi City and the model area, respectively.

4.6 Of all the entities discharging industrial wastewater, 33 to 44 % entities conduct self-monitoring appropriately, including periodical submission of monitoring reports, in Hanoi City and the model area, respectively.

4.7 In terms of numbers of projects, some 72 % and 60 % don't pay industrial wastewater fee in Hanoi City and the model area, respectively. In terms of discharged wastewater amount, some 70 % of wastewater and 59 % are discharged without the payment of industrial wastewater fee in Hanoi City

and the model area. As seen from this, it has been found that majority of entities don't pay wastewater fees. Especially, as high as some 81 % of the entities located independently don't pay the wastewater fee.

4.8 In terms of numbers of projects, some 77 % and 66 % do not take wastewater discharge license in Hanoi City and the model area, respectively. As seen from this, it has been found that majority of entities do not have necessary discharge license. Especially, as high as some 81 % of entities located independently don't take discharge license.

5. Assessment of Industrial Wastewater Compliance and Pollution Loads

5.1 In this Improvement Plan, the environmental compliance level is defined as the achievement status of industrial wastewater measures which industrial entities attain for observing legal rules and regulations. In order to numerically represent the compliance status, the Industrial Wastewater Compliance Rating (IWCR) has been developed and applied. Rating scores of IWCR are calculated by rating the status of each item of water pollution control (namely, compliance levels for 6 items) with three (3) degrees (1, 3 and 5).

5.2 Numerical rating scores of IWCR are calculated by using the pollution source table (PST) exported from the pollution source database (PSD). IWCR scores may be calculated in several ways, like the total score of entities, the average score of some entity groups, the individual score of respective compliance items and so forth, depending on the usage purposes.

5.3 IWCR may be used for different purposes, for instance: Setting a target of improving wastewater measures of entities or entity groups, formulating the check and inspection plan by selecting subject entities based on the scores of IWCR, choosing Best and Bad- Compliance entities and so forth.

5.4 As a result of the site survey in Output 3, major causes for the environmental incompliance have been identified to be low awareness and motivation of entity operators, lack of land spaces and lack of finance. That implies that there are needs for governmental supporting measures to overcome these causes, in parallel to more stringent administrative sanctions by DONRE.

5.5 Provisional regression curve may be formed between the rating score of ITWP provision and total BOD pollution loads in the region. Based on this provisional curve, the target of BOD load to be achieved may be expressed by the rating score of IWTP provision.

6. Proposed Outline of Improvement Plan for Wastewater Pollution Control

6.1 Present environmental compliance by entities is very different, depending on entities. This means that the water pollution control by DONRE is still immature in industrial wastewater management grounded mainly on the amended LEP. As a result of the problem analysis as shown in **Figure 1**, main problem in water pollution control by DONRE is summariezed as:

- Water pollution control by DONRE is ineffective in promoting industrial wastewater measures by entities for mitigating the environmental pollution.

6.2 In addition, four (4) key issues that are the reasons for the main problem have been identified, as follows:

- Key Issue 1: Environmental check and inspection by DONRE are ineffective in promoting the environmental compliance by entities.
- Key Issue 2: The awareness level of entity operators to the environmental compliance is low.
- Key Issue 3: Governmental supporting measures which encourage entities to take industrial wastewater measures are modest.
- Key Issue 4: Management tasks of DONRE for water pollution control are inefficient due to no provision of minimum scales for the management.

6.3 WG-3 has discussed and examined how to improve the present water pollution control by DONRE, employing the methodology of objective analysis by means of "measures" and "end" relationship. As a result, the purpose of this improvement has been set up, as follows:

- Water pollution control by DONRE functions well in promoting industrial wastewater measures by entities for mitigating the environmental pollution.

6.4 Based on the objective analysis, WG-3 has identified four (4) challenges to be tackled for attaining the improvement purpose, as follows:

- Challenge 1: To consolidate environmental check and inspection to promote the compliance by entities.
- Challenge 2: To enhance the awareness of entity operators to the environmental compliance.
- Challenge 3: To strengthen Governmental supporting measures to promote industrial wastewater measures by entities.
- Challenge 4: To streamline regulation systems of water pollution control.

6.5 Along the purpose and a series of challenges of the improvement, specific schemes of the Improvement Plan have been examined by means of the objective analysis. As a result, the framework of the Improvement Plan comprised of a series of

actions has been formulated, as shown in **Figure 2**. Contents of 10 actions to generate respective challenges are set forth in **Table 1**.

7. Conclusion and Recommendation

7.1 WG-3 has surveyed current water pollution control by DONRE and industrial wastewater measures by entities, collecting related data/ information in Hanoi City. Especially in the model area, WG-3 has conducted site surveys three (3) times to precisely clarify compliance status on wastewater measures, by means of direct interviews to industries and site observations. Based on these survey and analysis, this Improvement Plan has been formulated based on the analysis of actually collected data/ information in this Project.

7.2 Final outcome of Output 3 is titled the "Outline" of Water Pollution Control Measures. That means that more detail planning will be necessary before implementing the improvement plan suggested here. It has been confirmed that this detail planning for the implementation will be made by DONRE separately, following the Project.

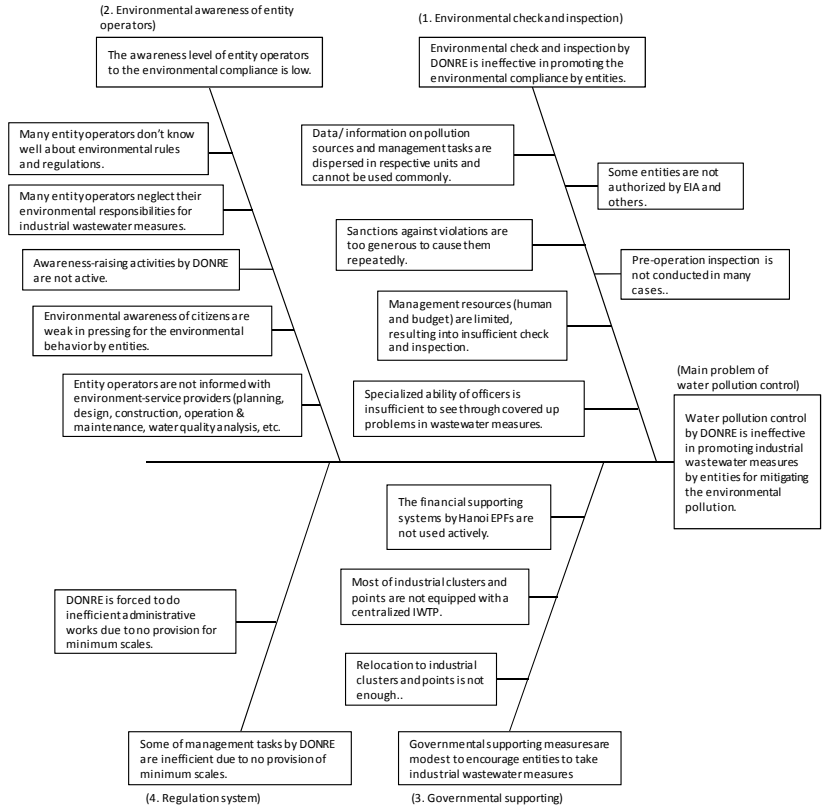
7.3 The proposed Outline of Improvement Plan for Water Pollution Control is aiming to achieve the purpose that water pollution control functions well in promoting industrial wastewater measures by entities for mitigating the environmental pollution. As a result of the problem and objective analysis, four (4) challenges to attain the improvement purpose have been identified. Achieving this improvement purpose will also help solve the "uneven management", which has been brought about by the ineffective enforcement at present.

7.4 Considering the character of this Outline of Improvement Plan, it is recommended that detail project schedule for the implementation should be discussed separately in DONRE, along with the examinations on detail contents to be carried out. **Figure 3** shows the referential road map for the Improvement Plan, assuming five (5) years period.

7.5 In activities of Output 3, the Pollution Source Database (PSD) has been developed and actually used to store and process collected data. In the Improvement Plan proposed by WG-3, the integrated information system is a key instrument to support water pollution control by DONRE. It is expected that the system and stored data of the PSD used in this project will be utilized for structuring the integrated information system. This PSD developed in this project can be used for actual management activities for water pollution control and, in the future, it should be considered that the PSD would be upgraded to more convenient and more functional type.

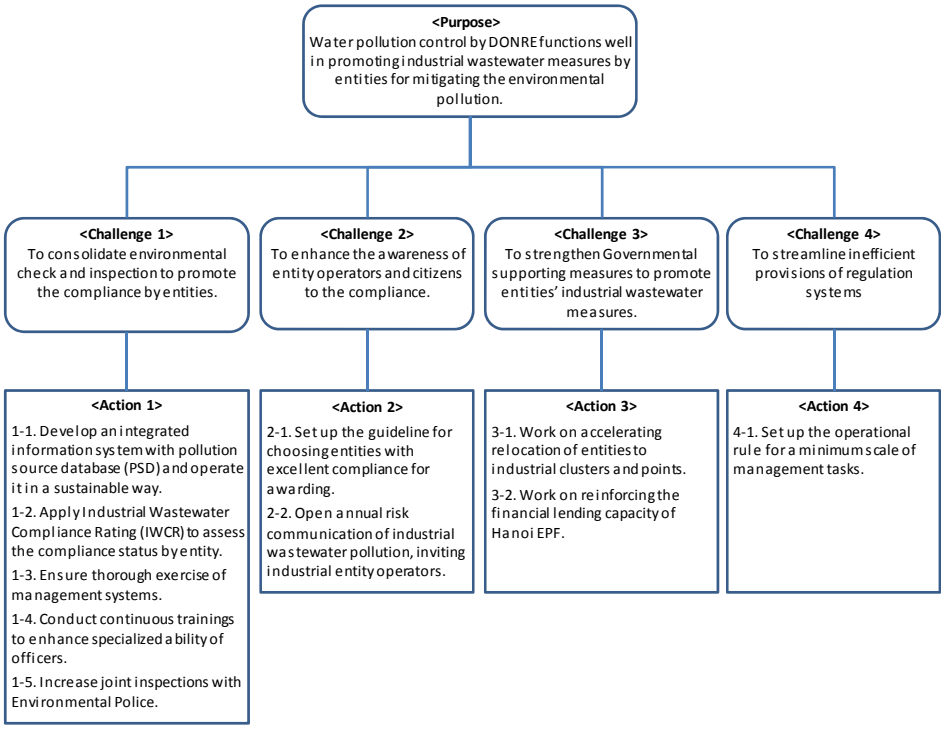
7.6 WG-3 has tried the use of Industrial Wastewater Compliance Rating (IWCR) to assess the status of wastewater measures taken by entities. The rating scores of IWCR, as a numerical indicator which may be calculated from data/information in the pollution source table (PST) formed from the PSD, represent the compliance status of environmental authorization, IWTP provision, wastewater fee and so forth. It is recommended that DONRE, in the industrial wastewater management, applies the IWCR to assess the compliance status of entities, setting up of improvement targets, selection of excellent entities for awarding, etc.

7.7 Main objective of this Plan is to improve water pollution control in the field of industrial wastewater management. Hanoi DONRE has been enforcing the water pollution control, by employing different environmental management activities and systems. In this JICA Project, the capacity development of other inter-related components, such as Pollution Source Inventory (Output 2-3), Inspection (Output 2-4) and Environmental Awareness (Output 4), were implemented. In detail planning of this Improvement Plan, it is suggested that outcomes from these capacity developments be also considered and utilized.



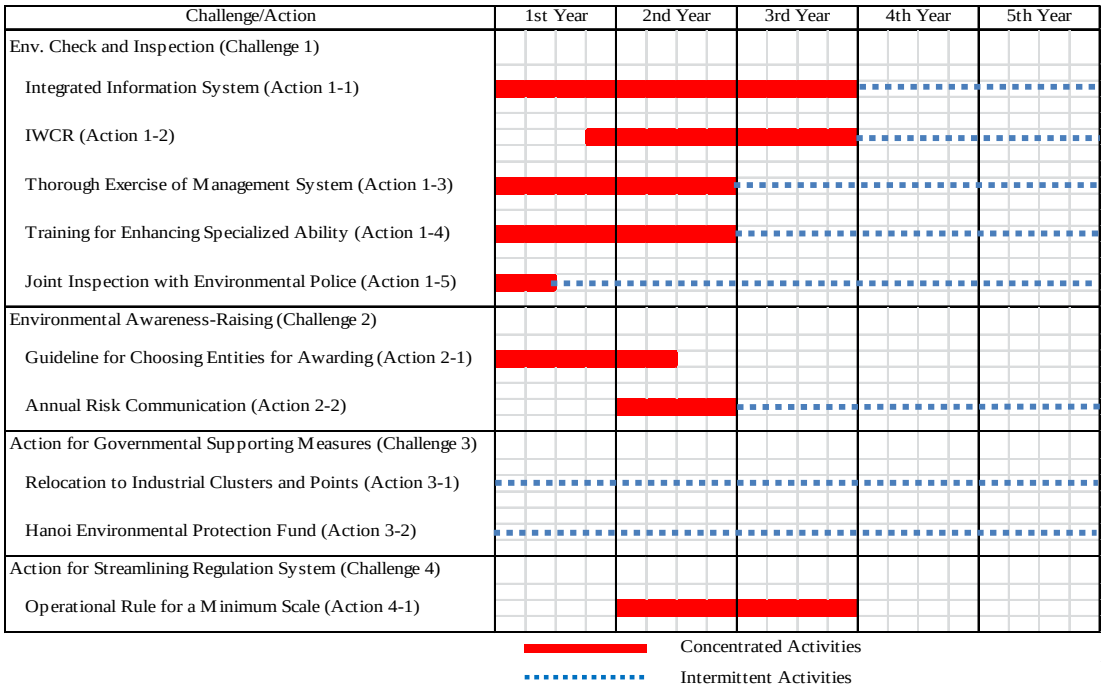
Source: Prepared by WG-3

Figure 1 Problem Structure of Water Pollution Control



Source: Prepared by WG-3.

Figure 2 Proposed Framework of Improvement Plan of Water Pollution Control



Source: Prepared by WG-3.

Figure 3 Road Map of Improvement Plan for Water Pollution Control in Hanoi City

Table 1 Profile of Proposed Actions

Challenge	Title of Action	Objective of Action	Component Activity
Challenge 1: Environmental Check and Inspection			
	Action 1-1: Integrated Information System	To develop integrated information system with pollution source database (PSD) and operate it in a sustainable way.	1) Operate the PSD 2) Utilize outputs of the PSD for environmental check 3) Upgrade the PSD and inspection
	Action 1-2: Assessment of Environmental Compliance with IWCR	To annually assess the compliance status of entities, by applying the Industrial Wastewater Compliance Rating (IWCR)	1) Annually calculate rating scores of the IWCR and analyze the compliance status 2) Use the rating score of the IWCR in regular management tasks
	Action 1-3: Thorough Exercise of Management System	To ensure thorough exercise of management systems	1) Ensure the enforcement of check and inspection before operation, and collect and record data/ information on actual wastewater measures. 2) Find out not authorized entities
	Action 1-4: Training for Enhancing Specialized Ability	To conduct continuous trainings to enhance specialized ability of officers engaged in environmental check and inspection.	1) Continue to hold periodical technical trainings for environment-specialized abilities.
	Action 1-5: Joint Inspection with Environmental Police	To increase joint inspections with Environmental Police.	1) Conduct more joint inspection with Environmental Police
Challenge 2: Environmental Awareness-Raising			
	Action 2-1: Publication of Compliance Situations on Industrial Wastewater	To publicize the compliance situation for industrial wastewater, after developing the guideline for choosing Best and Bad-Compliance Entity.	1) Prepare the guideline for choosing Best and Bad-Compliance Entities 2) Periodically publicize the compliance situations of industrial wastewater
	Action 2-2: Annual Risk Communication of Industrial Wastewater Pollution	To open annual risk communication of industrial wastewater pollution, inviting industrial entity operators and general citizens.	1) Choose most excellent- compliance entities for awarding 2) Open the risk communication of industrial wastewater pollution (annual meeting), inviting entity operators in Hanoi City and citizens
Challenge 3: Governmental Supporting Measures			
	Action 3-1: Relocation to Industrial Clusters and Points	To work on accelerating relocation of entities to industrial clusters and points.	1) Work on relocations of entities discharging environmental pollution into industrial clusters and points provided with a centralized IWTP.
	Action 3-2: Hanoi Environmental Protection Fund	To work on reinforcing the financial lending capacity of Hanoi EPF.	1) Work on the use and the capital increase of Hanoi EPF.
Challenge 4: Streamlining Regulation System			
	Action 4-1: Operation Rule for a Minimum Scale of Management Task	To set up the operational rule for a minimum scale of management tasks.	1) Set up the operation rule for certain minimum discharge for industrial wastewater fee, effluent water quality standard and wastewater discharge license.

Source: Prepared by WG-3

CHAPTER 1
INTRODUCTION

1.1 General

This Improvement Plan is a tangible outcome of Output 3 (water pollution control measures) that is defined in the Project Design Matrix (PDM) of the Project.

The PDM defines that the objective of Output 3 is "to strengthen the capacity of making water pollution control measures". As the pre-condition of Output 3 activities, manufacturing industry has been specified as the target group industry. Therefore, industrial wastewater discharged from manufacturing industries has been defined to be the specific target of water pollution control to be studied by Output 3.

Water pollution control is enforced by Hanoi DONRE and other related units, as one of environment management tasks. While the Vietnamese Government has set out a large number of regulations and rules to manage industrial wastewater, for the moment, many industrial entities discharging wastewater are exceeding the national standards with various violations against the regulations. Such imperfect water pollution control is one of causes for "uneven management" of industrial wastewater.

In light of the importance of the response to industrial pollution, this Improvement Plan is aiming to strengthen water pollution control in Hanoi City, especially focusing on wastewater discharged from manufacturing industry.

1.2 Objective

The objective of this Improvement Plan is:

- To propose the outline for strategic approaches for improving water pollution control being enforced by DONRE in Hanoi City.

In Vietnam, MONRE as the central government authority has the responsibility of formulating the national policies and management systems necessary for water pollution control. Meanwhile, DONREs in cities and provinces have the responsibility of enforcing water pollution control by employing management systems in their administrative territories in accordance with guiding from MONRE. Thus, approaches for improving water pollution control to be aimed in Output 3 focus on enforcement of management systems, excluding the setup of national policies and management instruments.

In this Project, component activities of water pollution control are subjects of capacity development in other Outputs. They are environmental monitoring (Output 2-1), pollution source inventory (Output 2-2), pollution source inspection (Output 2-3) and awareness promotion (Output 4). In Output 3, these activities are handled in combined and integrated tasks with other ones to deal with practical issues pertaining to industrial wastewater.

This Improvement Plan has been formulated in a series of Output 3 activities, like data collection on industrial wastewater measures by industrial entities and administrative management of DONRE, data processing and analysis, examination on improvement measures and so forth.

1.3 Definition and Clarification

1) Subject Group of Industry

Output 3 has chosen "Manufacturing Industry" as the subject group for pollution control measures for the following reasons:

a) Manufacturing industry is one of major sources of water pollution to be controlled by Hanoi DONRE, discharging a large portion of pollution load, and

b) Manufacturing industry is a suitable category for DONRE to examine possible improvement of its management tasks for water pollution control, in view of a limited period of this Project, because DONRE has a number of specialized and concentrated competences in water pollution control for manufacturing industry, unlike other sectors (such as hospital, households, commercial facilities, etc.)

2) Model Area

Tu Liem and Ha Dong Districts have been chosen as the model area for the study of Output 3. They are located along the upstream of the Nhue River, which is one of major water courses in the area, and accommodate diverse and major manufacturing industries in Hanoi City. In light of such importance in the water pollution control of Hanoi City, Tu Liem and Ha Dong District have been chosen as the model area.

Hanoi DONRE has competences for water pollution control in the whole territory of Hanoi City, and the objective of this Improvement Plan is to enhance the management of DONRE from the viewpoint of strategic approaches. Considering this, the scope of this plan is defined to be the whole area of Hanoi City. The model area (Tu Liem and Ha Dong District) is considered to be a specific subject area, in case the plan uses and/or refers to actual and specific data and conditions of industrial wastewater measures by entities and water pollution control by DONRE.

3) Industrial Wastewater Measure by Entities

Manufacturing industry has legal responsibility to take necessary undertakings to prevent discharging of wastewater that could cause harmful impact. In the Improvement Plan, the "industrial wastewater measures" are defined to be different undertakings to be made by industrial entities so as to mitigate negative influences caused by industrial wastewater.

4) Water Pollution Control by DONRE

Hanoi City DONRE and District DONREs are delegated with diverse responsibilities to regulate industrial wastewater discharged from industrial entities. In this Improvement Plan, various administrative activities and actions enforced by DONREs (of Hanoi City and districts) are defined to be the "Water Pollution Control".

5) Water Pollution Control Sector

The target of capacity development in Output 3 is Hanoi DONRE including district DONREs of Tu Liem and Ha Dong. More specifically, Hanoi EPA, Hanoi Inspectorate, Department of Water Resources Meteoro-Hydrology (DWRMH) and district DONREs (of Tu Liem and Ha Dong) are the constituent units of the target group for Output 3. In this Improvement Plan, Hanoi DONRE and district DONREs are called the "water pollution control sector". In this report, the word of Hanoi DONRE is expediently used for the water pollution sector in some sections.

6) Drafting the Outline of Water Pollution Control Measure

In this Project, the final outcome of Output 3 is titled the "Outline" of Water Pollution Control Measures. That means that more detail planning will be necessary before implementing the improvement plan suggested here. It has been confirmed that this detail planning for implementation will be made by DONRE following the Project. From this viewpoint, Output 3 is aiming to draft just key points and basic direction for the improvement. From such reason, the report to be drafted in Output 3 is titled the "Outline of the Improvement Plan."

1.4 Output 3 Activities

Objective of Output 3 is "to strengthen the capacity of drafting the outline of water pollution control measures". To this end, a series of activities, like preparing, examining and formulating the plan for improvement of water pollution control, have been carried out in different works of Output 3, over the project period between April 2011 and March 2013.

These activities are shown in **Table 1-1**.

Table 1-1 Chronology of Output 3 Activities

Activities (Activity Number)	Work Contents	Period
0. Setup of Working Group for Output 3	A working group is set up by members from Hanoi DONRE and related units.	April 1 – 15, 2011
1. Performance Assessment and Issues Identification in Hanoi City (Activity 3-1)	The effect of current water pollution control measures is assessed, by clarifying problems and constraints of environment protection measures at sources and management tasks by DONRE.	April 1 – August 31, 2011
2. Confirming Project Province (Activity 3-2)	Subject province is defined.	April 1 – 15, 2011
3. Specifying the Model Area and Industrial Groups (Activity 3-3)	The model area and target industrial groups are specified.	April 15 – 30, 2011
4 to 6. Drafting Outline of Water Pollution Control Measures (Activity 3-4)	The outline of water pollution control measures for the model area is drafted through series of the following activities.	
4. Clarification of Situation in Protection Measures & Management in the Model Area (Activity 3-4-1)	The existing situations related to water pollution control measures in the model area are surveyed and clarified, by way of: 1. Survey on industrial entities (first site survey and additional site survey) 2. Preparation of pollution source database (PSD) and pollution source table (PST)	June 1, 2011 – March 31, 2012
5. Identification of Issues to be Solved (Activity 3-4-2)	Issues in environment protection measures and management tasks which should be solved are identified.	February 1, 2012 – June 30, 2012
6. Examination for Strengthening & Improvement (Activity 3-4-3)	The strengthening of water pollution control is examined by the following steps: 1. Discussion of strengthening of environment management tools, including: 2. Verification of strengthened environment management tools (second site survey) 3. Estimation on the effect of pollution load reduction 4. Drafting the outline of effective water pollution control measures 5. Holding a sector seminar for industrial wastewater management	May 1, 2012 – Mar. 15, 2013 May 1, 2012 – Oct.31, 2012 Sep. 1, 2012 – Feb.28, 2013 Mar.15, 2013

Source: Work Plan by WG-3

1.5 Sources of Information

Through a series of activities mentioned above, various data/ information have been collected to clarify present situations of wastewater measures by entities and water pollution control by DONRE. These results have been compiled in the following intermediate reports:

a) Discussion Note on Current Status of Water Pollution Control in Hanoi City; including about 1,400 sets of data/ information on 1,170 pollution source projects (various industrial/economic activities that require pollution control by DONRE), gathered from Hanoi DONRE and District DONREs,

b) Field Note of First Site Survey in the model area; including data/ information gathered from the first site survey for 30 entities located in the model area,

c) Field Note of Additional Site Survey in the model area; including detail data/ information gathered from the additional site survey for 5 entities among the subject entities of the first site survey,

d) Field Note of Second Site Survey in the model area: including data/ information gathered from the first site survey for additional 60 entities located in the model area,

e) Pollution Source Database (PSD) and Pollution Source Table (PST) for Hanoi City; storing all collected data/ information in the activities mentioned above.

All of these collected data/ information have been used as sources of information in discussing the Improvement Plan.

1.6 Structure of This Report

This report is organized along the following chapters and contents:

Chapter 1: General	Generalities
Chapter 2: Description of Study Area	Geographical, socio-economic and environmental conditions, and major characteristics and dimensions of industrial entities
Chapter 3: Water Pollution Control by DONRE	Organizational characteristics, administrative management system for industrial wastewater, environmental check and inspection and capacity assessment.
Chapter 4: Industrial Wastewater Measures by Industries	Entities' duties and actual status of industrial wastewater measures
Chapter 5: Assessment of Industrial Wastewater Measures and Compliance	Concept of relationship between water pollution control and compliance, integrated information system with the PSD, method of compliance rating, application of compliance rating result, analysis of causes for incompliance
Chapter 6: Proposed Outline of Improvement Plan for Water Pollution Control	Issue identification, proposed framework for improvement, description of challenge and action
Chapter 7: Conclusion and Recommendation	Recommended road map of the improvement for water pollution control, others

1.7 Working Group

The Working Group 3 (WG-3) is organized by the following members from Hanoi DONRE, Tu Liem DONRE and Ha Dong DONRE who are regularly engaged in water pollution control duties. Two (2) JICA Short Term Experts (Mr. Matayoshi and Mr. Shoji) have been assigned to support them and give advice for their activities:

- Hanoi EPA: Ms. Dao Thi Anh Diep (WG-3 Leader, Deputy Director), Mr. Nguyen Trong Truong (Officer), Mr. Ta Ngoc Son (Officer),
- DWRHM: Mr. Pham Hung Cuong (Head), Mr. Nguyen Trong Dung (Officer),
- Hanoi Inspectorate: Mr. Nguyen Tien Hung (Deputy Chief Inspector),
- Ha Dong DONRE: Mr. The Anh (Head), Ms. Quan Thị Nam (Officer),
- Tu Liem DONRE: Ms. Dao Thi Hong Le (Officer)

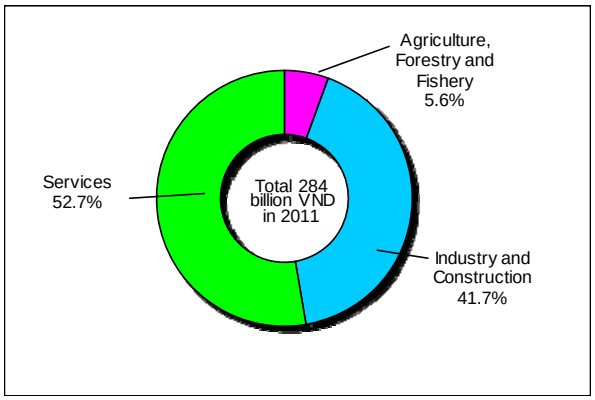
CHAPTER 2
DESCRIPTION OF STUDY AREA

2.1 General

Chapter 2 presents outline and profile of Hanoi City and the model area (Tu Liem and Ha Dong District). Data and information on features of industrial entities as pollution sources presented here are based on the survey results conducted by Output 3.

2.2 Overview of Socio-Economy of Hanoi City

Hanoi City, one of localities in the Northern EFR, has 6.1 million population ranked in the second in the population in the country, following Ho Chi Minh City. The per capita GDP of Hanoi City is 2,065 US$/year (current price in 2011). Massive industrial activities have been taking place, especially in/around the Hanoi urban center, and the industry and construction sector in Hanoi City occupies some 42 % in the regional GDP, as shown in **Figure 2-1**.



Source: Hanoi Statistical Office; Hanoi Statistical Book 2011

Figure 2-1 Structure of GDP in Hanoi City

Table 2-1 tabulates the outline of industrial activities in Hanoi City. Hanoi City has the industrial GDP of some 118 billion VND, with 9 - 14 % of annual growth rate (constant price in 1994) in the past seven (7) years. It has around 6,400 registered manufacturing enterprises with close to 255,000 workers.

Industrial activities take place mainly in industrial zones and industrial clusters in/around the urban center. Besides, many craft villages (about 260) are located in Hanoi City, especially in rural areas (the former Ha Tay Province) and 9 villages are situated in the urban area.

Table 2-1 Dimension of Manufacturing Industry in Hanoi City

Items	Dimensions
Industry and Construction GDP (billion VND/year)	118
Industry and Construction GDP annual growth rate (%)	9 to 14
Number of employees (persons)	255,000
Number of enterprises (unit)	6,363
Number of industrial zones (location)	11
Number of craft villages (location)	260

Sources: Based on the Situation of Enterprise through the Result of Survey in 2006 – 2008 issued by General Statistics Office of Vietnam, the JST prepared by compiling other data.

2.3 Profile of Model Area

Tu Liem District and Ha Dong District, as shown in **Figure 2-2**, have been defined as the model area, on the ground that they are representative areas that accommodate diverse manufacturing industries discharging large pollution loads into water courses.

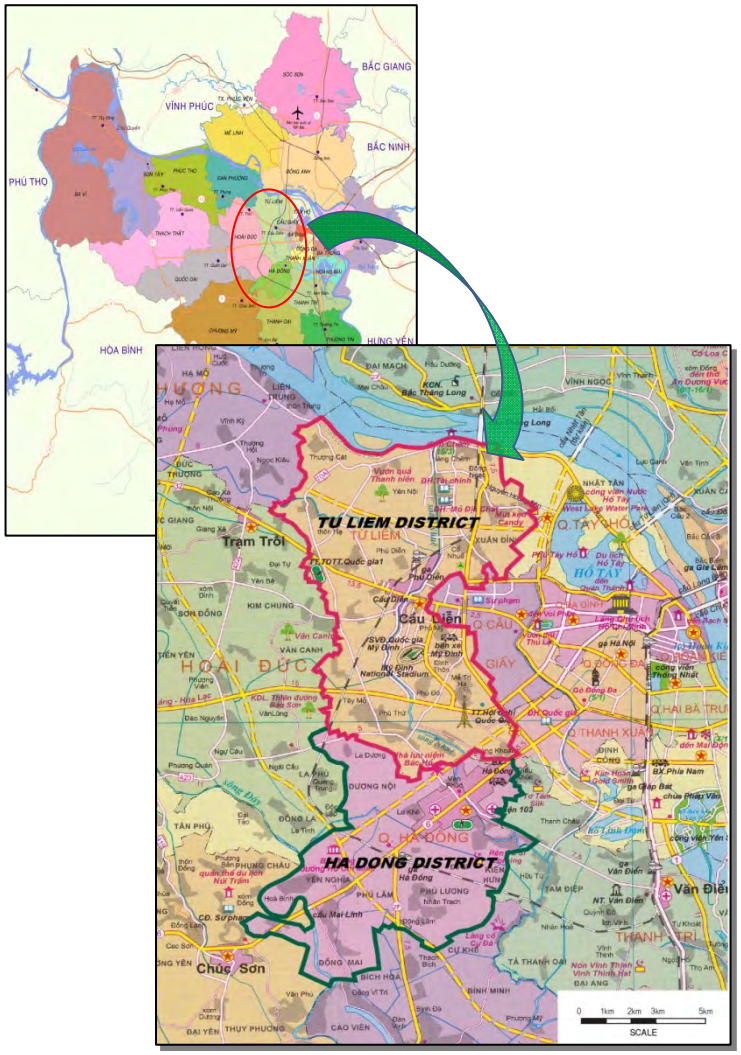


Figure 2-2 Location of Model Area

Geographical and socio-economic features of the model area are tabulated in **Table 2-2**.

Table 2-2 Profile of Model Area

Candidate Locations	Locations	Land Areas	Major Dimensions of Pollution Sources
Tu Liem District	Both side of the Nhue River	75 km^2	Population: 248,900 people Industries: 93 entities Industrial Park: Thang Long South IP Industrial Clusters: 2 Craft village: 5 locations
Ha Dong District	Right side of the Nhue River	48 km^2	Population: 198,700 people Industries: 39 entities Industrial Clusters: 3 Craft village: 4 locations

(Source: Compiled by JET based on Hanoi DONRE SOE 2008 and Hanoi Statistical Book 2011)

2.4 Environmental Conditions

1) Hydrological Network in Hanoi City

Major rivers flowing in/around the Hanoi urban center are the Red River, Duong River, Nhue River and Ca Lo River. The Day River flowing mainly in former Ha Tay Province is also a major river flowing in Hanoi City, after the geographical territory of Hanoi City has been extended in 2008. Among these major rivers, large portions of the Duong River and Ca Lo River run through outside the Hanoi urban center. Long dykes are constructed along both sides of the Red River and Duong River, not allowing the discharge of waters in urban Hanoi into these rivers without pumping.

The Nhue River receives water from the Red River through Lien Mac channel. The river also serves as drainage systems for Hanoi City, receiving much wastewater discharged from households, commercial centers, industries, etc. It joins the Day River in Ha Nam Province.

The Day River has only minimal water flow from the Red River to carry floods in the wet season and to convey water supplies in the dry season, since the construction of Day dam. The Day River has played an important role of flood divergence for the Red River and of irrigation for thousands of paddy fields and crops in down-stream regions.

In the Hanoi urban center, the sources for domestic and industrial water supply are groundwater and partly surface water of the Da River diverted into the Hanoi urban center from Hoa Binh reservoir. The surface water in/around the Hanoi urban center are not used for the source for domestic water due to unsuitable water qualities. The water of the Red River is not used for the domestic water use due to high turbidity and high iron content.

