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INDUSTRIAL WASTEWATER MANAGEMENT IN RIVER BASINS NHUE-DAY AND DONGNAI PROJECT

Final Report

Presented to

The World Bank
and
The Ministry of Planning and Investment of Viet Nam

By:

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Experco International Ltd

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LIST OF ACRONYMS

CETP:	Common Effluent Treatment Plant
DARD:	Department of Agriculture and Rural Development
DIZA:	Dong Nai Industrial Zone Authority
DONRE:	Department of Natural Resource and Environment
DoIT:	Department of Industry and Trade
DPI:	Department of Planning and Investment
DWRM:	Department of Water Resource Management
EIA:	Environmental Impact Assessment
EPS:	Environmental Protection Scheme
EPZ:	Export Processing Zone
HCMC:	Ho Chi Minh City
HH:	Household
HIZA:	Hanoi Industrial Zone Authority
HIEPZA:	Ho Chi Minh City Industrial Export Zone Authority
HNIZA:	Ha Nam Industrial Zone Authority
HW:	Hazardous Waste
IDC:	Infrastructure Development Company
IP:	Industrial Park
IC:	Industrial Cluster
IZ:	Industrial Zone
IZA:	Industrial Zone Authority
LEP:	Law on Environmental Protection
LWR:	Law on Water Resources
MARD:	Ministry of Agriculture and Rural Development
MOC:	Ministry of Construction
MOF:	Ministry of Finance
MOI:	Ministry of Industry
MONRE:	Ministry of Natural Resources and Environment
MPI:	Ministry of Planning and Investment
NDIZA:	Nam Dinh Industrial Zone Authority
ODA:	Overseas Development Assistance
PPC:	Province Peoples' Committee
SEDP:	Socio-Economic Development Plan
SEMLA:	Strengthening Environmental Management and Land Administration
SOE:	State-owned enterprise
VEPA:	Vietnam Environment Protection Agency
VND:	Vietnam Dong
VNEPF:	Vietnam Environmental Protection Fund
WWDP:	Waste Water Discharge Permit
WWTP:	Waste Water Treatment Plant

EXECUTIVE SUMMARY

This report provides a complete and comprehensive analysis of industrial wastewater management in industrial estates and craft villages in Vietnam. Experco and LBCD, on site, between February and October 2009, with the collaboration of the Ministry of Planning and Investment (MPI), undertook the research and fieldwork. The analysis was conducted in three separate stages:

(a) a detailed inventory of industries and industrial activities responsible for the pollution of the Nhue-Day River Basin, including industrial zones, industrial clusters, industrial points, craft villages and large-scale stand alone industries. In the Dong Nai River Basin, an inventory of the industrial parks is all that exists for now.
(b) An institutional and regulatory analysis in the Nhue-Day and Dong Nai River Basin provinces.
(c) Identification and determination of appropriate interventions for industrial estates and craft villages.

Part A: Inventories

This database, an inventory of industrial-zoned land, is the fruit of countless hours of fieldwork that was needed to validate and update existing data from various government and non-governmental sources. As a result, there is now an updated and accurate inventory of industrial land use for the Northern provinces, where previously such data was difficult to obtain and incomplete at best.

The database reveals that a high number of smaller industrial estates are being developed in the North (41 clusters and 57 industrial points in Nhue-Day basin compared to only 25 clusters in the Dong Nai). These clusters are located in all districts of peri-urban Hanoi and are being developed very quickly in the former Ha Tay rural and peri-urban districts. Ha Nam and Nam Dinh have fewer industrial estates but many new ones are in the process of being planned. As expected, most craft villages (and polluting craft villages) are located in former Ha Tay, Nam Dinh and Ha Nam.

Practically none of these industrial clusters, points, and craft villages has built any type of wastewater treatment infrastructure to date. Industrial zones in the North are experiencing rapid development and more growth than in the South but still number fewer overall, are still ewer in scale experiencing more rapid development and growth ed. Most of the wastewater treatment facilities in the North are either in the planning phase or under construction while 63% of the 75 industrial zones in the South have a central wastewater treatment plant in operation (46% in total) or one under construction (17% in total).

Synthesis of inventory results

	Industrial parks (and EPC)		Industrial Clusters		Industrial points		Polluting craft villages
	Total	Without CETP	Total	Without CETP	Total	Without CETP	(no WW treatment)
Ha Noi	13	12	37	35	43	43	257
Nam Dinh	11	10	16	16			75
Ha Nam	11	10	6	6	5	5	14
HCMC	15	2	30	28			
Dong Nai	29	20	43	42			

Binh Duong	28	9	9	8			
Binh Phuoc	19	18	17	17			
Ba Ria-Vung Tau	14	14	30	30			

The inventory's main findings are:

- Industrial park development in the North is more recent and wastewater treatment facilities have yet to be built.
- Industrial parks in the South have their wastewater treatment facilities built or under planning or construction in most of the cases.
- In both the north and south, numerous smaller Industrial clusters and points are very numerous have yet to build wastewater treatment plants yet (in both south and north). They may be responsible for the highest discharge of industrial water pollution.
- In the North, the upstream province (Hanoi) is contributing for most of the industrial pollution in the river basin.
- In the South, the downstream provinces Dong Nai, Ho Chi Minh, and Ba Ria-Vung Tau are contributing for most of the industrial pollution in the river basin.

Guidelines for maintenance of database

Most of the missing wastewater data may not exist at all at the moment. A majority of industries have no updated data about wastewater flow or characterization (only 7% have wastewater discharge permit).

As part of the investment program, the inventory should be completed to identify potential industries for the different categories of intervention options and required support. The inventory data presented in this study can be used as a basis to go into details for each districts and provinces. We recommend that **MONRE-DONREs should be the main partner of the River Basin Committee for establishing updated inventories.** Under the Law on Water Resources (LWR), it is forbidden to discharge untreated wastewater in the environment without declaring to DONRE by applying for a WWDP. Such an inventory shared with DONREs would provide a solid database and build improved capacities for pollution control and water resources management in the River Basin.

As a second step for according technical support, clear incentives must be used for industries to participate in the database. For example it should be publicized that in order to be eligible for the consideration of support, each industry must be responsible to provide their data to the database management office.

Database use for further studies

The inventory format as it's been developed could also be combined with sets of geographical data and other sets of regional pollution sources data for detailed analysis of the pollution load in the region. MONRE river basin committees, in both Nhue-Day and Dong Nai, are establishing that kind of comprehensive database and Geographic Information System (GIS).

Part B: Assessment of Regulatory and Institutional Framework in industrial estates and craft villages: Main findings and recommendations

An institutional and regulatory assessment undertaken identified the main gaps, overlaps, and inconsistencies among existing regulations. The findings and recommendations cover the following topics: regulatory and institutional framework, craft villages, permits, contracts, fees, monitoring, and liabilities. Provided here is a comprehensive set of recommendations, with the principle one being:

Institutional and Regulatory Framework for Industrial Estates

- ***Beside of issuance Circular 08/2009 by MONRE, the other Ministries should issue guidelines for the implementation of Decree 29 quickly.*** This will clarify the roles and responsibilities of each agency and IZA/IDC. Currently, some IZAs and DONREs have different interpretations.
- ***The national regulation on Industrial Parks should confirm the dispositions of the LEP and clearly mention that a CETP needs to be built before the start of operations of an Industrial Park[1].*** Without this clear declaration, it will be difficult for Infrastructure Development Companies to build and operate CETPs; industries with WWDP will not be interested in connecting to the CETP. Even if some provinces already included this clause in their own regulation, a clear signal from the national level is needed.
- ***The national regulation on Industrial Parks should also clearly state that when a CETP is present in an industrial estate, all the industries have to be connected***. It will facilitate the task of Infrastructure Development Companies in designing CETPs, and it will also guarantee more financial resources for infrastructure companies. In addition, it will also facilitate the monitoring of effluent for MONRE (only one effluent per industrial estate with a CETP).
- ***Large Stand*-alone industries should be regulated and managed by DONREs.** The management of stand-alone at the national level leads to delays in the implementation of measures when an environmental problem is arising. Local authorities have no authorities on large stand-alone industries.

Monitoring

- ***IZA should become the main environmental monitoring agency in industrial parks.*** Actually too much agencies are involved in the management of IPs. Decree 29 started to give IZA more environmental responsibilities. In particular, IZA should issue and monitor EIA, WWDP, EPC for all industries within IPs. IZA/IDC should also be responsible in the management of hazardous wastes in particular for the management of registration books. IZA should report all activities to DONREs. IZA/IDC will need to:
  - Develop a data management and analysis system based on the pilot projects proposed by SEMLA and by the HCMC TISEMIZ program.

[1] A new Circular No. 08/2009/TT-BTNMT providing for the environmental management and protection of economic zones, hi-tech parks, industrial parks and industrial complexes was issued on July 15 2009 confirmed the needs to build CETP before the starts of operation. However, Decree 29/2008 doesn't require such conditions.

- Increase in the number of staff, and resources devoted to monitoring environmental performance.

- ***Monitoring should be conducted without notice.***

Craft Villages

- ***Management plans for the most seriously polluting craft villages should be prepared by DONREs or the River Basin committee.*** This plan will include options for waste water collective treatments and financial measures for implementation of the pollution and waste treatment plans in the most polluted craft villages.
- ***Craft villages should obtain a DONRE wastewater discharge permit as an entity.*** It is not realistic to have a WWDP for individual HH within a craft village, due in particular to the difficulty in assessing the discharge volume of each HH; each Craft Village with a common drainage system should obtain a WWDP for all the HH activities.
- ***MOIT/DOIT should keep some responsibilities for craft villages and industrial points instead of a full transfer of craft villages' responsibilities to MARD/DARD as it is planned.*** Due to the expertise they developed for craft villages and the industrial points, DOITs have higher capacities to develop management plans and business upgrading.

Fees and Sanctions for Environmental Protection

- ***The sanctions for environmental violations and non-compliance should be strengthened[2]:*** Stronger penalties will need to be applied to recalcitrant enterprises. The current compliance system is not providing strong disincentives for poor environmental performances, in part because the sanctions are not adequately severe and in part because they are not being enforced.
- ***Waste water fees for environmental protection should be increased.*** Currently, the cost of assessment and collection often exceeds the revenues collected. Therefore, it doesn't create enough revenue for the environmental fund and monopolizes DONRE staff.
- ***IZA should keep a part of the fees collected for management environmental monitoring.*** This will help IZA to create a strong environmental unit.

Restoration of contaminated sites

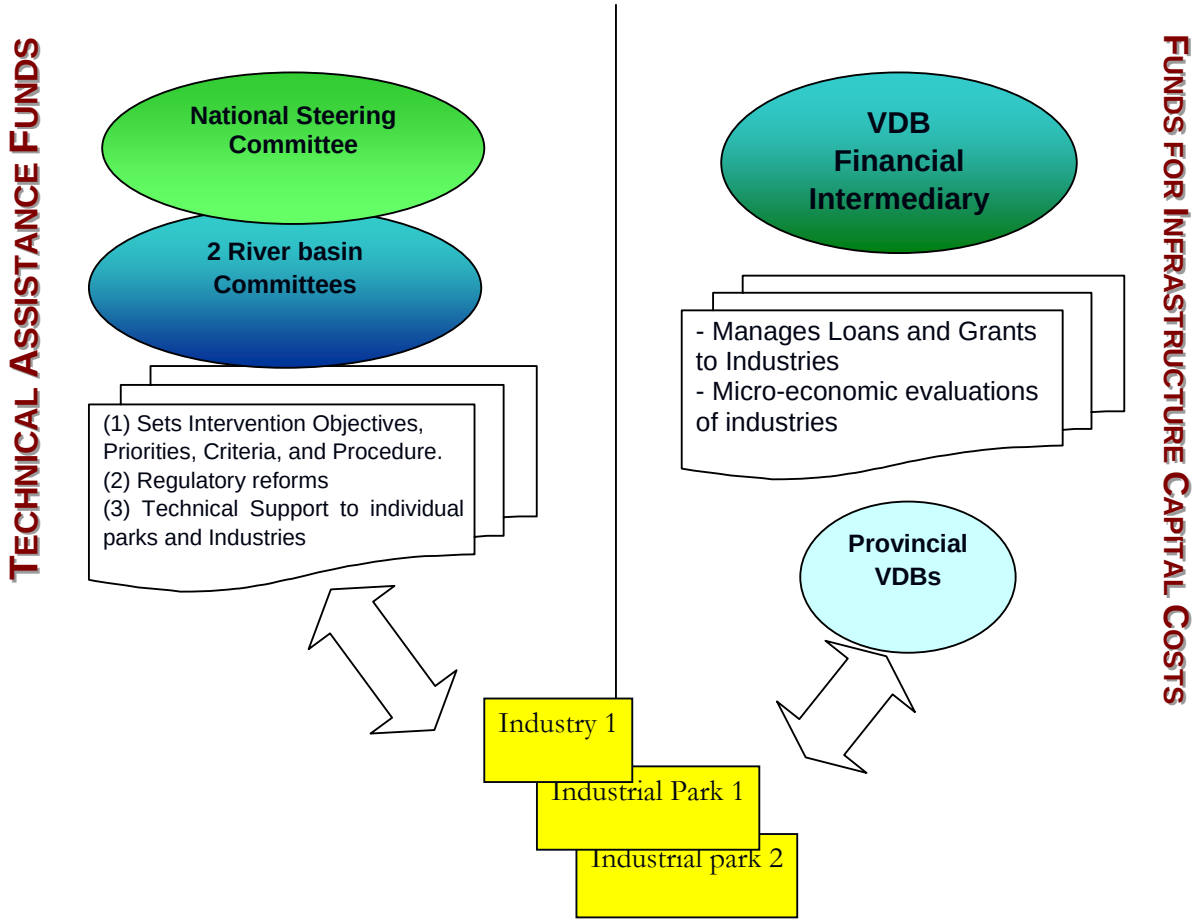
- ***A legal basis should be developed for assessing liability and cleanup of former sites after an industry has stopped operations or has been relocated.*** Currently, the eventual contamination of former sites is never managed due to the absence of regulation and also the high cost of decontamination. The process of environmental assessment, in case of relocation or stopping of operation, should be described in the regulation such as:

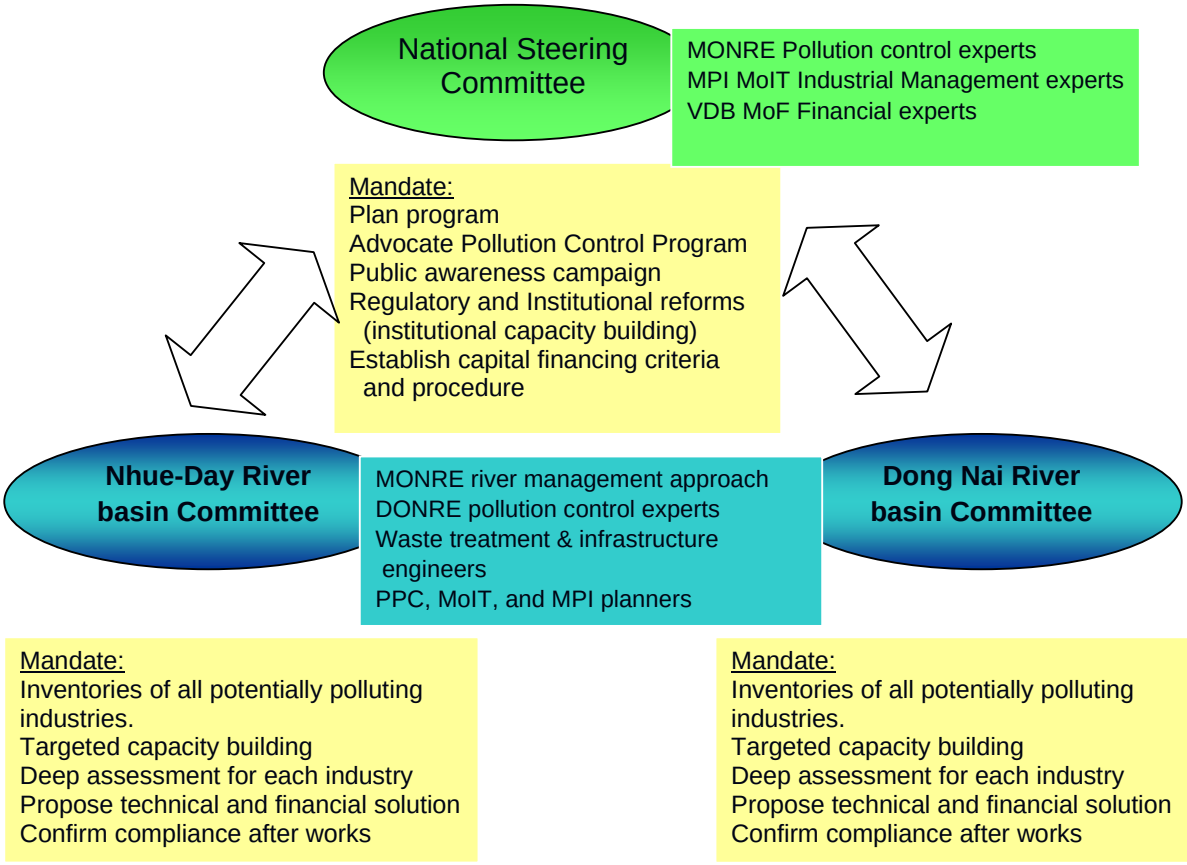
[2] Recommendation also proposed by ICEM/2007

- Phase One Environmental Site Assessment (ESA) will be conducted when an industry has stopped operation or has been relocated at the expense of the owner(s). .
- If contamination is likely to occur, a Phase Two ESA with analysis of soil sampling needs to be conducted.
- Preparation of remediation plan if necessary.
- The former owner should be responsible for the preparation of ESA and for all costs of decontamination.

Part C: Identification of interventions: Recommendations for an Investment program

We have developed a set of recommendations for planning an intervention program for industrial pollution control based on our assessment in Vietnam, the Canadian experience in its 1990s program and the review of international ODA financing of pollution control. The recommended structure with activities are illustrated in the two figures below.





We recommend an important technical assistance program to finance the activities of a National Steering committee and two River basins committees. The national steering committee would establish the regulatory reforms, the intervention objectives, criteria, and procedure. The river basin committees would process with the evaluation of individual industries and agree of the financial support. The major differences in the progress of environmental management in the North and the South have led to this division of two executive agencies, each agency with some latitude to focus on adapted needs for their region. The funds for infrastructure capital (loans and grants) ideally, will be managed by an external entity, such as the VDB or the Vietnam Environmental Funds for example.

Recommended activities part of a Technical Assistance program

The recommended activities to receive priority funding from the Technical Assistance Program are:

1. We recommend investing into data management equipment and training to increase capacity in industrial environmental management for officers at Industrial Zones Authorities and provincial departments (DOIT, DONRE, and DARD) officers in charge of environmental management and monitoring.

2. We recommend investing in a program of Environmental Management Plans for the most polluting craft-villages. The most polluted craft villages need support in

3. We recommend investing in technical support for a Cleaner production program.

Interventions and criteria for polluting industries

A) Industrial zones and clusters

As a central tool to improve industrial and environmental management, **industrial estates** should also be given priority financial support. All estates should be provided with centralized wastewater treatment plants that are flexible enough to welcome new industries over the years as the estates are fully occupied and industry productions and wastewater discharge can increase.

High-tech biological treatment plants are recommended to industrial parks that present higher flow and less land. Smaller industrial clusters and industrial clusters, however, present lower discharge of wastewater and lower economic capacities. Cheaper technologies (capital and operation costs) are then proposed, but they require more land area. It is assumed that these clusters and points located in rural areas and managed by local authorities can find the required land. It is estimated that natural technologies can easily cost 2 to 3 times less than high-tech technologies (and very cheap operating costs) but use 2 to 3 times the land area.

In case land is not available, some specialized treatment equipment as Bionest or DAF (Dissolved Air Flotation System) could be purchased for each industry, or to combined wastewater from the same industrial sector. Theses systems use very few land are, but they have to be operated carefully by skilled operators and are more expensive to operate, as they require electricity and chemicals.

B) Craft villages

The river basin committee should prepare detailed environmental management plans for the **most polluted craft villages**. The plans should include options for cleaner production training, low-cost options for communal wastewater treatment and financial measures for implementation.

C) Industries within industrial estates and stand-alone industries

For individual **industries**, stand-alone and industries within industrial estates, we recommend targeting a limited number of **high polluting industrial sectors**, rather than supporting all industries. The three following sectors are among the most polluting industries.

The priority interventions (relocation, closure or treatment) should go to: (1) the plants with the most toxic discharge in terms of toxicity[3]:

- Fertilizer;
- Pesticides;
- Paper and paperboard,;
- Plastics and
- Leather sectors.

and priority clean production interventions (2) a few strategic high polluters industrial sectors where cleaner production have demonstrated good results:

- Pulp and Paper;

[3] As found as the top manufacturing sectors in Vietnam producing the highest relative toxic hazard by: Giovanna Dore, Philip Brylski, Jostein Nygard, and Phuong Thi Thanh Tran. 2008. *Review and Analysis of the Pollution Impacts from Vietnamese Manufacturing Sectors*; EASRE, The World Bank; Washington, D.C.

- Food processing;
- Textile dyeing.

We recommend that a Cleaner production expert team should be created within the River Basin committees. Cleaner production has demonstrated good results in pollution reduction and quick payback period for in terms of reduced production costs. Implementation and process modifications costs would be covered by industries.

Relocation of industries into industrial estates in Hanoi and Ho Chi Minh City are led and supervised by a steering Committee chaired by the People Committee. They both lead a program to implement Decision 64 with some flexibility to adapt the relocation scheme to the urban planning and Master plan.

Both programs are handling the relocation with a series of financial and tax preferential measures. However, it appears that these measures have not been sufficient for small and medium enterprises to afford relocation costs. We recommend that each PC should establish a new unique "Funds for Urban Industrial Pollution Reduction" with simplified procedures. The fund should provide partial grants (30 to 40% of costs for SMEs) for new production and treatment works.

D) Infrastructure costs estimation

We have prepared a first budgetary cost assessment that will help the Government of Vietnam and the donor community to plan their support program for industrial pollution reduction. The budgetary cost assessment uses the updated inventory of polluting industries and industrial estates to estimate the costs of pollution reduction. The following assumptions were used

Assumptions for cost calculation of WWTP for industrial estates

Variable	Assumption	Reference
Estimated Wastewater flow per estate (if not specified by local survey)	Area (ha) X 17.6 m^3/day per ha	Metcalf & Eddy and ETM Center (Vietnam) for a fully operating estate in Vietnam
Area per industrial park (if not specified by local survey)	Average of 225 ha/park under construction	Hanoi IZA
Area per industrial cluster	Average of 40 ha/cluster planned	Hanoi Times/Investment in Hanoi webpage
Technology in Ind Parks	SBR because of high flow and limited space.	LBCD
Technology in Ind clusters	Aerated lagoons because of lower cost but space required.	LBCD
Technology in Ind Points	Facultative ponds for low capital and operating costs but space required	LBCD
Unit price for capital cost calculations ($/m3/day)	SBR 15000 m3: 500$/$m^3$ SBR 3000-4500 m3 700$/$m^3$ Lagoons 400-1400 m3: 550$/$m^3$ Lagoons 150-300m3: 650$/$m^3$ Facultative Lagoons 100m^3 for ind points : 650$/$m^3$	Above demonstrations including: -Vietnam existing WWTP -Detailed LBCD estimates
Operation and Maintenance costs	SBR: 0.07$/$m^3$ Aerated Lagoons: 0.08$/$m^3$ (for big) Small lagoons: 0,076$/$m^3$ + 4800$ for man-power Facultative ponds for ind points: Min 4800$/yr for man power	
Sludge disposal costs	Aerated lagoons: 0$* Facultative ponds: 0$* SBR: 4.12$/ 1000$m^3$ WW	

Each industrial park in the province of Hanoi will require a capital investment of 2,5 millions $US up to 7,5 millions US$, plus annual operation costs of around 100 000$/year. Each smaller industrial cluster will also require centralized wastewater facilities. Technological options are available to provide a good quality treatment for a smaller cost (as lagoons and ponds) but they require more land space and close follow-up of its operation and maintenance by full-time qualified staff. The following table presents the summary of the total required investment costs for central WWT industrial estates of the most polluting provinces of Nhue-Day river basin and Dong Nai river basin.

Total Capital Investment costs required for WWTP in industrial estates

	Industrial Parks			Industrial Clusters			Industrial Points		
	Total	w/o CETP	Cost	Total	w/o CETP	Cost	Total	w/o CETP	Cost
Hanoi	13	12	33 340 000 $	37	35	18 762 500 $	43	43	3 280 000 $
Ha Nam	5	4	9 450 000 $	6	6	930 000 $	5	5	325 000 $
Nam Dinh	11	10	22 750 000 $	16	16	8 363 750 $	n/a	n/a	n/a
TOTAL Nhue-Day basin	29	26	65 540 000 $	59	57	28 056 250 $	48	48	3 605 000 $

	Industrial Parks			Industrial Clusters		
	Total	w/o CETP	Cost	Total	w/o CETP	Cost
Ho Chi Minh	15	2	4 900 000 $	30	28	16 847 500 $
Dong Nai	29	20	57 610 000 $	43	42	22 980 000 $
Binh Duong	28	9	17 150 000 $	9	8	6 820 000 $
Binh Phuoc	19	18	60 307 500 $	17	17	11 440 000 $
BR-VT	14	14	46 480 000 $	30	30	23 100 000 $
Dong Nai basin	105	63	186 447 500 $	129	125	81 187 500 $

*This cost is only for known IE listed in the inventories. Many new IE are under planning in Vietnam and may not have been considered. These costs only include capital for construction and equipment and do not include land, design, feasibility studies, administrative fees, taxes, and management fees.

Wastewater treatment sludge

Wastewater treatment sludge costs in Vietnam are around 30$ US to 45USD a ton for landfill disposal, and up to 131USD a ton when the sludge contains a high concentration of heavy metals. A natural choice of technologies (as aerated lagoons or facultative ponds) can greatly reduce the operating cost and the sludge disposal costs, as they produce almost no sludge.

Hazardous wastes

Specialized infrastructures will be required in Vietnam in order to manage and dispose safely all hazardous wastes produced. Hazardous wastes have to be well separated and treated by highly specialized process in order to minimise the pollution. Industrial estates are not the ideal entity to treat hazardous waste but they could represent a key entity in order to improve control, management, and storage of hazardous wastes. We recommend that IZAs should issue registration books for hazardous wastes. Now, Industrial Zones Authorities are not aware of the volume of hazardous wastes produced in their zones.

The capacity (4 tons/day in Hanoi URENCO incinerator) for safe treatment is way under the actual production level in Vietnam and production level is planned to increase in the next years as industrialization increases. The case of an incinerator has been considered for Hanoi URENCO in order to increase the safe disposal capacity in the region. Of the over 63 tons/day of produced hazardous wastes in the great Hanoi (most of which is estimated to be produced out of industrial estates), 24 tons/day could be treated at this safe (5 millions USD) incinerator for 370USD/ton.

Impact of wastewater reduction due to improved practices
With improved practices in the future, it is possible that wastewater discharge will decrease at some industries if cleaner production approaches are applied. However, it should not dictate the reduction of the wastewater treatment plant's capacity at this moment. Treatment capacity at industrial estates is so low now in Vietnam that common facilities should use the scale factor to reduce the unit cost of treatment and increase its offer for treatment. Now, as regulation is enforced, demand for treatment will increase and the capacity to meet demands will remain low for the next decade as industrial estates become occupied by the increased industrialization. It is easier to connect more industries to a well working treatment plant than building new treatment plants.

E) Financing options and mechanisms

In order to make recommendations about ODA financial mechanisms for this investment program, we have reviewed 15 international case studies of similar ODA financing for pollution abatement. The cases has confirmed that loan subsidies and partial grants can offer an important incentive for industries to install wastewater treatment facilities, particularly in environments similar to Vietnam where regulations are still weak or applied inconsistently. Incentives are important because there has been no example in the developing world of industrial wastewater treatment that has been operated on a full cost-recovery or for-profit basis. In some particular cases, particularly SMEs, the access to finance alone can be an appropriate incentive for investing in wastewater treatment.

Beyond the financing of specific infrastructure projects, the World Bank should take into account the potential benefit of approaching environmental finance as a capacity building issue. There is potential, though not without risk, of developing sustainable and innovative pollution abatement products. An IBRD loan managed through the Vietnam Development Bank and on-lent at concessional rates to individual banks is suggested.

Financial support should be granted to industries according to their economic needs (access to credit), micro-economic viability (reimbursement capacity), technical feasibility of the pollution reduction and technology prices. The support can be a preferential loan managed by the VDB and/or some partial grants to the maximum value of 20% of the construction costs

We recommend that at least 50% of the loan should go to the private sector, including privately owned industrial parks and private industries. Industrial Parks and Clusters should be eligible to receive grants and loans on the condition of presenting a viable cost recovery plan transferring the wastewater treatment cost, complete or partial, to their industries. Industrial estates should present a serious management plan including regulation for wastewater treatment fees collection and environmental monitoring and management, as suggested by Decree 29.

<u>Financial mechanisms for small and medium enterprises SMEs</u>
SMEs in Vietnam have difficult access to credit. The access to preferential loan and grants through this program will definitely be an incentive to invest in wastewater treatment system. Furthermore, the successful reimbursement of this subsidies loan with the VDB will improve their credit line. Small and medium sized enterprises with bad access to credit should also be able to receive the training (as Technical Assistance) about financial tools by the VDB in

priority. The usage of the 20% grant element should also be considered vital to SMEs and craft villages as they have more difficult access to market finance.

Financial mechanism for craft villages

Most micro-industries/households have limited economic resources and can hardly absorb any waste treatment costs. A combination of grants and subsidized loans is recommended for carefully selected craft villages that show interest in pursuing deeper training and organizational processes by obtaining additional funding. Craft villages with a relocation plan to industrial points provide an interesting option for both economic viability and technical feasibility of wastewater treatment over the long-term.

1. INTRODUCTIONN

1.1 Background

Vietnam has seen its economy double in size during the last decade with rapid economic growth, over 10 percent annually since 2001, driven mostly by an increase in industrialization. Vietnam is thus experiencing a significant structural shift in its economy away from an agricultural-based system, towards a more industrialized one. There is also a switch of the government's role and responsibility of being an "owner" of the economy, to being more of a facilitator and regulator. This rapid industrialization and urbanization appears to be associated with a rapid environmental degradation and a great pressure on the natural resources.

Wastewater treatment and drainage systems are practically non-existent outside large urban areas in Vietnam and even though infrastructure has improved in the last few decades most of it is severely damaged and dates back to French colonisation (pre-1954). Municipal wastewater treatment is still in the early planning stages, under various pilot projects but the reality is that most industrial wastewater is discharged in to the sewers, irrigation canals, and open drainage channels without any treatment.

To address these and other issues the Government of Vietnam has developed its own environmental agenda with significant amendments to its Law on Environmental Protection (2005), in order to establish new policy tools for strategic environmental assessment and management of pollution prevention and cleanup controls for the private sector. An example of this was an intervention program adopted to manage the most polluting industries (Prime Minister Decision 64/2003QD-TTg) through wastewater fees (Decision 67/2003/ND-CP) but its implementation is slow and additional means and remedies are needed

The Ministry of Natural Resources and the Environment (MONRE) has adopted a River Basin Management approach for the severely polluted river basins of Nhue-Day, south of Hanoi; Cau, north of Hanoi; and the Dong Nai river basin flowing through Ho Chi Minh City.

The study of the three river basins called for a comprehensive inventory of pollution sources into the systems so that priorities could be set for taking decisive action to manage the most important sources while adopting a more systematic and long term approach for controlling the others. In Nhue-Day river basin, MONRE in partnership with the World Bank built pollution loads models from secondary data, derived from the General Statistic Office, such as number, size, and type of industry. At the basin level, the model showed that domestic sources of water pollution are the most significant contributor, estimated at BOD5 loads, while industrial sources on the other hand, are the largest in terms of Suspended Solids (SS).

According to the GSO Enterprise Census, a total of 3 290 manufacturing firms are operating in the Nhue-Day River Basin, employing 275 109 employees, and across 23 VSIC-2[4] classified sectors. The sectors with the largest numbers of firms are in the *fabricated metal products* (VSIC 2-28), *Food products and beverages* (VSIC 2-15) and *Publishing, printing and media* (VSIC 2-22). From an employment perspective, the largest are in *Wearing apparel* (VSIC 2-18), *Textiles* (VSIC 2-17), and *other non-metallic mineral products* (VSIC 2-26). According to the sector and the employment of each firm, the model came out with the most significant polluters sectors in the river basin in terms of B0D5

[4] VSIC stands for Vietnam Standard Industrial Classification. It is modeled on the International Standard Industrial Classification (ISIC).

(Pulp and paper, Alcohol distillation and Dairy products) and in terms of SS (Pharmaceuticals and Pulp and paper). The model could also rank all geographical districts by their pollution load in the river basin.

As exhaustive as these analyses were, the main critics were the lack of field verifications of the actual pollution discharge, and the out-dated data about the actual industries operation level. Only 5% of manufacturing firms were actually contacted to verify their actual location, operation level, employment, and wastewater discharge.

Following these studies and consultations with Ministries stakeholders, the present study was reoriented to update the list of industries, industrial estates, and craft village that would require some interventions within an industrial wastewater management program in the river basin. As a second objective, the potential approaches for improving industrial wastewater management were assessed and budgeted for the whole Nhue-Day river basin and the industrial estates of Dong Nai river basin.

The approach of developing Industrial Zones (IZs), High-Tech Zones and Industrial Clusters (ICs) have contributed considerably to the recent modernization of industrial development in Vietnam. These industrial estates can provide strategic location, high-tech infrastructures, and services to the industries while providing a better control and management over the industrial pollution. The relocation of problematic polluting urban industries towards industrial parks has been a preferred approach used by the Government to reduce industrial pollution close to residential area and improve environmental management. Even where urban sewerage is in place, municipal wastewater treatment is still very limited and most domestic wastewater is discharged without treatment. Furthermore, wastewater sewer networks are practically non-existent in suburban areas where most industries are located. Consequently, the major approach favoured by the Government for industrial wastewater is the pollution abatement within the industrial estate through centralized services and at the industry level. The discharge to the public sewer was not considered as a reasonable solution to be studied at this point.

It is estimated that over 35% of all manufacturing industries are located within industrial zones or clusters in Vietnam, with a continuously growing proportion. The term “Industrial Estates” is used to
Industrial Zones: also called industrial parks (Khu Công Nhiêp), are financed, and managed by the provincial governments, through the provincial Industrial Zone Authority (IZA), which is under direct authority of the Provincial People committee. They are applicable to Decree 29/2008, Decree 88/2007 and recent Circular 08/2009.
Export processing zones: are few high-tech Industrial Zones focused on exportation goods. They are financed by the National Government and responding to the same regulation as regular industrial zones.
Industrial clusters (Cum Công Nghiêp) are concentrated industrial area for smaller-scale industries. Under the Decision 105/2009/QD-TTg, the area of industrial clusters is under 75ha, District authorities should approve them, and they are under direct management of provincial DOIT. They can be under private or district ownership. Fewer regulations have been approved for industrial clusters so far.
Craft villages (làng nghê): to be identified as an official craft village by the provincial government, minimum 30% of households should take part in craft activities; business production activity must have been stable for at least 2 years; and they should follow the Craft village regulations and be registered at the provincial authorities (DOIT and DARD).
Industrial points (Điêm công nhgiêp): originally developed by district authorities for relocation and expansion of craft village’s production activities, they are funded privately or by district authorities and follow a patchwork of craft villages and industrial clusters regulations. Industrial points are mostly located in Ha Noi and Ha Tay provinces.