2) Water Pollution in Hanoi City

Nhue River

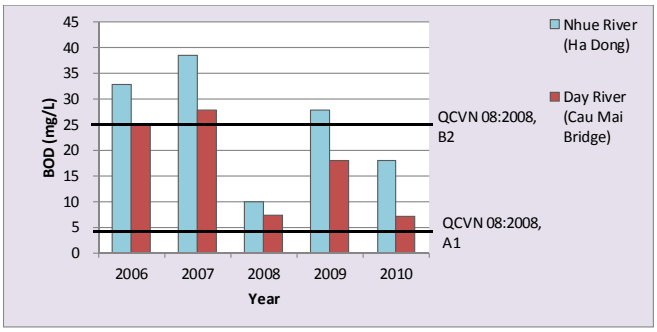
The Nhue River starts from Lien Mac sewer, receives water from the Red River and flows to Phu Ly then merges with the Day River. The Nhue River is a part of theinter-provincial agricultural irrigating system including Hanoi City, the former Ha Tay Province and Ha Nam Province.

Water quality of the Nhue River is strongly influenced by the runoff from the Hanoi urban center. The sections of the Nhue River through Ha Dong Town (Phuc La) before receiving water from the To Lich River, are seriously polluted; COD and BOD exceed the national standard (Class B2 of QCVN 08) by 3 - 4 times. DO remains very low and does not meet the national standard. The water has poor physical appearance, being black and scummy, and the river exerts strong offensive odors.

In the downstream from the To Lich River junction, the river water is extremely polluted, especially in the dry season when there are minimal diluting flows from the Red River. Even in the wet season, BOD, DO, ammonium nitrogen (N as NH_4^+) and coliform all fail to meet the national standard. From the To Lich River junction to the confluence with the Day River, the pollution level gradually decreases, as the pollutants are assimilated and dispersed. However, pollution generally remains at levels exceeding the national standard, as shown in **Figure 2-3**, **2-4** and **2-5**.

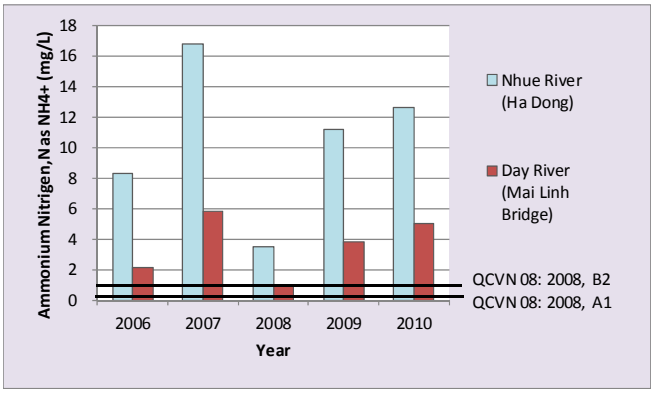
Day River

In the dry season, there is almost no flow in the section from Day dam to Ba Tha. Therefore, the water supply for irrigation is difficult. In the flood season, the water level of the Day River rises quickly and reduces slowly. The Day River has played an important role of flood divergence for the Red River and of irrigation for paddy fields and crops in the region of the former Ha Tay, Ha Nam and Ninh Binh Province.



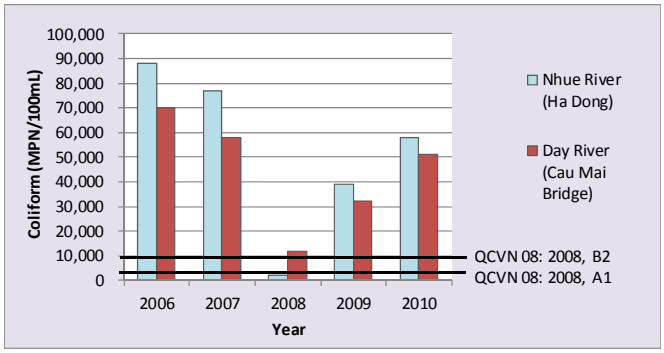
Source: Hanoi PC, State of Environment Report in Hanoi City for the Period of 2006 - 2010,

Figure 2-3 BOD Monitoring Data of Nhue River and Day River



Source: Hanoi PC, State of Environment Report in Hanoi City for the Period of 2006 - 2010,

Figure 2-4 Ammonium Nitrogen Monitoring Data of Nhue River and Day River



Source: Hanoi PC, State of Environment Report in Hanoi City for the Period of 2006 - 2010,

Figure 2-5 Coliform Monitoring Data of Nhue River and Day River

The Day River is locally polluted with the pollution level tending to increase, especially as the river is affected by the polluted inflows from the Nhue River. From Ha Dong District to Phu Ly Town (Ha Nam Province), water in the Day River is mainly polluted by organic substances. Typical parameters of organic pollution in the river sections flowing through Ung Hoa and My Duc (Hanoi City), and Kim Bang and Phu Ly (Ha Nam Province) have all exceeded Class B1 of QCVN 08. At Hong Phu bridge, the water is polluted with relatively high level of organic pollutants. This tendency is especially remarkable in the dry season, when Lien Mac Drain closes, as shown in **Figure 2-3**, **2-4** and **2-5**.

Inner Canals

In the Hanoi urban center, surface water in rivers connected to the Nhue River like the To Lich River, Lu River, Kim Nguu River and Set River is seriously polluted. All parameters measured exceed the national standard (Class B1 and B2 of QCVN 08). Pollution levels increase markedly in the dry season, when the Lien Mac channel of the Nhue River closes between each November and May. The river system is heavily polluted due to no treatment of domestic, industrial or agriculture wastewater.

Lakes and Ponds

In terms of inner lakes in Hanoi urban center, there are nearly 900 lakes and ponds with a hectare or more in size, within the boundaries of the former Hanoi City area. The urban core and urban fringe areas alone have more than 200 lakes. These lakes and ponds in the urban areas and their surrounding areas are commonly used as relaxation or recreation spots by residents. Almost all lakes are polluted by wastewater and sediments, with the depth of sludge of 0.5 - 1.5 m. Pollution and eutrophication lead to the degradation of water quality, lack of oxygen and increase sediments inside lakes.

Groundwater

The groundwater is crucial sources of water supply for domestic, industrial and irrigation in Hanoi City. The lower aquifer has been used for main water supply in Hanoi City and rural groundwater is produced from shallow well from the upper aquifer. The study result shows various pollution of groundwater, in terms of ammonia and organic matter pollution. The pollution by microbes (fecal coliform) indicates the similar sign to ammonia and organic matter, implying a sign of intrusion of untreated domestic and industrial wastewater.

2.5 Discharged Pollution Load in Model Area

The model area accommodates large numbers of households, institutional and commercial facilities and manufacturing industry. BOD pollution loads are discharged from households, commercial/institutional facilities, craft villages as well as manufacturing industries.

Table 2-3 shows BOD Pollution load discharged from different sources. BOD loads from manufacturing industry accounts for seven (7) to 11 % of the total load in the model area. As understood from this, domestic wastewater contributes to the pollution of the water environment in the region more seriously, as compared to industrial wastewater.

Table 2-3 Pollution Load Discharged from Pollution Source Categories

District	Items	Industrial Wastewater	Domestic Wastewater	Craft Village Wastewater	Total Pollution Load
Ha Dong	BOD (kg/day)	135	1,041	19.1	1,195
	Share (%)	11.3	87.1	1.6	100.0
Tu Liem	BOD (kg/day)	493	6,413	175	7,080
	Share (%)	7.0	90.6	2.5	100.0

Source: ICEM; Final Report of Day/Nhue River Basin Pollution Source Study; December 2007.

2.6 Characteristics of Pollution Sources

(1) General

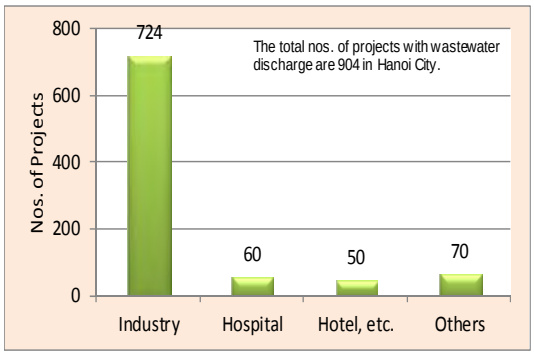
A series of activities for data collection, processing and analysis have been carried out throughout the project, by collecting existing records in DONRE and surveying industrial wastewater measures by industrial entities. All collected data/ information have been stored in the pollution source database (PSD) developed in this project. As one of outputs from the PSD, the pollution source table (PST) has been formulated, enumerating series of data records on

industrial entities. Major features of pollution sources presented below are analytical outputs from this PST.

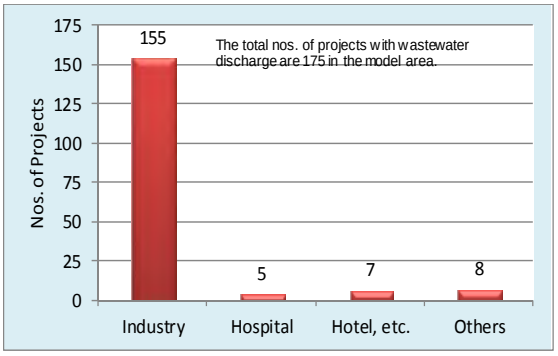
(2) Numbers of Pollution Source Projects

A total of 904 and 175 projects of all kinds have been identified in Hanoi City and in the model area, respectively, as shown in **Figure 2-6**. Of them, 724 and 155 projects are industrial entities discharging industrial wastewater, in Hanoi City and the model area, respectively.

In this survey, WG-3 has focused mainly on large and medium-scale industries which are subject to EIA (partly including EPC). Thus, it should be remarked that many small industries like craft village industries exist in Hanoi, other than the 175 projects surveyed.



Hanoi City)



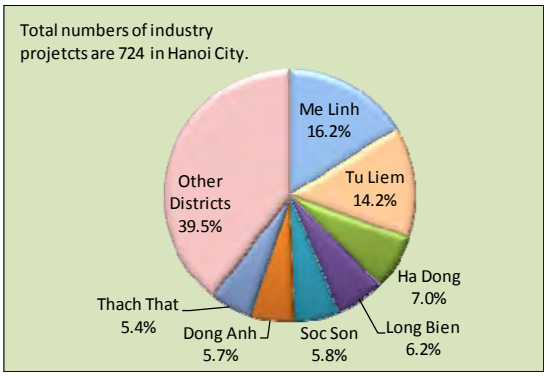
(Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-6 Numbers of Pollution Source Projects

(3) Geographical Distribution of Pollution Source Projects

In Hanoi City, Me Linh District accommodates the largest number of pollution source projects (117 projects with industrial wastewater discharge), as shown in **Figure 2-7**. Tu Liem and Ha Dong District are placed at the second and the third ranking.



Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-7 Numbers of Projects by District

(4) Industrial Locations of Pollution Source Projects

Industrial locations in Vietnam are classified into: industrial park, industrial cluster, craft village and independent. Status of locations of manufacturing industries is shown in **Table 2-4 and Figure 2-8**.

Manufacturing industries agglomerating in industrial parks or clusters account for 51 % in Hanoi City and in the model area. Manufacturing industries which are geographically located independently account for 17 % and 38 % in Hanoi City and in the model area, respectively.

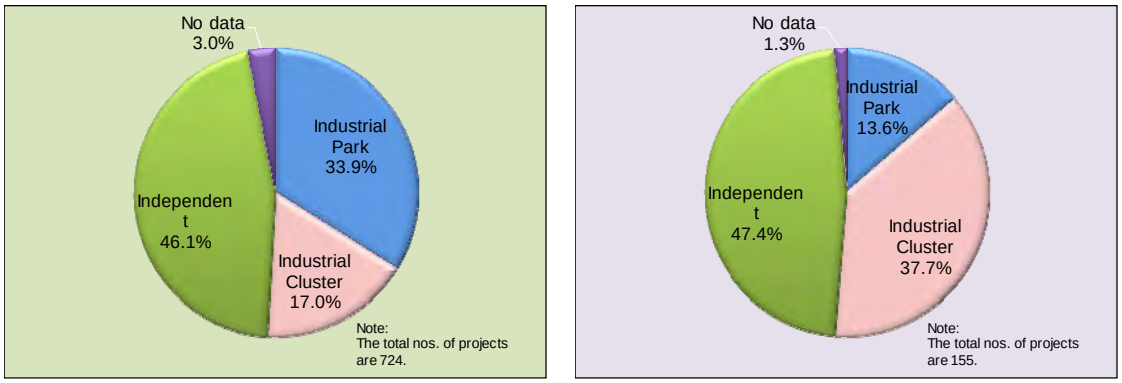
From this analytical result, it is assessed that the agglomeration of manufacturing industries in

industrial zones in Hanoi has progressed considerably.

Table 2-4 Numbers of Projects by Industrial Locations

Locations	Hanoi City		Model Area	
	Nos. of Projects	Rate of Located Projects (%)	Nos. of Projects	Rate of Located Projects (%)
Industrial Park	245	33.9	21	13.6
Industrial Cluster	123	17.0	58	37.7
Independent	333	46.1	73	47.4
No data	23	3.0	3	1.3
Total	724	100.0	155	100.0

Source: Survey Result by WG-3 in 2011 and 2012.
Note: The figures above show nos. of projects belonging to manufacturing industries.



Hanoi City) (Model Area)

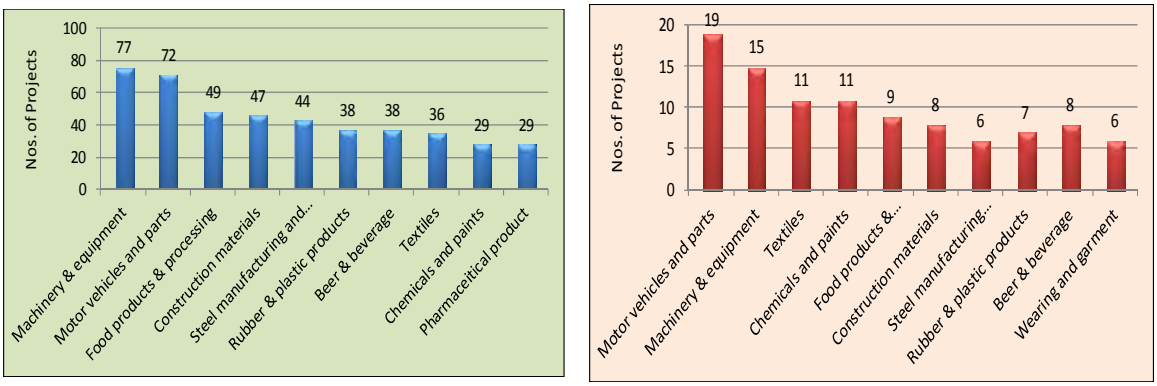
Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-8 Numbers of Projects by Industrial Location

(5) Categories of Manufacturing Industry

1) Entity Numbers by Industrial Categories

As shown in **Figure 2-9**, light industries producing parts for motors, machinery apparatus, paints, textiles, etc., occupy large part of manufacturing industry in Hanoi City and the model area, followed by food industries like brewery, food processing.



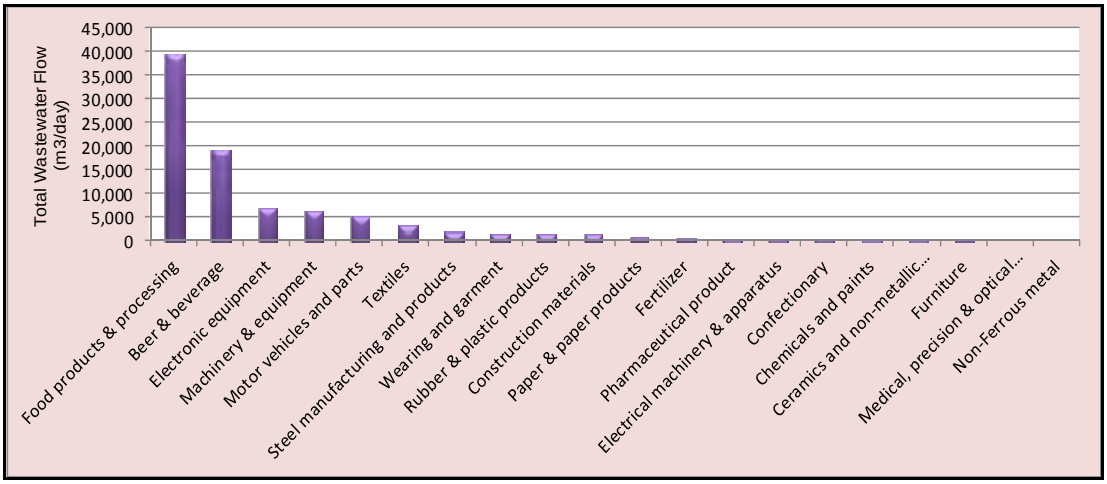
(Hanoi City) (Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-9 Top 10 Industrial Categories in Ranking of Manufacturing Industry

2) Total Wastewater Flow by Industrial Categories

In the WG-3 survey, data of wastewater flow were available for 453 entities in Hanoi City, and the total wastewater flow for these 453 entities was 65,002 m^3/day. Based on this survey result, **Figure 2-10** that presents wastewater flow-rate by industrial categories was formulated.



Source: Survey Result by WG-3 in 2011 and 2012.
Note: This figure shows only wastewater flows available in the PST formed in the WG-3.

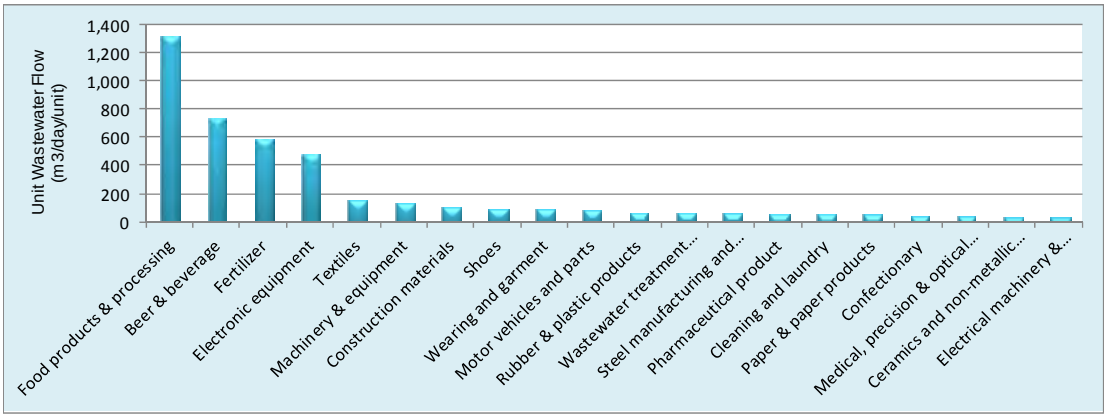
Figure 2-10 Total Wastewater Flow by Industrial Categories in Hanoi City

In Hanoi City, industrial categories that discharge large wastewater flow-rate are food products & processing, beer & beverage, electronic equipment and machinery & equipment and motor vehicle & parts, in the descending order.

3) Unit Wastewater Flow per Entity by Industrial Categories

Based on collected data of wastewater flow-rate in the WG-3 survey, **Figure 2-11** that presents unit wastewater flow per entity by industrial categories was formulated.

In Hanoi City, industrial categories which discharge large unit wastewater flow-rate per entity are food products & processing, beer & beverage, fertilizer, textile and machinery & equipment, in the descending order.



Source: Survey Result by WG-3 in 2011 and 2012.

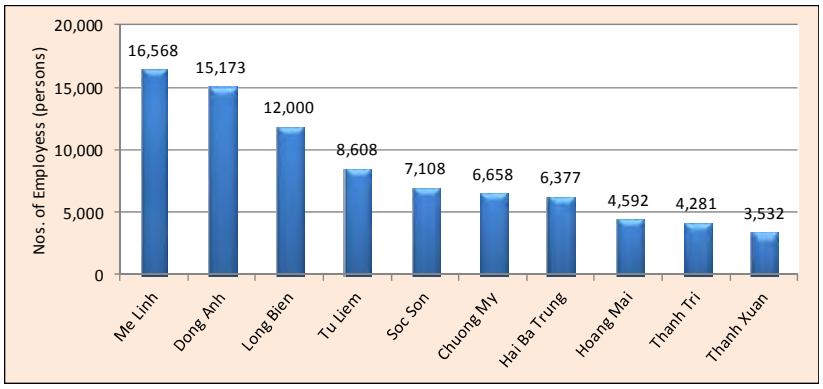
Figure 2-11 Unit Wastewater Flow per Entity in Hanoi City

(6) Numbers of Employees

1) Number of Employees by District

Figure 2-12 shows the top 10 districts in Hanoi City in employees' numbers, using the total numbers of about 110 thousands of numbers of employees collected in WG-3 survey. Three districts comprised of Me Linh, Dong Anh and Long Bien Districts occupy some 40 % of the

total employees in Hanoi City. Tu Liem District in the model area is placed at the forth ranking with about 8,600 employees.



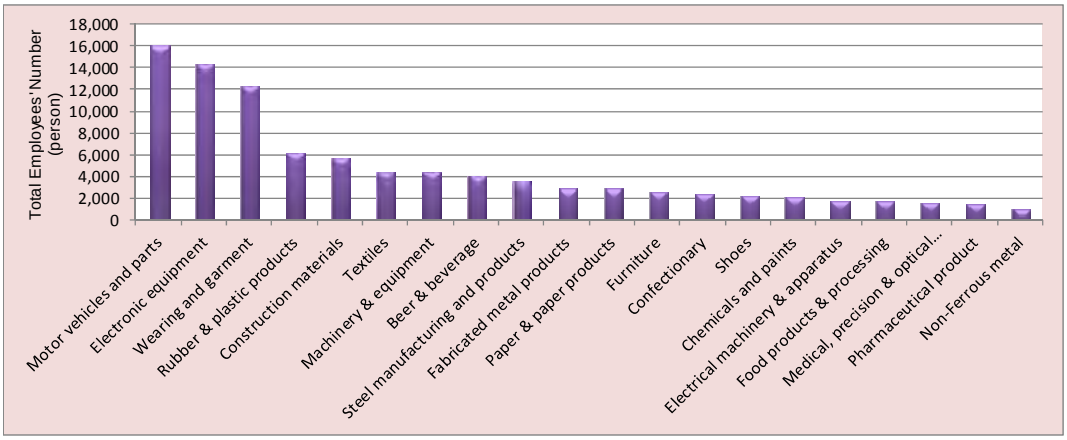
Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-12 Top 10 Districts in Employees' Numbers in Hanoi City

2) Total Numbers of Employees by Industrial Categories

Based on collected figures of employees' number in the WG-3 survey, **Figure 2-13** that presents total employees' number by industrial categories in Hanoi City was formulated.

In Hanoi City, industrial categories which accommodate a large number of employees are motor vehicle parts, electronic equipment, wearing & garment, rubber & plastic products and construction materials, in the descending order.



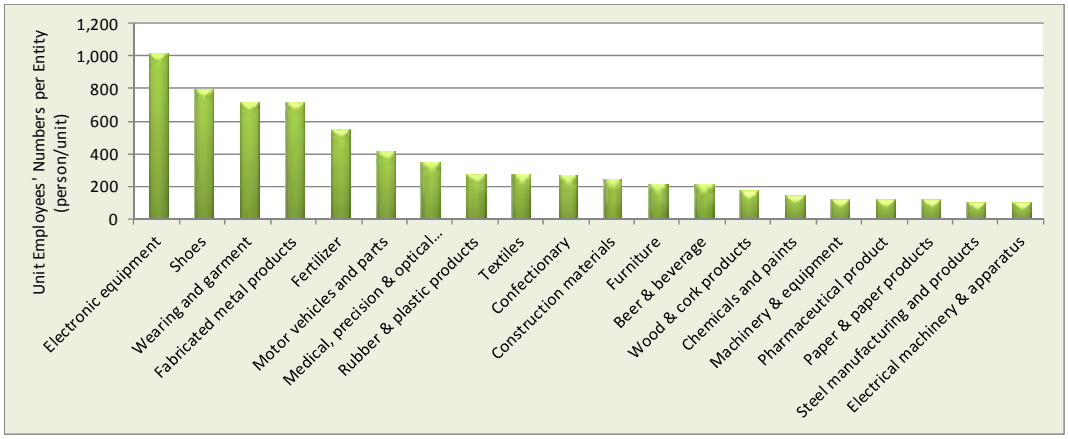
Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-13 Total Employees' Numbers by Industrial Category in Hanoi City

3) Unit Employees' Numbers per Entity by Industrial Categories

Based on collected figures of employees' number in the WG-3 survey, **Figure 2-14** that presents unit employees' number per entity by industrial categories in Hanoi City was formulated.

In Hanoi City, industrial categories that employ a large number of employees per entity are electronic equipment, shoes, wearing & garment, fabricated metal products and fertilizer, in the descending order.



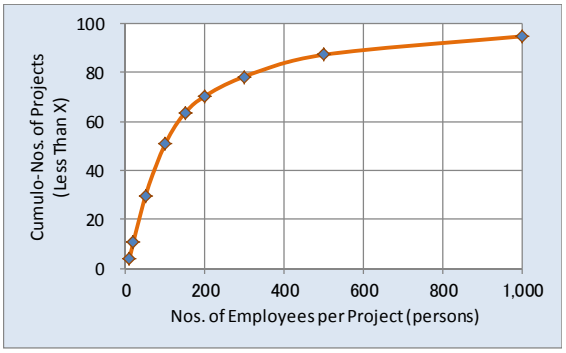
Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-14 Unit Employees' Numbers per Entity by Industrial Category in Hanoi City

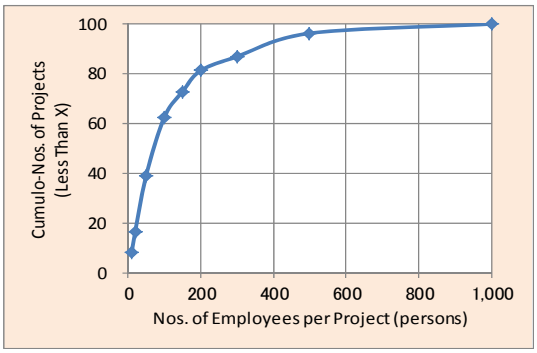
(7) Scale of Projects in Employees' Numbers

The scales of projects (in employees' numbers) in Hanoi City and in the model area are relatively small. The average employees' numbers of projects are some 270 and 128 persons per project in Hanoi City and the model area, respectively.

As shown in **Figure 2-15**, three quarters (75 %) of all the projects are occupied by small-scale industries with less than 300 and 180 persons per project in Hanoi City and the model area, respectively.



(Hanoi City)



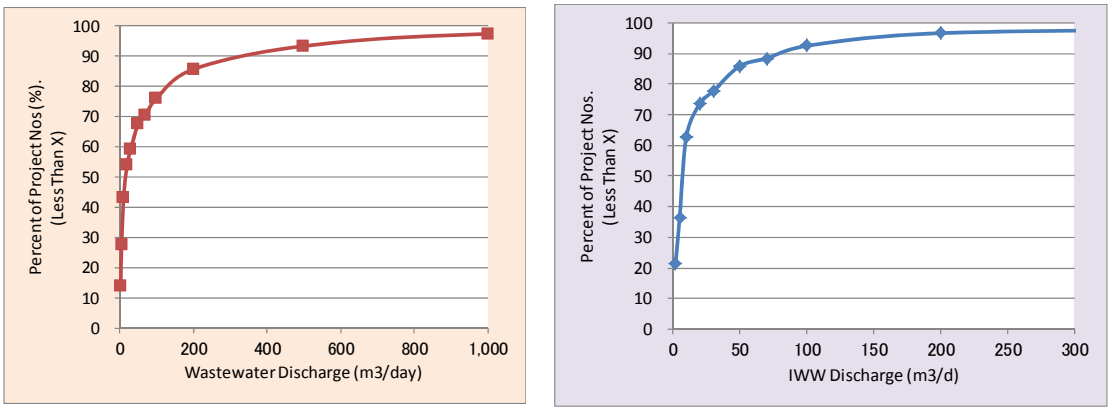
(Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-15 Scale of Projects in Employees' Number

(8) Scale of Projects in Wastewater Discharge

The scales of projects (in wastewater discharge) in Hanoi City and in the model area are relatively small, as shown in **Figure 2-16**. The average discharge per project is some 154 and 35 m^3/day in Hanoi City and the model area, respectively.



(Hanoi City) (Model Area)

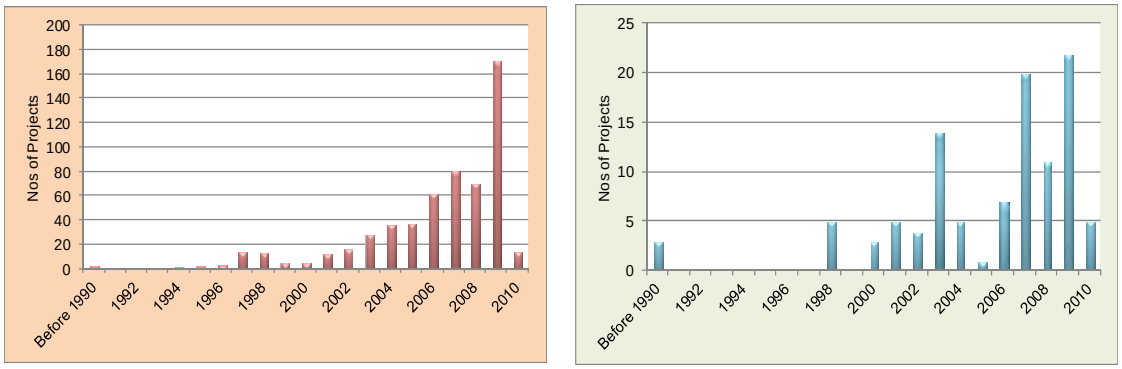
Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-16 Scale of Projects in Wastewater Discharge

(9) Starting Year of Operation

Figure 2-17 shows numbers of entities starting the operations in certain years. Some 60 % of the projects have started their operations in Hanoi City and the model area, after the Law on Environment Protection came into force in 2006.

According to the results of the survey conducted by WG-3, the majority of industrial entities in Hanoi City started their operations in relatively recent years, after the Law on Environment Protection in 2006. However, this result should be reviewed carefully by using more data, because it was difficult to collect data from old years in the WG-3 survey.



(Hanoi City) (Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.

Figure 2-17 Project Numbers vs Starting Year of Operation

2.7 Major Findings on Study Area Conditions

Conditions of the study area have been examined in Chapter 2. Major findings possibly associated with the improvement of water pollution control are enumerated, as below:

a) The Nhue River flowing through the model area is seriously polluted far beyond the national environment standards over the year, due to inflowing pollution loads discharged from anthropogenic activities in the surrounding area.

b) While different pollution sources are responsible for water pollution in the model area, major source is domestic wastewater discharged without treatment, accounting for some 90 % of the total pollution load. Industrial wastewater accounts for about 7 to 11 % in Tu Liem and Ha Dong District, respectively.

c) The total numbers of entities discharging industrial wastewater recorded in documents used by DONRE and surveyed by WG-3 are 724 and 155 in Hanoi City and the model area,

respectively. In addition, some other small-scale industries registered with EPC exist. Besides this, craft villages of 260 and nine (9) locations are operated in Hanoi City and the model area, respectively.

d) As for industrial locations, 51 % of manufacturing industries are sited in industrial parks or industrial clusters in Hanoi City and the model area. Remaining entities are located, independently.

e) The majority of manufacturing firms located in Hanoi City and the model area belong to the light industry, like machinery parts, textile, food processing and so forth. Heavy industries are not located in Hanoi City and the model area.

f) Production scales of industries located in Hanoi City and the model area are relatively small. In terms of employee numbers (employee/entity), averages are 270 in Hanoi City and 128 in the model area. In terms of discharged wastewater flow, averages are 154 m^3/day in Hanoi City and 35 m^3/day in the model area.

CHAPTER 3

WATER POLLUTION CONTROL BY DONRE

3.1 General

The direct responsibility for handling industrial wastewater discharged from production lines lies with industrial entities, under the amended Law on Environmental Protection (LEP). Meanwhile, the practical management of industrial wastewater involves both wastewater measures to be taken by industrial entities (pollution generators) and administrative management to be enforced by DONRE. In this Improvement Plan, this administrative management is defined to be "water pollution control".

Chapter 3 presents systems of regulation and management, and actual practices of a series of environmental tasks being enforced by DONRE and other units concerned with water pollution control.

3.2 Legal Setup for Water Pollution Control

(1) Approaches for Water Pollution Control

The amended LEP is a fundamental basis of environment management in Vietnam. Many policies/strategies and guidelines are stipulated in the amended LEP to realize environment management objectives. **Table 3-1** shows main management systems for water pollution control contained in the amended LEP along control approaches categorized as mentioned before.

Table 3-1 Management System Pertaining to Water Pollution Control in Amended LEP

Control Approaches	Pertaining Management Systems Stipulated in Amended LEP	Correspondent Stipulations in Amended LEP
1. Regulatory approach	Environmental authorization and compliance	Article 12, Article 18-22, Article 24-27, Article 35-40, Article 44-47, Article 49, Article 81-82, Article 94
	Environmental inspection and check	Article 35-7, Article 126
	Administrative sanction	Article 49, Article 127
	Licenses granting	Law on Water Resources, Law on Minerals
2. Economic approach	Wastewater fee	Article 113
	Preferential loan	Article 110, Article 115, Article 117
	Preferential land use	Article 117
	Preferential tax	Article 117
3. Technical renovation approach	Promotion of CP application	Article 6-5 and 6, Article 108
	Awarding of good practice	Article 106
	Promotion of environment-related service	Article 109, Article 116
4. Awareness raising approach	Environmental performance rating	Article 104
	Environment information disclosure	Article 104
	Awareness raising and guiding for agricultural activities	Article 46
5. Infrastructure development approach	Sewerage system development	Article 81, Article 82 and laws related with sewerage construction

Source: Compiled by WG-3 in 2011 and 2012.

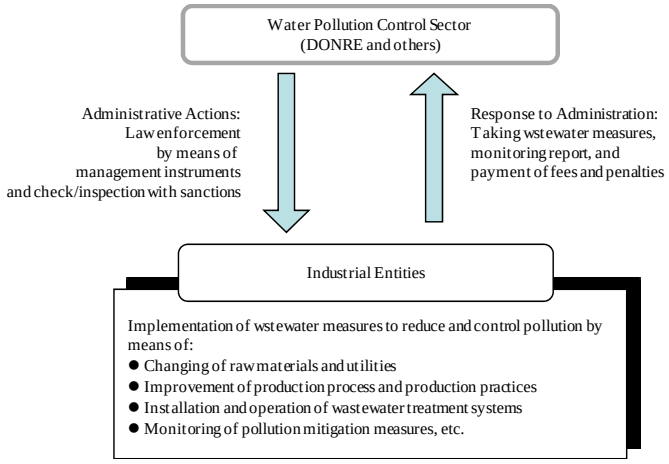
This diverse arrangement of management systems for water pollution control in the amended LEP in Vietnam is almost equal to that of many developed countries. However, actual activities and practices of environment management for water pollution are mainly concentrating on the regulatory approach and part of the economic approaches (accompanied by the system of

environmental protection fee and the environmental protection fund).