In December 2008, there were 219 established IZs including 118 operating IZs and 101 IZs under construction for a total land area of 61,472.4 ha, spreading over 54 provinces and cities. Approximately 65% of total industrial land area was occupied. According to the Government planning, there will be 91 additional IZs with 20,839 ha area and 22 IZs will be expanded with 3,543 ha by 2015. IZs, with the offer of infrastructure facilities, are one of the key Government strategies to attract international and national investors to the industrial sector.

Although the environmental protection task was enhanced in the IZs, there are only 60 IZs with concentrated wastewater treatment plant (CWWTP) into operation by 2008. As of 2009, the number of CWWTPs is expected to increase with 20 new ones. Thus, the amount of wastewater generated from other IZs without CWWTP will likely pollute receiving sources.

1.2 Overall design of the study

Part A of the study presents a detailed inventory of the industrial zones, industrial clusters, industrial points, craft villages, and large-scale stand-alone industries within the four most polluted provinces of Nhue-Day river basin (HaNoi-HaTay, HaNam, and NamDinh). In Dong Nai river basin, an inventory of the industrial zones was made.

Part B addresses the complex institutional framework related to the environment management of industrial estates and craft villages. It highlights the lack between the environmental protection institutional framework led by MONRE and the management framework implementing pollution control at the industries and industrial estates level.

Part C presents a set of recommendations for planning an intervention program for industrial pollution control based on our field assessment in Vietnam and a review of the relevant international experience in financing pollution control. The recommendations include a first budgetary assessment for centralized wastewater treatment plants for all industrial

1.3 Study limitations

The project started with a short schedule limitation for the whole study. This required the LBCD team to work in parallel, with close coordination, instead of a consecutive matter that would have allowed each team to base their work on the previous team's findings. The inventory tasks, which represent the highest numbers of work hours to gather and analyse data, required hiring sub-contractors, and local staff to complete the fieldwork within a short timeframe. This increased very much the complexity of coordination, in a context where various time-consuming administrative procedures had to be completed in order to access local information.

We would like to thank sincerely our expert subcontractors for completing data collection over the following months even if their work-hours initially planned on the project were already completed. The survey method through questionnaires showed mixed results and they expressed a professional attitude in order to provide complete data. They had to go through supplementary and extensive fieldwork and meetings with local authorities that were not planned initially.

PART A: DEVELOPMENT OF INVENTORIES

2. INVENTORIES SCOPE OF WORK

The complete Terms of Reference for this assignment are provided in Annex A. The following synthesizes the scope of work for *Task 1: Development of inventories*.

Inventory scope in the Nhue-Day river basin: The inventory focuses on the highly polluted provinces of the Nhue-Day river basin (Hanoi-Ha Tay, Ha Nam, and Nam Dinh). In those four provinces, questionnaires were distributed for the following industrial entities:

- Industrial estates (including export processing zones, industrial zones and industrial clusters);
- Polluting industries located within industrial estates
- Polluting large-scale, stand-alone industries; and
- Polluting craft villages
- Polluting industries that are candidates for relocation into industrial estates

By polluting, we mean the use of a WET INDUSTRIAL PROCESS producing INDUSTRIAL WASTEWATER.

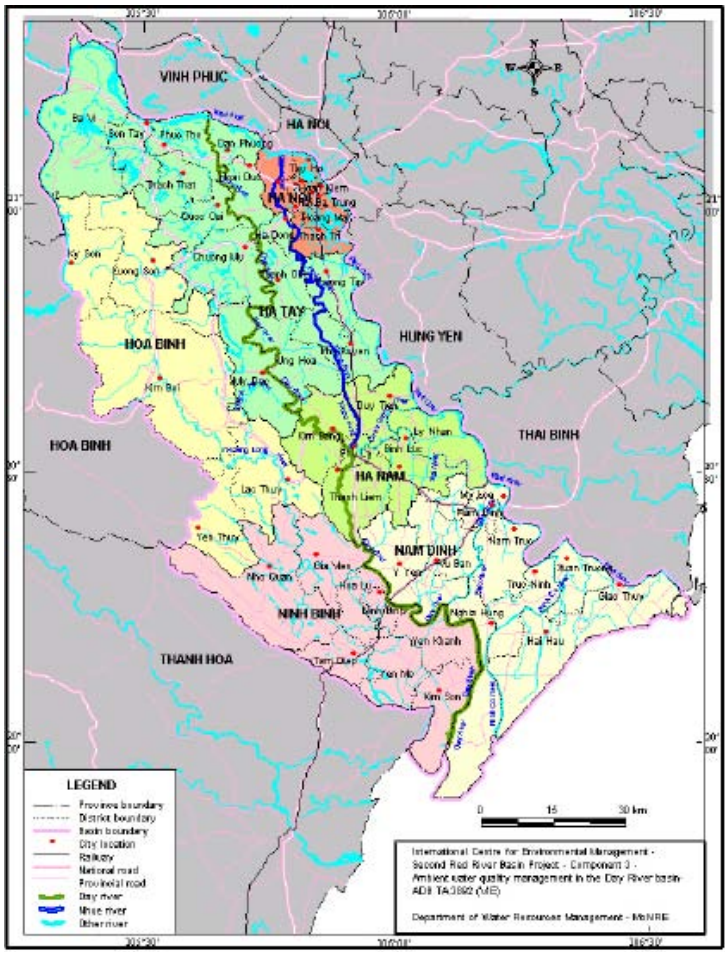


Figure 2-1: Nhue-Day River Basin administrative boundaries (*source: ICEM 2008***)**

Inventory scope in the Dong Nai river basin: because of a tight schedule for providing inventory data and the complexity of precisely defining the limits of the Dong Nai river basin, we suggested to prioritize the most industrialized provinces of the Dong Nai river basin that are polluting the fragile water supply sources of the river basin. This objective reflects that of the Dong Nai River Basin Water Resource Management Committee. For example, Thi Vai River is very polluted but is not a major water supply source. It is short and joins the Dong Nai river basin just before discharging into the sea.

This reduces the burden of data gathering to 5 specific provinces to survey (instead of the 11 that are part of the river basin):

- Ho Chi Minh
- Dong Nai
- Binh Duong
- Binh Phuoc.
- Ba Ria-Vung Tau

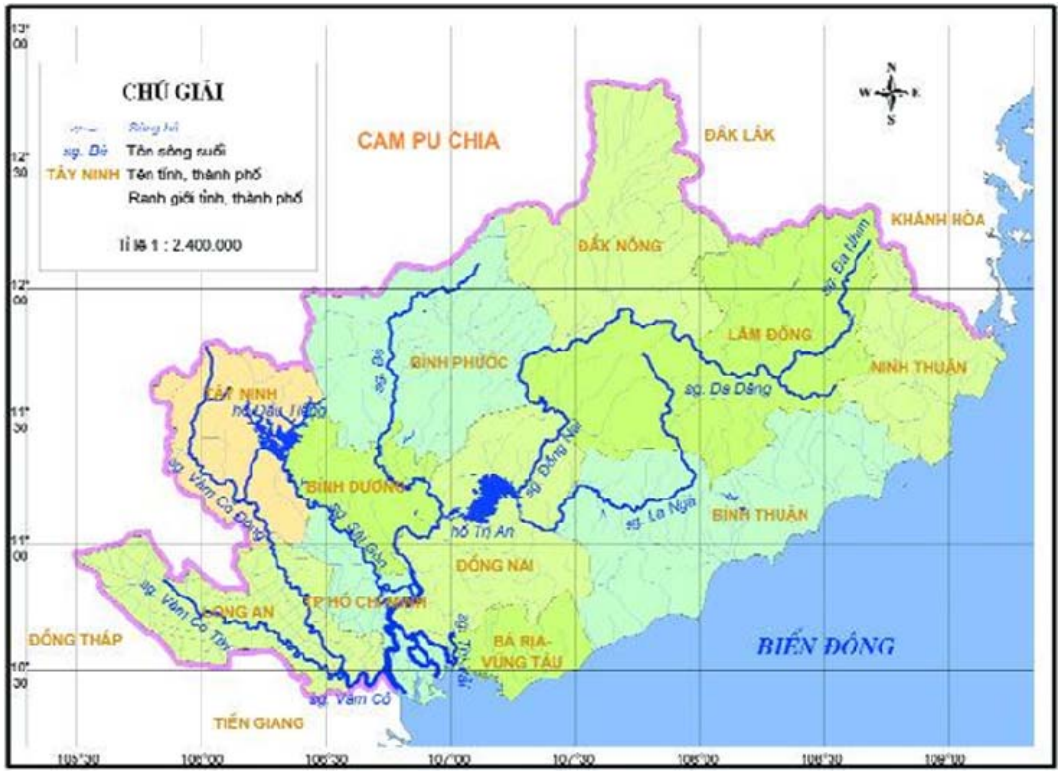


Figure 2-2: Dong Nai river basin administrative boundaries *(source: ETM center)*

According to the Terms of References, only Industrial estates should complete questionnaires in Dong Nai river basin.

2.1 Methodology for data collection

The approach for Inventory task-1 has been refined based on observations during the inception mission, discussions with MPI, DPIs and deep discussions with experts from the following research centers : CENTEMA, VNCPC (Vietnam Cleaner Production Centre), CETIA (Center of Environment for Towns and Industrial Areas) and IESE (Institute of Environmental Science & Engineering). The final methodology is supported by a fact often mentioned during most discussions: industrial estates, clusters, stand-alone industries, relocation candidates, and craft villages are under complex overlapping local management responsibilities.

Between all project tasks, the inventory task has required most of the project time, flexibility, and management skills. The survey by questionnaires was the main data collection method required by the WB. The survey forms were discussed with all stakeholders during the inception mission and the first consultation. They were then approved by the World Bank team leader and sent out to the industries with the help of the Gov of Vietnam counterpart, the industrial estates office of the Ministry of Planning and Investment (MPI).

Survey experience in Vietnam has shown that it is difficult to expect a high return level for questionnaires in such a short time, even more where respondents are industries that are suspicious to share data that is considered confidential. This project was not going to be an exception, so we planned a mixed-methods methodology for data collection. The following methods have been used to develop the inventories.

2.1.1 Survey with questionnaires

The Terms of Reference are very specific on information required to ask in the distributed questionnaires. Based on comments collected during the consultations with stakeholders, long-questionnaires were very likely to be left aside by respondents and produce a low return level of survey forms. The final versions of the questionnaires are simpler and shorter than the original version list of questions proposed by the Bank. This compromise has been found to simplify the data gathering and maximize the return level of survey forms. An official MPI letter requesting the authority and the industry to provide the required information accompanied the survey forms. A brief project description was also attached to explain the objectives of the survey as well as detailed instructions to explain how to complete and return the survey form. The sample documents are found in Annex A-2.

The consultant and the MPI- Office of Industrial Estates team set up the list of potential respondents jointly. The following table presents the construction of respondents' list. A first list of industrial estates zones could be set up directly by the MPI. The list of stand-alone industries and craft villages has been more difficult to establish and those two types of industries have been more difficult to reach by our study team in general. The main reason for that is that our counter-part, the MPI has no official authority over them.

Table 2-1: Setting up the list of potential respondents

Industrial Type	Responsible Agency	Best Respondent to questionnaire
Industrial Estates	DPIs, Industrial Management Boards	Industrial Management Boards
Industries (within IE)	Industrial Management Boards	Industrial Management Boards
Stand-Alone industries	DoIT, DONRE	Industry Manager
Craft Villages	DARD in HaNam and Nam Dinh, DoIT in Hanoi-Ha Tay	District Authorities District Authorities

The MPI required the help of their provincial DPIs to establish the links with provincial DoITs and DARDs to establish the final list of recipients. Hanoi DPI confessed to us that they could not send out a large number of questionnaires due to complexity in the reorganisation of recent merging of Hanoi and HaTay province. They only sent the survey forms to some sample industries they had good relations or to well known polluting industries.

The final number of returned questionnaire was different between provinces. By the end of May, close to 100% questionnaires from industrial estates had been returned in Southern provinces. Local experts explain this situation by the good organization in provincial Industrial Zones Authorities. On the contrary, in the North, the newly merged province of Hanoi-HaTay faced various difficulties with its new organization. Craft villages and stand-alone industries registrations were formerly managed by different agencies and there were still too much confusion to collaborate closely with this external project at this point.

By the end of May, no questionnaire from Hanoi province had been returned at all. The return level in smaller provinces of Ha Nam and Nam Dinh was about 30%. A new strategy was then conducted. The second consultation meeting was held in Hanoi at the end of May and this delicate situation was addressed with the Government representatives. Collaboration was requested with Hanoi DPIs, DoITs to work with the consultants to establish the inventory. After the meeting, communications improved with Hanoi departments: some 50 questionnaires were returned and districts offices of industry and environment showed good collaboration with field workers to establish updated lists.

2.1.2 Data collection at district level

In parallel to a close follow-up to industries and IZAs to ask the returns of questionnaires, we planned a parallel field data collection with our subcontractors to complete the database. MPI Dept of Industrial Estates assumed the leadership for accelerating the data collection by local DPIs. The expert subcontractors planned some complimentary fieldwork to visit all district authorities in Hanoi and HaTay that are part of the Nhue-Day river basin. Our experts subcontractors have visited the following district authorities: Huyện Phú Xuyên; Ứng Hòa; Mỹ Đức; Thường Tín; Thanh Oai; Chương Mỹ; Quốc Oai; Thạch Thất; Hoài Đức; Đan Phượng; Phúc Thọ; Từ Liêm; Thanh Trì; Quận Hoàng Mai, Cầu Giấy; Thanh Xuân; Hai Bà Trưng; Đống Đa and Hà Đông. In HaNam and Nam Dinh, individual meetings with districts authorities were not set, but follow up calls were given to provincial DPI and DoIT.

District authorities are well aware of the most polluting individual industries on their territory. The inventory data about Hanoi craft villages, industrial clusters, industrial points, and stand-alone industries have been updated from these meetings with Industrial officers from district authorities.

These meetings were the occasion to update the official listing of polluting industries in their districts and check for new industries or industries that had closed since. Industrial clusters and industrial points managers were met at these meetings. These smaller industrial estates are developing very quickly but few data is available publicly because many are privately managed and provincial Industrial Zone Authorities do not manage them.

Inventory data about Hanoi industrial zones their industries within are mostly the fruit of a direct collaboration established by the consultant directly with provincial Industrial Zones Authorities (IZAs).

2.1.3 Gap filling and revision methodology

Once the data from questionnaires and meetings has been incorporated into an integrated database, various methods were used to double-check the data and complete the gaps. Data received from questionnaires was double-checked over the phone with the main contact. About 5% of questionnaires were double-checked over the phone. Local experts reviewed closely all questionnaires and calls were given to industries when the data was questionable or answer denoted that question was clearly not understood.

Visits were also organized to industrial parks, clusters, and points at the time of meeting district authorities. Direct meetings to local authorities ended up being a good strategy to get quicker authorization to visit industrial estate (compared to requesting an introduction letter from MPI). In total, a direct visit was paid to about 10 to 15 estates per province over the data collection. Databases under construction were also presented at each meeting with district authorities to double-check recent industries changes.

Finally, the dataset has been compared with official lists of most-polluting industries from MONRE and provincial IZAs. These lists are available from the MONRE website and from some provincial IZAs websites (mostly Southern provinces).

3. SYNTHESIS OF INVENTORY RESULTS

The inventory database is presented in Annex A-1.

The database reveals a high number of smaller industrial estates being developed in the North (41 clusters and 57 industrial points in Nhue-Day basin compared to only 25 clusters in the Dong Nai). These clusters are located in all districts of peri-urban Hanoi and being developed very quickly in former Ha Tay rural and peri-urban districts. Ha Nam and Nam Dinh have a fewer number of industrial estates but many new estates are also being planned. As expected, most craft villages (and polluting craft villages) are located in former Ha Tay, Nam Dinh and Ha Nam.

As already documented in previous studies, the major part of all industries still belongs to the manufacturing sector: metal works, agro-food, textile, and wood products are the most important sectors. The development of formal industrial parks seems to have led a stable transfer of the biggest plants from traditional urban and urbanizing areas to organized, modern industrial sites. Largest industrial zones are mostly filled in with big state-owned manufacturing industries and foreign and joint stock industries, where good infrastructures and services are available and organized. The smaller

industrial clusters and industrial points are mostly established with more private industries and Small-Medium Enterprises (SMEs). The pollution situation of craft villages has been through more attention in the recent years due to their particular micro-scale model and their important role in the rural economic development of the Northern region[5]. The craft villages' productions are in general some heavy polluting manufacturing sectors involving a lot cheap manual work. The water pollution in these villages (involving agri-food, textile dyeing, metal, and wood and bamboo works, chemical lacquer or plastic recycling and melting) is very alarming due to proximity of household's residences.

No such similar in deep assessment had been done so far of the industrial zones or clusters in Vietnam. The general assessment of the manufacturing sector pollution load did not take in consideration the grouping approach by industrial estates for the assessment of the pollution load.

Almost none of the industrial clusters, points, and craft villages surveyed in the inventories have built waste treatment infrastructures so far. Industrial zones in the North are fewer than in the South and are more recently being developed. Most waste treatment facilities are also under planning phase or construction while 63% of the 75 operating industrial zones in the South have central wastewater treatment plant in operation (46%) or under construction (17%).

Number of Industrial Estates in Nhue-Day and Dong Nai river basins

	Industrial parks (and EPC)		Industrial Clusters		Industrial points		Polluting craft villages
	Total	Without CETP	Total	Without CETP	Total	Without CETP	(no WW treatment)
Ha Noi	13	12	37	35	43	43	257
Nam Dinh	11	10	16	16			75
Ha Nam	11	10	6	6	5	5	14
HCMC	15	2	30	28			
Dong Nai	29	20	43	42			
Binh Duong	28	9	9	8			
Binh Phuoc	19	18	17	17			
Ba Ria-Vung Tau	14	14	30	30			

Compared to the previous studies about pollution loads in the region, this study presents a lighter level of analysis. Following the previous reviews and consultations, the study was reoriented to focus on the update of too often recurrent sets of data that had been hardly field checked in the last years while traditional industries are seriously transforming and entire new zones are quickly being urbanized and industrialized.

The objective was then reoriented on specifically updating the list of industries, industrial estates and craft village that would require some interventions within an industrial wastewater management program in the river basin. As a second objective, the inventories were used to budget the potential approaches for improving industrial wastewater management for the whole Nhue-Day river basin and the industrial estates of Dong Nai river basin.

3.1 Inventories of industrial estates

This inventory includes the updated list of High-tech parks, industrial zones, industrial clusters, and industrial points in the relevant provinces. The list is updated with the operating estates and the estates

[5] Including a national focus in 2009 by the yearly extensive MONRE review about environmental pollution: *MONRE 2008 National Environmental Report on Vietnam's Craft Village Environment*

under construction or planned. Nhue-Day basin inventory demonstrate a very high number of industrial clusters and industrial points in operation and planned. There are 101 industrial zones and 94 industrial clusters in the South. Half of these are under planning or construction now. In the North, there are more twice industrial clusters and points than industrial zones. In Hanoi only, there are 37 industrial clusters, 43 industrial points for 13 industrial parks (with only 9 parks in operation now). The location of the official industrial parks is shown on province maps in Annex A-3.

In the case of a future investment program, these smaller entities will require special attention because their institutional and regulatory framework is not as well developed as the “more official” industrial zones managed by IZAs.

The inventories also demonstrate that almost none of these smaller clusters and points have wastewater treatment plant yet. In larger industrial zones, the proportion is 3 WWTP for 35 parks (8%) in the North and 42/105 (40%) in the South.

3.2 Inventories of industries within industrial estates

An inventory of industries within the industrial estates was developed for the provinces of Hanoi, Ha Nam, and Nam Dinh. While most of the data from Ha Nam and Nam Dinh province comes from returned questionnaires, few such questionnaires have been returned for Hanoi. The presented data has been updated with each industrial zone authority and industrial cluster/points managers at the district level. More than 600 industries are detailed for the province of Hanoi and 45 industrial estates. The data also shows that small and medium industries rarely present some kind of wastewater (pre-) treatment at the industry level.

3.3 Inventories of polluting craft-villages

Most of the craft villages are located in the former province of Ha Tay. The inventory was developed with both the managing (former Ha Tay) DoIT and revised at each district authorities to update (and validate) the official list that is circulating in numbers of official publications. One of the main lessons from this data collection is that many diffused data about craft villages pollution load is based on repeated assumptions and estimations. A comprehensive sampling and analysis campaign would be required to update these pollution load models.

3.4 Inventories of large-scale, stand-alone polluting industries

The inventory of large-scale, stand-alone industries is also the fruit of discussion with district authorities. This list represents what the local authorities were seeing as their largest polluter on their territory. Large-scale industries are usually well known by the district authorities as they are big local employers and district authorities are often called out to work with DONRE to coordinate pollution complaints and identify polluting sources in the district. All these industries are producing contaminated wastewater that is potentially harmful to the human health.

These industries usually discharge their wastewater directly to the environment without centralized treatment plant. The wastewater discharge permit emitted by DONRE controls the pollution level. The industries not complying with the DONRE discharge standards are listed on the official MONRE list of polluting industries. MONRE has published its list of polluting industries with its sampling and analysis campaign results.

Our inventory lists these polluting industries with the 2008 MONRE wastewater analysis results. Only two industries from Ha Nam and two from Nam Dinh are on the MONRE list, most polluting industries are located in Hanoi. However, most district authorities have told us that many industries still don't have wastewater discharge permit from DONRE, so many are still not officially controlled for pollution due to limited capacities.

The hazardous waste production has been difficult to identify with district authorities, as the hazardous wastes are not managed locally but by regional companies. Only some industries that have returned individual questionnaires detailed their hazardous waste.

3.5 Inventories of industries that are candidates for relocation

Industries candidate for relocation in Nhue-Day river basin are limited to the urban territory of Hanoi. The criteria for relocation in Hanoi are not specific enough to establish an official list of industries to be relocated. Discussions with DONREs officials in Hanoi concluded that such list was not official as MONRE and PPC officials were processing on a case-by-case basis to convince the most polluting urban industries to reduce their pollution. An improvement of the production process and pollution treatment is first considered before any relocation process. Officials see relocation as a last resort solution. Therefore, the government of Hanoi does not publish a list of candidates for relocation. Relocation criteria and procedures are reviewed in chapters 12 and 17 of this report.

Many industrial points are planned by the provincial and district authorities to relocate the most polluting craft villages. However, most industrial points are still not in operation, or not even under construction. It appears that clearing the agricultural land for new industrial development is a problem at the local level. This is discussed later in part B: Institutional analysis. However, the developed land will not be given in priority to polluting craft households but to households that can potentially expand their business by investing in this new land. Therefore, hardly any craft village or particular households could certainly be relocated. The few identified craft villages to be relocated (or "expanded") are identified in the database.

3.6 Inventories' main findings

The database is comprehensive as it includes, for the first time in the same exercise, the exhaustive list of all industrial estates, industries and craft villages causing industrial pollution in the river basin, including the non-official estates as private the industrial clusters and the locally managed industrial points and crafts villages.

The inventory's main findings are:

- Industrial parks development in the North is more recent and waste facilities have not been built yet.
- Industrial parks in the South have their wastewater treatment facilities built or under planning or construction in most of the cases.
- Smaller Industrial clusters and points are very numerous and have not built wastewater treatment plants yet (in both south and north). They may be responsible for the highest discharge of industrial water pollution.
- In the North, the upstream province (Hanoi) is contributing for most of the industrial pollution in the river basin due to its immense large number of industries (and population) compared to downstream provinces like Ha Nam that face a high river basin pollution while presenting low number of industries and low population.

- In the South, the downstream provinces Dong Nai, Ho Chi Minh, and Ba Ria-Vung Tau are contributing for most of the industrial pollution in the river basin.

Most industries and industrial estates are located in suburban districts where neither municipal sewers nor centralized municipal wastewater treatment was available. Furthermore, the centralized monitoring of pollution at the municipal level would add up a level of governance and accountability that our data collection demonstrates to be significantly low.

The data collection process itself provided very useful lessons. Data organization about polluting industries and pollution monitoring was sparse and complex due to too many institutions. Very complex regulation to follow could also mean easier way of delaying or escaping enforcement and fines. Apart from the comprehensive institutional assessment presented in the next section, the data collection at the various governing offices brought the conclusion that the most accountable institutions now were the closest administrative level to the industries themselves: the districts people's committee for smaller clusters, points and industries, and the industrial zones authorities (IZAs) for industries within industrial zones.

That is what led to the recommendation of prioritizing a governance approach by industrial estates rather that by industrial sectors, or by a geographical approach (or strict river basin approach) as a next step in the development of an intervention program.

A river basin approach requires a very exhaustive set of updated data including all sources of pollution and an integrated action that may complicate the institutional structure that is already missing the resources to update and manage according to the existing regulation framework.

4. DATABASE MANAGEMENT: NEXT STEPS

The work undertaken to update this first inventory of polluting industries have gave us precious insights about the organization of data in Vietnam. Here are our main recommendations for expansion and updating the database in the near future.

A majority of industries have no updated data about wastewater flow or characterization (only 7% have wastewater discharge permit). Most of the missing wastewater data may not exist at all.

MONRE-DONREs should be the main partner of the River Basin Committee for establishing updated inventories. Under the Law on Water Resources (LWR), it is forbidden to discharge untreated wastewater in the environment without declaring to DONRE by applying for a WWDP. Such an inventory shared with DONREs would provide a solid database and build improved capacities for pollution control and water resources management in the River Basin.

4.1.1 DONREs-DARDs

Through the process of according wastewater discharge permits, DONRE and DARD are keeping up files of all industries discharging wastewater. A WWDP is required for households and industries discharging more than10 m^3/day wastewater in the environment, including industrial wastewater treatment plants. When the industry is discharging into an irrigation canal, the permit is issued by the provincial Department of Agriculture and Rural Development (DARD). If the daily discharge exceeds 5 000 m^3/day, the national Ministry (MONRE or MARD) issues the permit. According to our investigation, DONREs (data from WWDP) are the only source of information about wastewater discharges in the country. If an industry is not registered with a WWDP, it is not likely to have any information about its waste or wastewater discharge content.

Various provincial officials met during our field visits believe that a high proportion of polluting industries are not registered with a WWDP. This is confirmed by a survey executed for the Water Sector Review[6] that showed that only 7% of industries that would need a WWDP are currently registered.

The WWDP has not yet been adapted to respond to *craft village's* particularities. At the moment, each individual household would be required to apply for a WWDP, which they do not. However, craft villages are officially managed by provincial DARDs (and DOIT in HaNoi-HaTay), so lists of operating craft villages can at least be established.

According to Circular 12/2006, **hazardous waste** producers must also apply to Vietnam Environmental Protection Agency (VEPA) for a Registration Book before they can manage their wastes off-site. A Registration Book is a document granted to the owners of hazardous waste sources, which contains information on registered types and amount of hazardous waste generated and definition of the owner's responsibilities. Field visits and actual DONRE data have shown that Registration Books process present the same lack of actual implementation as WWDPs.

4.1.2 Industrial Zones Authorities-DPI

Industrial Zones and Export processing zones are managed by their provincial Industrial Zones Authorities (IZAs). With the issuance of Decree 29 and Decree 62, IZAs are responsible with the Environmental Impact Assessment (EIA) and environmental management in their industrial zones. Each IZA has now established an environmental department to tackle their new responsibilities. Some IZAs seem to have developed more capacities in environmental management than others, like HEPZA in HCMC that has posted the list of polluting industries on their website with the necessary compliance. IZAs are definitely gathering lists of information relevant to the industrial management.

4.1.3 DOIT-MOIT-District authorities

In order to complete the assessment of polluting industries, MONRE and DONRE lists have to be complemented with lists existing of industries potentially discharging their wastewater into the river basin and its tributaries. These lists can then be analyzed for: (1) eliminating non-existing and non-polluting industries; (2) to assess production process and pollutant discharge of all "potentially" polluting industries by site visits, sampling and monitoring.

List of operating industries can be complemented with official registries found in Department of Industries and Trade, in Ministry of Industry (for big state-owned industries) and in district authorities. Those administrative units are more likely to have very enormous lists of thousands of industries and businesses that may not be updated or where sorting out of polluting industries may be a huge challenge.

District authorities may also be the main administrative unit for Industrial Clusters. Some clusters are operated directly by district authorities, where some clusters have been established privately. Private clusters and their industries may be more difficult to list because they are not required to monitor their current operations the Government.

[6] Kellogg, Brown and Root Pty Ltd (2009) TA 4903 *Water Sector Review Project* prepared for the Office of the National Water Resources Council on behalf of the Government of Vietnam and a number of international development partners led by the Asian Development Bank.

Database use for further studies

The inventory format as it's been developed could also be combined with sets of geographical data and other sets of regional pollution sources data for detailed analysis of the pollution load in the region. MONRE river basin committees, in both Nhue-Day and Dong Nai, are establishing that kind of comprehensive database and Geographic Information System (GIS).

In parallel, we are aware of two international projects that have shown interest in keeping up with the building of the database. The first one is the Vietnam-Canada Environmental project. In its second phase, the project financed by the Canadian International Development Agency aims at building capacities in environmental management and monitoring within DONREs from provinces. The second project is the Nhue-Day river basin management project financed by the Asian Development Bank with MONRE. It is precisely one of the objectives of the Nhue-Day river basin project to develop a database of the river basin polluting entities. These two projects have shown interest in sharing resources and staff to complete and share the interactive inventory with their Gov of Vietnam counterparts.

PART B: ASSESSMENT OF THE REGULATORY AND INSTITUTIONAL FRAMEWORK FOR INDUSTRIAL ESTATES AND CRAFT VILLAGES

As identified in the ToR, the objective of this section is to assess:

(i) the regulatory framework for industrial estates and craft villages in Vietnam;
(ii) the institutional framework for industrial estates and craft villages in Vietnam.

The assessment aims to clarify the environmental responsibilities within industrial estates and craft villages. It will assess the gaps and challenges in the system, and propose specific measures for strengthening the institutional framework for industrial estates and craft villages in Vietnam.

5. METHODOLOGY

The methodology was designed to achieve the following objectives:

- **Inventories of policies and regulations and reviews of existing studies**

The first step undertaken was the development of inventories of policies, regulations and legislation related to industrial estates and craft villages. This inventory was done at two levels:

- National level: Law, Decrees, Decisions, and Circulars issued by various government bodies;
- Provincial/city level: Decisions issued by the City/Provincial People's Committees

In addition to the national legal documents, City/Provincial People's Committees could also issue regulations on environmental protection, industrial estates and craft villages in accordance with competences delegated to them by the State and based on the national regulations. These regulations have not been analyzed in full depth due to time limitations In addition, translations in English are not always available and translation of such documents is time consuming. Therefore, only a general analysis of the main issues linked to industrial estates and craft villages has been conducted.

An assessment of the regulatory framework has been prepared in order to address the main gaps, overlaps and inadequacies.

As explained above, existing studies from the WB and the Water Sector Review were reviewed. Some findings and recommendations from these studies were also included in the present study.

- **Meetings with relevant agencies**

Various agencies (DoIT, DONRE, DPI, IZA, and IDC) were met in 3 city/provinces in the North (Hanoi[7], Ha Nam and Nam Dinh) and 4 in the South (HCMC, Dong Nai, Binh Duong, Binh Phuoc). Annex B-1 presents the list of agencies and persons met.

Semi-structured interviews were prepared for these meetings. The main purpose of these meetings was to clarify the different responsibilities of various agencies involved in the management of industrial estates and craft villages; to identify the problems encountered during implementation of environmental control measures, and to look for possible improvements.

[7] Since 2008 Ha Tay province and Hanoi City have merged. Hanoi City now includes the former territory of Ha Tay province.

Due to time limitations, it was sometimes difficult to meet with all the relevant agencies in all the provinces/cities. It was particularly difficult to meet representatives of DONRE in all the provinces.

5.1 Limitation of the Study

This study is the result of 1 month of work by the international consultant, including 2 weeks of field work, and 1, 5 months by the national consultant.

Due to time and budget limitations, the study does not constitute a full evaluation of the regulatory and institutional framework for industrial estates and craft village in Vietnam. Significant resources and time are needed for a rigorous assessment of all regulations that deal with some aspect of industrial estates and craft villages. The study identifies the main gaps, overlaps and inconsistencies among the existing regulation. However, a complete assessment will need further review and analysis.

The regulatory framework related to industrial estates and craft villages is changing rapidly and is complex. Several regulations are actually under preparation and will be issued soon. Therefore some findings and recommendations of this report will probably have to be updated in the coming months.

However, a large number of persons, from various agencies involved in industrial estates and craft villages, were met for this study (over 60) in 7 provinces/cities and a large number of regulations, contract and studies have also been reviewed in a short period of time. This was sufficient to ensure a comprehensive assessment of the regulatory and institutional framework for industrial estates and craft villages.

6. THE GENERAL REGULATORY FRAMEWORK

Industrial estates and craft villages are submitted to numerous laws and decrees concerning in particular pollution management. The national regulation on the environment and, especially, the Environmental Protection Law (LEP) and the Law on Water Resources (LWR) have been described in many recent documents[8]. This review will focus on recently promulgated legal instruments, particularly regarding permit requirement, environmental protection including targeted initiatives for severe polluters, economic tools, sanctions for administrative violations and the relocation of industries.

6.1 Socio-Economic Development Plan 2006-2010

The five-year Socio-Economic Development Plans (SEDP) identifies development strategies, but also sets development and investment targets. The MPI is responsible for the implementation of the SEDP. The SEDP has sections on environmental protection, conservation of natural resources, and sustainable development. Some major targets must be reached by 2010, including those most relevant to industrial pollution management. These targets were updated in December 2008 for the 2009 Socioeconomic Development Plan[9]. For 2009, they are:

- 65% of seriously polluting establishments will have their pollution treated;
- 82% of solid waste will be collected;
- 65% of hazardous waste will be treated;
- 65% of operating industrial parks will have systems treating wastewater.

These targets, even if they have been reduced from the first socio-economic plan, are still unrealistic.

6.2 Law, Decrees, Circulars and other Documents

Annex B-2 lists the national policies, regulations and legislation linked to industrial estates and craft villages and highlights the key-points of these regulations. The regulations have been divided in the following categories:

- Industrial Parks
- Requirements for Permits related to the Environment
  - Environmental Impact Assessment
  - Environmental Commitment
  - Environmental Protection Scheme
  - Waste Water Discharge
  - Registration Book for Owners of Hazardous Waste Sources
- Environmental Fees & Sanctions
  - Waste Water Fees
  - Solid Waste Fees
  - Sanctions
- Establishment Causing Serious Pollution/relocation of industries
- National regulations specific to craft villages
- River Basin Management;
- Hazardous Waste
- National regulation related to land acquisition and resettlement
- Provincial regulations
- Vietnamese Standards linked to waste water discharge

[8] Giovanna Dore, Philip Brylski, Jostein Nygard, and Phuong Thi Thanh Tran. 2008. Review and Analysis of the Pollution Impacts from Vietnamese Manufacturing Sectors; EASRE, The World Bank; Washington, D.C.