(2) Interaction between DONRE and Entities

Based on the "Polluters-Pay-Principle (PPP)" as stipulated in the amended LEP, industrial entities must assume direct responsibilities for taking industrial wastewater measures at pollution sources. Meanwhile, DONRE is delegated the mandate for enforcing water pollution control to achieve administrative objectives. Supervising of the status of the environment protection measures taken by pollution generators is also the responsibility of DONRE as the state environment management agencies.

The objective of water pollution control by DONRE is to reduce and control pollution loads generated from industrial entities, by promoting, regulating and supervising industrial entities. Such interactive relationship between state environment management agencies and industrial entities may be expressed as **Figure 3-1**.



(Source: Prepared by WG-3)

Figure 3-1 Concept of Administrative Management of Water Pollution Control

3.3 Administrative Organization for Water Pollution Control

(1) Central Government Level

1) Ministry of Natural Resources and Environment (MONRE)

As a result of the National Assembly in August 2002, MONRE was established by merging a number of former departments, agencies and institutes: General Department of Land-use Management, the General Department of Hydro-meteorology, the National Environment Agency (previously part of the MOSTE), the Department of Geology and Minerals and the Institute of Geology and Minerals (both previously part of Ministry of Industry, MOI) and the Water Resources Management and Irrigation Works Management Sections (previously a part of the Ministry of Agriculture and Rural Development, MARD).

MONRE is the Government's central pollution control organization and the main regulatory body for maintaining environmental quality nationwide, through the merging of units from other parts of government, each with their own structures and ways of working. Along the increasing need for mitigating environmental pollution, MONRE has been facing a period of expansion and deepening of environmental management responsibilities with around 1,700 members (as of September 2009). Regarding industrial wastewater management, MONRE is positioned in a national state management authority in Vietnam.

2) Vietnam Environmental Administration (VEA)

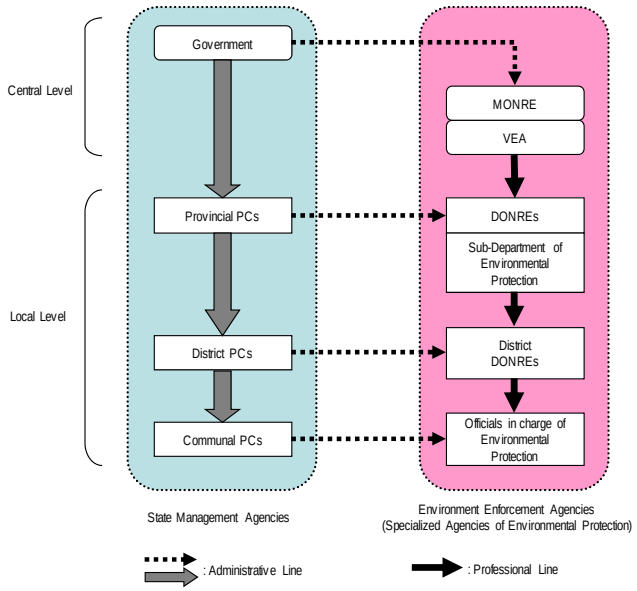
Vietnam Environmental Administration (VEA) was reorganized from Vietnam Environmental Protection Agency (VEPA) in 2008, with new definition of legal powers, tasks and responsibilities. In terms of industrial wastewater management, VEA is positioned in a leading national State management agency.

VEA is a Government's prime administrative agency in Vietnam for the State environmental management with a total of around 400 members (as of May 2010), especially in the field of pollution protection and control. VEA's primary role is to support MONRE's leadership in implementing the State management over environmental activities, including pollution prevention, environmental quality improvement, nature conservation, environmental technology promotion, enhancement of public awareness and so forth.

(2) Department of Natural Resources and Environment (DONRE)

After MONRE started to work as a State environmental management authority in 2002, the decentralization of the environment enforcement took place at the local level: provinces, districts and communes. In the environmental management in Vietnam, these local units play important roles as frontline agencies in respective administrative territories. In this decentralization, Departments of Natural Resources and Environment in province (Provincial DONREs) were created as specialized environmental protection agencies in provinces. Also, district people's committee became one of State management agencies, establishing Division of Natural Resources and Environment in district (District DONRE).

While Provincial DONREs are professionally under MONRE (through VEA, in most cases), they are structured and administratively operate within the organization of the local city/provincial governments, which are called provincial People's Committees (PPCs). Likewise, District DONREs and Officials in charge of environmental protection in communes have both administrative and professional instructive contacts at respective levels. Like this, the environmental management sector in Vietnam is comprised of: a) MONRE and VEA at the central level, and b) PPCs, Provincial DONREs (and Sub-Department of Environmental Protection), District PCs, District DONREs, Commune PCs and Officials in charge of Environmental Protection in communes at the local level, as shown in **Figure 3-2**.



Source: Compiled by WG-3 in 2011.

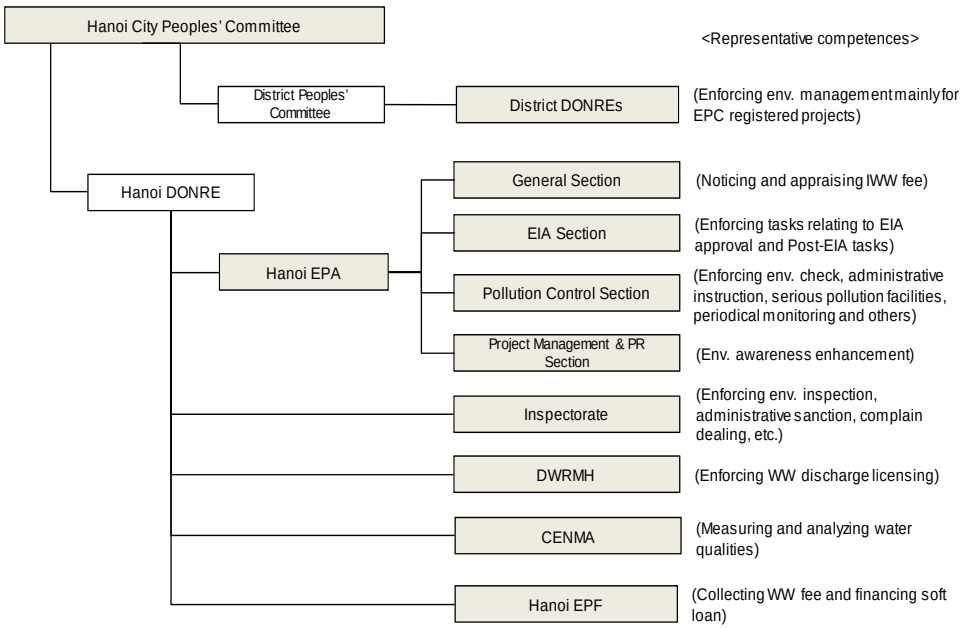
Figure 3-2 Organizational Hierarchy of Water Pollution Control in Vietnam

Water pollution control in Hanoi City is enforced by different units under DONRE, like Hanoi EPA, Hanoi Inspectorate and Division of Water Resources Management and Meteoro-Hydrology (DWRMH). District DONREs are involved in water pollution control in certain competences, also. Representative tasks of units related to the water pollution control sector are as shown in **Figure 3-3**.

In Hanoi City, Hanoi EPA, Inspectorate, DWRMH and CENMA are units in charge of water pollution control, and their staff numbers are 47, 24, 11 and 72, respectively, as of the end of the year 2011.

District DONREs have been formed to implement tasks of specialized environmental management agencies. Due to the lack of manpower and professional knowledge and skills, however, it is common that district DONREs cannot function properly as assigned. In many cases, they are not able to appropriately conduct environmental inspections and supervisions, to solve environmental disputes and/or public complaints about local environmental pollution as required by the amended LEP and other regulations.

Among them, Hanoi EPA is a leading player of local authorities delegated with variety of related competences. Besides, Environmental Police and Management Board of Industrial Park are involved in the local environment management with certain authorities.



Source: Compiled by WG-3 in 2011.

Figure 3-3 Administrative Structure of Water Pollution Control in Hanoi City

3.4 Management System for Water Pollution Control

(1) Overview

DONRE has the responsibility for supervising environment protection measures taken by business owners and has enforced in the frontline the administrative management against industrial wastewater by means of environment management systems. Meanwhile, MONRE formulates policies and regulatory mechanisms of management systems and gives guidance to DONREs to enforce them.

In terms of water pollution control, major management systems being employed by DONRE for water pollution control, as per **Table 3-2**, are aiming to promote and encourage appropriate environment protection measures.

Table 3-2 Major Management Systems for Industrial Wastewater

Management System (Relevant System)	Main Grounding Regulations	Objectives and Functions
1. Environmental authorization & compliance : Including the national effluent standard of industrial wastewater and self-monitoring of environmental protection measures.	Decree 80/2006/ND-CP Decree 29/2011/ND-CP	All pollution generators must be authorized through EIA or EPC (or EPP) under their environmental protection measures to comply with environmental protection requirements, including the provision of wastewater treatment meeting the effluent standards and self-monitoring.
2. Industrial wastewater fee (environment protection fee for wastewater)	Decree 67/2003/ND-CP (Amended later on)	Wastewater fees are collected from all pollution generators of domestic wastewater or of industrial wastewater, giving the economic incentive for reducing pollution load.
3. Wastewater discharge license	Decree 149/2004 /ND-CP Grounded on Law on Water Resources	Pollution generators to discharge wastewater into water sources must obtain wastewater license.

Source: Compiled by WG-3 in 2011.

(2) Authorization with EIA and Others

The Environmental Impact Assessment (EIA) is a crucial system for the government to authorize a project and an environmental protection measure to be taken by projects in Vietnam. Environmental protection measures required by the amended LEP and others must be proposed in the EIA report and approved by the government. The approved environmental protection measure must be realized through the construction, start-up and operation phase by the project owner without fault.

Projects subject to the authorization by EIA is specified by the decree grounded on the amended LEP. All kinds of undertakings which possibly cause environmental pollution are included in this project list with minimum scales to be applied categories by categories.

The typical procedural flow from the preparation to the approval of EIA reports are shown in **Figure 3-3**.

Relatively small-scale establishments (manufacturing, business and services establishments being family households and entities) not covered by EIA must make a written environmental protection commitment (EPC). After the registration of EPC, they can start their productions and business activities (Article 24 of the amended LEP).

In addition to EIA and EPC, MONRE has operated the administrative procedure called the certification of environmental protection project (EPP). This authorization of EPP is applied to unauthorized projects or establishments without EIA approval or EPC registration which was operated, before the period of the amended LEP.

Along with the environmental authorization, after the approval of EIA report, industrial entities have series of compliance obligations, as follows:

a) To design, construct and operate industrial wastewater treatment plant (IWTP) and other protection measures to meet the effluent standards,

b) To get authority's certificate of the completion of the environmental protection measures before the operation, and

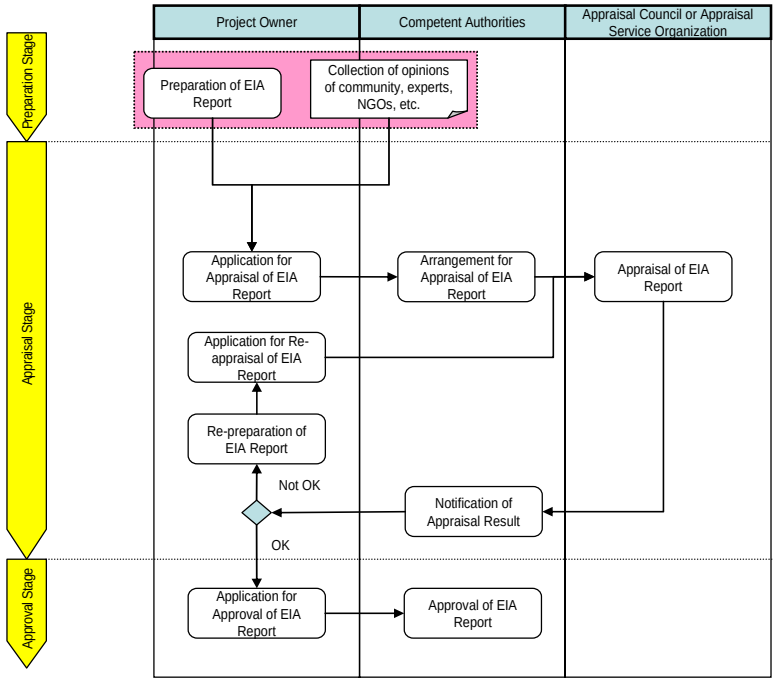
c) To conduct periodical self-monitoring of the environmental protection measures.

In the current management system of the authorization with EIA and others, series of ineffectiveness have been found, as follows:

a) Small parts of industrial entities are operated without authorization by DONRE and discharging wastewater.

b) Approved environmental protection measures in the authorization procedure are not taken at project sites, appropriately.

c) Supervisions and checks/inspections by DONRE for pre-operation and operation stage and have not been conducted sufficiently.



Source: Prepared by JICA Study Team based on related regulations

Figure 3-4 Procedural Flow of EIA Approval

(3) National Effluent Standard of Industrial Wastewater

Vietnam has issued the standards for discharged industrial wastewaters of National Technical Regulations (QCVN 40:2011/BTNMT). The effluent standards on wastewater specify the maximum values of pollution parameters of wastes in order to ensure that no harm is caused to humans and living creatures. Pollution parameters of wastes are determined on the basis of the toxicity and volume of the waste produced and the burden bearing capacity of the environment receiving such wastes.

Table 3-3 shows the "C Value" of effluent standard, which is applied to most industrial wastewaters. Different "C Value" have been set out for several other industrial wastewater, discharged from: natural rubber processing industry, aquatic product processing industry, pulp and paper mills and textile industry.

Table 3-3 National Effluent Standard of Industrial Wastewater

No.	Parameter	Unit	C Value	
			A	B
1	Temperature	^{0}C	40	40
2	Colour (Co-Pt)	-	50	150
3	pH	-	6-9	5.5-9
4	BOD_5 (20^0C)	mg/L	30	50
5	COD	mg/L	50	100
6	Suspended solids	mg/L	50	100
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
12	Chromium (III)	mg/L	0.2	1

No.	Parameter	Unit	C Value	
			A	B
13	Copper	mg/L	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
18	Total Cyanide	mg/L	0.07	0.1
19	Total Phenol	mg/L	0.1	0.5
20	Total Mineral Oil and fat	mg/L	5	5
21	Sunfide	mg/l	0.2	0.5
22	Fluoride	mg/l	5	10
23	Ammonium (as N)	mg/l	5	10
24	Total Nitrogen	mg/l	20	40
25	Total Phosphorous	mg/L	4	6
26	Chloride (not applied wastewater discharged into saline and brackish water)	mg/l	500	1000
27	Residual Chlroine	mg/L	1	2
28	Total Organic Chlorine; Pesticide	mg/l	0.05	0.1
29	Total Organic Phosphrous; Pesticide	mg/L	0.3	1
30	Total PCBs	mg/L	0.003	0.01
31	Coliform	MPN/100mL	3000	5000
32	Gross α activity	Bq/l	0.1	0.1
33	Gross β activity	Bq/l	1.0	1.0

Notes:
- Colume A stipulates value C of pollution parameter in industrial wastewater discharged into receiving facilities using for sources of domestic water supply.
- Colume B stipulats value C of pollution parameter in industrial wastewater discharged into receiving facilities not using for sources of domestic water supply.
- Parameter of chlorine shall not be applied to receiving facilities which are brackish and salt water.

Source: QCVN 40: 2011/BTNMT

Actual permissible quality of discharged industrial water must be calculated by correcting the C value with two coefficients (Kg and Kf), for the water discharge of receiving rivers and the discharge flow of discharged wastewater, respectively. This procedure and calculation are detailed in **Box 3-1**. Based on this, actually applied BOD values for the column B, for example, are ranging from 40 to 70 mg/L.

Box 3-1 Procedure and Calculation of Permissible Effluent Concentration

§ 1. Formula to calculate the maximum allowable concentration

Maximum allowable concentration of the pollution parameters in industrial effluent discharged from established producing, processing, trading, service facilities to water area is calculated as followed:

Cmax = C x Kq x Kf

In which:

Cmax: The maximum allowable concentration of the pollution parameters in industrial effluence discharged from established producing, processing, trading, and service facilities to water bodies, measuring by milligram per litter of effluent (mg/l).

C: The maximum allowable concentration of the pollution parameters regulated;

Kq: Flow coefficient/ capacity of receiving source;

Kf: Flow coefficient of the discharge sources.

§ 2. Coefficient value Kq

In case the wastewater is discharged into rivers, streams, etc., the coefficient value (Kq) (0.9 – 1.2) is applied, depending on the discharge of receiving waters.

In case the wastewater is discharged into reservoirs, lakes, etc., the coefficient value (Kq) (0.6 – 1.0) is applied, depending on the volumes of receiving waters.

Coefficient value Kq= 1.2 is applied for receiving source as costal area. Kq =1 is applied for coastal area for aquatic life, sport and entertainment.

§ 3. Coefficient value Kf

Coefficient value Kf (1.2 – 0.9) is defined depending on the discharge flow rate of wastewater.

(Source: QCVN 40: 2011/BTNMT)

(4) Industrial Wastewater Fee

With the adoption of Decree No. 67/2003/ND-CP, Vietnam started the wastewater fee system. According to this system, both domestic and industrial sectors must pay fees for discharging wastewater to the environment. This was the first application of economic instrument in Vietnam, based on the "Polluter-Pays-Principles".

The targets of the fee are household (or domestic) wastewater and industrial wastewater. In this system, industrial wastewater is defined to be the ones discharged from a total nine (9) fields including industrial production, handicraft production, mineral exploiting and processing, etc.

Fees for industrial wastewater are calculated based on the quantity of pollutants in wastewater. This quantity is calculated by multiplying the wastewater volume (m^3) by the concentration (mg/L) of substances concerned. Rates of industrial wastewater are specified by each pollutant in wastewater and the receiving region of wastewater, as shown in **Table 3-4**.

In respect of industrial wastewater, 20 % of the collected fees are retained by DONRE to use for expenses necessary for collecting fees, analyzing, etc. The rest is paid to the state budget, including 50 % for VEPF and 50 % to local budget for the purpose of protecting environment activities.

This industrial wastewater fee is a remarkable system representing the economic approach in Vietnam. However, this management system has not functioned enough, as seen from very low collection coverage of wastewater fees.

Table 3-4 Rate of Environmental Protection Fee for Industrial Wastewater

Rate/Receiving Environment / Pollutants	Charge rate (VND/kg of pollutant in wastewater)			
	Type-A	Type-B	Type-C	Type-D
Chemical oxygen demand, COD	300	250	200	100
Suspended solid, TSS	400	350	300	200
Mercury, Hg	20,000,000	18,000,000	15,000,000	10,000,000
Lead, Pb	500,000	450,000	400,000	300,000
Arsenic, As	1,000,000	900,000	800,000	600,000
Cadmium, Cd	1,000,000	900,000	800,000	600,000

Note: Receiving environments are defined as follows:

- Type-A: Inner cities and towns of urban centers of special grade and grade I, II and III.
- Type-B: Inner cities and towns of urban centers of grades IV and V, and outskirts of urban centers of special grade and grade I, II and III.
- Type-C: Outskirts of grade-IV urban centers and non-urban communes, excluding communes belonging to type-D wastewater-receiving environment.
- Type-D: Communes in border, mountainous, highland, deep-lying, remote, sea and island regions.

Source: Joint Circular No. 106/2007/TTLT-BTC-BTNMT: Amending and supplementing the Joint Circular No. 125/2003/TTLT-BTC-BTNMT which guide the implementation of the Government's Decree No. 67/2003/ND-CP on environmental protection charge for wastewater (September 6, 2007).

(5) Wastewater Discharge License

The license granting of wastewater discharge into water sources was launched in 2005, by the enactment of Decree No. 149/2004/ND-CP, grounded on the Water Resource Law (not the amended LEP). This license granting is aiming to regulate the water pollution of water sources to be caused by the inflows of wastewater. Decree No. 149/2004/ND-CP requests the treatment of discharged wastewater to the level specified in the national effluent standards as a principal condition of licensing.

This management of wastewater discharge license is enforced by DWRMH (Division of Water Resources Management and Meteoro-Hydrology) in DONRE.

(6) Assessment of Current Management System

As set forth above, the management system for water pollution control by DONRE is basically structured and operated by environmental authorization and compliance, industrial wastewater fee and wastewater discharge license. Since the enactment of the amended LEP in 2006, this principal management system has been established in Vietnam, but it has not functioned as expected, as follows:

1) Environmental Authorization and Compliance

While the main aim of the authorization and compliance is to regulate discharged wastewater to meet the effluent standards, functions of this management system are constrained by different reasons, as follows:

- Many entities are operating without approval of EIA (and others), due to their negligence of regulations and no clear guiding for the procedure on changing the conditions of subject business,
- Many entities are operating without getting the certificate of IWTP's performance prior to the operation, and because of this, information of actual IWTP is not available in DONRE,
- Many violations related to deviation from the approved contents of EIA (and others) are ignored and are repeated intentionally, due to relatively light administrative sanctions and ineffective enforcement of environmental check and inspection by DONRE,
- Management system with self-monitoring report is not functional, because many entities neglect its submission and the system to ensure the reliability of reports is not available, and
- The environmental awareness of entity operators is generally immature, and, at the same time, the activities for awareness-raising by DONRE are not active enough.

2) Industrial Wastewater Fee

Amount of collected fee is very limited for the moment, and thus this system does not contribute much resource funds to the environmental protection fund. Specific situations are as follows:

- The number of entities paying fee is very limited,
- Unit rates of fees are commonly low and not appropriate to give economic incentive to business owners, and the same rates are applied even in case of exceeding the effluent standard, and
- Penalty dispositions against no payment are not set up.

3) Wastewater Discharge License

The purpose and procedure of this management system that is grounded on the Water Resource Law are overlapping with those of environmental authorization grounded on the Law on Environmental Protection. For the moment, only limited licenses to industrial entities have been issued and primary purpose of this system is yet to be attained.

4) Minimum scale for Management Systems

Because management systems set forth above commonly do not set up the minimum scale for the administrative management, very small-scale industrial entities are subject to the management, despite limited environmental influences. This forces DONRE to a lot of inefficient administrative works, thereby causing "uneven management" in water pollution control.

WG-3 has discussed functions and problems of various management systems applied to water pollution control. Apart from specific descriptions set forth above on the enforcement of

management systems, some discussion results which are related to the ineffectiveness of policy and regulations for water pollution control to be dealt by MONRE are attached as **Annex 2**, as reference.

3.5 Governmental Supporting Measures

(1) General

The amended LEP stipulates and guides to set up a number of supporting measures by the government and to promote industrial wastewater measures by entities. For example, there are preferential loan, preferential land use, preferential tax, promotion of cleaner production technologies, promotion of environment-related service and so forth.

Among them, this section sets forth governmental measures of relocation and environment protection fund for industrial entities which play a significant role in water pollution control for industrial wastewater.

(2) Relocation of Industrial Entities

1) Relocation of Industrial Entities

Some industries located in the center area of Hanoi City have difficulties in dealing with the environmental pollution, due to lack of land space necessary for equipment installation. Hanoi PC issues a series of decisions[1] that press such entities to move to the outside of the city center. The prime purpose of the relocation along this policy is to deal with the environmental pollution, and, according to Hanoi City, different beneficial conditions to be met along the relocation are as follows, also:

- Benefit to Community: The community should benefit from the relocation through a better quality of life. The relocation of the industry should not move the pollution to another area, but should solve the pollution problem.
- Benefit to City: By relocating industries, the City aims to make better use of the land in the center of the city. The industrial land use within the city is perceived as a waste of land. The city aims to attract higher value activities to get more taxes from the new occupation.
- Benefit to Industry: Industry should benefit from the relocation by expanding its production or by being able to improve/change technology.

2) Aggregation and Relocation of Small-Scale Industries

In Vietnam, a number of industrial locations exist, besides the independent siting with stand-alone. They are classified by management bodies, authorities unit for approval, scale and categories of tenant industries and so forth, as follows:

- Industrial Park: Industrial park (or called industrial zone) is approved at the national and provincial level and managed by the provincial governments, through the provincial Industrial Zone Authority (IZA).
- Industrial Cluster: Industrial cluster is a concentrated industrial area for smaller-scale industries with the land area of less than 75 ha. It is approved by the district authority, and is under management of the provincial DOIT.
- Craft Villages: Craft village identified by an official of the provincial government is occupied by the minimum 30 % of households in the area and take part in craft activities (business production activity) for at least 2 years. Craft village should follow regulations for the craft villages and be registered at the provincial authorities (DOIT and DARD).
- Industrial Points: Industrial point is originally developed by district authorities for relocation and expansion of craft village's production activities. Industrial point is funded privately or by district authorities and follows regulations for craft villages and industrial

[1] : Hanoi PC has issued Decision No.74/2003/QD-UB, Decision 115/2003/QD-UB and so forth, pertaining to the relocation of industries.

clusters regulations.

For relative small-scale industries located in the center area of the city, Hanoi PC has been pushing forward with aggregation and relocation, by constructing industrial clusters. There are 37 industrial clusters in total, operating as of the year 2010 in Hanoi City. While the relocation has the effect to reduce the influences of the environmental pollution to the surrounding areas, only 2 industrial clusters has centralized IWTPs. Five (5) clusters are located in the model area, as shown in **Table 3-5**, and they do not have the centralized IWTPs.

This measure for relocating industries to industrial clusters should be actively enforced along with the plan and construction of a centralized IWTP, so that many small and medium-scale entities can use a common centralized IWTP for wastewater measures.

Table 3-5 Industrial Clusters in Model Area

Name	District	Land Area (ha)	Nos. of Located Industry
1.Tu Liem	Tu Liem	45.8	85
2. Phu Minh	Tu Liem	40	-
3. Phu Lam	Ha Dong	5	-
4. Bien Giang	Ha Dong	2.2	40
5. Yen Nghia	Ha Dong	5.2	22

Source: Final Report, Industrial Wastewater Management in River Basins Nhue-Day and Dong-Nai Project, January 2010.

Hanoi City accommodates craft villages in around 260 locations, comprised of mainly household-scale industries. Of them, nine (9) craft villages are located in the model area, as shown in **Table 3-6**. Major environmental problems in craft villages are discharge of wastewater without treatment, as seen from that all the craft villages have no IWTP. As a pilot project, MOIT is now preparing a wastewater treatment plant with the capacity of 300 m^3/day in starch processing village located in Quoc Qai District.

The objective of the industrial point is to move business activities to the industrial point provided with certain infrastructures. While a total of 43 industrial points are operating in Hanoi City, none of them has a centralized IWTP, as of 2011. Governmental intervention by industrial points should be actively implemented along with the provision of a centralized IWTP to mitigate environmental pollution by wastewater.

Table 3-6 Craft Villages in Model Area

Name	District	Nos. of Households	Industrial Category
1. Co Nhue	Tu Liem	4,000	Garment
2. Xuan Dinh	Tu Liem	54	Food processing
3. Phu Do	Tu Liem	450	Rice noodle, food processing
4. Hoe Thi	Tu Liem	75	Metal plating. forging
5. Trang Van	Tu Liem	980	Chain, plastic recycling
6. Van Phuc	Ha Dong	660	Textile
7. Da Sy	Ha Dong	1,000	Mechanic
8. La Noi-Y La	Ha Dong	30	Textile
9. La Duong	Ha Dong	6	Textile

Source: Final Report, Industrial Wastewater Management in River Basins Nhue-Day and Dong-Nai Project, January 2010.

(3) Environment Protection Fund

Hanoi Environmental Protection Fund (EPF) was established by Hanoi PC, to provide environmental project and activities with soft-loan. The capital of Hanoi EPF is 50 billion

VND provided from Hanoi PC, and additional capitals come from:

- Environmental protection fee for industrial wastewater, solid waste and so forth,
- Compensation payment for environmental damages,
- Penalties for administrative sanctions, and
- Aids and donations from the domestic and oversea.

Hanoi EPF provides financial supports with soft-loans not exceeding 50 % of the commercial interest rates, in order to promote environmental protection measures. The usage of soft-loan by Hanoi EPF is still limited, as shown in **Table 3-7**, for the moment. Only seven (7) entities have been using this soft-loan for industrial wastewater measures.

More active involvement of Hanoi EPF in promoting wastewater measures by entities calls for strengthening of the fund by increase of the charter capital and the dissemination to entities.

Table 3-7 List of Soft-Loan Borrowers of Hanoi EPF

Name of Borrower	Type of Industries or Services	Purpose of Loan	Amount (millionVND)
1. TL JSC	Solid waste transport, waste collection & treatment, sewer & drain pumping & dredging, etc.	Invest in 03 specific vehicles for dust sweeping and vacuuming, for the purpose of environmental protection.	899
2. YB JSC	Husbandry	Wastewater pollution treatment and minimization of air pollution	960
3. TC Cooperative	Main sector is environmental sanitary, waste processing and treatment	Socialization of sanitary, waste collection and transportation	5,690
4. MD JSC	Production, trading, processing of food, agricultural products and some other sectors	Investment in extension and upgrading of environmental treatment system of Minh Duong Food Technology Factory	980
5. RR JSC	Services of waste collection and transport, service of environmental treatment, treatment of waste, industrial waste, dredging of sewage system, underground sewers and other sectors	Investment in technical infrastructure serving for environmental sanitary	5,967
6. QT JSC	Production and trading of beverage, distilling, rectifying and blending of spirits; production of wines and other sectors	Investment in construction of wastewater treatment system	3,000
7. HB	Pig husbandry	Environmental pollution treatment due to husbandry and using bio-gas for operation of electrical generator	960
Total			18,456

Source: DONRE Report (No. 61/KHTC-QMT, May 24, 2011)

3.6 Environmental Check and Inspection

(1) General

In Vietnam, the terms of “inspection”, “check” and other related words (like “examination” and “supervision”) are often used without clear definition, thereby causing some confusions. In this report, in light of actual activities conducted by local EPA, Inspectorate and other units in DONRE, the following definitions are applied:

- "Environmental Check" means supervision and examination activities conducted by local EPA, grounded on the amended LEP, and
- "Environmental Inspection" means supervision and examination activities conducted by Inspectorate, grounded on Inspection Law, the amended LEP and others.

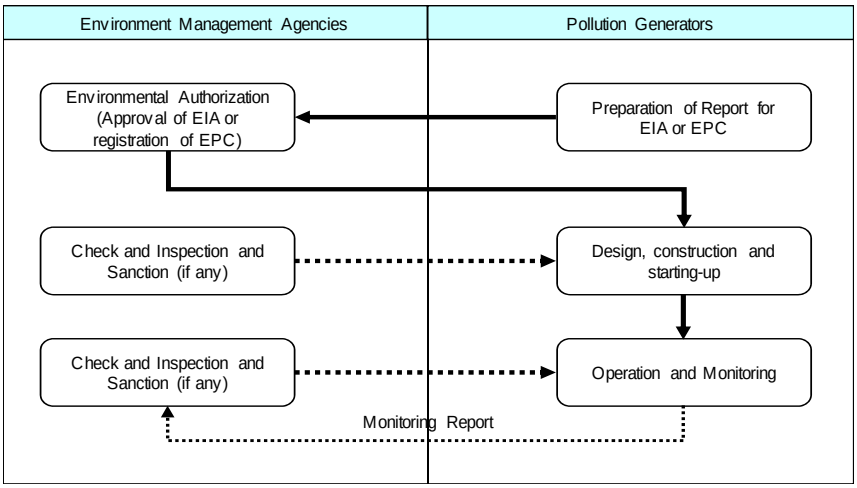
In addition, "administrative guidance" is interpreted as a collective term of orders and/or instructions given out by state management units as a result of check and inspection. More specifically, "administrative guidance" is defined in this report in relation with allocated competences to units, as follows.

- In case of the check, administrative guidance means administrative instructions (not sanctions) given out by local EPA, requesting that pollution generators take appropriate countermeasures.
- In case of the inspection, administrative guidance means administrative sanctions (cautions, monetary fines, cease of operation, etc.) against violations given out by Inspectorate (exactly, chief inspectors and inspectors) and others, grounded on Inspection Law and other regulations,

(2) Function of Environmental Check and Inspection

Environmental check and inspection are conducted by a state management agency to check the status of compliance with specified environmental requirement. In the connection of environmental authorization, the environmental check and inspection are carried out in not only the operation stage but also the design, construction and starting-up stages, as shown in **Figure 3-4**. Administrative sanctions are imposed to the project owner, when incompliance with predefined requirements and other violations are found in environmental inspection and check.

As the core regulatory instrument comprised of environmental authorization and compliance, environmental inspection and check (including administrative sanction) is crucial management tasks of water pollution control. It is, however, true that this instrument has not attained its administrative objectives for the time being, as it is evident from many reports and news on violations of effluent water quality standards, no provision of appropriate treatment systems, negligence of self-monitoring, etc.



Source: Prepared by WG-3.

Figure 3-5 Implementation Times of Site Check and Inspection

(3) Environmental Check by EPA

1) Function of Check

EPA is in charge of actual works of the environmental check. The environmental check aims to supervise (or examine) environment protection measures of pollution source projects required by the amended LEP and other regulations and/or requirements. If incompliances are detected, correspondent administrative instructions (otherwise called "administrative guidance") are given

out to enterprises to take countermeasures for the improvement. This instruction is of the character of not "sanction" but "recommendation". Local EPA is not delegated the authority for imposing administrative sanctions. Meanwhile, the check results may be used by Inspectorate as the documents explaining violations to impose sanctions, afterwards.

2) Practice of Check

In an environment check performed by local EPA, a number of related units also participate in the activity, depending on the subject project. They are Inspectorate, DWRMH, Department of Industry and Trade (DOIT), Department of Health (DOH), Mineral Resources Division, District DONRE and others. Besides, Environmental Police also joins the environmental check, occasionally. Among others, participation of Inspectorate and Environmental Police imply important meaning, because EPA has no authority to impose administrative sanction against violation. Even during an environmental check, which is not environmental inspection performed by Inspectorate, an inspector from Inspectorate who attends the check may impose administrative sanction against violation, provided that evidential record is established. In case of Environmental Police, it can legally deal with violation even as a criminal case as well as an administrative case.