[9] Resolution No. 23/2008/QH12 from the National Assembly issued on 6 November 2008.

- Vietnamese Standards linked to hazardous waste

7. REGULATORY AND INSTITUTIONAL FRAMEWORK PERTAINING TO INDUSTRIAL ESTATES

Industrial estates includes: i) industrial parks; ii) export processing zone; and industrial clusters. The term "industrial zones" is often used in the regulations and is assimilated to industrial parks.

7.1 Industrial Parks

7.1.1 Regulatory Framework

Table 7-1 and Annex B-2 (1 to 4) summarize the main regulations related to industrial parks.

- ***National regulations***

The GoV. has established a national framework for industrial parks (IPs). Three main regulations are covering Industrial Parks:

- Decree 29/2008/ND-CP;
- Decree No. 88/2007/ND-CP;
- Circular No. 08/2009/TT-BTNMT[10]

These 3 regulations originate from different ministries which have not the same objectives (MPI, MoC, MONRE). There are some inconsistencies/overlapping between the different regulations for industrial parks. While the LEP, former Decree 62 and Circular 08 required the building of a CETP prior to the operation of the industrial park, Decree 29 required a CETP only in the case of expansion of the industrial park. Circular 08 indicates in addition that Industrial Estates and Clusters, which have operated without concentrated wastewater treatment plants, shall build and commission such plants before December 31, 2010.

While the vast majority of IPs in Vietnam, including many of those recently established, have no or inadequately installed capacity and management systems for pollution prevention and control, the provisions of the LEP and former Decree 62 concerning waste water management have been, most of the time, not taken as conditions for the establishment of an industrial zone.
Paragraph deleted

- ***Provincial regulations***

Provinces are also issuing regulation related to environmental protection. These regulations also cover industrial estates.

- Binh Duong Province issued Decision 68/2008/QD-UB on December 12, 2008 on Regulation of Environmental Protection. Chapter V, Section deals with Environmental Protection in IP and IC.
  - Article 47.4 stipulates that all Industrial Parks and Industrial Clusters should have a CETP and wastewater discharge collection system.
  - Article 48.2 stipulates that: an industry can start operation only when the conditions of article 47 have been met (i.e. if a CETP is in operation).

[10] Circular No. 08/2009/TT-BTNMT replaced in September 2009 Decision 62/2002. Because Decision 62/2002 (from MOSTE, former MONRE) was in used during the last 7 years, we will still sometimes refer to this Decision.

- Dong Nai Province issued Letter 702/KCNDN-QHMT dated July 17, 2008. This letter was sent to the 15 IPs of the province and indicates: "Pursuant to the Article 36 of LEP 2005, letter 860/UBND-CNN dated Jan 29, 2008 issued by Dong Nai PPC, in 2009 Dong Nai Industrial Zone Authority (DIZA) will not review or approve any certificate of investment within an IP without a CETP in operation".

Even if it is not a clear requirement from the national regulations, some provinces, in their own regulation, require a CETP before the start of operation of all new IPs.

7.1.2 Institutional Framework

Table 4-1 summarizes the roles of ministries at the national level regarding industrial parks.

7.1.2.1 Ministries at National and Provincial/District Level

The main ministries involved in the management of industrial Parks are:

- The Ministry of Natural Resources and Environment (MONRE)
- The Ministry of Planning and Investment (MPI)
- Ministry of Construction (MOC)
- The Ministry of Industry and Trade (MOIT)

7.1.2.2 Agencies at Provincial/District Level

All Ministries have branches at the provincial and district level.

- ***DONRE***

  Following the issuance of Decree 81 in 2007[11], each DONRE now has an environmental protection agency. The first provincial EPA was established in 2004 in HCMC. It was seen as a business organization to earn income for HCMC. In 2007, MONRE established EPAs in each province. EPAs were an extension of the former Division of Environmental Management. However, in HCMC, because the EPA was already set-up, they have kept the EPA and the Environmental Management Division separate.

  DONREs have no real authority within industrial parks due to the transfer of authorities to IZA through Decree 29. However, even with this transfer of responsibilities, good cooperation between DONRE and IZA is necessary. DONRE will always control discharge outside the IP from industries or from CETP.

- ***Provincial/City People's Committees***

  Over the past 15 years, part of the institutional framework and mandate for the decentralization of environmental management has been transferred to the PPC, DONREs and other agencies and organizations. PPCs could also be the owners of infrastructures, (in particular CETP) if they have been invested with state budget funds. Some PPC also owned industrial parks.

- ***DOIT/DPI/DOC***

  DOIT/DPI/DOC have the same responsibilities as MOIT/MPI/MOC at the provincial level.

[11] Decree No.81/2007/NĐ-CP of May 23, 2007, on establishment of Provincial Environmental Protection Branches under DONREs

The ICEM/2007 report (p 225) analyses the situation of ministries with dual responsibilities (ownership and control of industries and industrial parks) at national and decentralized levels, notably the MOIT, MOC, MPI and their departments in the provinces and districts.

As industrial pollution intensifies in parallel with industrial growth, each of the above ministries responsible for managing and regulating industrial sectors is concerned with pollution issues. Further complicating their task is the continuing high level of industry ownership by these same Ministries. Therefore, contentious and often contradictory decisions are required of these Ministries to adjust their industrial development strategies, maintain employment and be in accordance with environmental protection objectives. Pollution control in the country largely rests on the commitment and capacity of these Ministries to take effective action to implement the necessary environmental policies and strategies.

7.1.2.3 Industrial Zone Authorities[12]

Each province and city has established an industrial zone authority (IZA). The IZA is a State Management Organization, which has been established by the Prime Minister. IZA is under the direct authority of the Provincial/City People's Committees. IZA manages all industrial parks (state-owned and private) within the province/city. Tasks and responsibilities of IZA, in particular related to environmental control, have been considerably increased with the issuance of Decree 29. Main tasks included: EIA review and evaluation, guiding procedures, cooperating with relevant agencies in environmental monitoring.

The IZA is organized as a department of the PPC and reports to the PPC on all subjects concerning IZs. The IZA oversees the activities of the infrastructure companies of all IZs in the province .

Each IZA has now established an environmental department to tackle their new responsibilities assigned by the GoV. Currently these departments are not well staffed and financed to fulfill all their responsibilities, but their capacity is growing. Presently, most of their tasks are still reviewing EIA; other tasks should be added soon. Even if at this moment, the environmental management demands are well beyond their resources and capacity to cope, in the future they could build strong environmental departments and be able to control environmental pollution.

With the issuance of Decree 29, IZA is becoming the key actor for IP management in general and for environmental protection, in particular. It is likely that IZA will become the main gate for environmental management and control for industries within IP. Due to their proximity to industries and infrastructure companies and their authority among industries, IZA is a good body to have the main responsibilities for environmental protection within IP (issuance of permits, approval of EIA, monitoring, sanctioning). However, reporting and strong coordination with DONRE is necessary to ensure uniformity of environmental management through the entire industrial sector.

7.1.2.4 Infrastructure Development Companies

Infrastructure development companies (IDC) are companies established for the purpose of developing the infrastructure of industrial parks. Infrastructure companies are mainly business companies who invest in and operate industrial parks. Large IDCs, like Vinaconex, Becamex or Sonadezi, are present in several industrial parks. They are the owners of the infrastructures and especially of CETP where they exist.

[12] Industrial Zone Authorities correspond to the management board of an industrial park in various regulations;

These large infrastructure companies are not only involved in the development of infrastructure for industrial parks but also in real estate, civil and industrial engineering; construction material production; port, storage and transport trading; water and water equipment; and service. Where Industrial parks are state-owned (as most parks in Nam Dinh province), IDCs are also state-owned. Where the park is private (as many park in the South), IDCs are then privately owned.

The infrastructure company is responsible for the development of the IZ and the renting of estates to industries. The management boards are also responsible for all infrastructure at IZs, including sewerage and common waste water treatment facilities.

IDC are on the front lines regarding the compliance of industries. Through the contracts they create with industries, IDC have direct control over industries and, in particular, over pollution control (waste water discharge standards). Therefore, it could be useful to use the contracts to improve pollution control. As indicated in Section 8.1.3, an environmental clause should be added to the contract to improve control of industries' compliance with environmental protection requirements.

7.1.2.5 Industries

In principle, specialized environment section must be available in every production plant. However, only industries which have to comply with ISO standards have competent staff. Most of the industries doesn't have any staff specialized in environment field. Environmental awareness among industries is necessary.

7.2 Industrial Clusters

Industrial clusters are usually small-scale industrial zones even if some large industries might be established in these clusters. To be established, industrial clusters only require a decision from the district area, while for industrial zones, a decision at the national and provincial level is needed. Industrial clusters can be defined as a 'clustering' or high concentration of industrial facilities within a limited geographical area. Industrial clusters are managed at the provincial and district level.

Up to now, there was no specific regulation on industrial clusters as is the case for industrial parks or craft villages. However a new Decision, No. 105/2009/QĐ-TTg by Prime Minister on industrial cluster management was issued on 19 August 2009 and will take effect on 5 October 2009. This decision includes a clear definition of industrial cluster as well as mechanism, policies and administrative management for clusters. In particular we should note that Decision 105 requires an existing CETP for expanding clusters of 15 ha and more. However Circular 08 ask for a CETP for all Industrial Clusters.

The Decision has not mentioned the roles of DONRE for IC environmental protection for IC or industries within IC. Some provinces issued regulations covering clusters.

Management of industrial clusters is not well defined and varies from one province to another. Even within one province, industrial clusters may be managed by several different entities.

Industrial clusters have less financial capacity than industrial parks. Therefore, infrastructure is generally limited. Very few industrial clusters have a CETP.

7.3 Stand alone industries

Stand alone industries were not included in the ToR for this Regulatory and Institutional Framework (Task B). The regulatory and institutional framework for pollution management of stand-alone industries was more extensively covered in previous studies about the manufacturing sector in Vietnam. ICEM (January 2007) technical report and following World Bank report[13] have reviewed the framework related to stand-alone industries and MONRE and DONRE roles, as well as the functions of MOI and industries managers.

However some information was collected about these types of industries. Stand-alone industries are often old industries located in urban or rural areas. It could also be a concentration of several industries. However, at the difference of industrial clusters, there is no comprehensive management and infrastructure system for this type of industries. Big scale stand-alone industries are under the management of ministries at the national level. A special regulation framework does not regulate stand-alone industries. As for industrial clusters, they have to comply with the national and provincial environmental regulations.

Table 7-1 presents, in a matrix form, the legislation, the agencies responsible, the main findings and the room for improvement for the establishment and the management of industrial parks, industrial clusters and stand alone industries.

[13] International Centre for Environmental Management. *Analysis of Pollution from Manufacturing Sectors in Vietnam. January 2007. Technical Repor*t. Prepared for the World Bank-MONRE-MOI.

Dore Giovanna, Philip Brylski, Jostein Nygard, and Phuong Thi Thanh Tran. 2008. *Review and Analysis of the Pollution Impacts from Vietnamese Manufacturing Sectors*; EASRE, The World Bank; Washington, D.C

Table 7-1: Analysis of Legal and Institutional Framework linked to Industrial Estates

Legislation	Agency responsible	Findings	Possible improvement
INDUSTRIAL ESTATES			
Establishment of Industrial Parks			
– LEP 2005 – Decree 29/2008/ND-CP, March 14, 2008 providing for Industrial Parks, Export-Processing Zones and Economic Zones (at the proposal of MPI) – Decree No. 88/2007/ND-CP of May 28, 2007, On urban and industrial park water drainage (at the proposal of MoC) – Decision No. 62/2002/QD-BKHCNMT, August 9, 2002. Regulation of the Protection of the Environment in Industrial Parks (at the proposal of MOSTE former MONRE) replaced by Circular No. 08/2009/TT-BTNMT of July 15, 2009, providing for the environmental management and protection of economic zones, hi-tech parks, industrial parks and industrial complexes (MONRE).	– Chairman of provincial-level People's Committees shall decide on the establishment or expansion of industrial zones already incorporated into the approved Master Plan on Development of Industrial Zones	– Resettlement is the main obstacle in the establishment of industrial zones due to the increase in land prices, especially in suburban areas, where most of the industrial estates are located. – The LEP clearly indicates the necessity for all industrial zones and even craft villages to build waste water treatment systems – The provisions of the LEP and former Decision 62 concerning waste water management have been, most of the time, not taken as conditions for the establishment of an industrial zone	– Some provinces (Binh Duong, Dong Nai) chose to comply fully with the LEP and require a CETP before the start of operation of all new IPs. Other provinces should follow these examples. – The issuance of guidelines to implement Decree 29 is needed rapidly to clarify the roles of each agency.
Management of industrial Parks			
– Decree 29/2008/ND-CP, March 14, 2008 providing for Industrial Parks, Export-Processing Zones and Economic Zones (at the proposal of	– **MONRE** - Issue regulation on management and protection of the environment; - Guidance to local agencies for their	– There are a number of serious overlaps and inconsistencies about how these general responsibilities can be interpreted	– MOIT/DOIT, MARD/DARD, and IZA have established environmental departments. However, the environmental

Legislation	Agency responsible	Findings	Possible improvement
MPI) – Decree No. 88/2007/ND-CP of May 28, 2007, On urban and industrial park water drainage (at the proposal of MoC) – Decision No. 62/2002/QD-BKHCNMT, August 9, 2002. Regulation of the Protection of the Environment in Industrial Parks (at the proposal of MOSTE former MONRE)	tasks related to the environment; - Impose sanctions – **MPI** - Development of industrial parks. - Issues investment certificates – **MOC** - Responsible for infrastructure related to waste management (including waste water treatment system) – **IZA** - approval of EIA, inspection examinations, sanctions for administrative violations – **Industrial Development Companies** - Maintain and operate infrastructures (including CETP) - Collect fees from industries – **DONRE** - Responsible for supporting the PPC with issues related to environment. – **Provincial/City People's Committees** - PPCs could also be the owners of infrastructures, (in particular CETP – **DOIT/DPI/DOC** - DOIT/DPI/DOC has the same responsibilities as MOIT/MPI/MOC at the provincial level.	and undertaken by individual Ministries and Agencies. – The most important areas of overlap and inconsistency are: - The responsibility for EIA approval appears to be divided between MONRE/DONRE and IZA. In some provinces/cities (DONRE) has kept the EIA responsibilities while in others, IZA is claiming responsibility under the new Decree 29/2008. – Inspection powers are shared by MONRE/DONRE, IZA, the infrastructure companies and the environmental police. These multiple responsibilities can lead to varying interpretations of the requirements and confusing advice and compliance efforts protection – DOITs have created environmental departments (usually 2 staff). However, the tasks and responsibilities of these staff are not clear. Currently, they mainly participate in EIA review and approval. They are also involved in safety issues.	protection departments need to be strengthened with adequate staff numbers, training, budgetary resources and authority within the ministry. There is a need, in particular, for IZA to strengthen their environmental department if they want to assume their role. – Coordination between IZA and DONRE is essential. If not, DONRE will not be informed of problems until they affect neighbouring communities. – It is expected that the new regulation to be issued by MONRE on environmental will clarify the monitoring role. – Most of the environmental responsibilities within Industrial Parks could be given to IZA, which are closer to industries and infrastructures companies.
Management of Industrial Clusters			
– New Decision, No. 105/2009/QĐ-TTg	– Industrial clusters are generally under	– However, environmental	– Some provinces (Ha Nam)

Legislation	Agency responsible	Findings	Possible improvement
by Prime Minister on industrial cluster management was issued on 19 August 2009 and will take effect on 5 November 2009. This decision includes a clear definition of industrial cluster as well as mechanism, policies and administrative management for clusters. – Some provinces issued regulation on industrial clusters (Binh Duong, Ha Nam)	the responsibility of DOIT – In some provinces, all industrial clusters (Hanoi-Ha Tay) or some (Ha Nam) are under the responsibilities of IZA. – Infrastructure companies like with industrial parks manage the largest industrial clusters. This is the case, for example, in Ha Nam Province. – DONREs are in charge of the implementation of all environmental regulation for clusters. In particular, DONREs issue various permits and WWDP to all industries. – Clusters are also managed at the district level under Divisions of Natural Resources and Environment (DNRE) established in 2004. DNRE are responsible for the implementation of state managerial function in term of environment protection at district level under the guidance of DONRE.	management within DoIT is limited. All DoITs have created environmental departments (usually 2 staff). However, the tasks and responsibilities of these staff are not clear. They are also involved in safety issues. – DOIT' environmental staff only participate in EIA reviewing and approval. They also provide general statistics and basic information but without really implementing environmental control measures.	issued Regulation on investment and management of industrial clusters and small-scale industries. Other provinces could take example from Ha Nam – DONRE at district have only one or two employees and are often not able to manage environmental issues. Strengthening of DONREs at district level is needed.
Management of Stand Alone Industries			
– No specific regulation at national and provincial level	– Large scale stand alone industries are under the management of national ministries (MPI, MOIT, MONRE) – Small scale stand alone industries are managed by PPC	– Because these industries are often managed at the national level, there is not regular follow-up of their activities. In case of environmental problems, local people have little power, they can just report to higher level. This leads to delays in solving the problems.	– Management of stand-alone industries should be done at the provincial or district level, if DONREs at district level are strengthened. .

7.4 Hazardous Waste Management in the Industrial Sector

Table 7-2 present a summary of hazardous waste (HW) management in the industrial sector. Results of the meetings with various stakeholders, indicate that industrial hazardous waste treatment systems are largely inadequate in industrial estates

7.4.1 Actual practices

Given the lack of combined treatment facilities and limited incentives for safe disposal, many industries practice a variety of unsafe methods of treatment and disposal (mixed with non-hazardous waste, collected and treated by companies without license, kept at site, discharged with wastewater or recycled or sold).

As indicated in the effective waste management for Vietnam project[14] and as noticed during our meetings, for larger industries and industrial zones, some common practices are emerging, including using simple furnaces or industrial boilers in nearby industries or specialized waste treatment enterprises. However these practices are not generalized.

Meetings with IZA and Infrastructure development companies showed that no IDC is managing hazardous waste within industrial parks. Individual industries manage hazardous wastes by themselves. As indicated in section 8.1.3 a service contract, between industries and IDC, with environmental clause could include the management of HW. This will help a sound management of hazardous wastes.

7.4.2 Implementation of Hazardous Waste Requirement at the Provincial Level

Only some provinces have started to implement the hazardous waste requirements. The capacity in these and the remaining provinces is limited. A range of training manuals, guidelines and protocols will be needed to assist in implementation.

During our meetings in Nam Dinh province, we were informed that a hazardous waste management project has been set up in Nam Dinh Province by the Swiss Agency for Development and Cooperation[15] This project is implemented by DONRE. The main objectives of this project are the following:

- Enhancing the capacities of DoNRE, other departments and Nam Dinh institutions and develop the infrastructure necessary to implement the Hazardous Waste Management Strategy in the province.
- Contributing to the implementation of the Van Chang Craft village subproject and develop a model to transfer the lessons learned to other provinces and the national government thus raising the developmental impacts of hazardous waste management project to a higher level.

The second phase of this project has just started. It includes establishing a Hazardous Waste Management Unit in DONRE, the selection and training of staff for the Unit, inventory of hazardous wastes in industrial parks, the design and construction of a hazardous waste transfer station and the development of an associated collection system.
Results of this project could be used as a model for managing HW by DONREs for the industrial sector.

[14] http://www.waste-viet.com/en/waste-management-vt/
[15] Swiss Agency for Development and Cooperation Hazardous Waste Management Project in Nam Dinh http://www.sdc.org.vn/en/Home/Programmes/Rural_Livelihood_and_Natural_Resource_Management/Hazardous_Waste_Management

Table 7-2: Summary of Management of Hazardous Waste in the Industrial Sector

Legislation	Agency responsible	Findings	Possible improvement[16]
Hazardous Waste			
– Amended Law on Environmental Protection (No. 52/2005/QH11) Chapter VIII, paragraph No.2. Articles 70 to 76 – Decree No. 59/2007/ND-CP of Government dated April 9, 2007, on solid waste management – Decision 155/1999/QD-TTg on the Promulgation of Regulation on Hazardous Wastes Management – Decision 23/2006/QD-BTNMT, 26 December 2006List of Hazardous wastes (Updated List of HWs in HW Regulation 155 and TCVN 6707 – 2000 – Circular 12/2006/TT-BTNMT, 26 December 2006 Guideline for hazardous waste treatment condition and procedures for HW treatment license – Decision 60/2002/QD-BKHCNMT, 7 August 2002 Providing the technical guidelines on the dumping of hazardous waste	– VEPA has the responsibility to issue licenses for hazardous waste transporters and for treatment / disposal facilities where the wastes being taken across provincial borders. – DONRE has been given the responsibility to issue licenses for transporters and treatment / disposal facilities where wastes are being managed within the same province. In addition, DONRE will issue Registration Books for all hazardous waste owners. – IZA/IDC should get responsibilities to manage HW within industrial parks.	– Decision 155, Decision 23/2006/QD-BTNMT and Circular 12/2006/TT-BTNMT provide a good foundation for managing hazardous wastes in Vietnam. They provide a "cradle to grave" control system that has the potential to ensure the effective management of these wastes. – Inspection powers are shared by MONRE, VEPA, MOI and DONRE. These multiple responsibilities can lead to varying interpretations of the requirements and confusing advice and compliance efforts. It can also be argued that it is a conflict of interest for MOI to be responsible for enforcing requirements when it is also responsible for maintaining industrial output and overall competitiveness. – The responsibilities of VEPA and the provincial DONRE are an area of potential overlap / inconsistency. Circular 12/2006/TT-BTNMT has gone a long way in addressing this potential. However, two separate	– In order to be successful in managing hazardous wastes MONRE, VEPA and DONRE need to develop a broad range of manuals, guidelines and protocols for all groups involved. For example, owners, transporters and treatment / disposal facility operators require clear guidance if they are to comply with the regulations. DONRE engineers and inspectors will require these as well. This work has already begun in selected provinces through the training initiatives of VCEP (Vietnam Canada Environment Program). – To date, only four or five provinces have begun to implement the hazardous waste requirements. An intensive program of support will be needed from VEPA and from international donors to support these efforts. IZA should be responsible for the management of registration books for owners of HW.

[16] Recommendations also proposed by Breeze and Associates Inc (2007) Assessment of the Policy, Regulatory and Legislative Framework Prepared for the World Bank GEF PCB Waste Management and Disposal Demonstration Project (P099460) TF058119

Legislation	Agency responsible	Findings	Possible improvement[16]
		licensing authorities for both transporters and facilities can result in infractions "falling between the cracks" between the agencies. Coordination and information sharing will be a key to avoid this. – Decision 155 and Circular 12/2006 require training for all persons managing hazardous wastes. At this point, the specific training curricula are not specified. In addition, no training requirements are specified for government decision makers, engineers or inspectors.	

8. REGULATORY AND INSTITUTIONAL FRAMEWORK PERTAINING TO CRAFT VILLAGES

8.1 Definition of Craft Village

To be identified as an official craft-village, the following criteria have to be reached:

- 30% at minimum of total households take part in craft activities;
- Business production activity must have been stable for at least 2 years;
- Strict compliance with the State's law and policy.

Business productions need a business license to be identified in the calculation of the 30%. Regarding the compliance with state regulations, there is no specific explanation. Under these criteria, there are around 1,450 official craft villages nationwide.

8.2 Legal and Institutional Framework

A legal framework concerning environmental management of craft village activities is now in place. The legal framework, in particular, provides assistance for relocation of business activities in industrial points. Craft villages have historically been under the responsibility of the MOIT. Through the issuance directive 28, the GoV seems to have moved the responsibility for all craft villages to MARD/DARD.

We can distinguish two types of businesses within craft villages:

- Household scale: all production is made by family members within the house;
- Small enterprise: production is done in adjacent buildings with employees

This legal and institutional framework for craft village is presented in Table 5-2.

8.3 Report 2117/BTNMT-BVMT/2008

In June 2008, VEPA issued a list of the most polluting industries in the Nhue-Day River Basin. On this list, some craft villages and households with productive activities and an industrial point[17] have been identified (see Table 5-1).

The two mains problems met are the wastewater discharge with high concentration of pollutants and the absence of environmental protection commitments for households and enterprises.

It is important to note that an industrial point is included in the list. It indicates that the relocation of business activities from craft villages to industrial points did not solve the issue of pollution and has just moved the pollution to another location.

[17] Industrial points are planned areas where production activities of craft villages have been relocated.

Table 8-1: Craft Village, Enterprises, HH with Production Activity and Industrial Point Listed in the CV 2117

Location	Type of pollution or violation of regulations
Hanoi	
2 craft villages	- WW discharge at high concentration of pollutant
3 HH with production activities	- No EPC
2 enterprises in craft villages	- No EPC
HaTay	
2 craft villages	- WW discharge at high concentration of pollutant
1 industrial point	
2 enterprises in craft villages	- 1 no EPC, - 1 doesn't declare EP Charge for wastewater
1 HH with production activities	- No EPC
Ha Nam	
2 HH with production activities	- 1 has WW discharge at high concentration of pollutant
Nam Dinh	
1 craft village in craft villages	- WW discharge at high concentration of pollutant
1 HH with production activities	- No EPC

8.3.1 Problems met

A study of craft villages conducted in 2003[18] identified five significant issues affecting environmental management in craft villages:

- At both the central and provincial/city levels, the number of staff in charge of environmental protection is too small compared to the given requirements and tasks, and the staff are not yet well trained.
- There are no concrete regulations on pollution prevention, and even the existing environmental regulations are not consistent between central and local governments and among local governments. Especially at the rural level, the dissemination of legal documents on environmental protection has not been systematically implemented. Therefore, craft manufacturers are not aware of their duties and responsibilities for protecting their environment.
- The Vietnamese government is keenly interested in environmental infrastructure investment, but there are often few mechanisms to mobilize capital resources for investment, which has led to significant underinvestment in environmental facilities. The Vietnamese government has been making efforts to develop solutions to diversify investment into environment, and established the Vietnam Environmental Protection Fund (VEPF) in 2002 for helping localities and enterprises to invest in environmental infrastructure. However, the investment is often not well organized, and the investment rate is still lower than in other countries in Asia.
- Environmental monitoring systems are not yet firmly established. Environmental Impact Assessments (EIAs) and inspections are carried out, but they are still limited and far less than

[18] Institute of Environmental Science and Technology (INEST), *Research on the Scientific and Factual Basis for the Development of Policies and Measures to Solve Environmental Problems in Craft Villages in Vietnam*".

necessary to meet actual needs. A national environmental monitoring and analysis network is operating, managed cooperatively by the Ministry of Natural Resources and Environment (MONRE), other ministries, and localities. However, monitoring frequency is still insufficient and monitoring points are scattered. Monitoring equipment also is insufficient and has not been standardized. There is still no monitoring station to measure waste discharge standards, and no national standardized laboratory under central EM agencies. As a result, data is not comprehensive enough to identify environmental issues and problems.

- Production characteristics of craft villages make streamlined and consistent environmental management difficult. The products of craft villages are individual and spontaneous; as a result, concentrated production planning and concentrated wastewater treatment systems cannot be achieved, resulting in failed effectiveness.

In 2009, most of these remarks remain valid. As indicated above, even if the regulatory framework has been improved and strengthened, the lack of staff at DONRE's level, the lack of funding for waste water treatment systems at the city/provincial level, the weakness of monitoring by DONRE and the difficulty in planning concentrated waste water treatment systems have been confirmed through the present short review.

The issue linked to an improvement of the environmental situation in craft villages is not added regulation. If the provisions of the regulation framework are adequately resourced and conscientiously implemented, it will lead to an improvement in environmental conditions in craft villages. A clarification of the responsibilities of various agencies involved is also necessary.

The relocation of production activities to industrial points, as presented in section 9.2.1.2, could be used as a central tool in a more comprehensive strategy to improve environmental management in the most polluting craft villages.

8.3.2 Hazardous Waste Management for Craft Villages

Hazardous waste accounts only for a small part of solid waste in craft villages. Most of craft villages in Vietnam are involved in food processing, construction materials, textile and dying, art and craft where few hazardous waste is produced. Craft village specialized in metal, paper or plastic recycling are the most likely to produce hazardous waste (especially mud containing heavy metal). According to a study[19] on solid waste on craft villages, the volume of toxic waste produces in Northern Vietnam is around 2,200 tons/year; the total volume of solid waste is estimated at 140,000 tons/year.

Actually, no management of hazardous waste in craft village is really conducted. Craft village environmental management are under district DONRE who have limited staff (1 or 2) and cannot manage properly environmental issues within craft villages.

The first step to manage hazardous waste in craft villages is to set-up an important awareness program among craft-villages in order to identify hazardous waste. The next steps will be separate collection and disposal of hazardous waste. This needs the help of provincial DONREs who are in charge of the implementation of the hazardous waste requirements.

[19] Dang Kim Chi (2005) Solid waste in craft villages in Vietnam- challenges and opportunities for applying 3R

Table 8-2: Analysis of Legal and Institutional Framework linked to Craft Villages

Legislation	Agency responsible	Findings	Possible improvement
CRAFT VILLAGES			
Management of Craft Villages			
– Law on Environmental Protection (No. 52/2005/QH11) Chapter V, Article 38; – Decree No: 66/2006/ND-CP on Development of Rural Trades; – Circular 116/2006/TT-BNN of Ministry of Agriculture and Rural Development dated 18th Dec, 2006 on supplying guidelines for the implementation of Decree No 66/2006/NĐ-CP approved by the State on the growth of the craft sector on 7th July, 2006; – Directive No. 28/2007/CT-BNN of April 18, 2007, stepping up the implementation of the planning on development of rural trades and crafts and the prevention and control of environmental pollution in craft villages – Decree No: 66/2006/ND-CP on Development of Rural Trades	– **MARD/DARD** Craft village management has recently been assigned to MARD. Within MARD, the Department of Processing, Commercial, Agriculture, Forestry and Salt now has specific responsibilities for craft villages. – **MOIT/DOIT** MOIT/DOIT has been in charge of the development of craft villages and, in particular, about relocation of business activities in craft villages to industrial points. At this time, the remaining responsibilities of MOIT/DOIT regarding craft villages are not clear. – **DONRE** Issuance and control of WWDP among HH discharging more than 10 m^3/day of waste water from industrial processes. – **Provincial People's Committee** - collecting statistics, assessing the pollution levels in craft villages and implementing the following measures: - Improving, upgrading or building common waste water collection and treatment systems;	– Despite this legal framework, little has been done for the environmental prevention and protection in craft villages. There is no or little control on waste water discharge and very few treatment systems are installed. There is still no environment planning in almost all craft villages. No information or prevention campaigns are conducted. – It should be important to clarify the roles between MOIT/DOIT and MARD/DARD. The coordination between these agencies is weak and the activities of the ministries often overlap. Overlaps concern environmental management of craft village and relocation of polluting industries. If MARD/DARD will take responsibility, a strong cooperation will be necessary between the two ministries	– MARD should establish strong cooperative arrangements with MOIT or ensure a consistent approach. MONRE should be involved in all activities related to wastewater discharge. – The issue linked to an improvement of the environmental situation in craft villages is not added regulation. If the provisions of the regulation framework are adequately resourced and conscientiously implemented, it will lead to an improvement in environmental conditions in craft villages. A clarification of the responsibilities of various agencies involved is also necessary

Legislation	Agency responsible	Findings	Possible improvement
	- Building sites to gather solid waste and hazardous waste, arranging equipment to meet waste collection requirements and suit the sorting of waste at source, serving the common treatment; - Planning zones and clusters to relocate polluted production activities from craft villages located within residential areas; - Disseminating information on less polluting new technologies among the people to improve knowledge and application; **District/commune Level** - Day to day management of craft village;	– Craft villages are often managed at the district and commune level. However, this management is very limited. District/commune authorities intervene only when a serious environmental problem arises. If some infrastructure works are necessary (drainage system, ponds), they will be in charge of the construction work.	
Prevention and reduction of environmental pollution in craft villages			
– Directive 28/2007/CT-BNN of Ministry of Agriculture and Rural stepping up the implementation of the planning on development of rural trades and crafts and the prevention and control of environmental pollution in craft villages. –	– Provincial People's Committee: supervise the overall activities; plan and invest for the relocation of polluting activities out of the residential areas; conduct awareness campaign on environmental protection; – DARD: organize and implement activities; prepare program for development and conservation of craft villages; plan environmental pollution prevention;	– People in craft villages have poor awareness of environmental pollution and their legal responsibilities as the Law, regulation, policy and environmental management measures are very new.	– At present, the communities directly affected by environmental pollution are not managing the environmental issues at the local level by themselves. More involvement of local communities to manage craft villages is needed.

9. REQUIREMENTS FOR STUDIES AND PERMITS RELATED TO THE ENVIRONMENT

Industrial estates, craft villages, industries and HH with business productions are required to prepare a number of studies and to get permits concerning the environment. In this section, we will mainly focus on permits linked to wastewater and hazardous waste management. These permits are presented and analysed in Table 6-1.

9.1 Certificate of Investment

Even if the certificate of investment is not related directly to the environment, it is the first permit required for the establishment of a new industry in an industrial estate.

9.2 Environmental Impact Assessment

Environmental impact assessment (EIA) is applied to existing and planned projects in Vietnam. According to the ICEM report[20], an extraordinary number of EIAs have been reviewed in Vietnam. Between 1994 and 2004 about 27 000 EIA reports were reviewed and appraised, of which more than 800 reports were reviewed at central level, and more than 26 000 reports at provincial level.

According to Dr. Nguyen Khac Kinh[21], EIA compliance is weak and implementation of mitigation measures prescribed in the EIA reports is often ignored. Overall, there is poor follow-up on EIA activities by both project owners and environmental authorities.

9.3 Environmental Protection Commitment

For industries not submitted to the EIA process, a commitment to environmental protection is necessary. This covers the small-scale production companies.

9.4 Environmental Protection Scheme

An Environmental Protection Scheme (EPS) is needed for industries or industrial estates that were registered before July 1, 2006, without an approved EIA or Commitment to Environmental Protection. The EPS process can be seen as a measure to guarantee that existing industries or industrial estates have no serious impacts on the environment.

9.5 Waste Water Discharge Permits

Waste Water Discharge Permits (WWDP) is an important tool to reduce pollution. According to the ICEM/2007 above-mentioned report, wastewater discharge permits are a potentially powerful activity-focused pollution management approach, which is common to environmental and natural resource management legislation throughout the world. Pollution permits ensure that polluters do not transfer their waste disposal costs to the community and to other businesses by discharging inadequately treated wastes that affect a healthy living environment. Pollution permits work by defining the rights and responsibilities of polluters, and ensuring these are adhered to through an effective monitoring, reporting and compliance scheme. It also allows environmental improvement to occur through agreements brokered between the regulator, the polluter and the affected community.

[20] ICEM (2007) Analysis of Pollution from Manufacturing Sectors in Vietnam

[21] Dr. Nguyen Khac Kinh, D/G EIA, MONRE. 'Status of Environmental Impact Assessment in Vietnam'. Presentation to "Sharing Experience in Environmental Assessment and Development: Vietnam and Bhutan". 23 January 2006.