EPA has been conducting environmental checks as a routine work by setting up the annual implementation plan. According to reports of environmental checks, series of items related with environment management activities are examined at sites, such as dossiers for authorization, payment of environment protection, provision and operation of wastewater treatment plant, etc.

Hanoi EPA carried out environmental checks of 112 entities in 2008, 216 entities in 2009 and 256 entities in 2010. Based on site examination, the check teams have given out administrative instruments in almost all checks. An administrative instruction is just a request of Hanoi EPA urging the pollution generator to take appropriate measures. Because they do not have the legal power to impose an administrative sanction against negligence, these instructions seem to be neglected in many cases.

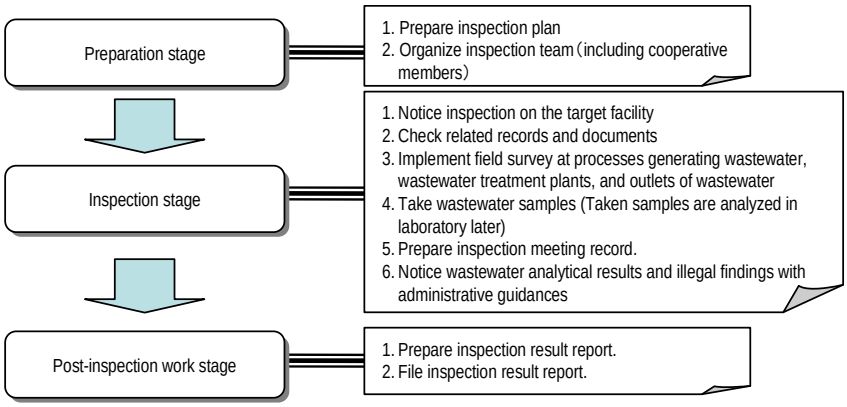
(4) Inspection by Inspectorate

1) Function and Practice of Inspection

Environmental inspection performed by Hanoi Inspectorate aims to examine adequacy of environment protection measures taken by a pollution source project as required by the amended LEP and other regulations and/or requirements. If any violation is detected, corresponding administrative sanction is imposed in accordance with the Inspection Law and other related regulations.

Basically, environmental inspection is carried out in accordance with the inspection manual established by MONRE. **Figure 3-6** shows typical procedure of an environmental inspection including the preparation, inspection on site and post-inspection stage. Before the inspection on site, individual inspection plan is prepared to clarify details and specific information on respective pollution source project.

Hanoi Inspectorate carried out environmental inspections of 150 entities in 2010.



Source: Prepared by WG-3

Figure 3-6 Procedure of Environmental Inspection

2) Administrative Sanction

Administrative sanctions are imposed based on Decree No. 117/2009/ND-CP. Chief inspector and inspectors of DONRE have the legal competence to give sanctions. According to this decree, not only monetary fines but also other sanctions (cease of operation, remedies, etc.) can be given as per **Box 3-2**, but it has been reported that cease and ban of operation have never been exercised, up to now. Besides chief inspectors and inspectors of DONRE, even chairpersons of commune-level, district-level and province-level have the competence for administrative sanctions.

Box 3-2 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: Decree No. 117/2009/ND-CP (on the handling of law violation in the domain of environmental protection)

(5) Cooperation with Environmental Police

Since Decision No.1899/2006/QĐ-BCA was enacted, DONREs have been actively cooperating with the environmental police in the execution of environmental inspection in various regions. The functions of the environmental police are to:

a) Detect, prevent and fight against the crimes and violations committed to the legislations on environmental protection,

b) Receive and handle the information on the crimes, and

c) Prosecute and investigate the crimes and carry out judicial tasks as regulated by legislations.

Environmental inspection by the environmental management sector can deal only with administrative sanction (not a crime) in the field of environmental protection. Meanwhile, violations committed to the legislations on environmental protection may be transferred to the environmental police for prosecution and investigation, if there is any evidence of the criminal involvement.

In Vietnam, it has been reported that there are some enterprises which decline environmental inspection by the environment management agency. In such circumstances, it is expected that the intervention of the environmental police may give a good help for the environmental management agency to fulfill objectives of the environmental inspection.

(6) Actual Situations of Environmental Check and Inspection in Hanoi City

1) Overview

Environmental check and inspection are enforced by Hanoi EPA and Inspectorate in the attendance of related parties, as a routine task. According to collected information, DONRE has enforced the check or inspection of 110, 323 and 295 entities (728 entities in total[1]), in 2008, 2009 and 2010, respectively.

Based on the result of these checks or inspections, the following status has become clear on the environmental compliance of industrial entities. It is remarkable that very large numbers of violations against environmental regulations are found in the environmental checks and inspections.

2) Violations

Under the amended Law and Environment Protection and its derivative regulations, DONRE has carried out environmental checks and inspections, as its regular tasks. As the result, some

[1] : Some entities inspected from 2008 to 2010 are overlapped.

administrative violations have been found. **Table 3-8** and **Figure 3-7** show status on violations found in the environmental check and inspection and imposed administrative sanctions in Hanoi City and the model area, over the past three (3) years.

Table 3-8 Numbers of Violation Cases

Item	Total in Hanoi City (from 2008 to 2010)	Total in Model Area (from 2008 to 2010)
Nos. of entities with violation	664 (91%)	140 (95%)
Nos. of entities without violation	10 (7.4%)	0
No data	54	7
Nos. of entities for inspection/check	728	147

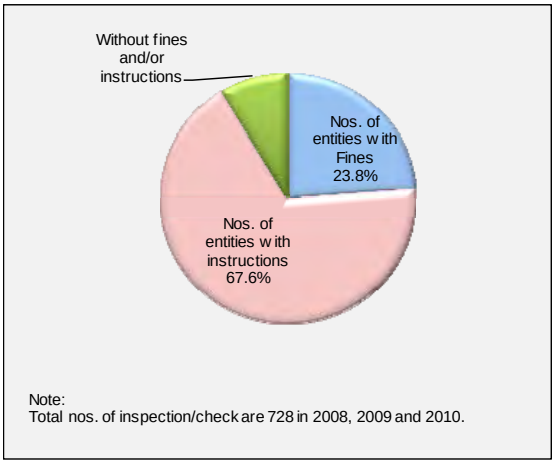
Source: Survey Result by WG-3 in 2011.
Note: This table shows results for only water pollution control.

As many as more than 90 % of projects, out of all the projects subject to the environmental checks or inspections, have committed some violations.

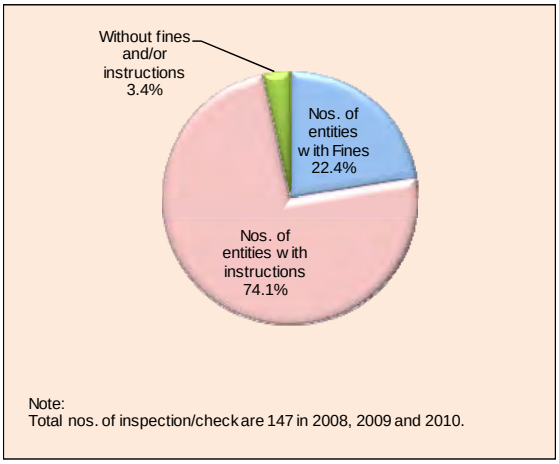
3) Administrative Sanctions

As the result of environmental inspections, some administrative sanctions (monetary fines and/or instructions) against violations have been imposed.

More than 90 % of the projects subject to the environmental check or inspection have received administrative sanctions of some types.



(Hanoi City)



(Model Area)

Source: Survey Result by WG-3 in 2011.

Figure 3-7 Status of Administrative Sanctions

4) Monetary Fines

As the result of environmental inspection, monetary fines against violations have been imposed. **Table 3-9** shows current status on monetary fines imposed in the environmental check and inspection in 2008 and 2010 in Hanoi City and the model area.

Table 3-9 Status of Monetary Fines

Item	Total in Hanoi City		Total in Model Area	
	2008	2010	2008	2010
Max. amount of fines (mill VND)	25.5	205.0	25.5	205.0
Min. amount of fines (mill VND)	1.2	1.0	1.2	1.0
Average amount of fines (mill VND)	15.0	37.3	15.0	37.3
Total amount of fines (mill VND)	209.3	2,756.9	63.4	407.8

Source: Survey Result by WG-3 in 2011.
Note: This table shows results for only water pollution control.

(7) Assessment of Environmental Check and Inspection

Recently, Hanoi DONRE has been carrying out many environmental checks and inspections, as compared to other provinces. For example, over three (3) years (from 2008 to 2010), a total of 728 times of checks and inspections have been enforced against entities discharging wastewater.

Through these checks and inspections, DONRE found many violations against environmental regulations and imposed administrative sanctions. Even so, many industrial entities have been repeating violations without rectifying their environmental protection measures. Although the environmental check and inspection are important management activities to observe and supervise wastewater measures by entities, the effects of them are assessed to be very limited in deterring entities from environmental violations.

It is analyzed that effects of environmental check and inspection by DONRE have not been exerted sufficiently, by the following reasons:

1) Integrated information system of pollution sources for common use is not available.

Information pertaining to wastewater measures which comes from the approval of EIA and pre-operation certification is not properly shared to the units involved in the check and inspection. Records of different management tasks are not properly shared among units concerned. Concerning other management systems (such as industrial wastewater fee, wastewater discharge license and so forth), mutual sharing of relevant information among concerned units is again very limited. This limited demand for information sharing is why integrated information systems necessary for implementation of check and inspection have not been built for the moment. Thus, the check and inspection are not prepared well beforehand, and tend to miss underlying environmental infringements.

2) Specialized ability to have insight to environmental violations is immature.

Most of officers engaged in the check and inspection lack specialized knowledge and abilities in evaluating wastewater measures. Thus, there are many cases that officers concerned do not have technical insights to actual conditions of wastewater measures at the site, resulting into missing underlying environmental violations.

3) Administrative sanctions are too light.

Decree No. 117/2009/ND-CP stipulates sets of administrative sanctions against assorted violations. It is, however, assessed that the economic disincentives to violators are too small to prevent re-violations. In many cases, paying fines are much more economical than actually taking measures.

3.7 Capacity Assessment of Units Engaged in Water Pollution Control

(1) Self-Assessment of Water Pollution Control Capacity

WG-3 has conducted self-assessment on the capacity of making water pollution control. In this assessment, the capacities were evaluated based on the elements of individual level and organizational level, as follows:

1) Organizational elements

- Job plan & instruction
- Technical guidance and training
- Baseline data/information

2) Individual elements

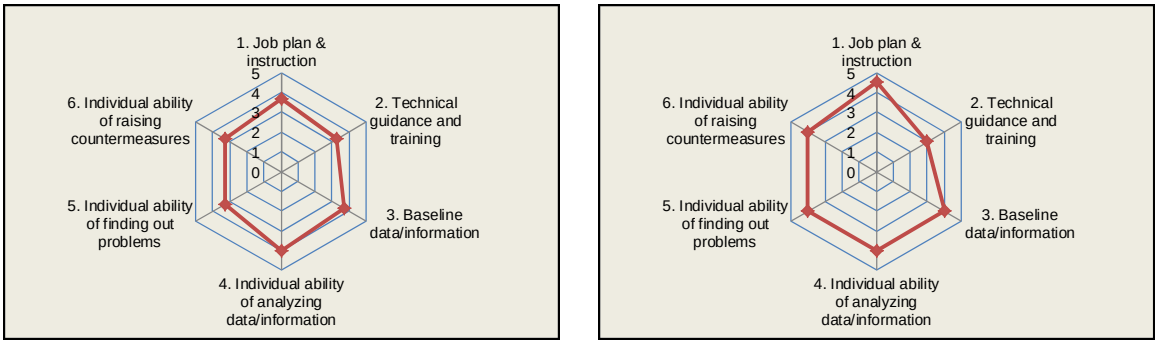
- Individual ability of analyzing data/information

- Individual ability of finding out problems
- Individual ability of raising countermeasures

The present capacities level has been assessed based on the computed scores by capacity elements by using rating scores from "1" to "5".

(2) Results of Self-Assessment

The self-assessment results of Hanoi EPA and District DONREs are shown from **Figure 3-8**. From these results, it is clear that staff of both units have strong needs of technical guidance and training. Together, it is also implied that they need reliable data/ information system for water pollution control and capacity building for individual ability for different purposes.



(Hanoi EPA, 3 persons) (Ha Dong District, 2 persons)

Source: Survey Result by WG-3 in 2011.

Figure 3-8 Capacity Assessment of Hanoi EPA and District DONREs

(3) Management Resources

Generally, human resources, budget, equipment and materials and information are considered to be crucial management resources which units concerned with water pollution control should be given to fulfill their duties. All the WG-3 members have agreed that Hanoi DONRE seriously lacks all of these management resources.

It is certain that human resources, budget and equipment and materials are now insufficient, and the availability of these resources highly depends on the decision of PPC. However, the situation on information resources (especially pollution source information) is different from others. There is a certain possibility that DONRE can utilize information generated from daily tasks and activities as useful resources for water pollution control, if secure information system will be constructed and be operated in a sustainable way.

3.8 Major Findings on Water Pollution Control by DONRE

In Chapter 3, water pollution control by DONRE has been examined from different aspects. Major findings possibly associated with the improvement of water pollution control are enumerated, as below:

a) The purpose of authorization and compliance (including EIA approval, self-monitoring and so forth) is yet to be attained, as seen from many and repeated violations against environmental requirements. Functions of this management system are constrained by different reasons, like low environment awareness of entity operators, immature enforcement of administrative process, ineffective check and inspection by DONRE and so forth.

b) The system of industrial wastewater fee is not functioning as expected and the amount of collected fee is very limited, due to unrealistic setup in applied unit rate of fee.

c) The purpose and activities of wastewater discharge license are overlapped with the management system of environmental authorization and compliance grounded on the amended LEP. For the moment, only limited licenses to industrial entities have been issued.

d) Because the provision of setting a minimum scale is not in place commonly in management systems (such as the application of the national standard of discharged industrial wastewater quality, wastewater fee, etc.), DONRE is forced to do a lot of inefficient administrative works.

e) As governmental supporting measures for environmental protection, Hanoi PC has pushed forward with relocation and agglomeration of industries, and the environmental protection fund. Among others, it is important that the relocation with industrial clusters be pursued more, along with the installation of a centralized IWTP.

f) Although environmental check and inspection are a main management tool which enforces the water pollution control, its effect is limited for the moment. Major causes are considered to be: lack of appropriate information system on pollution sources, lack of specialized ability associated with water pollution technologies and ineffectual administrative sanctions against violations.

g) Concerning the management resources, DONRE lacks enough human resources, budget and equipment, as compared to large numbers of pollution sources. As for information resource, DONRE can use it as effective resources for water pollution control, by building secure information system.

CHAPTER 4

INDUSTRIAL WASTEWATER MEASURES BY ENTITIES

4.1 General

Prime purpose of industrial wastewater measure is to reduce and control pollution load discharged from industries to the water environment, by means of appropriate pollution mitigation measures. These industrial wastewater measures are taken by industrial entities, by way of curbing pollution load generation in production lines and/or reducing it by means of "End-of- Pipe" treatment systems.

In Chapter 4, measures against industrial wastewater at pollution sources (hereinafter called "industrial wastewater measures") have been studied and assessed based on collected data/ information in WG-3 activities.

4.2 Entities' Duty for Industrial Wastewater Measures

(1) Legal Responsibilities of Entities

Along the "Polluter-Pay-Principle (PPP)", responsibilities of entities engaged in manufacturing activities are defined clearly in the amended LEP (Article 35), as follows.

- To comply with the provisions of the law on protection of the environment,
- To take environmental protection measures as stipulated in an approved environmental impact assessment (EIA) report or a registered environmental protection undertaking, and to comply with environmental standards,
- To prevent and restrict adverse impact on the environment caused by the activities of any such organization or individual,
- To overcome environmental pollution caused by the activities of any such organization or individual,
- To disseminate information to and to educate and enhance awareness of environmental protection by employees working in their manufacturing, business and services establishments,
- To implement the regime of environmental reporting in accordance with the provisions of the law on protection of the environment,
- To comply with the regime for checks and inspection of environmental protection, and
- To pay environment tax and environmental protection fees.

As seen from the above, the amended LEP states clearly that entities (pollution generators) which generate and discharge wastewater are principally responsible for taking appropriate mitigation measures so as to prevent water pollution.

(2) Specific Approaches of Industrial Wastewater Measures

Entities are regulated to fulfill numbers of specific responsibilities to take pollution protection measures under the amended LEP and related regulations. Among others, the most important and representative obligations of pollution generators may be categorized, as follows:

- Acquirement of environment authorization: Acquiring the authorization of the State management agency for an intended project through the approval of EIA (or EPP) or the registration of EPC,
- Reduction of generated pollution load: Improving production technologies so as to reduce pollution loads generated from production processes,
- Treatment of generated wastewater: Installing and operating an appropriate wastewater treatment system so as to meet the wastewater standards specified in QCVN,

- Industrial wastewater fee: Paying fees for wastewater discharge
- Wastewater discharge license: Taking license for wastewater discharge.
- Self-monitoring: Periodical self-monitoring the operation status of adopted environmental protection measure.

(3) Pollution Load Reduction in Production Process

Along the international trend, it is widely considered that pollution load reduction by improvement of production processes and practices is an effective pollution mitigation measure in manufacturing industries. For that reason, cleaner production (CP) is introduced in industries in the world. In Vietnam, however, a statistical report says that the number of the application of CP are still very limited, although significant efforts for promoting have been made by various institutes concerned.

According to the survey conducted by WG-3 in 2011 and 2012, it has been found that 20 of 90 entities (22 %) have experienced actual applications of CP technologies in the model area.

4.3 Actual Status of Industrial Wastewater Measures

(1) General

Under the amended LEP, industrial entities must take appropriate measures to prevent environmental pollution caused by industrial wastewater. To realize these duties of entities, DONRE has set up a series of management systems for water pollution control, as follows:

- Environmental authorization and compliance (including: EIA approval, provision of IWTP, effluent water quality and self-monitoring),
- Industrial wastewater fee, and
- Wastewater discharge license

Table 4-1 indicates specific requirements for industrial wastewater measures which are different, depending on industrial locations (stand-alone siting, industrial parks, etc.) and availability of a centralized WTP.

Table 4-1 Entities' Responsibilities for Industrial Wastewater Measures

Compliance Items	Stand-alone (Located Independently)	Industrial Park (or Zone)		Industrial Cluster	
		Not installing a centralized WTP	Installing a centralized WTP	Not Installing a centralized WTP	Installing a centralized WTP
1. Environment authorization (EIA and others)	To get the approval by an entity from PPC.	To get the approval by an entity from PPC.	To get the approval by an entity from PPC.	To get the approval by an entity from PPC.	To get the approval by an entity from PPC.
2. Provision of Industrial WTP	To install by an entity.	To install by an entity.	To install only a pre-treatment plant (if necessary).	To install by an entity.	To install only a pre-treatment plant (if necessary).
3. Effluent water quality	To operate so as to meet the national effluent standard by an entity.	To operate so as to meet the national effluent standard by an entity.	To discharge wastewater to meet the discharge conditions set by IDC.	To operate so as to meet the effluent standard by an entity.	To discharge wastewater to meet the discharge conditions set by IDC.
4. Self-monitoring of protection measures	To submit self-monitoring report to DONRE every 6 months.	To submit self-monitoring report to DONRE and IZA every 6 months.	To submit self-monitoring report to DONRE and IZA every 6 months.	To submit self-monitoring report to DONRE every 6 months.	To submit self-monitoring report to DONRE every 6 months.
5. Industrial wastewater fee	To pay calculated amounts to DONRE.	To pay calculated amounts to DONRE.	IDC will pay IWW fee to DONRE. Enterprises which are located inside IP and connect to the IP central IWW Treatment facility will not pay IWW fee, but they only	To pay calculated amounts to DONRE.	IDC will pay IWW fee to DONRE. Enterprises which are located inside IP and connect to the IP central IWW Treatment facility will not

Compliance Items	Stand-alone (Located Independently)	Industrial Park (or Zone)		Industrial Cluster	
		Not installing a centralized WTP	Installing a centralized WTP	Not Installing a centralized WTP	Installing a centralized WTP
			need to pay wastewater treatment fee to IDC.		pay IWW fee but they only need to pay wastewater treatment fee to IDC.
6. Wastewater discharge license	To get a license from DONRE by an entity.	To get a license from DONRE by an entity.	Only IDC needs to ask for discharge permit and WW discharge permit is granted to IDC only. Enterprises located in IP do not need to register for the permit.	To get a license from DONRE by an entity.	Only IDC needs to ask for discharge permit and WW discharge permit is granted to IDC only. Enterprises located in IP do not need to register for the permit.

Source: Prepared by WG-3 along the information shared by HEPA.

Note: IZA grants EPCs and EPPs to small-scale industries located in IPs, except for large-scale industries subject to EIAs.

Based on the survey results undertaken by WG-3, status of industrial wastewater measures implemented by entities in Hanoi City and the model area has been evaluated.

As mentioned in **Table 4-1**, environmental requirements for entities are different, depending on industrial locations. Hence, the following evaluations are made in projects which are located in industrial parks and/or clusters accompanied by central IWTPs.

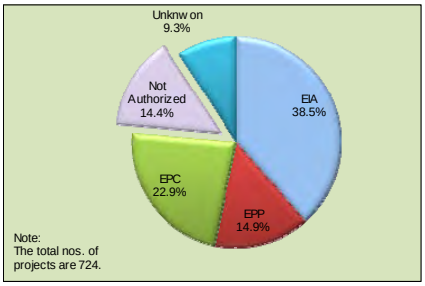
- IWTP provision: Considered to be installed.
- Effluent water quality: Considered to be satisfied the national effluent standards.
- Industrial wastewater fee: Considered to be paid.
- Wastewater discharge license: Considered to be taken.

(2) Environmental Authorization

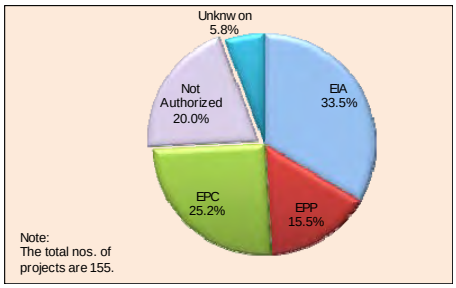
In the EIA approval and others, appropriate pollution mitigation measures to prevent water pollution must be stated before the start of a project. This authorization system gives a basic and crucial data/information in industrial wastewater management. However, in the past studies, it has been reported that there are many enterprises which are under operation without any authorization by EIA and others in Vietnam.

In the WG-3 survey, the status of the environmental authorization has been clarified on a total of 724 entities in Hanoi City. As shown in **Figure 4-1**, around 14 % and 20 % of all the listed projects are not authorized by the authority in Hanoi City and the model area, respectively. This implies that many pollution source projects are operating in the illegal status in terms of the environmental regulations.

Existence of such unauthorized entities is one of reasons why DONRE does not have a common ledger of pollution sources to be used for water pollution control. The EIA system in Vietnam requests the pre-operation inspection before the operation of industrial production. However, it has been known that actual implementation of these pre-operation inspections has been very limited.



(Hanoi City)

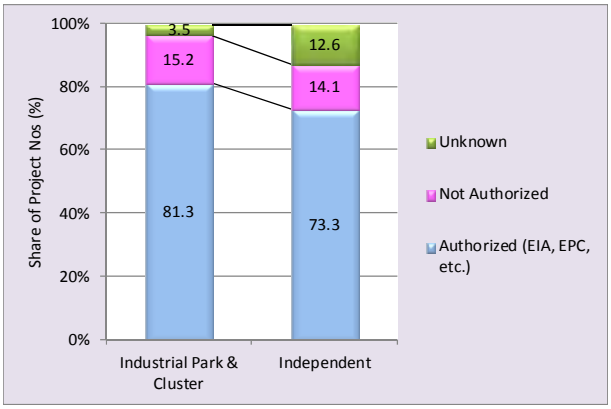


(Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.

Figure 4-1 Status of Environment Authorization (in Terms of Numbers of Projects)

In the comparison of the environmental authorization status by industrial locations, it has been known that the share of projects acquiring the authorization (with EIA, EPC, etc.) in industrial parks and clusters are slightly higher than that of independent siting, as shown in **Figure 4-2**.



Source: Survey Result by WG-3 in 2011 and 2012.

Figure 4-2 Status of Environment Authorization by Industrial Location in Hanoi City

(3) Industrial Wastewater Treatment Plant (IWTP)

1) General

It is very common that industrial wastewater contains some parts of raw materials and by-materials which are used in the production processes. Because they are detected as pollution parameters, like pH, BOD, SS, heavy metals and others, enterprises must install necessary wastewater treatment plant to treat wastewater to the national standard of effluent water. Such industrial wastewater treatment plant (IWTP) is installed independently for an enterprises or is installed as common facilities for a number of enterprises sited in industrial parks or clusters.

IWTP is usually comprised of several treatment stages (like pre-treatment, main treatment and post-treatment), depending on characteristics of wastewater and conditions of treated wastewater which meet with discharge criteria.

2) Installation of IWTP

a) Status of IWTP Installation

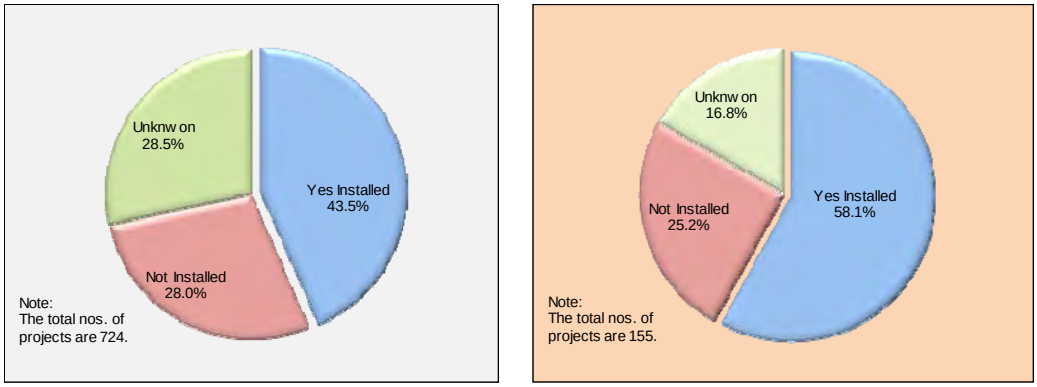
According to the survey conducted by WG-3, 44 % and 58 % of total entities surveyed have installed (or used) different kinds of IWTP in Hanoi City and the model area, respectively, as shown in **Figure 4-3**.

It means that many of remaining entities don't have any IWTP. 40 % and 33 % of entities with

IWTP in Hanoi City and the model area (respectively) use a common central IWTP installed in IP or IC, and the rest of entities installed individual IWTP.

Through the site survey, it has been also found that the specifications of many IWTPs installed are not sufficient to meet expected treatment performance, and that many IWTPs are not designed to ensure environmentally-acceptable operation.

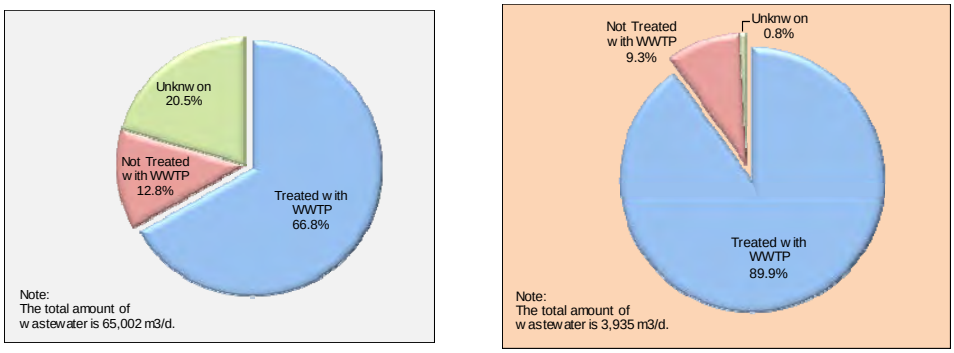
Data of wastewater flow-rate are often not available. The availabilities of data of wastewater flow-rate are 63 % and 74 % in Hanoi City and the model area respectively, in terms of numbers of projects. Based on collected flow-rate data, **Figure 4-4** shows installation status of IWTP (for the entire entities) in terms of wastewater volume. In view of wastewater volume, of the total wastewater volume, 66 % and 90 % are discharged after receiving some treatment by IWTP in Hanoi City. In the model area, wastewater volume of as high as 90 % are treated before the discharge into the environment, because major projects with large wastewater volume are equipped with IWTPs.



(Hanoi City) (Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.
Note: Projects connected to a central IWTP for industrial parks and clusters are counted as "Yes".

Figure 4-3 Installation Status of IWTP (in Terms of Project Numbers)



(Hanoi City) (Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.
Note:
1) Wastewater flows of projects using a central IWTP for industrial parks and clusters are calculated as treated wastewater volume.
2) Wastewater from projects connected to a central IWTP for industrial parks and clusters are counted as "Treated".

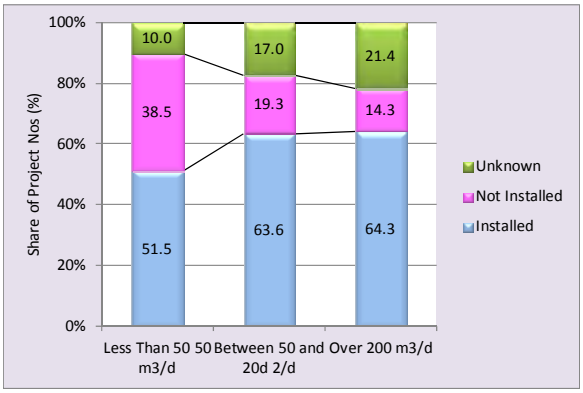
Figure 4-4 Installation Status of IWTP (in Terms of Wastewater Volume)

Figure 4-5 shows the status of IWTP installation by industrial locations (industrial park & cluster and independent). From this result, there is no significant difference in the share of IWTP installation between industrial locations.

Source: Survey Result by WG-3 in 2011 and 2012.
Note: This graph shows the share of numbers of 702 projects with data of industrial locations.

Figure 4-5 Installation Status of IWTP by Industrial Location in Hanoi City

Figure 4-6 shows analytical result of the installation status of IWTP by wastewater flow-rate in Hanoi City. This result implies that projects with larger flow-rate are more likely to be equipped with IWTP.



Source: Survey Result by WG-3 in 2011 and 2012.
Note: This graph shows the analytical result for 453 projects with flow-rate data in Hanoi City.

Figure 4-6 Installation Status of IWTP by Wastewater Flow-Rate in Hanoi City

b) Installation Status of Centralized IWTP for Industrial Parks and Clusters

Table 4-2 shows industrial parks located in Hanoi City and the availability of centralized wastewater treatment plant. Of 11 industrial parks in Hanoi City, eight (8) parks are equipped with centralized wastewater treatment plants operating or immediately going to operate.

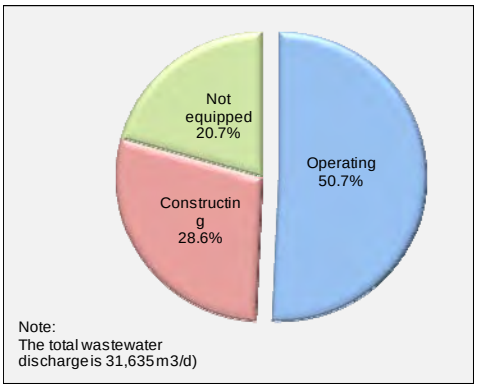
Table 4-2 Industrial Parks in Hanoi City

No.	Industrial Parks	District	Wastewater Treatment Flow (m^3/day)	Centralized WWTP (As of 2010)
1	Noi Bai IP	Soc Son	2,432	Operating
2	North Thang Long IP	Dong Anh	3,345	Operating
3	Thach That - Quoc Oai IP	Thac That, Quoc Oai	4,825	Constructing
4	North Thuong Tin IP	Thuon Tin	1,216	Not yet
5	SouthThang Long (1st period) IP	Tu Liem	576	Operating
6	Quang Minh II IP	Me Linh	2,304	Not yet
7	Quang Minh I IP	Me Linh	6,810	Operating
8	Sai Dong B IP	Long Bien	960	Constructing
9	Phu Nghia IP	Chuong My	3,266	Constructing
10	Phung Hiep IP	Thuong Tin	3,021	Not yet
11	Ha Noi - Dai Tu IP	Long Bien	2,880	Operating

Source: Data/information in this table are sourced from the "State of Environment Report in 2009," issued by MONRE.

The installation status with centralized IWTP in industrial parks is around 51 %, in terms of wastewater volume, as shown in **Figure 4-7**. In addition, another 29 % of wastewater volume is going to be treated with centralized IWTPs which are under construction, now.

Meanwhile, WG-3 survey in 2011 and 2012 has indicated that the numbers of entities using a centralized IWTP for IPs and ICs are a total of 129 and 30 in Hanoi City and the model area, respectively, and the wastewater flow treated by centralized IWTP is about 14,500 and 310 m^3/day in Hanoi City and the model area, respectively, as shown in **Table 4-3**.



Source: Data/information in this table are sourced from the "State of Environment Report in 2009," issued by MONRE.

Figure 4-7 Installation Status with Centralized IWTP in Hanoi City (in Terms of Wastewater Volume)

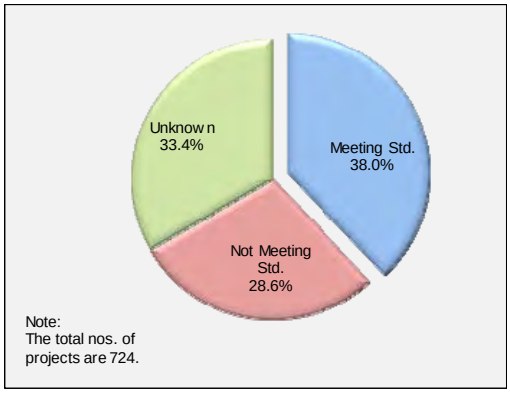
Table 4-3 Summary of Centralized IWTP for IPs and ICs from WG-3 Survey

Status	Hanoi City	Model Area
Total Nos. of Projects Located in Industrial Parks and Clusters	368	80
Nos. of Projects Using Central IWTPs	129 (35.0%)	30 (38.0 %)
Total industrial Wastewater Flow (m^3/d) , Discharged from Industrial Parks and Clusters	22,437	2,014
Industrial Wastewater Flow (m^3/d), Discharged into Central ITWPs	14,475 (64.5%)	306 (15.2%)

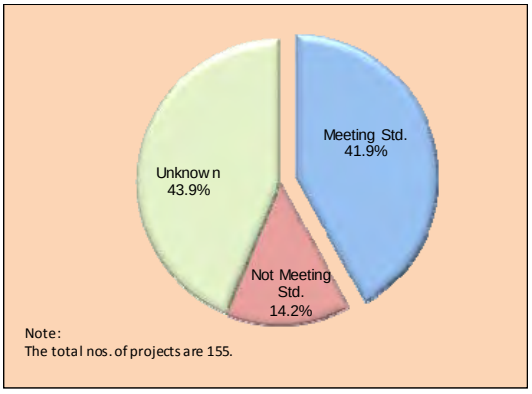
Source: Survey Result by WG-3 in 2011 and 2012.