Table 9-1: Licensing Authorities for Waste Water Discharge Permits

<table>
<tr><th rowspan="2"></th><th colspan="3">VOLUME OF DISCHARGE</th></tr>
<tr><th>< 10 m^3/day</th><th>10 m^3/day< < 5 000 m^3/day</th><th>> 5 000 m^3/day</th></tr>
<tr><td rowspan="2">Discharge in natural environment (river, lake) or in drainage system</td><td rowspan="3">No permit required. City/Provincial PC can change this threshold based on local conditions</td><td>City/Provincial PC (DONRE)</td><td>MONRE</td></tr>
<tr><td>10 m^3/day < < 1 000 m^3/day</td><td>> 1 000 m^3/day</td></tr>
<tr><td>Discharge into irrigation canal</td><td>City/Provincial PC (DARD)</td><td>MARD</td></tr>
</table>

9.5.1 Content of Waste Water Discharge Permits

Several WWDP were collected in various locations and for various uses. Annex B-3 presents 3 of these permits, they are:

- WWDP issued by Hanoi People's Committee (DONRE) for an industrial cluster (Thanh Tri Industrial Cluster in Hanoi);
- WWDP issued by HCMC People's Committee (DONRE) for a stand alone industry, Sanofi-Aventis
- WWDP issued by HCMC People's Committee (DARD) for Van Hung Ltd Co. located in Tan Phu Trung Industrial Park without CETP.

Table 6-2 presents the main contents of the permits. All the permits have the same characteristics and requirements. The first part describes the characteristics of the industry (type of production, volume discharged, receiving water body, location method and regime of wastewater discharge).

- **Compliance standards**

Under the permit conditions, industries and industrial clusters are obliged to discharge wastewater of category B of TCVN 5945-2005 into selected water bodies. However, meetings with IZA showed that IPs with CETPs make efforts to discharge category A wastewater only. The industries that discharge into irrigation canals have to comply with another standard, which is generally less demanding.

Viet Nam uses standards for chemical and physical parameters in water as a general tool for assessing water quality. TCVN 5945-2005 is the standard for industrial waste water discharge. The following table identifies the limit value of parameters under TCVN 5945-2005. These standards (in particular A and B) are comparable to most of the international standards. However, treated waste water in industrial park and industrial often did not meet these standards.

Table 9-2: TCVN 5945-2005 Limit values of parameters and maximum allowable concentration of pollutants in industrial waste water

No.	Parameters	Unit	Limit values		
			A	B	C
1	Temp.	^{0}C	40	40	45
2	pH		6-9	5.5-9	5-9
3	Odor		Endurable	Endurable	
4	Color, Co-Pt at pH =7		20	50	
5	BOD_5 at 20^{0}C	Mg/l	30	50	100
6	COD	Mg/l	50	80	400
7	Suspended solids	Mg/l	50	100	200
8	Arsenic	Mg/l	0.05	0.1	0.5
9	Mercury	Mg/l	0.05	0.01	0.01
10	Lead	Mg/l	0.1	0.5	1

11	Cadium	Mg/l	0.005	0.01	0.5
12	Chromium (VI)	Mg/l	0.05	0.1	0.5
13	Chromium (III)	Mg/l	0.2	1	2
14	Copper	Mg/l	2	2	5
15	Zinc	Mg/l	3	3	5
16	Nickel	Mg/l	0.2	0.5	2
17	Manganese	Mg/l	0.5	1	5
18	Iron	Mg/l	1	5	10
19	Tin	Mg/l	0.2	1	5
20	Cyanude	Mg/l	0.07	0.1	0.2
21	Phenol	Mg/l	0.1	0.5	1
22	Mineral oil and fat	mg/l	5	5	10
23	Animal-vegetable fat and oil	mg/l	10	20	30
24	Chlorine residual	mg/l	1	2	-
25	PCBs	mg/l	0,003	0,01	-
26	Pesticide: organic phosphorous	mg/l	0,3	1	
27	Pesticide: organic chlorine	mg/l	0,1	0,1	-
28	Sulfide	mg/l	0,2	0,5	1
29	Fluoride	mg/l	5	10	15
30	Chloride	mg/l	500	600	1000
31	Ammonia (as N)	mg/l	5	10	15
32	Total nitrogen	mg/l	15	30	60
33	Total phosphorous	mg/l	4	6	8
34	Coliform	MPN/100ml	3000	5000	-
35	Bioassay		90% of the test fish exposed to the concentration of 100% wastewater survive after 96 hours of constant exposure	-	
36	Gross α activity	Bq/l	0,1	0,1	-
37	Gross β activity	Bq/l	1,0	1,0	-

- **Monitoring/Reporting**

Owners have the responsibility to monitor the effluent (quantity and quality) every 3 or 6 months and to make reports for the issuing agency every 6 months.
We should note that for industrial clusters, monitoring should cover the influent (before treatment) and the effluent (after treatment).

- **Duration of permit**

According to Decree 149 (Article 7), a WWDP shall be issued initially for duration of 10 years from the date of its approval and periodically renewed to extend the permit for up to 5 years. In the 3 permits reviewed, the duration varied from 1 to 5 years. A request should be made at least 3 months before the permit expires.

- **Evaluation of Impacts**

For the Thanh Tri Industrial Cluster, the permit indicates those 6 months after permit issuance, owners must evaluate the impact of wastewater discharge into the watercourse receiver, which is, in this case, the Hong Van Canal (Nhue River Basin). The report should be sent to DONRE. However, there is no information on the scope of the evaluation and the method used to evaluate.

Table 9-3: Content of Waste Water Discharge Permits

Content of permit	Sanofi-Aventis HCMC Stand alone industry	Van Hung Co. (HCMC) Within IP	Thanh Tri Industrial Cluster (Hanoi) WWTP
General information			
Permit Issuing Agency	HCMC/DONRE	HCMC/DARD	Hanoi City/DONRE (Division of Water Resources and Hydrometeorology)
Type of production	Medicine/drugs	Mattresses and round rubber bands	Various industries
Water course receiver	HCMC water drainage system	Hoc Mon – North Binh Chanh Irrigation System	Hong Van Canal (Nhue River Basin)
Method of discharge	After pre-treatment, (lagoon) pumping to the city drainage system	N/A	Gravitation
Regime of discharge	Continuously	N/A	Continuously
Flow of discharge	60 m^3/day	20 m^3/day	1 800 m^3/day
TCVN standards applicable	Column B of TCVN 5945-2005	TCVN 6773-2000 (standards for WW into irrigation system)	Column B of TCVN 5945-2005 multiplied by 0.9 of received water flow factor (kg) and with 1.0 of ww discharge flow factor
Duration of permit	1 year	5 years	3 years
Responsibility of Owners			
Pre-treatment before discharging into water course receiver according to:	Column B of TCVN 5945-2005	TCVN 6773-2000	Column B of TCVN 5945-2005 multiplied by 0.9 of received water flow factor (kg) and with 1.0 of ww discharge flow factor
Monitoring quality of discharged waste water	Every 6 months at the effluent	Every 3 months at the effluent	- Every 3 months (in January, April, July, and October) - At the influent (before treatment) and at the effluent (after treatment)
Monitoring flow of discharge	Monthly (to be recorded in a register book)	To be recorded in a register book	Install flow measure equipment in front of the effluent point
Reporting	Report to permit issuing agency every 6 months	Report to permit issuing agency every 3 months	Report to Division of Water Resources and Hydro-meteorology every 6 months
Incident during discharging in water course receiver	Must inform issuing agency and take appropriate measures		
Others			6 months after permit issuance, owner must evaluate the impact of wastewater discharge in the Hong Van Canal (Nhue River Basin) and sent it to DONRE
Extension of permits	If still discharge waste water, need to ask for extension 3 months before the expiry of the permit		

9.6 Registration Book for Owners of Hazardous Waste Sources

A Registration Book is a document granted to the owners of hazardous waste sources, which contains information on registered types and amount of hazardous waste generated and definition of the owner's responsibilities on environmental protection relating to the registered hazardous waste.

9.7 Summary of Permits Requirements and Approval Authorities

Table 6-3 summarizes the main environmental requirements for industrial estates and Table 6-4 for craft villages, industries and HH involved in production activities. It also includes the authorities in charge of the issuance/approval of various permits. Table 6-5 presents a summary of approval authorities for each types of permit required. We should note the importance taken by IZA at provincial/city level for the issuance of various permits and approval of EIA.

Table 9-4: Permits Requirements for Industrial Estates

Legislation	Agency responsible	Findings	Possible improvement
Permits requirement			
Certificate of investment			
– Law on Investment No 59/2005-QH-11	– MPI/DPI issues certificate of investment for industries outside Industrial Parks and for infrastructure development company – IZA issues investment certificates for industries within Industrial Parks	– Environmental protection measures are required for the issuance of an investment certificate. However, most of the time, these measures are general and without design.	– More information on the wastewater treatment system should be required for the certificate of investment.
Environmental Impact Assessment			
– LEP (Articles 18 to 23) – Decree No. 80/2006/ND-CP of August 9, 2006 detailing and guiding the implementation of a number of articles from the Law on Environmental Protection – Circular 08-2006-TT-BTNMT dated 8 September 2006 Providing Guidelines for Strategic Environmental Assessment, EIA, and Environmental Protection Undertakings – Circular No. 05/2008/TT-BTNMT, December guiding strategic environmental assessment, EIA and environmental protection commitment – Decree No. 21-2008-ND-CP Amendment of and Addition to a Number of Articles of Decree 80-2006-ND-CP	**MONRE** – Approval of EIA for large projects (larger than 200 ha) and potentially the most polluting (such as chemical industries with a capacity of 20 000 tons or more, cement plants with a production of 1 200 000 tons a year). **DONRE/IZA** – Approval of EIA for smaller projects. . **Provincial and district authorities** – Appraisal of EIA reports and monitoring of post EIA activities	– Responsibility for EIA approval is divided between MONRE/DONRE and IZA. – At the EIA stage, information given is too general. It does not include CETP design, just the anticipated volume treated, and the type of contaminant anticipated and the standards to comply with. – Few industries go to the end of the EIA process. The objective of the industry is to get the EIA approval to start the construction of the plant. – When the EIA approval is obtained, the industry often does not follow its commitments (building of treatment works,	– Issuance of guidelines for the interpretation of Decree 29 is needed quickly to avoid any misunderstanding. – The EIA should give more detailed information on the type and capacity of treatment planned – Actually all the efforts from DONRE/IZA are put in EIA review and approval but few effort is put on post EIA-activities due to lack of staff and budget. Significant efforts on monitoring of post-EIA activities are necessary.

Legislation	Agency responsible	Findings	Possible improvement
		testing, etc.).	
Environmental Protection Scheme (EPS)			
– Circular 04/2008/TT- BTNMT, Sep 18, 2008 Guiding on preparing, examining and confirming study of environmental protection scheme and monitoring and inspecting implementation of the study; – According to Decree 21/2008 (Article 1.9) and Circular 04/2008/TT-BTNMT an Environmental Protection Scheme (EPS) is needed for industries or industrial estates that were registered before July 1, 2006, without an approved EIA or Commitment to Environmental Protection.	– DONRE approve EPS for industries submitted to the EIA process; – District department of environment and natural resources approve EPS for industries not submitted to the EIA process; – IZA approve EPS for industries within industrial parks	– According to Circular 08, industry/industrial estates submitting an EPS should complete the construction of wastewater treatment infrastructure by December 2009. This is a requirement included in all approvals or confirmations of environmental protection registration schemes.	– The EPS issuance process needs more enforcement especially concerning the construction of wastewater treatment infrastructure.
Environmental Protection Commitment (EPC)			
– Same as for EIA – For industries not submitted to the EIA process, a commitment to environmental protection is necessary. This covers the small scale production companies	– Within industrial estates, DONRE at District level & IZA are responsible for the issuance & implementation of EPC. – For stand-alone industries and HH within craft villages, DONRE at district level are responsible.	– EPCs must be registered at the local people's committee (district or commune). The production can start only once the relevant authority has issued the EPC registration certificate.	– IZA should be assigned full responsibilities by the GoV for the issuance of EPC within industrial parks.
Waste Water Discharge Permit (WWDP)			
– Under the Law on Water Resources (LWR), it is forbidden to discharge untreated wastewater in the environment without getting a WWDP. A WWDP is required for households and industries (above a minimum volume) and for the effluent of a Waste Water Treatment Plant	– MONRE for industry discharging a volume of waste water over 5 000 m^3/day – PPC/DONRE for industries and households discharging less than 5 000 m^3/day in all types of water bodies (rivers, lakes, reservoirs, etc.)	– Due to the absence of water treatment plants in most of the industrial estates, WWDPs ensure compliance with environmental standards for waste water discharge – Very few wastewater discharge permits are currently issued.	– All WWDP should be issued by MONRE/DONRE even for wastewater discharged into an irrigation canal. – An inventory of existing

Legislation	Agency responsible	Findings	Possible improvement
(WWTP). – Decree 149/2004 on Regulation on Licensing of Water Resources Exploitation, Extraction and Utilization and Waste Water Discharge in Water Sources; – Circular 02/2005/TT-BTNMT dated 24/06/2005 guiding the implementation of Decree 149/2004/NĐ- CP regarding the issuance of permits for water resource exploration. – Discharge of water sources on a small and familial scale is not submitted to permit application. The volume of wastewater discharged which requires a permit is clarified in Article 3, cause 3.1 or Circular 02/2005/TT-BTNMT.	except irrigation systems. – MARD For industries discharging into an irrigation canal if the volume is over 1 000 m³/day. – PPC/DARD For industries discharging into an irrigation canal is below 1 000 m³/day.	– There is a risk that the licensing of seriously polluting establishments will be seen as an endorsement of their pollution impacts, rather than as a first step in their regulation and control. – In an industrial park or an industrial cluster, once all the industries got their WWDP, there is no incentive for the Infrastructure Development Company, in charge of building infrastructures, to build a CETP. – Industries who have a WWDP could refuse to discharge waste water into the common drainage system and to the CETP once built	industrial estates and industries without WWDPs should be done. These businesses should be required to obtain wastewater discharge permits. – All industries should be connected to the CETP when existing.
Registration Book for Owners of Hazardous Waste			
– According to Circular 12/2006, owners of hazardous wastes must make an application to DONRE for a Registration Book before they can manage their wastes off-site. The regulation prescribes the application form and information required to be submitted with the form. – Registration Books remain in force until amendments are required as determined by operations at the generating facility.	– VEPA has the responsibility to issue licenses for hazardous waste transporters and for treatment / disposal facilities where the waste is being taken across provincial borders. – DONRE has been assigned as the provincial level authority. –	– Owners must take measures to reduce pollution, properly code and package wastes, not mix wastes, transport wastes within six months (or report to DONRE), manage spills, protect against fire and support worker safety. In addition, they must have a contract with the treatment / disposal facility.	– IZA/IDC could take responsibilities to manage registration books within industrial parks

Table 9-5: Permits Requirements for Craft Villages

Legislation	Agency responsible	Findings	Possible improvement
Permits requirement			
Business Licence			
– Law on Investment No 59/2005-QH-11 – Law on Enterprises No 60/2005-QH-11	– Household scale business could get a registration from District level – Small enterprise needs a business licence from DPI.	– Most of the business activities do not have business licenses. HH in rural craft villages are not aware or do not care to register their business activities. Only large HHs who are planning to expand their business capacity will get the business license	
Environmental Impact Assessment			
– LEP (Articles 18 to 23) covers the Environmental Impact Process. – Under Decree No. 21-2008-ND-CP, an EIA is required for the construction of a new handicraft village group (also called industrial points)	– DONRE at provincial level	– It has been reported that almost no industrial points have been submitted to the EIA process.	– Enforcement of EIA process for industrial points is required before land clearance.
Waste Water Discharge Permit			
– A waste water discharge permit is required if the HH discharge more than 10 m^3/day under Decree 149/2004	– DONRE at provincial level (Division of Natural Resources and Mines)	– No households involved in production activities, even registered enterprises in craft villages, got either the EP commitments or the WWDP. – Based on discussion with DARD and DONRE and local authorities, all discharged water samples at craft villages exceed the discharge standards.	– A better enforcement of the regulation for WWDP is essential; – A craft village could consider as an entity, in some cases, to deliver a WWDP.
Environmental Protection Commitment			
– An environmental protection commitment is required (Decree 80/2006 and Circular 08/2006)	– DONRE at district level	– Only enterprises have an EPC; no household have an EPC.	– Regulation linked to EPC should be enforced especially for polluting HH

Table 9-6: Summary of Environmental Permit Requirements and Approval Authorities for Industrial Estates, Craft Villages, Industries and HH with Production Activities

	New projects				Existing project before July 1st 2007 or operating after July 1st 2007 to September 18, 2008
	At planning stage		After construction		
	EIA	Environmental Protection Commitment	Waste Water Discharge Permit	Registration book of hazardous waste	Environmental Protection Scheme
Permit Requirement					
EPZ	Yes, for construction of infrastructures	N/A	Yes if CEPT	Yes, if they store hazardous waste	Yes for industrial estates, industries and HH with business production without approved EIA or Environmental Protection Commitment
IZ		N/A	Yes if CEPT		
Industrial Clusters		N/A	Yes if CEPT		
Craft villages/ industrial points		N/A	No		
Industry in EPZ/IZ, clusters or stand alone industries	Yes, if included in the list of Decree 21/2008	Yes if not included in the list of Decree 21/2008	Yes if EPZ/IZ and clusters without CETP and waste water volume > 10 m^3/day		
HH in CV with production activities	N/A	Yes	Yes if waste water volume > 10 m^3/day		
Approval authorities					
EPZ	- MONRE if > 200 ha (Appendix II Decree 80/2006) - DONRE/IZA if <200 ha	N/A	- MONRE if > 5 000 m^3/day - DONRE if < 5 000 m^3/day If discharge in an irrigation canal - MARD if > 1 000 m^3/day - DARD if < 100 m^3/day	DONRE	- Provincial IZA
IZ		N/A			
Industrial Clusters		N/A			- DONRE for approval of EPS - District DONRE to confirm EPS registration
Craft village/ industrial point		N/A			
Industry in EPZ/IZ	- MONRE if included in Appendix II Decree 80/2006 - IZA if not included	District DONRE or provincial IZA			- Provincial IZA
Industry in clusters	- MONRE if included in Appendix II Decree 80/2006 - DONRE/IZA if not included	District DONRE			- DONRE for approval of EPS - District DONRE to confirm EPS registration

10. POLLUTION FEES AND SANCTIONS

Recently the GoV adopted the Polluter-Pay-Principle and issued regulation to charge environmental protection fees for discharging wastewater and solid waste. The choice of economic tools is a good step forward to reduce pollution. According to the World Bank's Environmental Monitor 2006, economic tools use market forces so that organisations and individuals choose effective responses as they exploit, use and preserve natural resources - particularly by consumptive uses of water such as irrigation, urban water supply and drainage and water pollution reduction.