(4) Quality of Discharged Wastewater

Entities have the responsibility for discharging wastewater after treating to meet the national effluent standards, as described in the section 3.2. **Figure 4-8** and **Figure 4-9** shows the treatment status of industrial wastewater, before it is discharged into water courses.



(Hanoi City)

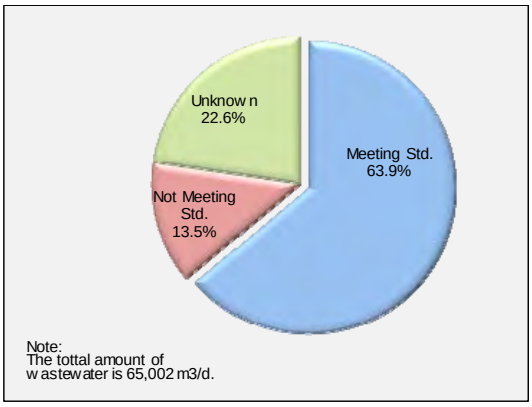


(Model Area)

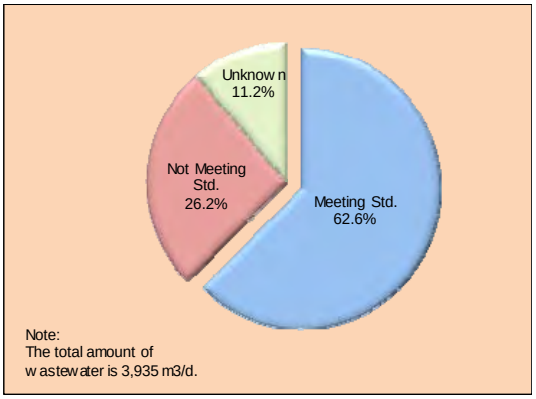
Source: Survey Result by WG-3 in 2011 and 2012.
Note: Projects connected to a central IWTP for industrial parks and clusters are counted as "Meeting".

Figure 4-8 Treatment Status of Industrial Wastewater (in Terms of Project Numbers)

In terms of project numbers, only 38 % and 42 % of entities located in Hanoi City and the model area respectively discharge wastewater with the quality meeting the national effluent standards. In terms of wastewater volume, 64 % and 63 % of projects located in Hanoi City and the model area respectively, discharge wastewater with the quality meeting the national effluent standards. As obvious from this, significant portions of industrial entities are discharging industrial wastewater exceeding the national effluent standard, without installation of appropriate IWTP and/or appropriate operation.



(Hanoi City)



(Model Area)

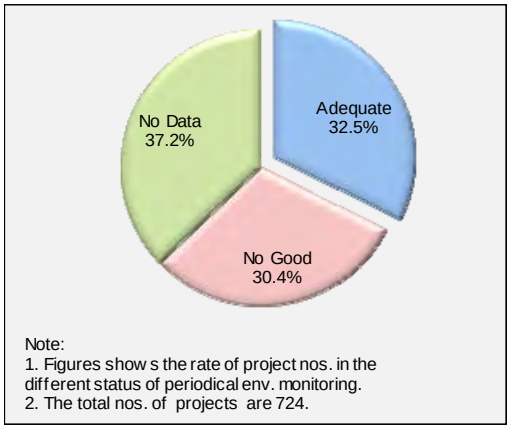
Source: Survey Result by WG-3 in 2011 and 2012.
Note: Wastewater from projects connected to a central IWTP for industrial parks and clusters are counted as "Meeting".

Figure 4-9 Treatment Status of Industrial Wastewater (in Terms of Wastewater Volume)

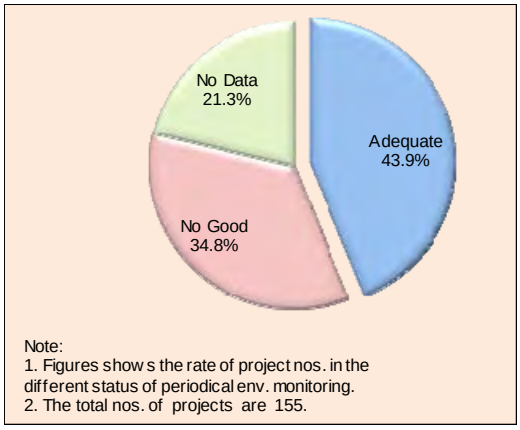
(5) Self-Monitoring of Industrial Wastewater Measures by Entities

Conducting appropriate self-monitoring of environmental protection measure for pollution mitigation is one of indispensable requirements specified in the system of EIA. Entities are requested to submit self-monitoring report to DONRE, periodically. However, majority of establishments have been neglecting their obligation to conduct periodical self-monitoring.

As shown in **Figure 4-10**, only 33 % and 44 % of entities, located in Hanoi City and the model area respectively, have observed the obligation of self-monitoring of industrial wastewater measures.



Hanoi City)

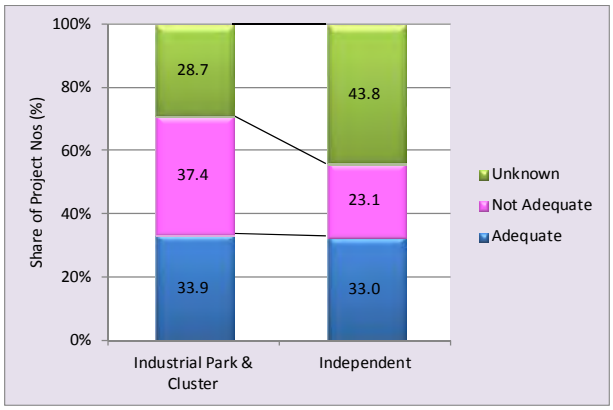


(Model Area)

Source: Survey Result by WG-3in 2011 and 2012.

Figure 4-10 Status of Self-Monitoring in Terms of Project Numbers

Figure 4-11 shows the status of self-monitoring by industrial locations (industrial park & cluster and independent). From this result, there is no significant difference in the share of self-monitoring activity between industrial locations.



Source: Survey Result by WG-3 in 2011 and 2012.

Note: This graph shows the analytical result for 702 projects with data on industrial locations in Hanoi City.

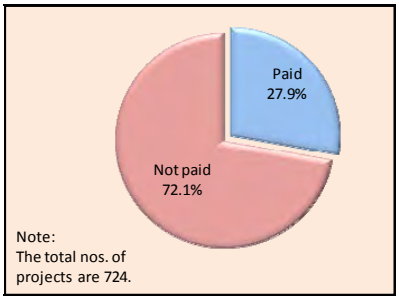
Figure 4-11 Status of Self-Monitoring by Industrial Location in Hanoi City

(6) Industrial Wastewater Fee

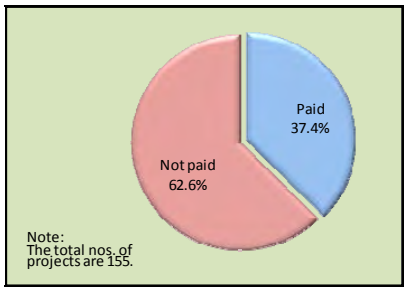
Based on the Decree No.67 (2003/ND-CP), entities discharging industrial wastewater are obliged to pay industrial wastewater fee. In case of industrial parks and clusters, IDC (Infrastructure Development Company) pays the industrial wastewater fee to DONRE, if centralized IWTPs are available. Entities connected to a central IWTP pays treatment fees to IDC and don't need to pay wastewater fees to DONRE.

Figure 4-12 and **Figure 4-13** show numbers and rate of projects paying IWW fee. In these figures, entities connected to central IWTF for industrial parks and clusters are assumed to have paid their industrial fees.

In terms of numbers of projects, some 72 % and 60 % don't pay industrial wastewater fee in Hanoi City and the model area, respectively. In terms of discharged wastewater amount, some 70 % of wastewater and 59 % are discharged without the payment of industrial wastewater fee in Hanoi City and the model area. As seen from this, majority of entities don't pay wastewater fees.



(Hanoi City)



(Model Area)

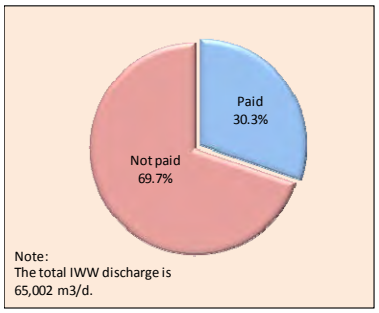
Source: Survey Result by WG-3in 2011 and 2012.

Note:

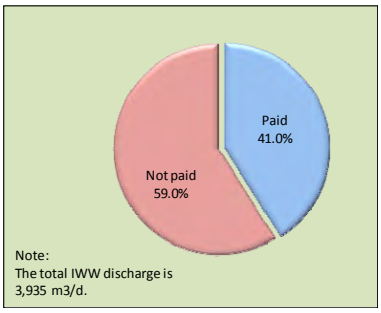
1) "Not Paid" includes projects with "No Data" in this graph.

2) Projects connected to a central IWTP for industrial parks and clusters are counted as "Paid".

Figure 4-12 Status of Payment of IWW Fee (in Terms of Project Numbers)



(Hanoi City)



(Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.

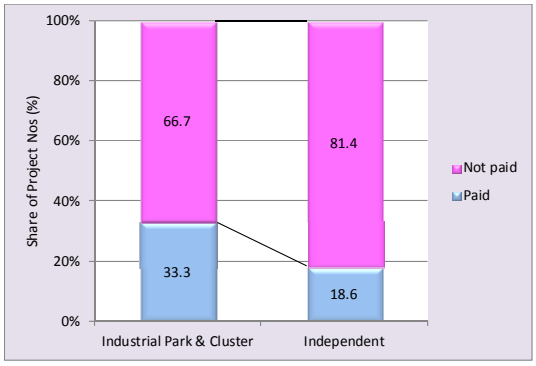
Note:

1) "Not Paid" includes projects with "No Data" in this graph.

2) Note: Wastewater from projects connected to a central IWTP for industrial parks and clusters are counted as "Paid".

Figure 4-13 Status of Payment of IWW Fee (in Terms of Wastewater Volume)

In terms of industrial locations, as shown in **Figure 4-14**, wastewater fees for entities located in industrial parks and clusters are collected at a higher rate, as compared to those located independently.



Source: Survey Result by WG-3 in 2011 and 2012.

Note: "Not Paid" includes projects with "No Data" in this graph.

Figure 4-14 Status of Payment of IWW Fee by Industrial Location in Hanoi City

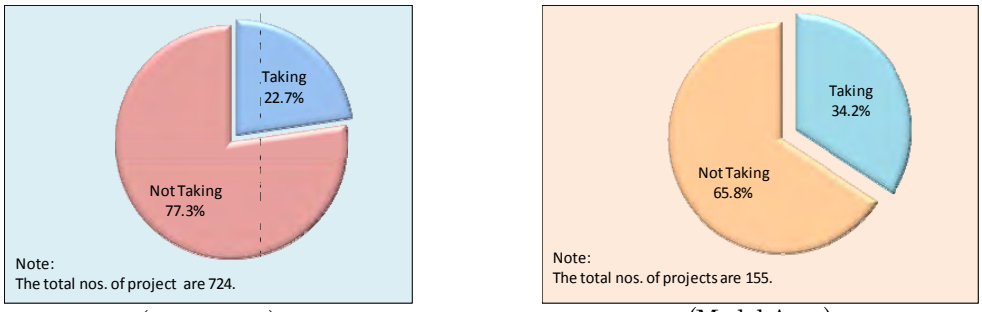
(7) Wastewater Discharge License

Based on the Decree No.149 (/2003/ND-CP), entities discharging wastewater into public water courses are obliged to take wastewater discharge license.

In case of central IWTPs in industrial parks and clusters, IDC needs to take wastewater discharge license from DONRE and entities connected to central IWTP do not need discharge license. Therefore, in this report, it is assumed that entities connected to central IWTP have granted discharge license.

Figure 4-15 show the status of obtaining a discharge license. In terms of numbers of projects, some 77 % and 66 % do not have wastewater discharge license in Hanoi City and the model area, respectively. As seen from this, it has been found that majority of entities do not have necessary discharge license.

In terms of industrial locations, as shown in **Figure 4-16**, discharge license of entities located in industrial parks and clusters are granted at the higher rate, as compared to those located independently.



(Hanoi City) (Model Area)

Source: Survey Result by WG-3 in 2011 and 2012.
Note:
1) Projects with "No Data" are included into projects with "Not Taking".
2) Projects connected to a central IWTP for industrial parks and clusters are counted as "Taking".

Figure 4-15 Status of Taking Wastewater Discharge License

Source: Survey Result by WG-3 in 2011 and 2012.
Note: "Not Paid" includes projects with "No Data" in this graph.

Figure 4-16 Status of Wastewater Discharge License by Industrial Locations in Hanoi City

4.4 Major Findings on Industrial Wastewater Measures

Industrial wastewater measures by entities have been examined in Chapter 4. Major findings possibly associated with the improvement of water pollution control are enumerated, as below:

a) The amended LEP states requires enterprises to take necessary measures for industrial wastewater, and there are specific regulations on industrial wastewater management. Nevertheless, majority of industrial entities do not take appropriate industrial wastewater measures, as set forth below:

b) There are some entities operating without any environmental authorization (EIA, EPP, EPC, etc.). Of all the entities discharging industrial wastewater, 14 and 20 % entities do not have any type of authorization in Hanoi City and the model area, respectively. This is one of basic issues to be solved in the environmental compliance in Hanoi City.

c) Some 44 and 58 % of entities in Hanoi City and the model area respectively are operating with different types of IWTP. Meanwhile, some 28 and 25 % of entities in Hanoi City and the model area respectively are discharging wastewater without treatment. In terms of wastewater volume, 67 and 90 % of discharged wastewater in Hanoi City and the model area respectively are treated with different types of IWTP. It has been found that the larger scale projects (in terms of wastewater flow-rate) tend to be equipped with IWTP at the higher rate.

d) In terms of projects located in industrial parks and clusters, 51 % of wastewater volume discharged in parks and clusters are treated with central IWTPs in Hanoi City. In addition, central IWTPs with the capacity of another 29 % treatment are under construction now.

e) Of all entities, discharged wastewater of 38 and 42 % is meeting the national effluent standards in Hanoi City and in the model area, respectively. In terms of wastewater volume, 64 and 63 % of total wastewater are discharged after treated to the level of the national standards, in Hanoi City and the model area, respectively.

f) Of all the entities discharging industrial wastewater, 33 to 44 % entities conduct self-monitoring appropriately, including periodical submission of monitoring reports, in Hanoi City and the model area, respectively.

g) In terms of numbers of projects, some 72 % and 60 % don't pay industrial wastewater fee in Hanoi City and the model area, respectively. In terms of discharged wastewater amount, some 70 % and 59 % are discharged without the payment of industrial wastewater fee in Hanoi City and the model area. As seen from this, majority of entities don't pay wastewater fees. Especially, as high as some 81 % of entities located independently don't pay the wastewater fees.

h) In terms of numbers of projects, some 77 % and 66 % don't take wastewater discharge license in Hanoi City and the model area, respectively. As seen from this, majority of entities don't have necessary discharge license, in the meantime. As high as some 81 % of entities located independently don't take discharge license.

CHAPTER 5

ASSESSMENT OF INDUSTRIAL WASTEWATER COMPLIANCE AND POLLUTION LOADS

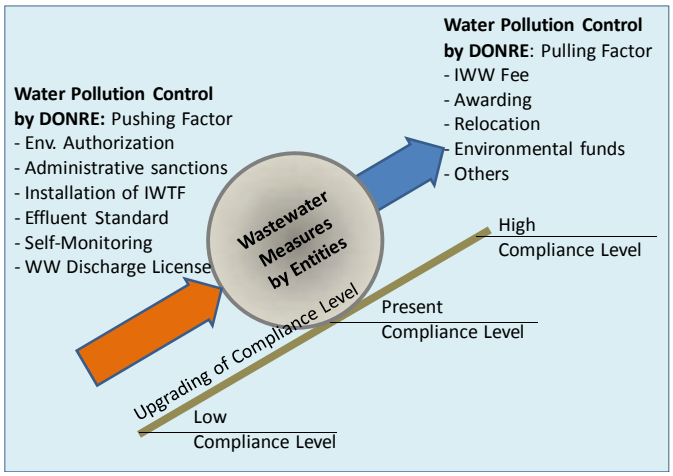
5.1 Overview

The objective of water pollution control by DONRE is to promote industrial wastewater measures by entities in order to reduce environmental pollution load discharged from manufacturing process. Chapter 5 presents the analysis on the achievement status of industrial wastewater measures by entities with using the compliance rating raised in WG-3.

5.2 Water Pollution Control and Compliance

In this Improvement Plan, the environmental compliance level is defined as the achievement status of industrial wastewater measures which industrial entities attain for observing legal rules and regulations.

Meanwhile, water pollution control by DONRE is comprised of a series of activities to promote the compliance by entities, by means of pushing and pulling management systems, as shown in **Figure 5-1**.



Source: Prepared by WG-3

Figure 5-1 Concept of Water Pollution Control and Compliance

As clarified in Chapter 3, DONRE employs a number of management systems as listed in **Table 5-1** to promote environmental compliance with various legal requirements. These management systems are categorized to two (2) types. One is the management system containing pulling factor to encourage the implementation of environmental actions by rendering some economic incentives, like industrial wastewater fee. Another is the management system containing pushing factor to press entities for taking actions by imposing penal sanctions.

As mentioned above, it is understood that the environmental compliance level represent the effect of DONRE's water pollution control with pushing and/or pulling factor.

Table 5-1 Management System for Industrial Wastewater and Compliance

Management System		Legal Requirements for Entities (Compliance)
1. Environmental authorization and compliance		
	1) EIA approval	To acquire the approval of EIA, before the construction.
	2) Provision of IWTP	To install of IWTP to treat industrial wastewater as stated in the EIA, before the operation.
	3) Effluent water quality	To treat the effluent water so as to meet the national standards.
	4) Self-monitoring	To conduct self-monitoring of environmental protection measures and to report the result periodically.
2. Industrial wastewater fee		To pay wastewater fee calculated according to the discharged pollution load.
3. Wastewater discharge license		To acquire the license and to observe the legal requirements.

Source: Prepared by WG-3

5.3 Methodology of Industrial Wastewater Compliance Rating (IWCR)

(1) Purpose and Method of IWCR

Chapter 4 presents current status of industrial wastewater measures taken by entities which has been clarified through series of surveys by WG-3. A brief description of these results is shown in **Table 5-2**, implying that current industrial wastewater measures by entities are very deficient in all aspects of measures on the whole.

Also, the site surveys have found out that the deficiency level of industrial wastewater measures are widely different depending on entities, namely, some entities have excellent measures but others inferior measures.

Table 5-2 Summary of Current Industrial Wastewater Measures by Entity

Compliance Items	Status of Industrial Wastewater Measures by Entities	
	In Hanoi City	In Model Area
1. Environment authorization (EIA and others)	Around 14 % of entities are not authorized by any type of authorization.	Around 20 % of entities are not authorized by any type of authorization.
2. Provision of IWTP	Around 28% of entities are not equipped with IWTP.	Around 25 % of entities are not with IWTP.
3. Effluent water quality	Some 29 % of entities discharge effluent water with the quality exceeding the national standard, and other 33 % are discharging the effluent with unknown quality.	Some 14 % of entities discharge effluent water with the quality exceeding the national standard, and other 44 % are discharging the effluent with unknown quality.
4. Self-monitoring of protection measures	Around 30 % of entities don't conduct appropriate self- monitoring, and the situations of other 37 % are not known.	Around 44 % of entities don't conduct appropriate self- monitoring, and the situations of other 21 % are not known.
5. Industrial wastewater fee	Around 72 % of entities don' pay industrial wastewater fee.	Around 63 % of entities don' pay industrial wastewater fee.
6. Wastewater discharge license	Around 77 % of entities don't take the licenses.	Around 86 % of entities don't take the licenses.

Source: Based on Survey Result by WG-3in 2011.

Note: In case an entity is connected to a central IWTP in industrial parks or clusters, the entity is assumed to satisfy environmental requirements, in the provision of IWTP, effluent water quality, industrial wastewater fee and wastewater discharge license.

In this Improvement Plan, the Industrial Wastewater Compliance Rating (IWCR) has been developed and applied to clearly express such differences in industrial wastewater measures of each entity by using simple numerical indicators.

Rating scores of IWCR is calculated by rating the status of each item of water pollution control (namely, compliance levels for 6 items) with three (3) scores (1, 3 and 5). The total rating score is calculated by averaging respective rating scores of 6 items for an entity. Specifically, the IWCR is performed by using the Pollution Source Table (PST) to be formed from the Pollution Source Database (PSD), as explained below:

(2) Criteria and Data Sources for Industrial Wastewater Compliance Rating (IWCR)

In the IWCR, six (6) compliance items are scored by three (3) degrees; one (1) for very deficient status, three (3) for imperfect status despite some achievements observed, and five (5) for excellent status with perfect achievement. More detail explanation for respective items are explained in **Table 5-3**.

Table 5-3 Criteria of Industrial Wastewater Compliance Rating (IWCR)

Rating / Compliance Item	"1"	"3"	"5"	Remark
1. Env. Authorization	Not taking the approval	Taking the approval is "Not Clear".	Taking the approval	
2. Provision of IWTP	No provision	Yes and sufficient is "Not Clear".	Yes and sufficient	The use of centralized IWTP gives "5".
3. Effluent water quality	Not meeting against the std.	Meeting against the std. is "Not Clear".	Meeting against the Std.	The use of centralized IWTP gives "5".
4. Self-monitoring of protection measures	Not observed	Observed is "Not Clear".	Observed	
5. Industrial wastewater fee	Not paid	Paid is "Not Clear".	Paid	The use of centralized IWTP gives "5".
6. Wastewater discharge license	Not taking	Taking is "Not Clear".	Taking	The use of centralized IWTP gives "5".

Source: Prepared by WG-3

The rating scores of respective compliance items are calculated by using the Pollution Source Table (PST) which is formulated in the Task 22 of the Pollution Source Database (PSD). The original data entered in the PSD come from various management tasks made by DONRE, as shown in **Table 5-4**.

Table 5-4 Sources of Data for IWCR

Compliance Item	Units of Data Source
1. Env. Authorization	EIA Section of Hanoi EPA
2. Provision of IWTP	Pollution Control Section of EPA or Inspectorate
3. Effluent water quality	Pollution Control Section of EPA, Inspectorate or CENMA
4. Self-monitoring of protection measures	Pollution Control Section of EPA
5. Industrial wastewater fee	General Section of EPA
6. Wastewater discharge license	Division of Water Resources Management and Meteoro-Hydrology (DWRMH)

Source: Prepared by WG-3

(3) Pollution Source Database (PSD) and Pollution Source Table (PST)

1) Overview

As clarified in Chapter 3, data/information on pollution sources are not used effectively in the

water pollution control of DONRE, at present. This is one of major reasons why the water pollution control by DONRE is uneven and ineffective in responding to real situations. In response to such situation, the pollution source database (PSD) has been introduced to this project, aiming to be used as an integrated information system.

A database system has been used for storing and processing collected data/ information through Output 3 activities (such as the performance assessment of water pollution control, 1st site survey, additional site survey and 2nd site survey). As of October 2012, the PSD has stored data/ information on a total of 1,161 pollution sources in Hanoi City.

The specification of this database system is set forth, as below:

2) Pollution Source Database (PSD)

The PSD is a program which has been developed to store different data generated from water pollution control with the following specifications:

- Platform: Windows OS,
- Dependency: stand-alone software,
- Software specification: MS Access 2003 or later versions,
- Interface: English/Vietnamese,
- Users: Multi-user, and
- Data source: Mainly from Excel, keyboard input.

The PSD is based on a multi-users system, as shown in **Figure 5-2**, whereby all users of units concerned with water pollution control can use the database by the function of data synchronization.

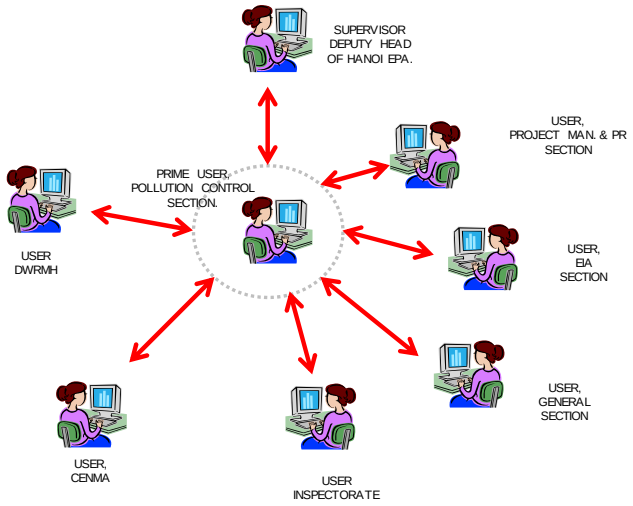


Figure 5-2 Concept of PSD Operation Task Force

The PSD has 22 data tables, as shown in **Table 5-5**, enabling the entry of data/ information generated from water pollution control and the output of aggregating tables.

Table 5-5 Management Tasks in the PSD

Task No.	Groups	Management/Registration Tasks
1	Inventory	Entity
2		Project
3		Contact
4		Basic Information
5	Water Environment Management	Environment Authorization
6		Inspection and Check
7		Effluent Measurement

Task No.	Groups	Management/Registration Tasks
8		Environment Protection Fee
9		Wastewater Discharge License
10		Serious Pollution Facilities
11		Environment Monitoring Report
12		Wastewater Information
13	Other Management	Hazardous Waste Generator
14		Hazardous Waste Transport
15		Hazardous Waste Treatment
16		Hazardous Waste Management
17		Mineral Resource License
18		Environment Rehabilitation
19		Environment Protection Expense Report
20	Data Aggregation	Pollution Load Calculation (PLC)
21		Pollution Load Table (PLT)
22		Pollution Source Table (PST)

Source: Prepared by WG-3

3) Outputs of Pollution Source Database (PSD)

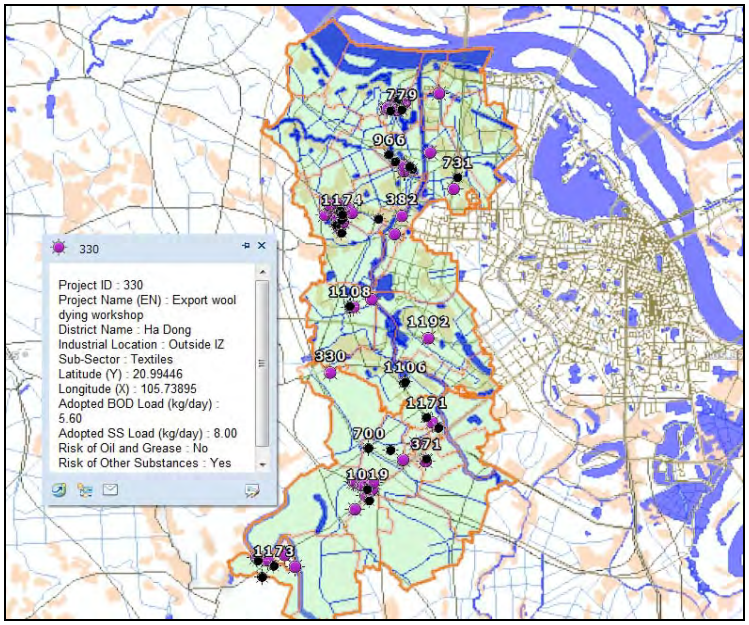
a) Pollution Source Table (PST)

By processing and analyzing collected data/information in the PSD, the pollution source table (PST) tabulating basic information of pollution sources and the status of environmental compliance and other data is formed, as shown in **Annex 1** for Hanoi City. Rating scores are calculated by using several compliance items in the field of the pollution source table (PST) to be formed from the PSD by exportation.

b) Pollution Load Table (PLT) and Pollution Source Map (PSM)

Furthermore, pollution source maps (PSM), which are geographical images of pollution sources are made, as shown in **Figure 5-3**, based on pollution load tables (PLT) produced in the PSD.

Pollution Load Table (PLT) in the model area and more examples of Pollution Source Maps (PSM) are shown in **Annex 7** and **Annex 8**, respectively.



Source: JET

Figure 5-3 Example of Pollution Source Map (PSM) in the Model Area

5.4 Result and Analysis of Industrial Wastewater Compliance with IWCR

(1) Overview

WG-3 has applied the Industrial Wastewater Compliance Rating (IWCR) to the rating of entities belonging to manufacturing industry in the model area and Hanoi City.

The results on the model area (155 entities) are based on site survey and data collection. Especially measures of 90 entities surveyed through 1st and 2nd site surveys have thoroughly examined. Specific scoring method and actual calculating sheet with IWCR is attached as **Annex 3** and **Annex 4**.

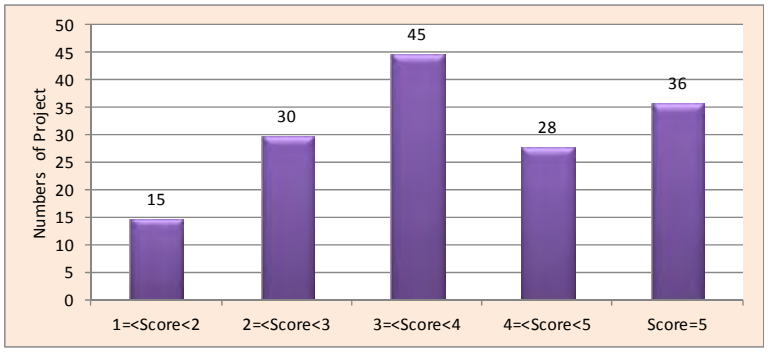
Meanwhile, the rating with IWCR on manufacturing industries (724 entities, including those in the mode area) located in Hanoi City was performed with the same method, by using collected data/information in DONRE office.

The summarized rating results are explained, as below:

(2) Result of IWCR in Model Area

1) Total Compliance Rating

Of 155 projects located in the model area, 36 projects show perfect rating score "5" on the total compliance, meaning that these projects are meeting all six (6) compliance items, as shown in **Figure 5-4**. Largest numbers (45) of projects are located in the range of the rating scores on the total compliance: equal to or higher than "3" and lower than "4". Meanwhile, 15 entities are in the rating score of equal & higher than "1" and less than "2". This means that these entities have failed in observing the environmental regulations in almost all compliance aspects.

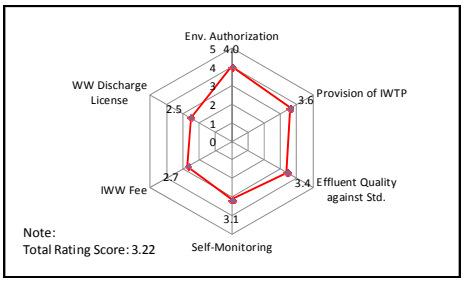


Source: Prepared by WG-3

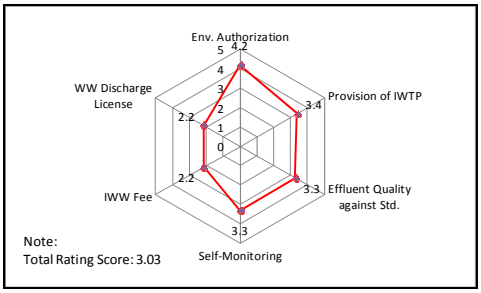
Figure 5-4 Results of IWCR on Total Compliance in Model Area

2) Average Rating Scores by Compliance Items

Average values of total rating scores for entities of 103 and 52 located in Tu Liem District and Ha Dong District are shown in **Figure 5-5**, respectively. From this result, it has been clarified that the compliance status on wastewater fee and wastewater discharge are generally very low.



(Tu Liem District)



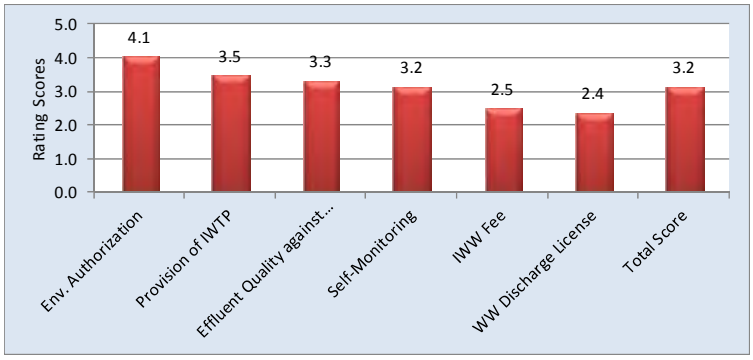
(Ha Dong District)

Source: Prepared by WG-3

Figure 5-5 Results of IWCR for Tu Liem District and Ha Dong District

Figure 5-6 shows the result of average rating by six (6) compliance items over 155 entities located in the model area, implying that the compliance levels are different depending on items ,distributing between scores 2.4 and 4.1.

Among the six (6) compliance items, the rating score on the environmental authorization shows the highest (score 4.1), meaning that majority of projects have obtained necessary EIA approval and so forth. Meanwhile, the compliance for wastewater discharge license shows low score (Score 2.4), indicating that the discharge license system has not been enforced widely.

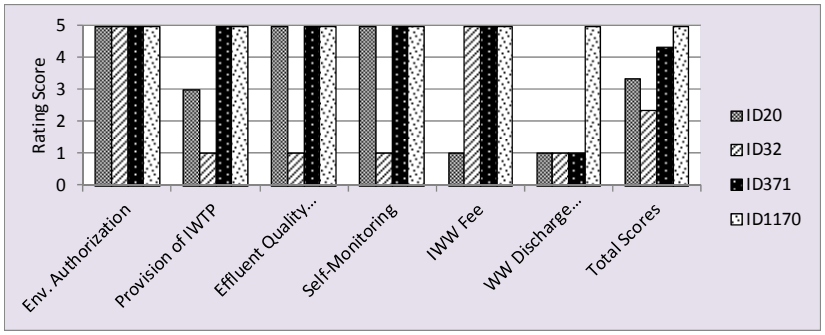


Source: Prepared by WG-3

Figure 5-6 Results of IWCR on Average Rating by Compliance Item in Model Area

3) Individual Rating Scores by Projects

Figure 5-7 shows samples of the individual rating result by projects. For instance, as seen from this graph, Project ID 1170 (wood processing) indicates excellent compliance levels over all the items. On the other hand, Project ID 32 (beer & beverage) indicates very low compliance levels for almost all items.



Source: Prepared by WG-3

Figure 5-7 Results of IWCR on Individual Rating by Projects

As seen from this example, rating scores based on the IWCR clearly indicate the differences in compliance status between projects and compliance items.

(3) Result of IWCR in Hanoi City

1) Compliance Rating Scores by Districts

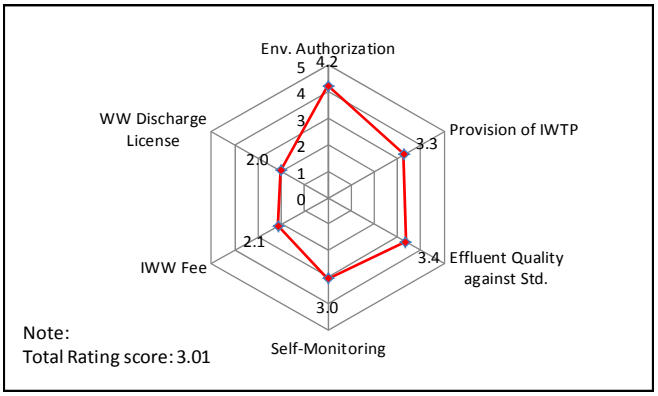
Table 5-6 shows averaged rating scores with IWCR on pollution source projects for 27 districts in Hanoi City.

Table 5-6 Averaged Rating Score of IWCR by District

District	Nos. of Project	Rating Score of IWCR						
		Env. Authorization	Provision of IWTP	Effluent Quality against Std.	Self-Monitoring	IWW Fee	WW Discharge License	Total Scores
Ba Dinh	7	3.6	3.3	3.9	3.6	2.1	2.1	3.10
Ba Vi	1	5.0	3.0	3.0	3.0	1.0	1.0	2.67
Cau Giay	6	2.7	3.7	2.3	2.3	2.3	1.7	2.50
Chuong My	30	4.7	2.6	1.9	1.7	1.3	1.3	2.24
Dan Phuong	11	3.7	3.4	2.6	2.5	1.7	1.7	2.61
Dong Anh	41	4.5	4.2	4.2	3.5	3.3	3.4	3.87
Dong Da	8	4.3	3.5	3.5	3.3	2.5	1.0	3.00
Gia Lam	14	4.4	3.3	3.4	3.4	1.9	1.3	2.95
Ha Dong	52	4.2	3.4	3.3	3.3	2.2	2.2	3.03
Hai Ba Trung	20	4.4	2.8	4.0	3.9	2.8	1.8	3.28
Hoai Duc	8	4.5	3.0	3.5	3.5	1.0	1.0	2.75
Hoan Kiem	3	4.3	3.7	3.7	3.7	2.3	1.0	3.11
Hoang Mai	27	3.7	3.1	2.7	2.7	1.4	1.0	2.46
Long Bien	45	4.7	4.6	4.5	3.2	3.7	3.8	4.07
Me Linh	117	4.1	2.6	2.9	2.7	1.3	1.3	2.49
My Duc	6	3.3	2.3	3.3	3.3	1.0	1.0	2.39
Phu Xuyen	1	5.0	5.0	5.0	5.0	1.0	1.0	3.67
Phuc Tho	4	4.5	3.0	3.0	2.5	2.0	2.0	2.83
Quoc Oai	10	4.6	2.2	4.2	4.2	1.4	1.0	2.93
Soc Son	42	4.8	4.4	4.3	2.9	3.8	3.8	3.98
Son Tay	7	4.7	3.3	3.6	3.6	1.0	1.0	2.86
Thach That	39	3.4	2.6	2.3	2.3	1.1	1.2	2.15
Thanh Oai	14	4.9	2.6	3.7	3.7	1.6	1.0	2.90
Thanh Tri	37	4.6	3.0	3.2	3.1	1.4	1.3	2.77
Thanh Xuan	22	4.0	3.1	3.8	3.7	2.5	1.7	3.14
Thuong Tin	21	4.1	2.9	3.8	3.7	1.8	1.8	3.00
Tu Liem	103	4.0	3.6	3.4	3.1	2.7	2.5	3.22
Unknown	28	4.7	3.4	3.4	3.0	1.9	2.3	3.11
Total	724	4.2	3.3	3.4	3.0	2.1	2.0	3.01

Source: Prepared by WG-3

Average values of total rating scores for 724 entities located in Hanoi City are shown in **Figure 5-8**. From this result, it has been clarified that the compliance statuses of wastewater fee and wastewater discharge are particularly low.

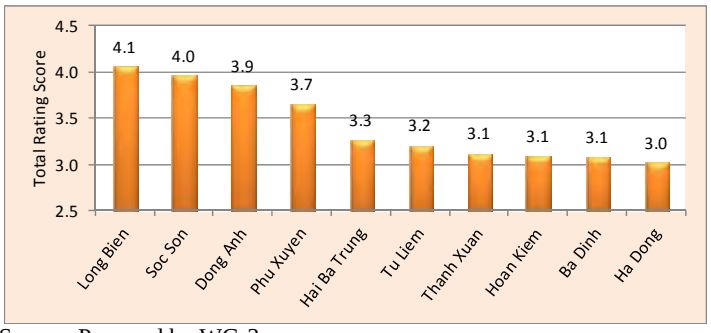


Source: Prepared by WG-3

Figure 5-8 Results of IWCR on Average Rating for Hanoi City

2) Ranking of Compliance Rating Scores of Districts

Averaged total compliance scores of districts range from 2.2 to 4.1 and overall average score is calculated to be "3.01". As shown in **Figure 5-9**, scores of Districts of Long Bien, Soc Son, Dong Anh, etc., are high in ranking.



Source: Prepared by WG-3

Figure 5-9 Ranking of High Compliance Rating Scores in Hanoi City

(4) Application of IWCR to Water Pollution Control

As mentioned already, the compliance statuses are widely different, depending on entities. Such different statuses can be evaluated with the numerical figures, by using the IWCR. Therefore, DONRE may use the rating scores for different ways, because the rating scores of the IWCR represent the status of industrial wastewater measures and the compliance levels of entities. The following actual applications of the IWCR are possible, as example:

a) Setting of Improvement Target

The scores calculated with the IWCR represent the compliance status as numerical indicators. Thus, DONRE may use them to set up the improvement target of the industrial wastewater compliance in individual entities and/or grouped entities in industrial wastewater management.

More specifically, on the environmental compliance of individual entities, rating scores with IWCR may be applied to assess:

- Respective compliance status of six (6) items (like environmental authorization, IWTP provision, wastewater fee payment, etc.), by means of individual rating scores, and
- Total compliance status of certain entities over six (6) compliance items, by means of total rating scores.

The IWTP can also be applied to set improvement target for priority regions and priority industries (as classified by administrative territories, industrial locations, industrial categories and so forth). For example, in case of the improvement targets by administrative area, DONRE may set up an appropriate improvement target, taking account of current compliance status shown in **Table 5-7**. The ultimate target scores of IWCR in any aspects should be "5" in a long term improvement. DONRE should examine appropriate strategies of improvement in a short and mid-term and set up specific target rating scores, considering current rating scores of respective compliance items.

Table 5-7 Current Rating Scores of IWCR by Compliance Item

Items	Whole Hanoi City	Tu Liem District	Ha Dong District
Env. Authorization	4.2	4.0	4.2
Provision of IWTP	3.3	3.6	3.4
Effluent Quality against Std.	3.4	3.4	3.3
Self-Monitoring	3.0	3.1	3.3
IWW Fee	2.4	2.7	2.2

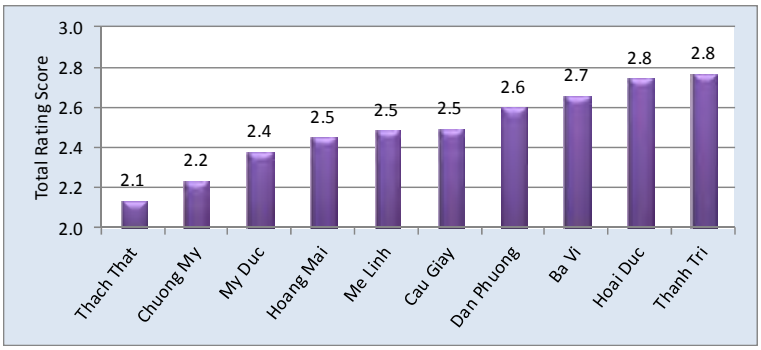
WW Discharge License	2.1	2.5	2.2
Total Scores	2.0	3.2	3.0

Source: Prepared by WG-3

b) Selection of Subject Entities for Environmental Check and Inspection

Results of the IWCR may be used to select entities with deficient compliance, in planning the environmental check and inspection. In such way, it is possible to implement the environmental check and inspection effectively and efficiently, by choosing and concentrating on focal entities with certain conditions.

For example, **Figure 5-10** shows districts with IWCR less than the average total rating score "3". This analytical result may be used to choose districts which need to be improved the environmental compliance, immediately.



Source: Prepared by WG-3

Figure 5-10 Districts with Low Rating Scores of IWCR in Hanoi City

For another example, **Table 5-8** lists projects located in Ha Dong District which indicate the lower total rating scores of IWCR less than "3". By using this analytical result, DONRE can choose projects which need the strict environmental check and inspection.

Table 5-8 Projects with Low Rating Scores of IWCR in Ha Dong District

Line No.	Project ID	Industrial Category	Rating Score of Industrial Wastewater Compliance						
			Env. Authorization	Provision of IWTP	Effluent Quality against Std.	Self-Monitoring	IWW Fee	WW Discharge License	Total Scores
1	691	Motor vehicles and parts	1	1	1	1	1	1	1.0
2	973	Furniture	1	1	1	1	1	1	1.0
3	1182	Food products & processing	1	1	1	1	1	1	1.0
4	728	Motor vehicles and parts	1	3	1	1	1	1	1.3
5	754	Shoes	1	3	1	1	1	1	1.3
6	330	Textiles	5	1	1	1	1	1	1.7
7	515	Construction materials	5	1	1	1	1	1	1.7
8	1180	Textiles	5	1	1	1	1	1	1.7
9	1175	Food products & processing	5	1	3	1	1	1	2.0
10	1186	Paper & paper products	1	3	1	5	1	1	2.0
11	238	Paper & paper products	3	3	3	3	1	1	2.3
12	885	Construction materials	5	1	3	3	1	1	2.3
13	971	Textiles	5	5	1	1	1	1	2.3
14	1172	Textiles	5	1	1	5	1	1	2.3
15	1177	Warehouse	5	3	3	1	1	1	2.3
16	1183	Motor vehicles and parts	5	3	3	1	1	1	2.3
17	1187	Machinery & equipment	5	3	3	1	1	1	2.3
18	124	Chemicals and paints	5	3	3	3	1	1	2.7
19	859	Confectionary	5	1	3	1	1	5	2.7

Source: Prepared by WG-3

c) Choosing "Best and Bad-Compliance" Entities

In selecting entities with excellent compliance for awarding and also entities with bad practice for publicizing, the IWCR may be used for the initial step to nominate entities.

Table 5-9 shows the initial result for selecting the best and bad- compliance projects. These projects located in the outside of industrial parks or clusters in the model area which were rated as the total score "5" or "1" have been chosen by using the IWCR.

Table 5-9 Initial Screening Result for Selecting Best and Bad Compliance Projects

Line No.	Project No.	District	Industrial Category	Total Rating Score
Best- Compliance Candidate Projects				
1	373	Ha Dong	Textiles	5.0
2	393	Ha Dong	Pharmaceutical product	5.0
3	700	Ha Dong	Motor vehicles and parts	5.0
4	879	Ha Dong	Motor vehicles and parts	5.0
5	966	Tu Liem	Shoes	5.0
6	1019	Ha Dong	Chemicals and paints	5.0
7	1170	Ha Dong	Wood & cork products	5.0
Bad-Compliance Candidate Projects				
1	29	Tu Liem	Motor vehicles and parts	1.0
2	274	Tu Liem	Furniture	1.0
3	482	Tu Liem	Publishing & printing	1.0
4	691	Ha Dong	Motor vehicles and parts	1.0
5	731	Tu Liem	Motor vehicles and parts	1.0
6	733	Tu Liem	Furniture	1.0
7	919	Tu Liem	Rubber & plastic products	1.0
8	973	Ha Dong	Furniture	1.0
9	997	Tu Liem	Beer & beverage	1.0
10	1004	Tu Liem	Rubber & plastic products	1.0
11	1114	Tu Liem	Wearing and garment	1.0

Source: Prepared by WG-3

Note: The selection of entities above have been done among entities located outside industrial parks and clusters.

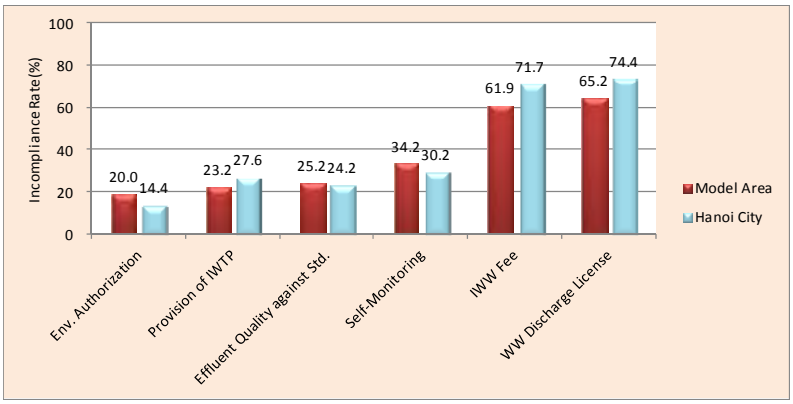
In actual cases, final entities for awarding and publicizing will be selected based on the following different aspects, in addition to the results of the IWCR.

- Degree of environmental impact/risk potentially caused by the wastewater of the entity,
- Degree of the influence which an entity gave to wastewater measures and improvement of production lines of other industries (in case of "Best-Compliance"),
- Degree of environmental damages actually caused by wastewater (in case of "Bad-Compliance"),
- Actions to reduce pollution load in the production line (including the application of cleaner production technologies),
- Environmental consciousness and behavior for general environmental fields,
- Records of environmental violations and administrative instructions in the past, and
- Future prospects of the wastewater measures subject to the assessment.

5.5 Analysis of Factors Related to Environmental Incompliance

1) Overview

In the IWCR, the rating score "1" implies that an entity has not taken any necessary industrial wastewater measures in response to the environmental requirements, and thus the entity is evaluated to be in the state of "incompliance". According to results of the rating of IWCR, there are large numbers of incompliances found in six (6) compliance items: environmental authorization, provision of IWTP, IWW fee and so forth. **Figure 5-11** shows the incompliance rates of entities with respect to different requirements, namely the percentage of entities with rating score "1" for each requirement (out of 155 entities in the model area and 724 entities in Hanoi City investigated.).



Source: Prepared by WG-3

Note: This Graph shows the rate of projects with the rating score "1" of the total numbers of projects.

Figure 5-11 Rate of Environmental Incompliance

From these results, characteristics on the environmental incompliance may be described as follows:

- Many entities (62 – 74 %) fail to fulfill their duties for wastewater fee and wastewater discharge license.
- Some entities (24 – 30 %) have to take appropriate measures to satisfy the environmental requirements with respect to provision of IWTP, effluent quality and self-monitoring.
- Though most entities have obtained necessary authorization (like EIA, EPP, etc.), some entities (14 %) are yet to obtain necessary authorization.

Meanwhile, WG-3 has identified causes for incompliance, by examining and analyzing answers given by entities in the interviews, as shown in **Table 5-10**.

Table 5-10 Identified Causes of Deficient Compliance

Causes	Nos. of Entities Answering
1. Less financial capacity	7
2. Low awareness and /or motivation	52
3. Poor organization, technology and/or human resources	13
4. Lack of land space	7

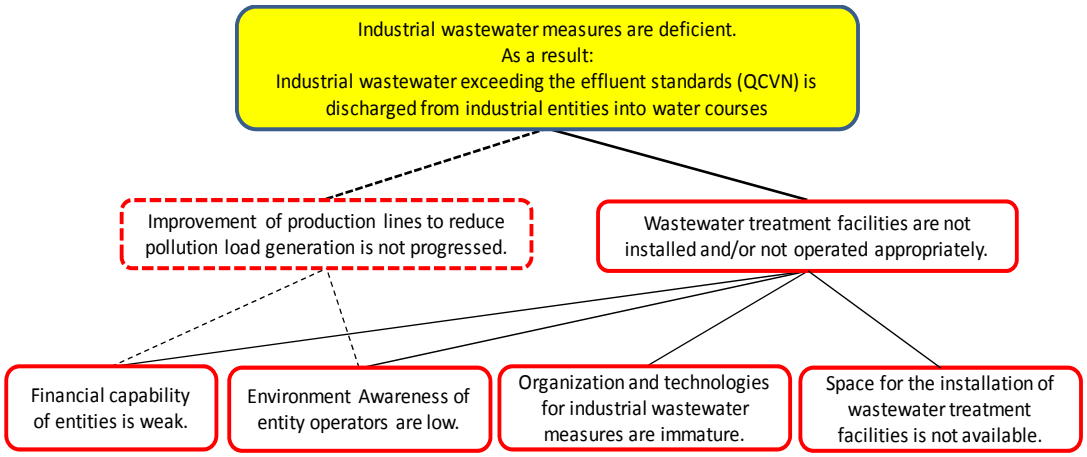
Source: Prepared by WG-3, based on collected answers through 1st and 2nd site survey.

Based on these analyses, the problem structure of deficient industrial wastewater measures has been constructed as shown in **Figure 5-12**.

In addition to the approach of "End of Pipe", industrial wastewater measures include pollution reduction by application of cleaner production technologies in the production processes. It has

been clarified in the analysis of the results of the 1st site survey that the lack of financial capability and the environmental awareness are major causes behind delayed application of cleaner production.

Causes for deficient wastewater measures found here imply necessary directions of actions that water pollution control by DONRE should take.



Source: Prepared by WG-3

Figure 5-12 Problem Structure of Deficient Industrial Wastewater Measures in Entities

2) Awareness and Motivation

Limited environmental awareness and limited motivation of entity operators to improve environmental performance are underlying causes of delayed wastewater measures. To improve the situation, DONRE needs to actively incorporate environmental awareness-raising, enhancement of knowledge on environmental regulations and rules and so forth, into its programs. More stringent sanctions against environmental violations are also one of factors to promote the awareness and motivation.

In this sense, environmental awareness-raising of general citizens is also another effective approach to press for better environmental compliance by entities.

3) Financial Capacity is insufficient

A number of entity operators need some financial support to take industrial wastewater measures. DONRE may help such entities by guiding them to Hanoi EPF that provides soft-loan for the investment necessary for wastewater measures. In parallel, the management system for industrial wastewater fee needs to be reinforced to increase the charter capital of Hanoi EPF.

4) Land space is not enough.

Generally, IWTPs need certain land spaces for installation. Thus, some entities, especially ones located in densely populated old urban center areas, may encounter the difficulty in finding a land space for installation of IWTP. In such case, the relocation scheme to an industrial cluster, as promoted by Hanoi PC, is an effective measure to solve the problem. Along this relocation scheme, it is a matter of course that installation of centralized IWTP for industrial clusters must be promoted.

By the same token, the relocation to an industrial point is also effective for large numbers of households located in craft villages.

5) Organization, human resource and technology are inadequate.

This problem pertains to specialized knowledge and skills necessary for planning, constructing and operating IWTPs. Especially small-scale industries lack human resources to manage such matter. To solve such issues, DONRE may provide entities with the supports like guiding for

industrial wastewater technologies and its operation and introducing environment service contractors for installation and operation of IWTPs.

5.6 Analysis of Pollution Loads and Pollution Risks

(1) Overview

As set forth in the section 5.3, the pollution source database (PSD) has been developed in this project to store and process diverse management data on water pollution control. In this project, various data collected through the performance assessment, the 1st site survey and 2nd site survey have been entered into the PSD. A total of 1,158 pollution source projects of diverse types located in Hanoi City are registered in the PSD.

By using the function of the PSD, Pollution Source Table (PST) has been formulated, enumerating most important data in the water pollution control. In terms of manufacturing industry, a total of 724 projects in Hanoi City and 155 projects in the model area are listed in the PST, respectively.

This section presents analysis results of pollution loads and pollution risks on pollution source projects belonging to manufacturing industry, associating them with the rating results of IWCR.

(2) Basis of BOD Load Calculation

1) Calculated BOD Loads

BOD loads from individual pollution source projects located in Hanoi City and the model area have been calculated to get the following three (3) outputs:

- Generated BOD load: Pollution load generated from production lines in the manufacturing, before entering IWTP (that is, "before treatment").
- Present discharged BOD load: Pollution load currently discharged from the factory of pollution source project into the environment. Thus, this means the pollution load discharged from IWTP installed currently (if a firm installs and operates a IWTP).
- Permissible BOD load: Pollution load that a project is allowed to discharge into the environment in accordance with the national effluent standards. This is calculated by using the flow-rate of wastewater and the BOD concentration corresponding to the effluent standards specified in QCVN 40:2011/ BTNMT. In the calculation in this section, BOD effluent is uniformly assumed to be 50 mg/L to make the calculation simplified.

2) Wastewater Flow-rate

The flow-rate of wastewater is crucial to calculate BOD load. However, only 63 % (on the whole) of pollution sources stored in the PSD have data of flow-rate (m^3/day). Therefore, in the Hanoi City, the total wastewater flow-rates have been calculated by correcting with using the capture rate (63 % on an average).

As for flow-rates of projects located in the model area, flow-rates of projects without flow-rate data have been calculated by using unit rates of flow-rate per employee formed based on experience, as shown Table 1 in Appendix 2 of **Annex 5**. Data on numbers of employees of entities have been collected in the 1st and 2nd site survey.

3) BOD Concentration for Calculation

<u>BOD of raw wastewater</u>

The BODs of raw wastewater (before the treatment) to be used for the calculation of the generated BOD load have been set to be values by industrial categories, as per **Annex 6**, based on empirical data in Japan and Vietnam.

<u>BOD of present discharged wastewater</u>

BODs of present discharged wastewater are used for the calculation of present discharged BOD load. Present BODs are set by the following different methods.

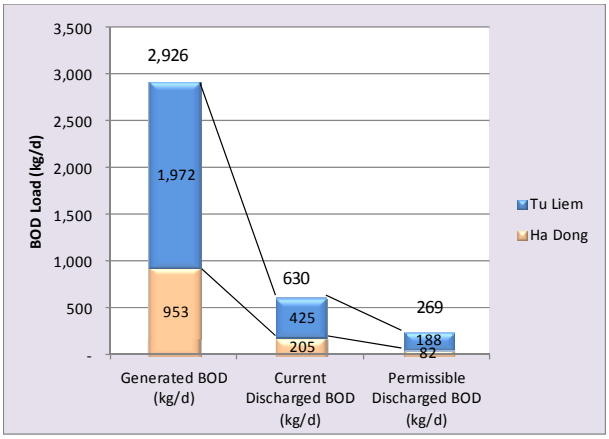
- For pollution sources located in the model area: BODs of present discharged wastewater have been set based on measured BOD, if available. If not available, they have been assumed taking account of the status of IWTP provision and operation based on the inspection and check record.
- For pollution source located outside the model area: Simplified calculation method employing rating scores of IWCR for "effluent quality against the standard" has been applied as follows:
  - If the rating score is "5", discharged BOD is 50 mg/L.
  - If the rating score is "3", discharged BOD is (Raw BOD x 50%).
  - If the rating score is "1", discharged BOD is equal to the raw BOD.

(3) Calculation of BOD Load

1) Model Area

Calculation results of generated loads, current discharged loads and permissible loads (corrected with the capture rate of flow-rate data) by districts in the model area are shown in **Figure 5-13** (as summarized data) and **Annex 7** (in detail). In the whole model area, BOD pollution loads from manufacturing industry are described as follows:

- Manufacturing industry in Hanoi City generates around 2,930 kg-BOD/day and discharges 630 kg-BOD/day in to the environment (resulting into the overall removal rate 78 %).
- s permissible BOD load (assuming BOD 50 mg/L of the effluent standard) is calculated to be around 270 kg-BOD/day according to the national standards, industry discharges about 2.3 times BOD load, at the present.



Source: Prep*ared by WG-3*
Note: Values of BOD loads shows have been corrected by the capture rate of flow-rate data.

Figure 5-13 BOD Loads in Model Area

2) Hanoi City

Calculation results of generated loads, present discharged loads and permissible loads by districts in Hanoi City (including the model area) are shown in **Table 5-11**. In the whole Hanoi City, BOD pollution load from manufacturing industry may be described as follows:

- Manufacturing industry in Hanoi City generates 66.2 ton-BOD/day and discharges 17.5 tonne-BOD/day into the environment (resulting into the overall removal rate 74 %).
- Permissible BOD load (assuming BOD 50 mg/L of the effluent standard) is calculated to be around 6.4 tonne-BOD/day according to the national standards. Manufacturing industry discharges about 2.7 times BOD load, at the present.

Table 5-11 BOD Load by Districts in Hanoi City

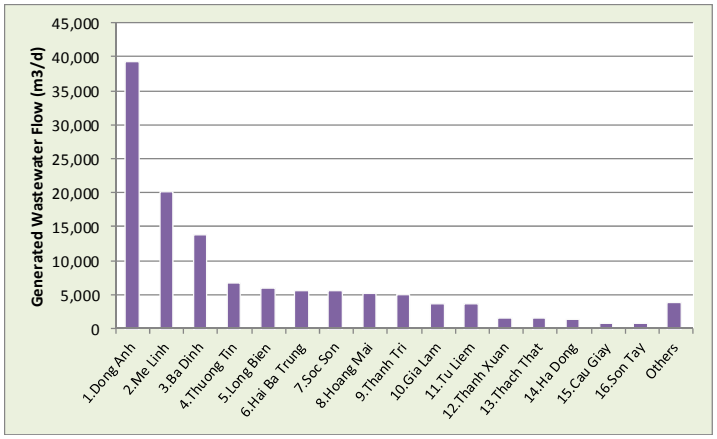
District	Nos. of Project	Wastewater Flow (m^3/d)	Generated BOD Load (kg/d)	Present Discharge BOD Load (kg/d)	Permissible Discharged BOD (kg/d)
Ba Dinh	7	14,000	11,200	700	700
Ba Vi	1	0	0	0	0
Cau Giay	6	1,050	809	464	53
Chuong My	30	822	539	471	41
Dan Phuong	11	69	18	10	3
Dong Anh	41	39,349	12,552	2,426	1,967
Dong Da	8	862	668	58	43
Gia Lam	14	3,815	2,076	247	191
Ha Dong	52	1,634	953	205	82
Hai Ba Trung	20	5,765	4,034	616	288
Hoai Duc	8	521	339	26	26
Hoan Kiem	3	96	48	5	5
Hoang Mai	27	5,284	2,733	661	264
Long Bien	45	6,157	2,919	676	308
Me Linh	117	20,346	14,472	7,787	1,017
My Duc	6	405	221	73	20
Phu Xuyen	1	20	12	1	1
Phuc Tho	4	0	0	0	0
Quoc Oai	10	649	238	64	32
Soc Son	42	5,680	2,379	452	284
Son Tay	7	875	280	166	44
Thach That	39	1,679	807	566	84
Thanh Oai	14	633	482	37	32
Thanh Tri	37	5,144	2,133	273	257
Thanh Xuan	22	1,784	889	270	89
Thuong Tin	21	6,884	3,446	790	344
Tu Liem	103	3,758	1,972	425	188
Unknown	24				
Total	724	127,279	66,219	17,468	6,364

Source: Prepared by WG-3.
Note: Values of BOD loads shows have been corrected by the capture rate of flow-rate data.

(4) Ranking of BOD Load

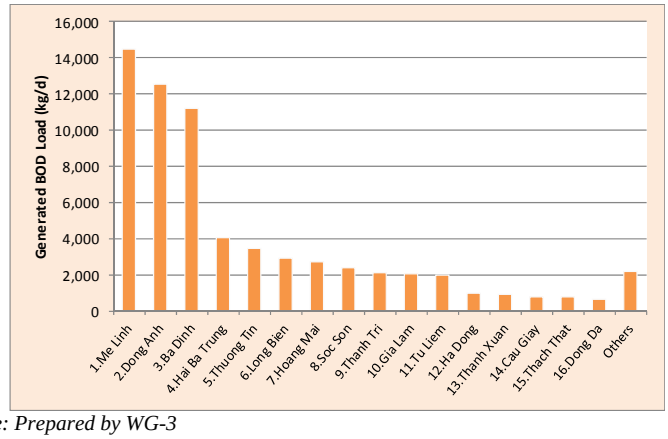
1) Ranking in Districts

In terms of BOD load (generated and present discharged), Dong Anh, Me Linh, Thuong Tin, Bao Dinh, Long Bien are placed high in the ranking, as shown in **Figure 5-14**, **5-15** and **5-16**.



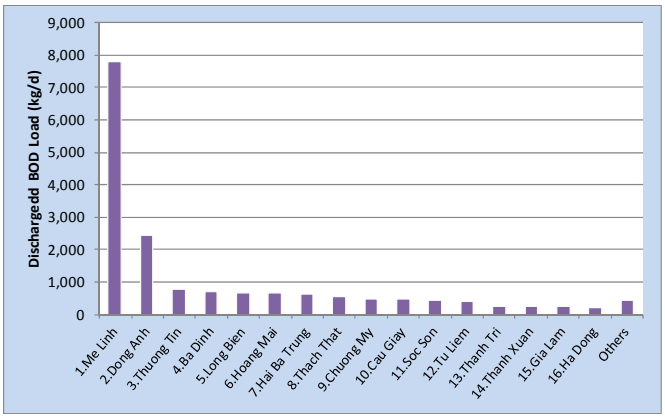
Source: Prepared by WG-3

Figure 5-14 Ranking of Wastewater Flow-Rate by District



Source: Prepared by WG-3

Figure 5-15 Ranking of Generated BOD Load by District



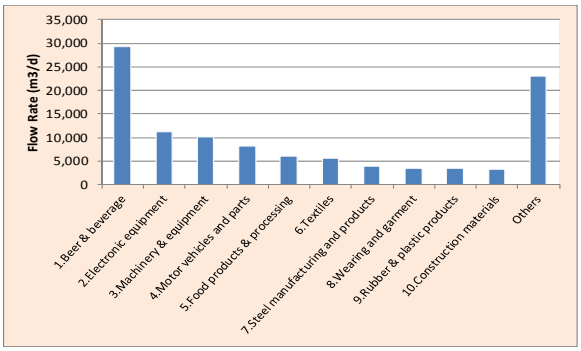
Source: Prepared by WG-3

Figure 5-16 Ranking of Discharged BOD Load at Present by District

Although Tu Liem and Ha Dong defined as the model area are placed within the top 3 ranking in terms of project numbers, they are not high in the ranking of BOD load. That implies that the model area accommodates mainly manufacturing industries with small and medium-scale sizes.

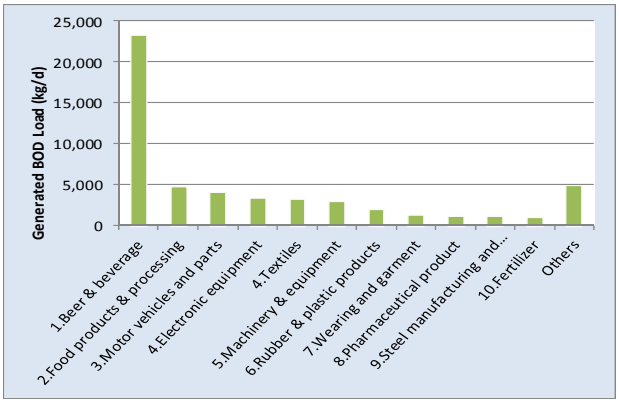
2) Ranking in Industrial Categories

As for pollution loads in industrial categories, breweries and food-related production are major industries in Hanoi City, as shown in **Figure 5-17**, **5-18** and **5-19**. While electrical equipment and motor-related parts, which are considered to be small water consumers, are placed high in the ranking, this is because numbers of projects belonging to this category are considerably large.



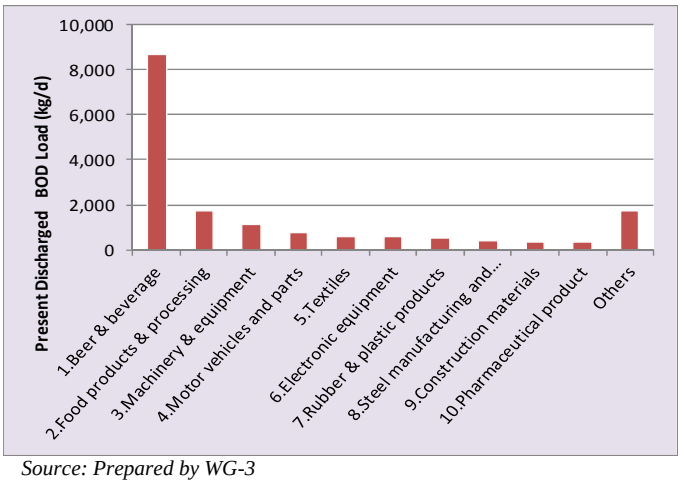
Source: Prepared by WG-3

Figure 5-17 Ranking of Wastewater Flow-Rate by Industrial Category



Source: Prepared by WG-3

Figure 5-18 Ranking of Generated BOD Load by Industrial Category



Source: Prepared by WG-3

Figure 5-19 Ranking of Present Discharged BOD Load

(5) Relationship between BOD Load and Rating Score of IWCR

1) Model Area

In terms of IWCR, if an entity discharges BOD load equivalent to the generated BOD load, the rating score of the entity is "1.0" as it means no treatment. Similarly, if an entity discharges BOD load equivalent to the permissible BOD load, it means perfect provisions of IWTP, and the rating score is "5.0". Based on these extreme cases, the situation of discharge of BOD load at present with the current provisions of IWTPs in the model area is equivalent to the rating score of 3.52. These situations are enumerated as **Table 5-12**.

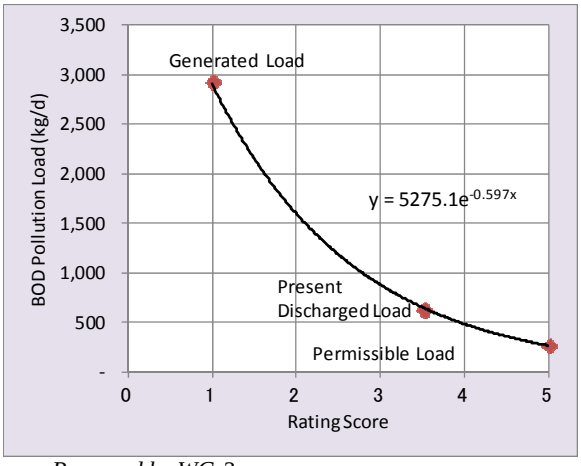
Table 5-12 BOD Loads in Model Area

Situation	Rating Score of IWTP Provision	BOD Load (kg/d)
Generated BOD Load	Assumed to be 1.00	2,926
Present Discharged BOD Load	Calculated 3.52	630
Permissible BOD Load	Assumed to be 5.00	269

Source: Prepared by WG-3

By using three (3) sets of BOD loads and rating scores, the regression curve is created as per **Figure 5-20**. This graph shows the tendency of discharged BOD pollution load from the model area along the average rating score which increases as the industrial wastewater measures improve. This graph does not indicate accurate numerical relationship between BOD loads and

rating scores, because rating scores are the result of arithmetic average of all pollution projects, regardless of the scale of projects' BOD discharge. However, it is considered that this may be used for a regression curve for rough prediction.



Source: Prepared by WG-3.

Figure 5-20 Provisional Regression Curve of Rating Score vs. BOD Load in Model Area

2) Hanoi City

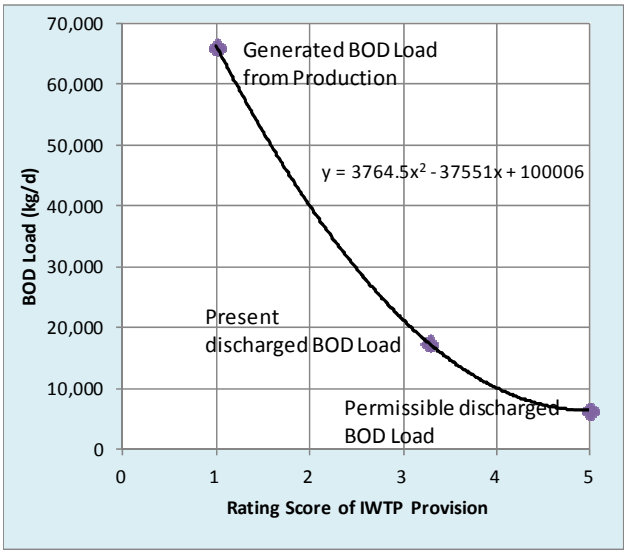
Similarly, the BOD loads of generated, present and permissible-levels and corresponding IWCR scores for the Hanoi City are enumerated in **Table 5-13**.

Table 5-13 BOD Loads in Hanoi City

Situation	Rating Score of IWTP Provision	BOD Load (kg/d)
Generated BOD Load	Assumed to be 1.00	66,219
Present Discharged BOD Load	Calculated 3.27	17,468
Permissible BOD Load	Assumed to be 5.00	6,364

Source: Prepared by WG-3

By using three (3) sets of BOD loads and rating scores, the regression curve is created as per **Figure 5-21**. This graph shows a tendency of discharged BOD pollution load from Hanoi City along the average rating score which increases as industrial wastewater measures are improved.



Source: Prepared by WG-3.

Figure 5-21 Provisional Regression Curve of Rating Score vs. BOD Load in Hanoi City

(6) Share of BOD Load Discharged from Manufacturing Industry

By using collected data and rating scores of IWCR, BOD loads which are generated from manufacturing industry and discharged into the water environment are calculated in this chapter.

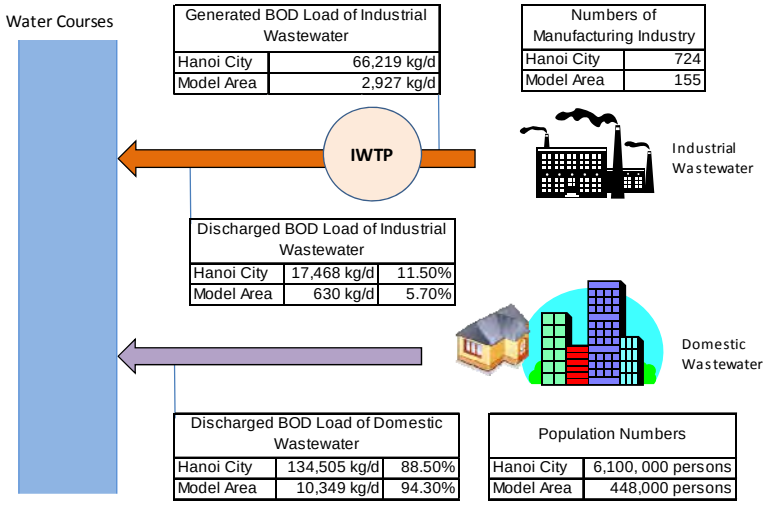
Meanwhile, domestic wastewater is another cause of water pollution in the region. **Table 5-14** shows estimation results of BOD load originated from domestic wastewater based on the population numbers. In this estimation, it is assumed in this table that generated domestic wastewater is discharged into the water course without treatment, except for certain degradations with septic tanks.

Table 5-14 Calculation of BOD Loads in Model Area and Hanoi City

Items	Unit	Model Area	Hanoi City
1. Domestic Wastewater			
Population	person	448,000	6,100,000
Coefficient of Daytime Population	-	1.1	1.1
Runoff Ratio		0.6	0.6
BOD Generation Rate	g/day/person	35	35
Generated BOD	kg/day	10,349	134,505
Discharged BOD	kg/day	10,349	134,505
Domestic BOD Ratio (for Total BOD)	%	94.3	88.5
2. Industrial Wastewater (as calculated in this chapter)			
Generated BOD	kg-BOD/day	2,927	66,219
Discharged BOD	kg-BOD/day	630	17,468
Industrial BOD Ratio (for Total BOD)	%	5.7	11.5

Source: Prepared by WG-3.
Note:
1) It is assumed in this table that generated domestic wastewater is not treated.
2) Population data are sourced from Hanoi Statistical Book 2011.

As shown in **Figure 5-22**, the share of BOD pollution loads (for the load totaling domestic and industrial wastewater) are only 5.7 and 11.5 % in the model area and Hanoi City, respectively.



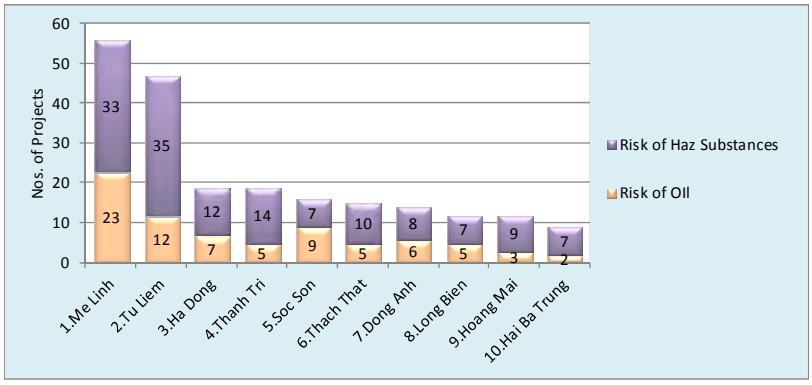
Source: Prepared by WG-3
Note: The shares of discharged BOD Loads means the ratios for the total load of domestic and industrial wastewater.

Figure 5-22 Ratio of Industrial Discharged BOD Load

(7) Pollution Risks of Oil and Hazardous Substances

Some manufacturing industries discharge pollutants which possibly causes environmental pollution. In this section, oil and hazardous substances are examined. Oil pollution is caused by the leak of fuel, lubricant and other oils. Meanwhile, the discharges of acid and alkali, and toxic chemicals (like cyanide, heavy metals, etc.) also give environmental pollution. The existence and magnitude of actual pollution risk must be determined, based on precise examination on respective entities.

In general, it is considered based on the experience that some manufacturing industries use certain substances which may cause environmental pollution, as listed in Table 2 in Appendix of **Annex 5**. For example, food processing, steel manufacturing and other industries have the possibility of oil pollution. Meanwhile, chemical, electronic, printing and other industries have the possibility of pollution by hazardous substances. **Figure 5-23** shows numbers of entities located districts containing possible pollution risk, based on this empirical table.



Source: Prepared by WG-3

Figure 5-23 Pollution Risk of Oil and Hazardous Substances

As seen from this result, Me Linh, Tu Liem and Ha Dong Districts accommodate large numbers of entities with possible pollution risks.

5.7 Major Findings in Assessment on Water Pollution Control and Compliance

Industrial wastewater measures and environmental compliances by entities have been assessed by using IWCR in Chapter 5, and the relation between the rating score of IWCR and the pollution load in the model area and in Hanoi City was examined.

Major findings possibly associated with the improvement of water pollution control are enumerated, as below:

a) Numerical rating score of IWCR is an indicator representing the compliance level for industrial wastewater measures. It can be calculated by using the pollution source table (PST) formed from the pollution source database (PSD). Rating scores of IWCR may be computed in several ways, like the total score of entities, the average score of some entity groups, the individual score of respective compliance items and so forth, depending on the usage purposes.

b) The IWCR may be used for different purposes, for instance: Setting a target of improving wastewater measures of entities or entity groups, formulating the check and inspection plan by selecting subject entities based on the scores of IWCR, choosing Best and Bad-Compliance entities and, so forth.

c) As a result of the site survey in Output 3, major causes for the environmental incompliance have been identified to be low awareness and motivation of entity operators, lack of land spaces and lack of finance. That implies that there are the necessities of the governmental

supporting measures, in parallel to more stringent administrative sanctions responded by DONRE, to overcome these causes.

d) Provisional regression curve may be formed between the rating score of ITWP provision and total BOD pollution loads in the region. Based on this provisional curve, the target of BOD load to be achieved may be expressed by the rating score of IWTP provision.

CHAPTER 6

PROPOSED OUTLINE OF IMPROVEMENT PLAN FOR WATER POLLUTION CONTROL

6.1 General

In Chapter 2, 3, 4 and 5, characteristics of manufacturing industries in Hanoi, current status of water pollution control by DONRE, industrial wastewater measures by entities and compliance status have been examined. As a result, a variety of findings that could potentially lead to improvement of water pollution control were made.

On the basis of these findings, WG-3 has analyzed and identified issues in the water pollution control by DONRE and has proposed the Outline of Improvement Plan for Water Pollution Control in Hanoi City, according to the following steps, as explained in this Chapter:

- Step 1: Gather all findings extracted from respective aspects,
- Step 2: Identify main problem and perform the problem analysis to form the problem structure of water pollution control,
- Step 3: Set up the main purpose and perform the objective analysis to form the framework of the improvement plan,
- Step 4: Set up the targets of the improvement plan, and
- Step 5: Design outlines on respective actions.

6.2 Problem and Constraint in Water Pollution Control

(1) What is Main Problem in Water Pollution Control?

1) Major Findings

Through data collection, site survey and analysis of collected data, characteristics, problems and constraints in current water pollution control were examined. Among them, major findings associated with the improvement of water pollution control are enumerated in **Table 6-1**.

Table 6-1 Major Findings on Current Water Pollution Control

Aspect	Major Findings
1. Study area's conditions	
	a) The Nhue River flowing through the model area is seriously polluted far beyond the national environment standards over the year, by inflowing pollution loads discharged from anthropogenic activities in the surrounding area.
	b) While different pollution sources are responsible for water pollution in the model area, major source is domestic wastewater discharged without treatment, accounting for some 90 % of the total pollution load.
	c) A total number of pollution source entities discharging industrial wastewater which are recorded in documents used by DONRE are 726 and 131 in Hanoi City and the model area, respectively. In addition, some other small-scale industries registered with EPC and craft village industries exist.
	d) As for industrial locations, 51 % of manufacturing industries are sited in industrial parks or industrial clusters in Hanoi City and the model area. Remaining entities are located independently.
	e) Manufacturing firms located in Hanoi City and the model area belong to the light industry, like automobile and motor parts, machinery parts, textile, food processing and so forth.
	f) Production scales of industries located in Hanoi City are relatively small. In terms of employee numbers (employee/entity), the average is 270 in Hanoi City. In terms of discharged wastewater flow, the average is 154 m3/day in Hanoi City.
2. Water pollution control by DONRE	
	a) The purpose of authorization and compliance (including EIA approval, self-monitoring and so forth) is yet to be attained, as seen from many and repeated violations against environmental requirements. Functions of this management system are constrained by different reasons, like low environment awareness of entity operators, immature enforcement of administrative process, ineffective check and inspection by DONRE and so forth.
	b) The system of industrial wastewater fee is not functioning as expected and the amount of collected fee is very limited, due to unrealistic setup in applied unit rate of fee.

Aspect	Major Findings
	c) The purpose and activities of wastewater discharge license are overlapped with the management system of environmental authorization and compliance. For the moment, only limited licenses to industrial entities have been issued.
	d) Because the provision of setting a minimum scale is not in place in many management systems, DONRE is under pressure to fulfill required but inefficient administrative works.
	e) As governmental supporting measures for the environmental protection, Hanoi PC has pushed forward with relocation and agglomeration of industries, and the environmental protection fund. Among others, it is important that the relocation with industrial clusters be pursued more, along with the installation of centralized IWTPs.
	f) Although the environmental check and inspection are a main management system to enforce water pollution control, their effect is limited for the moment. Major causes are considered to be: lack of appropriate information system on pollution sources, lack of pre-operation inspection, lack of specialized knowledge and ability of officers on water pollution technologies and ineffectual administrative sanctions against violations.
	g) Concerning the management resources, DONRE lacks enough human resources, budget and equipment, as compared to large numbers of pollution sources. As for information resource, DONRE can use it as effective resources for water pollution control, by building secure information system.
3. Industrial wastewater measures by entities	
	a) The amended LEP states a series of entities' duties to take necessary measures for industrial wastewater, setting specific provisions by promulgation of different regulations. Nevertheless, most of industrial entities do not take appropriate industrial wastewater measures.
	b) There are some entities operating without any environmental authorization. Of all the entities discharging industrial wastewater, 14 and 20 % of entities do not have any type of authorization in Hanoi City and the model area, respectively.
	c) Some 44 and 58 % of the entities in Hanoi City and the model area respectively are operating with different types of IWTP. Meanwhile, some 28 and 25 % of the entities in Hanoi City and the model area respectively are discharging wastewater without treatment.
	d) Of all entities, 38 and 42 % discharge wastewater meeting the national effluent standards in Hanoi City and in the model area, respectively.
	e) Of all the entities discharging industrial wastewater, 33 to 44 % of the entities conduct self-monitoring appropriately, including periodical submission of monitoring reports, in Hanoi City and the model area, respectively.
	f) In terms of numbers of projects, some 72 % and 60 % don't pay industrial wastewater fee in Hanoi City and the model area, respectively. Especially, as high as some 81 % of entities located independently don't pay the wastewater fees.
	g) In terms of numbers of projects, some 77 % and 66 % don't take wastewater discharge license in Hanoi City and the model area, respectively. Especially, as high as some 81 % of entities located independently don't take discharge license.
4. Water pollution control and compliance	
	a) Numerical rating score of IWCR is an indicator representing the compliance level for industrial wastewater measures. IWCR scores may be computed in several ways, like the total score of entities, the average score of some entity groups, the individual score of respective compliance items and so forth, depending on the usage purposes.
	b) The IWCR may be used for different purposes, for instance: Setting a target of improving wastewater measures of entities or entity groups, formulating the check and inspection plan by selecting subject entities based on the scores of IWCR, choosing Best and Bad- Compliance entities and so forth.
	c) Major causes for the environmental incompliance have been identified to be low awareness and motivation of entity operators, lack of land spaces and lack of finance. That implies that there are the necessities of governmental supporting measures, in parallel to more stringent administrative sanctions imposed by DONRE, to overcome these causes.
	d) Provisional regression curve may be formed between the rating score of IWTP provision and total BOD pollution loads in the region. Based on this provisional curve, the target of BOD load to be achieved may be expressed by the rating score of IWTP provision.

(Source: Prepared by WG-3)

2) Main Problem in Water Pollution Control

In Hanoi City, some 14 % of the entities do not have the environmental authorization stipulated in the amended LEP, around 28 % are not equipped with IWTP and some 29 % of the entities discharge their effluents that exceed the national standards without appropriate provisions of

IWTPs. As represented by this, majority of entities do not have appropriate industrial wastewater measures, and the level of their environmental compliance is very low.

Meanwhile, DONRE, a leading environment authority at the local level, has different legal responsibilities for water pollution control associated with industrial wastewater. Major role of DONRE is to promote industrial wastewater measures by entities so as to reduce pollution load discharged from productions. To this end, DONRE has been enforcing a series of management systems grounded on the amended LEP and others. Despite such efforts made by DONRE, industrial wastewater measures by entities are substandard, as seen from many and repeated violations against the environmental rules and regulations.

Present environmental compliance by entities is very different depending on entities. While some entities have taken reasonable wastewater measures, others are lagging far behind. This means that the water pollution control by DONRE creates "uneven state" in industrial wastewater management.

Taking into account of situations set forth above, main problem in water pollution control by DONRE for industrial wastewater is defined, as follows:

Main Problem: "Water pollution control by DONRE is ineffective in promoting industrial wastewater measures by entities for mitigating the environmental pollution."

(2) Problem Structure of Water Pollution Control

1) Analysis of Cause-and-Effect Relationship

By using these findings enumerated in **Table 6-1**, WG-3 has made the problem analysis and elucidated the problem structure of water pollution control by DONRE. **Figure 6-1** shows the examination result expressed with a fish-born shape, meaning the "Cause" and "Effect" relationship around the main problem of water pollution control identified in the previous section (1).

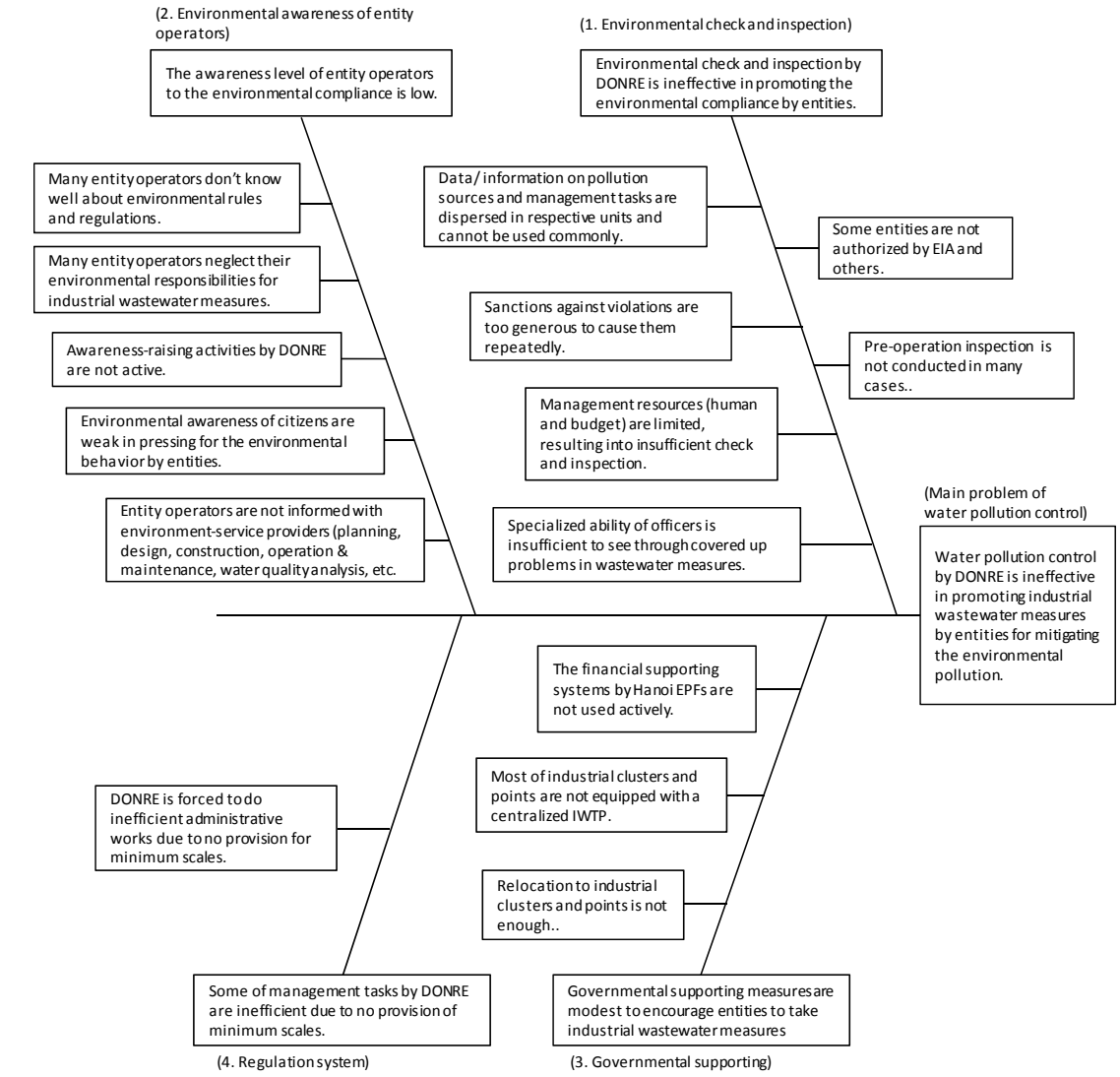
In the water pollution control in Vietnam, MONRE (the central government agency) has the responsibility for forming the basic policy and mechanism of management system and guiding them. Meanwhile, DONREs (local agencies) has the responsibility for enforcing management systems in their territories.

In this analysis, findings including the contents pertaining to MONRE's responsibility have been excluded in the above problem analysis, because Output 3 is focusing on the improvement of water pollution control to be enforced by DONRE.

2) Key Issues for Improvement of Water Pollution Control

As a result of the problem analysis, WG-3 has identified four (4) key issues which have caused the main issue and must be solved for improvement of water pollution control by DONRE, as follows:

- Ineffective environmental check and inspection (Key Issue 1)
- Low environmental awareness of entity operators (Key Issue 2)
- Insufficient governmental supporting measures (Key Issue 3)
- Inefficient regulation system of water pollution control (Key Issue 4)



Source: Prepared by WG-3

Figure 6-1 Problem Structure of Water Pollution Control

a) **Key Issue 1:** Environmental check and inspection by DONRE are ineffective in promoting the environmental compliance by entities.

Environmental check and inspection are prime management tasks of DONRE to ensure basic functions of water pollution control, by promoting observation of environmental requirements by entities. Judging from the current low-level compliance of industrial wastewater measures, it is assessed that these check and inspection are not working well. Though environmental check and inspection are activities to examine the implementation status and to correct unsuitable situation, many and repeated violations have continued. It has been identified that main causes behind this ineffectiveness are: lack of reliable and effective pollution source data/ information for check and inspection, deficient human resources (both quantitatively and qualitatively) and management mechanism of regulations pertaining to administrative sanctions.

b) **Key Issue 2:** The awareness level of entity operators about environmental compliance is low.

As clarified in the amended LEP, an entity operator is defined to be the direct party who has the responsibility to take environmental protection measures associated with their industrial activities. At present, the awareness level of entity operators is low, thereby resulting in ineffective motivations and behaviors for taking industrial wastewater measures. Many

operators do not know very well their responsibilities and legal requirements specified in the amended LEP or tend to neglect their duties, even if they are aware. General citizens are also not active in pressing for entities' compliance, and DONRE does not carry out strong activities to enhance entities' awareness.

c) **Key Issue 3:** Governmental supporting measures which encourage entities to take industrial wastewater measures are modest.

Some industrial entities are not endowed with different resources necessary to take industrial wastewater measures, like finances, technologies, land spaces and so forth. It has become clear that many small-scale entities (including households located in craft villages) cannot afford to deal with wastewater, due to lack of different resources. In response, Hanoi PC and some district PCs are pushing forward with measures for developing industrial clusters and points. An environmental protection fund is operated under the DONRE, also. However, these governmental supporting measures are not enough to meet the actual needs.

d) **Key Issue 4:** Management tasks of DONRE for water pollution control are inefficient due to lack of provision of minimum scales for the management.

Many officers concerned have attested that Hanoi DONRE lacks management resources to enforce water pollution control, especially in terms of the quantity of human resources. It is true that there is too much work to fulfill all the tasks specified in their job instruction. Meanwhile, some management systems include provisions that demand a lot of inefficient works that do not result in definite environmental improvement. For example, the provision that clearly defines the minimum scale of entity is not in place for environmental authorization and compliance, causing inefficient administrative works by DONRE.

6.3 Purpose and Challenge of Improvement Plan

(1) Improvement Purpose and Target

1) Purpose

Based on the result of the problem analysis, WG-3 has discussed and examined how to improve the present water pollution control by DONRE, employing the methodology of objective analysis by means of "measures" and "end" relationship. For this discussion and examination, the purpose of this improvement has been set up based on DONRE's tasks, as follows:

Improvement Purpose: Water pollution control by DONRE functions well in promoting industrial wastewater measures by entities for mitigating the environmental pollution.

This improvement purpose indicates that water pollution control is enhanced by upgrading the management systems (including check and inspection and others) and their procedures, and also by expanding and upgrading the management resources (development of integrated information system, build-up of environment-specialized ability, etc.). The improvement purpose means that enhancement of water pollution control by DONRE accelerates industrial wastewater measures by entities, and bringing about the improvement of environmental compliance.

By attaining this purpose, DONRE may ensure to bring about even management of industrial wastewater under the amended LEP.

2) Target

The target should be expressed with numerical figures, as much as possible, so that people concerned can easily realize their situations. This numerical target becomes possible by using the rating score of IWCR. For the moment, it is not possible to set up specific target for the whole Hanoi City, but **Table 6-2** shows the example for the model area. This sample means that the improvement plan will be implemented, aiming to increase the score of 2.4– 4.1 to 4.0-4.5 as the short-term target, apart from the long-term target of "5.0".

Table 6-2 Example (1) of Target for Improvement in Model Area

Compliance Items	Current Compliance Rating Score	Target of Rating Score (as example)
Env. Authorization	4.1	4.5
Provision of IWTP	3.5	4.5
Effluent Quality against Std.	3.4	4.5
Self-Monitoring	3.2	4.5
IWW Fee	2.5	4.0
WW Discharge License	2.4	4.0
Total Scores	3.2	4.3

Source: Prepared by WG-3

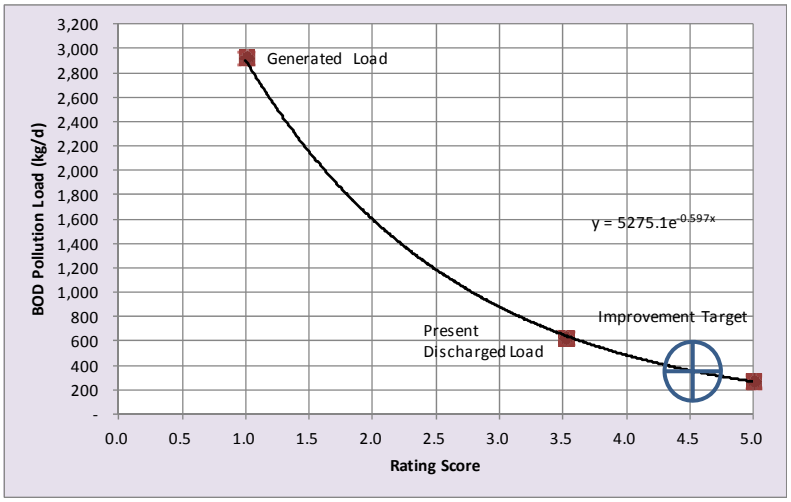
Table 6-3 indicates another example which sets the target for the score of WWTP provision. At present, the model area discharges the pollution load of 630 kg/d into the environment.

Table 6-3 Example (2) of Target for Improvement in the Model Area

	Current Discharged Load		Permissible Load		Target BOD Load	
	Rating Score	BOD Load (kg/d)	Rating Score	BOD Load (kg/d)	Rating Score	BOD Load (kg/d)
Rating Score of WWTP Provision	3.5	630	5.0	270	4.5	Around 370

Source: Prepared by WG-3

Aiming to reduce the pollution load into 370 kg/d as the provisional target, the target of the rating score 4.5 is set up, by employing the regression curve of BOD pollution load in the model area, as shown in **Figure 6-2**. As set forth above, the rating score of IWCR may be used as convenient numeric targets. It is recommended that specific improvement target be raised and set up by DONRE.



Source: WG-3

Figure 6-2 Target BOD Load of Improvement Plan in Model Area

(2) Challenges

As a result of the objective analysis, WG-3 has identified four (4) challenges to be tackled for attaining the improvement purpose, as follows:

- To consolidate environmental check and inspection to promote the compliance by entities (Challenge 1).
- To enhance the awareness of entity operators to the environmental compliance (Challenge

2).

- To strengthen governmental supporting measures to promote industrial wastewater measures (Challenge 3).
- To streamline regulation systems of water pollution control (Challenge 4).

a) **Challenge 1:** To consolidate environmental check and inspection to promote the compliance by entities

Environmental check and inspection are core management tasks enforced by DONRE for water pollution control. Consolidation of check and inspection is crucial for promoting the environmental compliance by entities in industrial wastewater measures. Considering massive numbers of entities and limited human resources of DONRE, the environmental check and inspection must be performed effectively and efficiently. To this end, the Challenge 1 is aiming to build and effectively use an integrated information system on pollution sources and to differentially supervise entities according to achieved compliance levels, by means of rating scores of IWCR. This Challenge includes other actions to ensure the strengthening of the check and inspection in terms of practices of management system and qualities of human resources, also.

b) **Challenge 2:** To enhance the awareness of entity operators and citizens to the environmental compliance.

According to the "Polluters-Pay-Principle (PPP)", industrial entities are direct parties who must take industrial wastewater measures. However, most entity operators are immature in terms of their environmental awareness. Hence, the Challenge 2 is aiming to enhance environmental awareness of entity operators by disseminating information on compliance situations and regulatory requirements and by encouraging the improvement of compliance through frequent communications, involving general citizens.

c) **Challenge 3:** To strengthen governmental supporting measures to promote industrial wastewater measures.

Industrial entities, especially small-scale industries (including households located in craft villages) need to be supported by the government in terms of finances and land spaces for the installation of IWTP. The Challenge 3 is aiming to accelerate the governmental supporting measures to promote industrial wastewater measures.

d) **Challenge 4:** To streamline regulation systems of DONRE.

Some regulation systems require DONRE to enforce its management duties to all the industrial entities, regardless of the degrees of environmental impacts that entities could possibly cause. Taking into account of current human resources, DONRE has difficulty in enforcing its duties completely, and such situation may cause unevenness among entities. The Challenge 4 is aiming to lay down operational provisions to set up minimum scales, to ensure the administrative efficiency in DONRE's management work. By fulfilling its own tasks, DONRE may ensure to solve "uneven management" in terms of enforcing the water pollution control.

(3) Effect of Water Environment Improvement

As industrial wastewater measures are promoted, the installation and the operation of IWTP are advanced. As a result, discharged pollution load from industrial entities is reduced. However, actual improvement of the water environment such as rivers, lakes and so forth are highly dependent on the pollution load of domestic wastewater discharged from households, commercial and institutional facilities.

As set forth in Chapter 4, BOD pollution load discharged from the model area at present is estimated at only some 5.7 % of the total pollution load. It is obvious that the majority of pollution load come from untreated domestic wastewater generated in households and commercial/ institutional facilities, because the model area is yet to be covered with sewerage

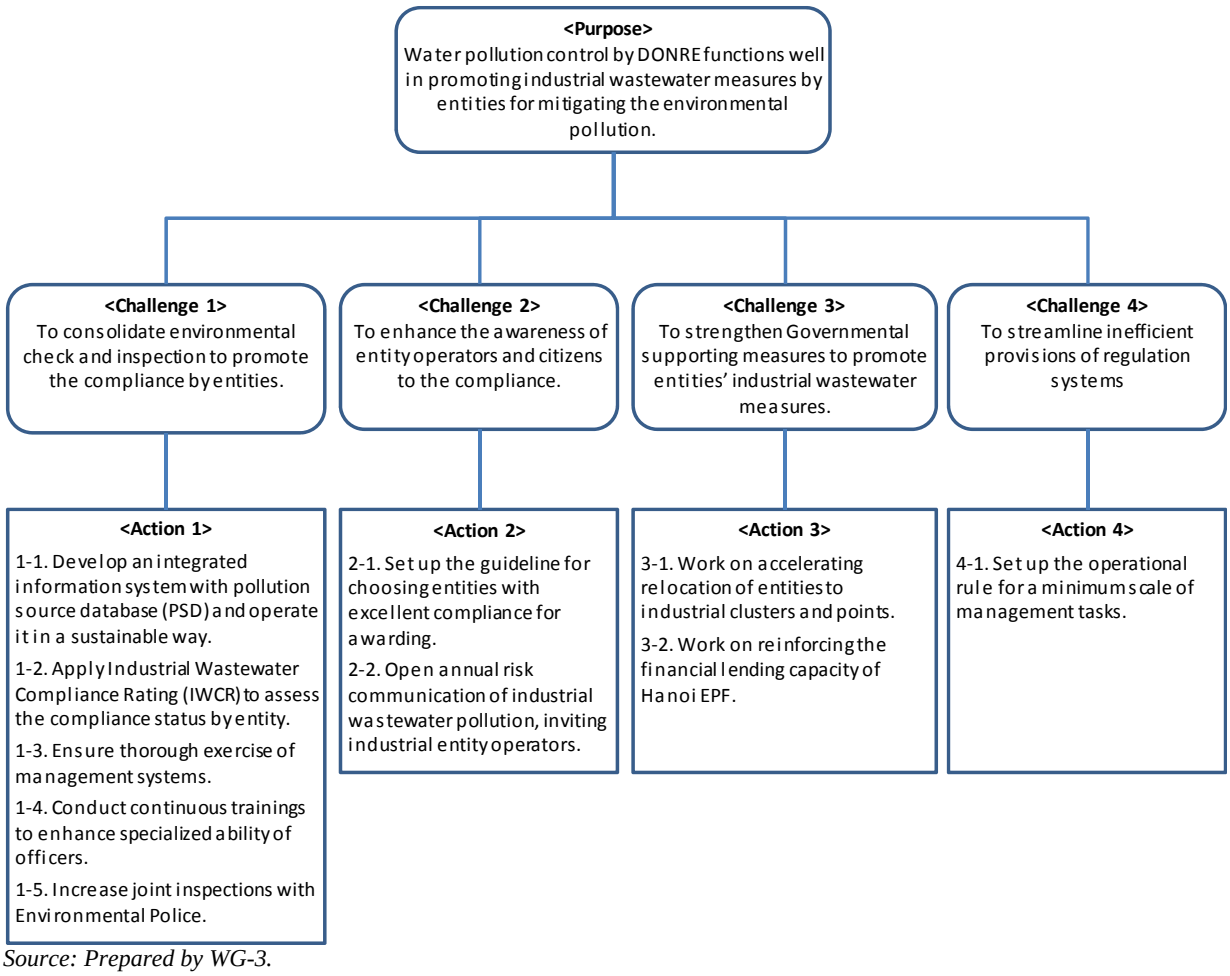
system with wastewater treatment. Hence, even if industrial wastewater measures are advanced, it is not the case that the water quality of rivers flowing through the model area is improved drastically. The improvement of water quality in the water course nearby must wait for the development of the sewerage system for domestic wastewater treatment.

Hence, strong cooperation among concerned sectors (such as DOC, DOH, DARD and others) are crucial to improve the water environment quality. To this end, it is expected that DONRE plays a leading role in such cross-sector undertakings.

6.4 Framework of Improvement Plan for Water Pollution Control

Along the purpose and a series of challenges of the improvement, the whole scheme of the Improvement Plan has been examined by means of the objective analysis. As a result, the framework of the Improvement Plan comprised of a series of actions has been formed, as shown in **Figure 6-3**.

A series of actions to overcome respective challenges are set forth in the following section.



Source: Prepared by WG-3.

Figure 6-3 Proposed Framework of Improvement Plan of Water Pollution Control

6.5 Action for Environmental Check and Inspection (Challenge 1)

(1) Integrated Information System (Action 1-1)

Objective: To develop integrated information system with pollution source database (PSD) and operate it in a sustainable way.

Justification: Environmental check and inspection (led by Hanoi EPA, Inspectorate and other units) are core management tasks for water pollution control by DONRE. To ensure effective and efficient outcomes from them, reliable data/ information on pollution source are crucial. However, data/ information are dispersed in different units, making it difficult to use for check and inspection, at present.

In this Project, a trial version of pollution source database (PSD) has been developed and used to store collected data/ information in the Output 3 activities. The PSD is a program which has been developed to store different data generated from water pollution control with the following specifications:

- Platform: Windows OS
- Dependency: stand-alone software
- Software specification: MS Access 2003 or later versions
- Interface: English/Vietnamese
- Users: Multi-user
- Data source: Mainly from Excel, keyboard input

This PSD has been designed to store data pertaining to different environmental management, such as:

- Basic information
- Environmental authorization
- Environmental check and inspection
- Effluent measurement
- Industrial wastewater fee
- Wastewater discharge license
- Serious pollution facilities
- Self-monitoring report

All data generated in management tasks of different units in charge are stored into the PSD. The PSD has various functions that may generate data records to be used for water pollution control, as follows:

- Pollution source ledger
- Pollution load table
- Wastewater discharge permission table
- Wastewater fee collection table
- Pollution source table (PST), etc.

By exporting the pollution load table generated from the PSD, the pollution source map (PSM) is formed in the shape of geographical expression.

As of September 2012, the PSD has stored a combined set of data for 1,161 and 227 pollution sources in Hanoi City and the model area, respectively. It is considered that this PSD developed in the Project will be used as a prototype in the beginning stage in order to be upgraded to the improved PSD in the Improvement Project.

This Action is aiming to realize effective and efficient environmental check and inspection by using the integrated information system of the PSD, including organizing a task force, updating the PSD with data-entry, and upgrading PSD functions.

Component activities:

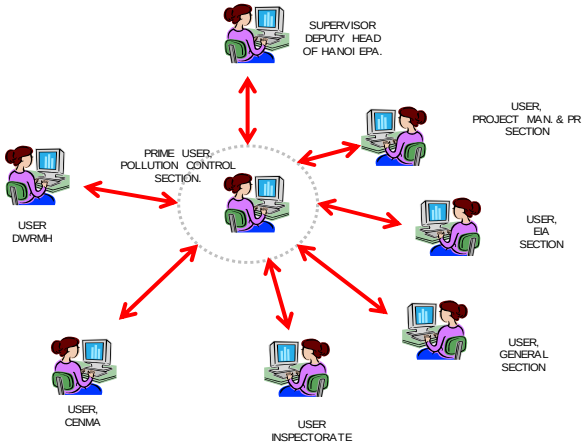
1) Operate the PSD

The PSD is operated by DONRE officers concerned with water pollution control. Because the current PSD is "Stand-alone" (meaning "Not-Internet Connected), the master database file will be updated by synchronization every 6 months.

Hanoi EPA and other units concerned will use the PSD to input data which are collected in the environmental check and inspection and other daily management duties.

To ensure sustainable operation of the PSD, DONRE forms a task force to operate the PSD, designating officers from units in charge. This task force, as shown in the figure below, is organized by a supervisor, a prime user and general users. Main roles of respective officers are as follows:

- Supervisor (Deputy Head of Hanoi EPA): to supervise the whole operation,
- Prime user (Hanoi EPA, Pollution Control Section): To register pollution sources, synchronize the master database (every 6 months) and to input new data for charged tasks (daily basis).
- General users (Units involved): To update respective tasks in charge (daily basis) and hand-over the user's database to the prime user for synchronization (every 6 months).



Concept of PSD Task Force

2) Utilize outputs of the PSD for environmental check and inspection

Especially, environmental check and inspection can effectively use outputs of the PSD, because it requests many data for the preparation stage and generates many data as a result of check and inspection. For instance, representative examples are shown as below:

- For planning of annual implementation for check (or inspection): Officers establish annual implementation plan, by using the past records from Pollution Source Table (PST, Task 22).
- For preparing for check (or inspection): Officers prepare for the check beforehand, checking the past records of check (or inspection), by using Inspection & Check (Task 6).
- For data-entry after check (or inspection)

After the check, officers enter different data coming from the check, by using

Inspection & Check (Task 6).

3) Upgrade the PSD

Because the current PSD is depending on a type of "Stand-alone" (meaning "Not-Internet Connected), the master database will be updated by synchronization every 6 months. After continuing to use the PSD for a period, it is expected that the PSD be improved more conveniently by connecting to the Internet Environment, so that the "real-time input" to the database becomes possible.

4) Other uses of the PSD besides check and inspection

Outputs of the PSD can be utilized for different activities in different management tasks, such as EIA approval, industrial wastewater fee, wastewater discharge license and so forth in different ways, depending on needs. DONRE should promote to expand the use of the PSD for different management tasks.

Leading unit: Hanoi EPA and Hanoi Inspectorate

(2) Assessment of Environmental Compliance with IWCR (Action 1-2)

Objective: To annually assess the compliance status of entities, by applying the Industrial Wastewater Compliance Rating (IWCR)

Justification: Current measures by entities for industrial wastewater are generally very deficient over all the measures, and the deficiency levels are widely different over entities.

Namely, some entities have excellent measures but others inferior measures. In this Improvement Plan, the Industrial Wastewater Compliance Rating (IWCR) system has been developed to express such differences in industrial wastewater measures by using simple numerical indicators.

Considering the major management systems enforced by DONRE for industrial wastewater, it is suggested that six (6) compliance items are used for the rating, as below:

- Environmental authorization
- Provision of industrial wastewater treatment plant (IWTP)
- Effluent water quality
- Self-monitoring of protection measures
- Industrial wastewater fee
- Wastewater discharge license

Six (6) compliance items are scored by three (3) degrees; "1" for very deficient status, "3" for imperfect status despite some achievements observed and unknown status, and "5" for excellent status with perfect achievement. In addition to six (6) items, the total compliance is scored by averaging all the six (6) items.

The rating scores of respective compliance items are calculated by using data in the Pollution Source Table (PST) which is formulated in the Task 22 of the PSD. Respective original data entered in the PSD come from various management tasks made by DONRE, as below.

Data Source of Compliance Items

Compliance Item	Data Source
1. Env. Authorization	EIA Section of Hanoi EPA
2. Provision of IWTP	Pollution Control Section of EPA or

	Inspectorate
3. Effluent water quality	Pollution Control Section of EPA, Inspectorate or CENMA
4. Self-monitoring of protection measures	Pollution Control Section of EPA
5. Industrial wastewater fee	General Section of EPA
6. Wastewater discharge license	Division of Water Resources Management and Meteoro-Hydrology (DWRMH)

The rating criteria to be applied to IWCR are enumerated in the following table. Actual criteria and calculation method of rating scores with IWCR are shown in **Annex 3** and **Annex 4** with the example calculation.

Rating Criteria of IWCR

Rating / Compliance Item	"1"	"3"	"5"
1. Env. Authorization	Not taking the approval	Taking the approval is "Not Clear".	Taking the approval
2. Provision of IWTP	No provision	Yes and sufficient is "Not Clear".	Yes and sufficient
3. Effluent water quality	Not meeting against the std.	Meeting against the Std, perfectly is "Not Clear".	Meeting against the Std, perfectly
4. Self-monitoring of protection measures	Not observed	Observed perfectly is "Not Clear".	Observed perfectly
5. Industrial wastewater fee	Not paid	Paid is "Not Clear".	Paid
6. Wastewater discharge license	Not taking	Taking is "Not Clear".	Taking
7. Total Compliance	"Near 1": Almost all the compliances are not ensured.	"From 2 to 4" Compliances are not ensured perfectly, on the whole.	"5" All the compliances are ensured perfectly.

As understood from the above, the rating scores with IWCR can be used to know actual compliance status with simple numerical index.

Because the rating scores with the IWCR indicate the compliance level by entities, they may be used for:

- Assessment of the status of environmental compliance of entities

To assess the achievement status of industrial wastewater measure in individual entities and/or grouped entities.

- Selection of subject entities for regular environmental check and inspection

To select entities with deficient compliance, in planning the environmental check and inspection, and to implement the environmental check and inspection that concentrate on focal entities with certain conditions.

- Choosing "Best and Bad-Compliance" entities:

To select "Best and Bad Compliance" entities for awarding and disclosing, for the first step to nominate entities.

This Action is aiming to introduce numerical rating scores with the IWCR (easy to understand sensuously) to know the compliance level in industrial

wastewater measures.

Component activities: 1) Annually calculate rating scores of the IWCR and analyze the compliance status

By using the PST outputted from the PSD, Hanoi EPA annually calculates rating scores of the IWCR for all the entities. Hanoi EPA computes the rating scores by individual, regional group, category group, etc. to analyze the achievement level and transitional tendency of the environmental compliance levels. These analytical results should be shared to DONRE and all units concerned.

2) Use the rating score of the IWCR in regular management tasks

Hanoi EPA and others use analytical result of rating scores in their regular management activities. For instance, these data may be used to develop annual implementation plan of the check and inspection, to select certain focal entities, and to choose excellent and bad compliance entities for awarding and disclosing (as the first step), and so forth.

Leading unit: Hanoi EPA, Hanoi Inspectorate and others

(3) Thorough Exercise of Management System (Action 1-3)

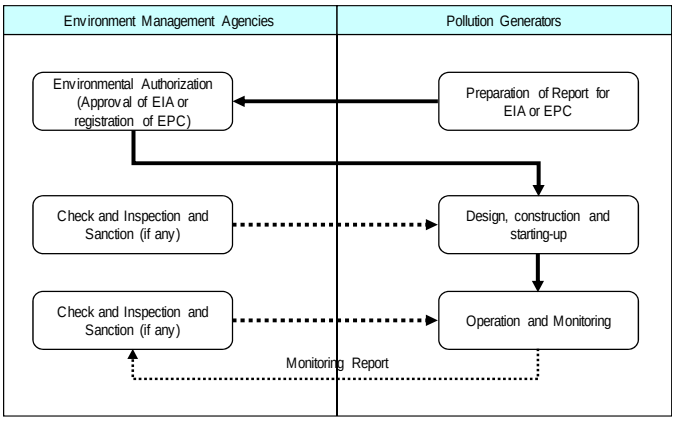
Objective: To ensure thorough exercise of management systems

Justification: This Action is necessary to ensure functions of the environmental check and inspection.

- Pre-operation inspection

In many entities, DONRE has not implemented environmental check and inspection at the time of pre-operation. Therefore, it is presumed that many entities start to operation, without the check and inspection by DONRE before the operation.

According to the environmental regulations in Vietnam, the check and inspection must be enforced at the time of pre-operation (design, construction and start-up) as well as operation, as follows:



Procedure of Environmental Check and Inspection

This Action is aiming to ensure the enforcement of check and inspection at the time of pre-operation in compliance with the environmental regulation, without neglecting. This Action is necessary to collect reliable data on wastewater measures.

- Finding un-authorized entities

As a result of the PST preparation, it has been clarified that some 15 % of all listed entities do not have any type of environmental authorization. It is necessary to reduce such entities by identifying such entities, and to input

such entities' data into the integrated information system, so that the integrated information system becomes exhaustive.

This Action is aiming to ensure the enforcement of the check and inspection on entities which is currently not authorized, and to collect actual data on wastewater measures.

Component activities: 1) Ensure the enforcement of check and inspection before operation, and collect and record data/ information on actual wastewater measures.

Documents of EIA approval include the plan of wastewater measures at the time of obtaining business permission. It is not unusual that wastewater measures to be applied are changed in the course of plan and design.

In this view, the check and inspection before the operation is crucial for not only examining the accomplishment and performance of measures but also collecting data/ information on wastewater measures implemented actually.

2) Find un-authorized entities

DONRE should take periodical actions to identify un-authorized entities in partnership with District PCs. To realize this, Hanoi DONRE and district DONREs should organize some notification system to find un-authorized entities and inform it.

Leading unit: Hanoi EPA, Hanoi Inspectorate

(4) Training for Enhancing Specialized Ability (Action 1-4)

Objective: To conduct continuous trainings to enhance specialized ability of officers engaged in environmental check and inspection.

Justification: Almost 90 % entities inspected in Hanoi City have been imposed administrative sanctions. Though different violations are found, it is common in Vietnam that many entities discharge industrial wastewater beyond the national standards. Even though self-monitoring reports are submitted, these are not reliable to judge the treatment performance of IWTP.

Most of officers engaged in the check and inspection are immature in specialized abilities in wastewater measures, because they do not have enough experiences in this field. Thus, there are many cases that officers concerned do not have technical insights, and miss underlying environmental violations. This is one of major reasons why serious violations concerning wastewater treatment are continuing, repeatedly.

This Action is aiming to enhance specialized ability of officers concerned with water pollution control and to give them insight into environmental violations.

Component activities: 1) Continue to hold periodical technical trainings for environment-specialized abilities.

Trainees for technical trainings are officers of not only Hanoi DONRE but also district DONREs. Fields for trainings are general principle of industrial wastewater treatment, operation and maintenance of IWTP, treatment technologies by industrial categories, cleaner production technologies and so forth.

To realize such opportunities, internal training within DONRE should be held. Besides this, technical trainings should be held, calling outside experts. Hanoi University, VAST/IET and so forth are considered to be teaching candidates.

Leading unit: Hanoi EPA, Hanoi Inspectorate and District DONREs

(5) Joint Inspection with Environmental Police (Action 1-5)

Objective: To increase joint inspections with Environmental Police.

Justification: Since Decision No.1899/2006/QĐ-BCA was enacted, DONREs have been actively cooperating with the environmental police in the execution of environmental inspection.

Environmental inspection by the environmental management sector can deal with only administrative sanction (not a crime) in the field of environmental protection. Meanwhile, violations committed to the legislations on environmental protection may be dealt by the environmental police for prosecution and investigation, if there is any evidence of the criminal involvement.

In Vietnam, it has been reported that there are some enterprises which refuse environmental inspection by the environment management agency. Also, it has been widely known that administrative sanctions against violation are very light. In such circumstances, it is expected that the intervention of the environmental police may give a good help by means of criminal punishment for DONRE to fulfill objectives of the environmental inspection.

This Action is aiming to enhance the effects of check and inspection by joint inspections in the partnership with Environmental Police.

Component activities: 1) Conduct more joint inspection with Environmental Police

Hanoi EPA or Inspectorate considers conducting joint inspection with Environmental Police in the annual implementation plan for environmental check and inspection, and implement it.

Leading unit: Hanoi EPA, Hanoi Inspectorate

6.6 Action for Environmental Awareness-Raising (Challenge 2)

(1) Publication of Compliance Situations on Industrial Wastewater (Action 2-1)

Objective: To publicize the compliance situation for industrial wastewater, after developing the guideline for choosing Best and Bad- Compliance Entity.

Justification: According to the site survey in the model area, it has been clarified that lack of environment-awareness of entity operators is a prime reason for the incompliance in industrial wastewater measures.

Namely, it has been identified that, in many entities, IWTP is not installed or properly operated, and the improvement of production lines to reduce generated pollution load is delayed due to low-awareness and motivation of operators.

To change such deficient awareness about environmental compliance, it is important to disseminate information on current situations to entity operators, by publicizing actual compliance situations on the website of Hanoi PPC, Hanoi EPA and other media. This is expected to promote the interest of general citizens to the environmental problems with industrial wastewater, also.

This Action is aiming to set up the guideline for choosing entities with Best and Bad-Compliance and to publicize the compliance situations.

Component activities: 1) Prepare the guideline for choosing Best and Bad-Compliance Entities

DONRE set up the guideline for choosing Best and Bad- Compliance Entity. For instance, an example using the rating score of the IWCR is as below:

In selecting of Best-Compliance entities, the IWCR may be used for the first

step to nominate entities which belong to the "Perfect Compliance group". In actual cases, final entities for awarding will be selected based on the following different factors, in addition to the results of the IWCR.

- Degree of negative impact, in case of no wastewater measures,
- Actions to reduce pollution load in the production line with Cleaner Production,
- Environmental consciousness and behavior for other environmental fields and
- Records of environmental violations in the past.

Also, as for Bad-Compliance Entity, the rating scores may be used for the first step to nominate (in this case, entities are selected from "Worst Compliance group). Especially, careful criteria should be examined for determining Bad- Compliance entity, taking account of the social influences to be caused by the disclosure. In this wise, the publication of Bad-Compliance Entity means the use of public pressures to the enhancement of awareness-raising of entity operators.

2) Periodically publicize the compliance situations of industrial wastewater

DONRE publicizes periodically (for example, annually) the compliance situations of industrial wastewater on the website of Hanoi PPC or Hanoi EPA, and other media. For this purpose, DONRE prepares the situation report on the compliance situations of industrial wastewater, using the assessment on the compliance rating with IWCR (Action 1-2).

This situation report should include the following Best and Bad-Compliance Entities to stimulate the environmental awareness of entities and citizens:

- "Best-Compliance Entities": To encourage entities to upgrade the wastewater measures, by praising an entity for the excellent compliance.

- "Bad-Compliance Entities": To discourage against incompliance behavior, by disclosing and exposing deficient attitude to the public.

Leading unit: Hanoi EPA

(2) Annual Risk Communication of Industrial Wastewater Pollution (Action 2-2)

Objective: To open annual risk communication of industrial wastewater pollution, inviting industrial entity operators and general citizens.

Justification: According to the site survey in the model area, it has been clarified that lack of environment-awareness of entity operators is a prime reason for the incompliance in industrial wastewater measures.

In many entities, IWTP is not installed or not properly operated, and the improvement of production lines to reduce generated pollution load is delayed due to low-awareness and motivation of operators.

Although the enhancement of environment-awareness calls for diverse approaches like environmental education, general citizen involvement and so forth, DONRE needs to take actions, step by step.

In this Project, a part of actions included in Action 2-2 have been carried out as a trial, such as: opening of risk communication, preparation of guidebook for industrial wastewater management and so forth. These should be used as experiences for actual actions.

In Hanoi City, awarding of entities was tried as part of a foreign aid project long time ago, but it has not been carried out, recently. It is considered that awarding entities with excellent compliance is useful for enhancing the environment-awareness of entity operators. The rating scores of the IWCR

raised in this Project may be used for choosing excellent entities.

This Action is aiming to set up periodical meetings in which DONRE takes a series of actions for awareness-raising, inviting entity operators in Hanoi City and general citizens.

Component activities:

1) Choose Most Excellent-Compliance Entities for awarding

DONRE chooses Most Excellent-Compliance Entities (achieving remarkable results in wastewater measures), for awarding in the annual risk communication, among the entities chosen in Action 2-1.

2) Open the Risk Communication of Industrial Wastewater Pollution (annual meeting), inviting entity operators in Hanoi City and citizens

DONRE prepares and holds the annual meeting of Risk Communication of Industrial Wastewater Pollution. The agenda of the meeting is, for instance:

- Explanation of industrial wastewater measures and compliance,
- Explanation of environmental regulations and rules (including some amendments, if any), using guidebook of industrial wastewater management,
- Introduction and/or lecture of technologies or experiences from experts in the field of industrial wastewater treatment or cleaner production technologies,
- Awarding ceremony for Most Excellent-Compliance Entities,
- Information exchange and introduction on environment-related service providers (like consultant, laboratory firm, engineering company, constructor and so forth)

Leading unit: DONRE, Hanoi EPA

6.7 Action for Governmental Supporting Measures (Challenge 3)

(1) Relocation to Industrial Clusters and Points (Action 3-1)

Objective: To work on accelerating relocation of entities to industrial clusters and points.

Justification: For relative small-scale industries located in the center area of the city, Hanoi PC has been pushing forward with aggregation and relocation, by constructing industrial clusters. There are 37 industrial clusters located in Hanoi City and five (5) are located in the model area, and none of them has a centralized IWTP, as of 2010.

Hanoi City accommodates craft villages in around 260 locations, comprised of mainly household-scale industries. Of them, 9 craft village are located in the model area. While some industrial points are operating in Hanoi City, none of them has a centralized IWTP.

As seen from industrial clusters and points, governmental supporting measures (led by Hanoi PC and/or district PCs) are under way. While this relocation scheme gives an opportunity to take industrial wastewater measures to small-scale entities, problems are that land-plots are limited and a centralized IWTP is usually not provided.

This Action is aiming that DONRE works on promoting entities' relocation and installing centralized IWTP in cooperation with Hanoi PC, district PCs, DOIT, DARD and so forth.

Component activities:

1) Work on relocations of entities discharging environmental pollution into industrial clusters and points provided with a centralized IWTP.

A number of entities which has no IWTP have stated no land-space as reason

for no provision, in the site survey.

This measure for industrial clusters and points should be actively enforced along with the plan and construction of a centralized IWTP. While the relocation has the effect to reduce the influences of the environmental pollution to the surrounding areas, only 2 industrial clusters in Hanoi City has centralized IWTP, as of now. Five (5) clusters are located in the model area but they do not have a centralized IWTP.

DONRE should work on that governmental intervention to industrial clusters and points should be enforced along with the provision of a centralized IWTP to mitigate environmental influences by wastewater.

Leading unit: DONRE in the cooperation with Hanoi PC, district PCs, DOIT, DARD and so forth

(2) Hanoi Environmental Protection Fund (Action 3-2)

Objective: To work on reinforcing the financial lending capacity of Hanoi EPF.

Justification: It has been clarified through the site survey in Output 3 that lack of finance is one of major causes for deficient wastewater measures.

As a governmental supporting measures, Hanoi EPF provides financial supports with soft-loans not exceeding 50 % of the commercial interest rates, in order to promote environmental protection measures. However, actual usage of soft-loan by Hanoi EPF is still limited to only seven (7) entities, as of 2011. In such situations, this Hanoi EPF does not function actively as useful supporting measures, for the moment. This Action is aiming that DONRE works on the use of Hanoi EPF.

Component activities: 1) Work on the use and the capital increase of Hanoi EPF.

The capital of Hanoi EPF is 50 billion VND provided from Hanoi PC and other capital sources are limited. DONRE should more effectively collect the industrial wastewater fee, because it is one of capital sources of Hanoi EPF. At the same time, DONRE should work on the increase of investment from Hanoi PC who is a prime finance supplier.

DONRE should also disseminate information on the financial lending system and encourage industrial entities to use the fund.

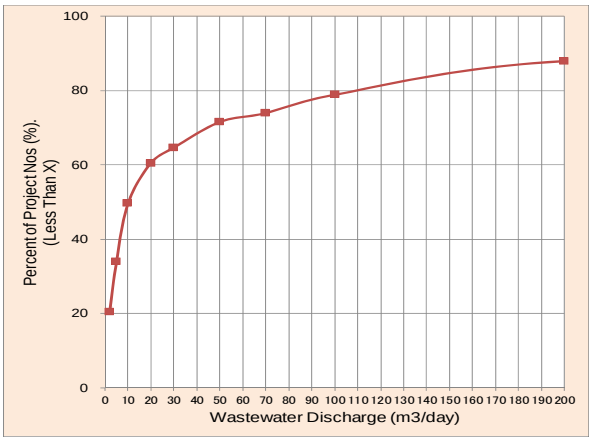
Leading unit: DONRE

6.8 Action for Streamlining Regulation System (Challenge 4)

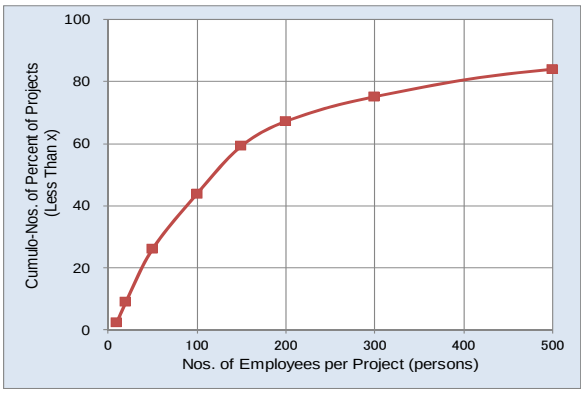
(1) Operation Rule for a Minimum Scale of Management Task (Action 4-1)

Objective: To set up the operational rule for a minimum scale of management tasks.

Justification: One of features of industrial entities in Hanoi City is their very small-scale. As shown below, entities with less than 10 m^3/day account for 50 % of entities. Entities with less than 100 employees account for 43 % of entities in terms of employee numbers.



Wastewater Discharge (m^3/d) vs Percentage of Entity Numbers (%)



Employee Numbers (persons/entity) vs Percentage of Entity Numbers (%)

Many officers concerned have asserted that Hanoi DONRE lacks management resources to thoroughly enforce water pollution control, especially in terms of the quantity of human resources. It is the fact that there are too much work to fulfill all the tasks specified in their job instruction.

Meanwhile, some management systems include provisions to force inefficient works that do not result in definite environmental improvement. For example, the provision that clearly defines the minimum scale of entity is not in place for environmental authorization and compliance, causing inefficient administrative works by DONRE.

Taking account of current human resources, DONRE has difficulty in enforcing its duties thoroughly, due to the shortage of human resources, and such situation may cause unevenness among entities.

As for wastewater discharge license, this system defines the minimum flow of 10 m^3/day, and thus entities with less than this flow rate are exempted from the administrative sanction specified based on the Water Resources Law.

For instance, many local governments in Japan has the provision to exempt small entities with less than 50 m^3/day discharge rate from the regulation, as long as the wastewater does not contain hazardous substances.

This Action is aiming to lay down operation provisions to set up certain minimum scales, to ensure the administrative efficiency in DONRE's management work.

Component activities:

1) Set up the operation rule for certain minimum discharge for industrial wastewater fee, effluent water quality standard and wastewater discharge license.

DONRE does not manage industrial entities with the wastewater discharge of less than certain wastewater flow in industrial wastewater fee, effluent water quality standard and wastewater discharge license, to ensure sufficient management for influential entities.

However, this minimum discharge is not applied to entities discharging wastewater potentially containing hazardous substances that is specified in the separate regulation.

Leading unit: Hanoi EPA and others

CHAPTER 7
CONCLUSION AND RECOMMENDATION

1) WG-3 has implemented a series of activities to strengthen the capacity of making water pollution control measures, focusing on industrial wastewater management in the model area (Tu Liem and Ha Dong District) as the specific subject. This Improvement Plan is a tangible product of Output 3 (drafting the outline of water pollution control measures) defined in the indicator of the PDM. WG-3 recommends that this Improvement Plan will be implemented to improve industrial wastewater management in Hanoi City, after detail planning is made by DONRE.

2) In this Project, the final outcome of Output 3 is titled the "Outline" of Water Pollution Control Measures. The "Outline" means that more detail planning will be necessary to implement the improvement plan suggested here. Hence, it has been scheduled from the beginning that this detail planning for the implementation will be made by DONRE separately, following the Project.

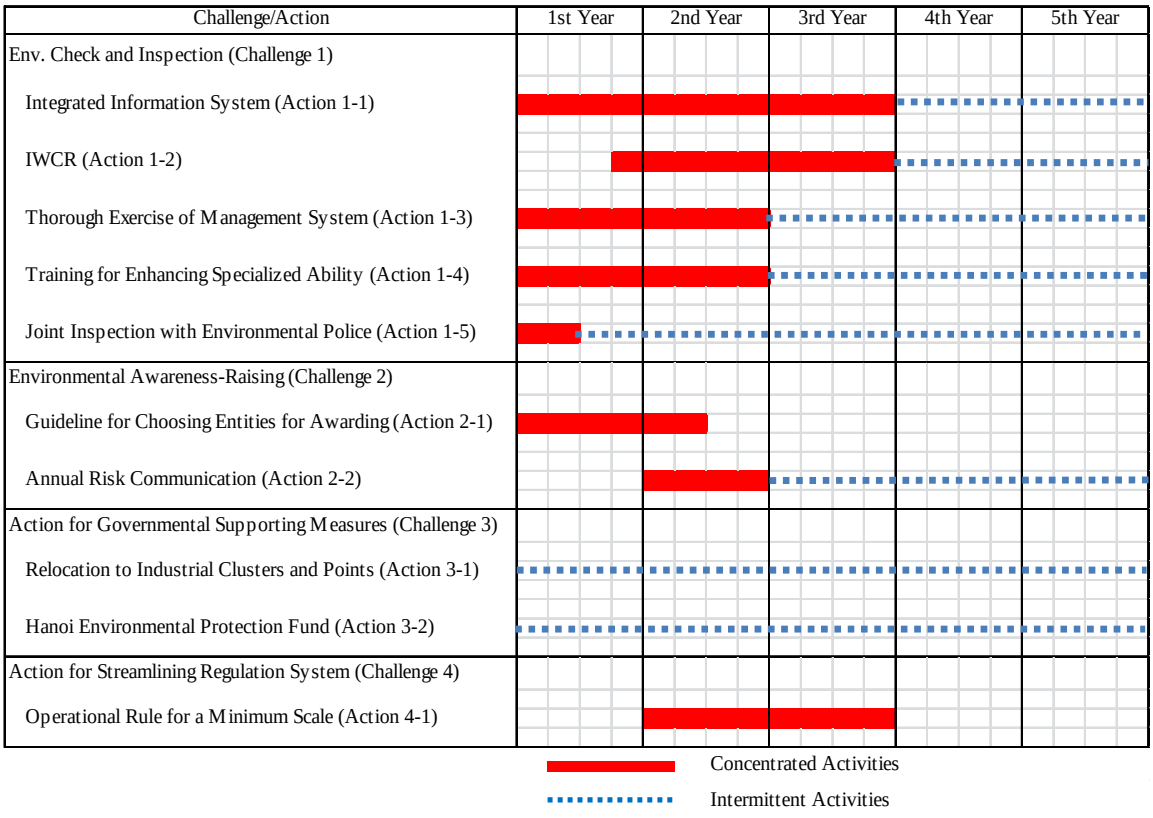
3) WG-3 has surveyed current water pollution control by DONRE and industrial wastewater measures by entities, collecting related data/ information in Hanoi City. Especially in the model area, WG-3 has conducted site surveys over three (3) times to precisely clarify the compliance status of wastewater measures, by means of direct interviews to industries and site observations. In this wise, this Improvement Plan has been formulated based on the analysis of actually collected data/ information in this Project.

4) The proposed Outline of this Improvement Plan is aiming to achieve the purpose "water pollution control functions well in promoting industrial wastewater measures by entities for mitigating the environmental pollution". As a result of the objective analysis, four (4) challenges to attain the improvement purpose have been identified, as follows:

    - To consolidate environmental check and inspection to promote the compliance by entities (Challenge 1).
    - To enhance the awareness of entity operators to the environmental compliance (Challenge 2).
    - To strengthen governmental supporting measures to promote industrial wastewater measures (Challenge 3).
    - To streamline regulation systems of water pollution control (Challenge 4).

    By achieving this improvement purpose, it will be realized for the water pollution control to solve "uneven management" which has been brought about by the ineffective enforcement at present.

5) Considering the character of this Outline of Improvement Plan set forth above, detail project schedule for the implementation is not discussed in Output 3. This should be discussed separately in DONRE, along with the examinations of detail contents to be carried out. **Figure 7-1** is just for referential use for discussion to be made by DONRE, assuming the total time-frame of five (5) years.



Source: Prepared by WG-3.

Figure 7-1 Road Map of Improvement Plan for Water Pollution Control in Hanoi City

6) In activities of Output 3, the Pollution Source Database (PSD) has been developed and actually used to store and process collected data. In the Improvement Plan proposed by WG-3, the integrated information system is a key instrument to support water pollution control by DONRE. It is expected that the system and stored data of the PSD used in this project will be utilized for structuring the integrated information system. This PSD developed in this project can be used for actual management activities for water pollution control and, in the future, it should be considered that the PSD would be upgraded to more convenient and more functional type.

7) WG-3 has tried the use of Industrial Wastewater Compliance Rating (IWCR) to assess the status of wastewater measures taken by entities. The rating scores of IWCR, as a numerical indicator which may be calculated from data/information in the pollution source table (PST) formed from the PSD, represent the compliance status of environmental authorization, IWTP provision, wastewater fee and so forth. It is recommended that DONRE applies the IWCR to assess the compliance status of entities, setting up of improvement targets, selection of excellent entities for awarding, etc.

8) Main objective of this Plan is how to improve water pollution control in the field of industrial wastewater management. Hanoi DONRE has been enforcing the water pollution control by employing different environmental management activities and systems. In this Project, the capacity development programs of component management activities are ongoing as the agenda of other Outputs; like Pollution Source Inventory (Output 2-3), Inspection (Output 2-4) and Environmental Awareness (Output 4). In detail planning of this Improvement Plan, it is suggested that outcomes from these capacity developments be considered and utilized.

End