10.1 Waste Water Fees

According to the ICEM/2007 report, with the adoption of Decree 67 on Environmental Protection Charges for Wastewater, and the accompanying regulations, the GoV went for legislated principles to action: As of January 1 2004, industrial sectors must pay a fee for discharging wastewater in the environment. GoV clearly embarked on the use of economic instruments for pollution control.

Decree 67 aims to implement a system of pollution fees for industrial wastewater and a large number of establishments are targeted. It specifies a minimum and maximum level of fee for each targeted pollutant. Fees are applied to 7 pollutants, including 3 organic pollutants (BOD, COD, and TSS), and 4 heavy metals (see Table 7-1))[22].

Table 10-1: Environmental Charge Rates Applicable to Industrial Waste Water (Decree 67/2003)

POLLUTANTS IN WASTEWATER		CHARGE RATES (VND/kg of pollutants found in wastewater)	
Names	Symbols	Minimum	Maximum
Biological oxygen demand	ABOD	100	300
Chemical oxygen demand	ACOD	100	300
Suspended solids	ATSS	200	400
Mercury	AHg	10 000 000	20 000 000
Lead	APb	300 000	500 000
Arsenic	AAs	600 000	1 000 000
Cadmium	ACd	600 000	1 000 000

According to a study on the implementation of Decree 67[23], DONRE clearly lack of technical and human capacity to implement Decree 67 given both the number of industries to control and the number of targeted pollutants. In particular, the capacity to monitor heavy metals concentration in effluent discharges is extremely limited. In addition, such measurement is typically very costly. This assessment was confirmed during our meeting with DONRE.

In Binh Duong province, DONRE collected fees for only 600 industries among the 6000 presents in the province. Due to a lack of budget for sampling and investigation, they decided to focus only the 600 bigger industries. Therefore, many industries do not pay any fee to the government.

[22] Decree No.67/2003/ND-CP was amended by Decree 04/2007/ND-CP, dated 08 January 2007 revising and supplementing some articles of the Decree No.67/2003/ND-CP. Decree 04/2007 have reduced BOD pollutant, and there are now only 6 target pollutants.

[23] Dr. Benoit Laplante International Centre for Environmental Management (2006) Review of Implementation of Decree 67/2003 on Environmental Protection Charges for Wastewater in Viet Nam.

Industrial sectors differ greatly in terms of their pollution intensity[24]. Therefore, significant reduction in discharges of industrial pollution could be achieved by targeting a limited number of industrial sectors instead of targeting all industries. This targeting would greatly facilitate the task of all DONREs to implement successfully Decree 67.
The fees collected are used as follow:

- 20% of the collected fees can be retained by DONRE to cover the costs of fee collection, wastewater assessment, and sample analysis;
- The remaining portion of the revenues collected is to be allocated equally between the central State budget and local State budget i) 50% will go to the Vietnam Environmental Protection Fund (VEPF) at national level and 50%) will be used, at local level, for environmental protection, sewage dredging, regular repair and maintenance of drainage system.

According to MONRE, up to December 2008, over 200 billion VND (12 M USD) has been collected from pollution fees, transferred to VEPF and allocated for DONREs for wastewater improvement projects in provinces.

DONREs met reported that 20% of collected revenues are not sufficient for them to undertake their task. Collecting a larger part of the pollution fees could help the DONRE to increase their capacity and resources (staffing, equipment, laboratories, computers, database, etc.).

10.2 Solid Waste Fees

The GoV also issued fees for solid waste under Decree 174/2007/ND-CP and Circular No. 39/2008/TT-BTC. According to these regulations, environmental protection charges for solid wastes (must be paid for ordinary and hazardous solid wastes discharged from the process of production and operation.

Part of the fees collected will be retained to cover charge collection expenses and the remainder will constitute local budget revenue to cover the following expenses:

- Expenses for the treatment of solid wastes up to environmental standards, such as hygienic incineration, sterilization, neutralization, incineration and burial of solid wastes and the strict control of environmental pollution in the course of waste treatment;
- Expenses in support of the classification of solid wastes, including communication activities to raise public awareness about classification of solid wastes at source;
- Expenses in support of the construction of landfills, solid waste treatment facilities and the use of solid waste recycling, reuse, treatment and destruction technologies.

Due to the new implementation of these regulations, little information on the fee collection for solid waste has been collected.

10.3 Sanctions for Infractions

Sanctions for violation of environmental regulation are an important tool to reduce environmental pollution. Decree 81/2006 ND-CP and Decree 31/2007ND-CP have recently been passed to provide new sanctions for infractions.

[24] The report prepared by ICEM for the WB: Review and Analysis of the Pollution Impacts from Vietnamese Manufacturing Sectors, identifies the pollution intensity of various industrial sectors; see especially Annex 2: Detailed Pollution Estimates for Priority Sectors

The police can also impose fines according to the criminal code. It has been reported that industries feared much more environmental police than DONRE inspectors. Environmental police can enter without notice in any industry.

Decree 81 is a solid step forward for promoting compliance with environmental requirements. However, the fines are actually too low and are not providing strong disincentives to environmental violations. Industries often prefer to pay fines then to solve the environmental problem.

Table 10-1: Analysis of Institutional and Regulatory Framework for Pollution Fees and Sanctions

Legislation	Agency responsible	Findings	Possible improvement
Pollution Fees			
Waste Water Fees			
– Decree No. 67/2003/ND-CP on Environmental Protection Charges for Wastewater on June 13, 2003, – Joint Circular No. 125/2003/TTLT-BTC-BTNMT providing guidelines for the implementation of Decree 67; – Joint Circular No. 106/2007/TTLT-BTC-BTNMT of September 6, 2007, of MOF and MONRE amending and supplementing Joint Circular No. 125/2003/TTLT-BTC-BTNMT providing guidelines for the implementation of Decree	– MOF in cooperation with MONRE stipulate the fees rates in order to be suitable for each kind of receiving environment. – MOF assume the prime responsibility and coordinate with MONRE/DONRE – Industries make self-declaration to DONRE; DONRE will appraise, calculate and collect fees.	– Due to a lack of budget for sampling DONRE cannot collect all fees from companies. – Iinfrastructures companies are also collecting waste water fees from industries when they operate a CETP (for operation and maintenance of the CETP). This double collection of pollution fees leads to a lack of clarity and overlapping of responsibilities between DONRE and infrastructure companies for collecting wastewater fees. In addition, it creates confusion among industries that do not always understand why they have to pay twice for wastewater discharge. – Pollution fees appears to be too low and that most of the time, the industries are too small to produce significant quantities of pollutants and therefore, the costs of fee assessment and fee collection exceed the revenues collected from the pollution fees	– It should be more efficient to target a limited number of industrial sectors instead of targeting all industries. This targeting would greatly facilitate the task of all DONREs to implement successfully Decree 67. – The different types of waste water fees should be clearly explained to industries – Various fees for waste should be collected by only one agency (preferably the infrastructure companies) which is closer to industries. It will also help to avoid some industries to pay any fee to the government; – The level of wastewater fees should be revised to cover the fees assessment and collection.

Legislation	Agency responsible	Findings	Possible improvement
Solid Waste Fees			
– Decree 174/2007/ND-CP dated 29 November 2007 defines the environmental protection charges for solid waste. Under this Decree, the Ministry of Finance has issued Circular No. 39/2008/TT-BTC dated 19 May 2008 to guide the implementation of Decree 174.	– Provincial/City Peoples' Committee will decide on the rates applicable to each type of solid waste. Fees for hazardous solid wastes cannot exceed VND 6 000 000/ton (350 USD/ton).	– According to these regulations, environmental protection charges for solid wastes (must be paid for ordinary and hazardous solid wastes discharged from the process of production and operation	–
Sanctions			
– Decree 81/2006 ND-CP and Decision 31/2007ND-CP have recently been passed to provide new sanctions for infractions. Decree 81/2006ND-CP replaces Decree 121/2004/ND-CP. Under Decree 81, maximum fine imposed for violation of environmental regulations could reach 70 000 000 VND (4 500 USD). Key points of these regulations are presented in Annex B-2. – Decree 81 is actually under revision in particular in order to increase the fine up to 500 million (30 000 USD).	– Commune/ward/township Peoples' Committee (CPC); – District Peoples' Committee (DPC); – Provincial/City Peoples' Committee (PPC); – MONRE/DONRE inspectors; – Chief inspectors of DONRE at provincial/city level; – Chief inspector of the Ministry of Natural Resources and Environment. These different administrative bodies have the authority to: – Impose caution; – Impose fines of up to VND 500 000 (CPC), 200 000 (MONRE/DONRE inspectors) 20 000 000 (DPC, Chief inspector of DONRE) and 70 000 000 (PPC & Chief inspector of MONRE); – Confiscate material evidence and means used for commission of	– No cases of deprivation of environmental permits have been noticed; – The actual revision of the Decree 81 to increase the level of fines is welcome. –	– Strong enforcement of the sanctions by the various agencies is necessary to provide disincentives for polluting industries. Lack of enforcement is often due to a lack of budget. –

Legislation	Agency responsible	Findings	Possible improvement
– Under the criminal code, individuals who caused pollution to water resources could be fined from 10,000,000 VND to 100,000,000 VND (600-6000USD). If he caused serious consequences, the violator could be sentenced to 2-7 year prison. If he caused extremely serious consequences, 5-10 year prison could be sentenced. Violators could also be fined from 5,000,000 – 10,000,000 VND (300-600USD) and forbidden to practice their professions for 1-5 years.	administrative violations related to environment; – Force the application of measures to remedy environmental pollution or depletion caused by acts of violation; – Force the destruction of polluting goods and articles; – Deprive of the right to use environment permits under their authority (Chief inspectors only); – Force the leave of the Vietnamese territory or the re-export of polluting goods and articles, which have been brought into the country (Chief inspector of MONRE only).		

11. PROVISION OF SERVICES TO INDUSTRIES

11.1 Contracts between Infrastructures Development Companies and Industries

Infrastructure Development Companies (IDC) are in charge of the management of all infrastructures within industrial parks. These companies contract services for industries.

11.1.1 Content of Contracts

Each industry signs a contract with the IDC in charge of managing the industrial park. The contract usually concerns the following services:

- Land leasing conditions (including land leasing fees);
- Infrastructure facilities provided (road, drainage system) including infrastructure fees;
- Wastewater treatment (if a Common Effluent Treatment Plant is available); when a CETP is available, a specific contract for wastewater treatment is prepared.

Table 12-1 presents some extracts from contracts between the service providers (the infrastructure development company) and the industries leasing plots of land in the industrial park. The contract identifies the sharing of responsibilities between the industry and the infrastructure company regarding environmental compliance for the two above-mentioned contracts.

- One contract between Sonadezi, a large state owned company which operates several industrial parks in the South, and industries;
- One with Nam Dinh Infrastructure Company, a state owned company operating all the state owned IPs in Nam Dinh Province.

Table 11-1: Contracts between Infrastructure Development Companies and Industries

Content of Contract	Sonadezi Bien Hoa IP II - Dong Nai Province	Nam Dinh IPs Infrastructure Co. Hoa Xa IP – Nam Dinh Province
Responsibilities and Rights of Industries		
Compliance with Investment Certificate (IC)	- Using land according to land use purpose included in IC and provision of contract - Construct works according to the provision of IC, IP regulations and the contract	
Compliance with IP regulations	- Complete construction and beginning operations within 12 months after the date of signing of the contract	- Compliance with Nam Dinh IP management regulations and approved detailed design of the IP
Infrastructure Protection	- Pay compensation for any damage to IP infra-structure caused by the industry or their employees - Construct a water storage tank to ensure the water supply demand and pressure	- Protect IP infrastructures
Environmental Protection	- Treat air emissions to comply with applicable standards - Pre-treat wastewater to meet standards of CETP and authorize control and inspection by IP and DONRE - Volume of industrial ww corresponds to 80% of volume of water supplied to the tenants' factory.	- Discharge rain water and treated WW at level A (TCVN 6995) to drainage system of IP based on approved construction design

Transfer/sell owned property/ works on the leased land	- Land use rights for the leased land, buildings, and infrastructures,
	  - can mortgage the land and other assets;
	  - transfer or sell all or a part of property with notice to IP to signed leasing contract with the new owner
		- It is right of industry, but with 30 day- advance written notice to IP of signed leasing contract with the new owner

Responsibilities and Rights of Infrastructure Development Company		

Content of Contract	Sonadezi Bien Hoa IP II - Dong Nai Province	Nam Dinh IPs Infrastructure Co. Hoa Xa IP – Nam Dinh Province
Compliance with IP regulations	- Review and approve as soon as possible detailed design of industry before their construction to ensure the construction is compatible with IP plan	- Maintenance of infrastructure system according to applicable regulations
Infrastructure protection	- Maintain and manage infrastructure system (except telephone and power lines)	- Ensure the good condition of infrastructure system for operation of industries. - Inform industry in advance in case of major repairs and carry out the measures for reduction of impact
Environmental Protection	- Ensure the discharged treated wastewater from CETP according to TCVN 5945-2005 and provision of LEP	- Ensure the good management of industrial waste water and environment within IP
Other support to industries	- Support industry to obtain licenses at lowest rate - Provide land use rights for industry according to the investment certificate - Assist industry to access and install the power , telecommunication services - Install power line of 22 kV and suitable water supply system to the border of the lot	- Inform industry of changes in infrastructure or land leasing fees for adjustment of the contract

Areas of responsibilities are clearly defined between industries and infrastructure companies. However, the following remarks can be highlighted:

- Environmental protection covers waste water and, in some cases, air emissions; there is no clause about hazardous materials;
- For the Bien Hoa II IP, it is mentioned that the industry has to facilitate the wastewater monitoring by both the Infrastructure Company and DONRE.
- In Bien Hoa II, the IDC helps to provide licenses to industries; helping industries to get all types of permits including environmental permits could be a service offered to industries by IC.

For wastewater treatment, a specific contract is usually written between industries and infrastructure companies. Three examples of contracts are presented in the table 8-2. The general contract used in Nhon Trach III Industrial Park is presented in Annex B-4. The following findings can be noted:

- ***Pre-treatment***
  - All contracts require industries to pre-treat wastewater before discharging it into the CETP. Generally, industries have to reach level C of TCV standards 5945 (2005) to be authorized to discharge waste water into the CETP
- ***Monitoring***
  - In Dong Van II and Tai Binh II, industries have to take samples quarterly and send the results to the CETP owner; however, the low environmental consciousness and the lack of staff are not a guarantee of the efficient self-control of industries; in addition, it was reported that industries often install waste water pre-treatment works to comply temporarily with DONRE/IDC monitoring activities. After testing, the system is not maintained properly causing its deterioration, the ineffectiveness of pre-treatment operations, and the discharge of wastewater exceeding the standards into CETP, which causes problems with CETP operation.
  - It was also reported that many enterprises have waste water system but they do not use them to reduce operating costs. When environmental monitoring agencies/IDC announces an inspection, they start the treatment systems; otherwise, untreated waste is released directly into

the environment. Therefore, inspectors must catch them in the act and prove they are discharging wastewater illegally.

- ***Sanctions***
  - Sanctions in cases of violation are well identified. However, the CETP has the right to stop receiving WW discharge from industries in some cases of violation; it is however not mentioned if the industry can continue its operation and, therefore, discharge waste water into the environment;
  - In practice, violation sanctions are mainly fines. Some IZAs met considered that fines are not sufficient to incite the industry to reduce environmentally polluting activities. In many cases, industries do not implement any sanctions and even do not pay fines. Therefore, they do not solve the environmental problem targeted by the sanction. More drastic measures such as the closure of the industry, the interruption of water & power supply services, or the interdiction to discharge WW (as identified in the contract) have never been taken based on our meetings. In addition, the seriously violating environmental cases are not sent to the criminal courts. Therefore, industries often repeat their offences. There is a clear lack of enforcement of environmental measures in most of the IP.

    On another contract reviewed (Amata Industrial Park in Dong Nai Province) the sanctions are based on the percentage of exceedance for each pollutant:

Exceedance	Sanction
From 10 to 20%	100% total treatment cost
21% to 30%	200% total treatment cost
31 % to 40%	300% total treatment cost
41% to 50%	400% total treatment cost
Over 51%	500% total treatment cost

    In this contract, if the violation happens twice, in addition to inform the violation to all environmental relevant agencies, the IDC will not authorize the industry to discharge wastewater in the CETP until the discharge standards are met

- ***Information***
  - There is a clear need for more information for industries related to the environment:
    - Information on the environmental regulations and industries' responsibilities (in particular concerning waste water and hazardous materials);
    - On monitoring methods and objectives;
    - The permit requirements.

- ***Other***
  - In Nhon Trach, the industry has to build a storage tank for wastewater in case of repair or maintenance of the CETP. It is a good option to avoid the discharge of untreated WW in the environment when the CETP is not working;
  - According to IZA met (Dong Nai), there is no regulation to oblige an industry to be connected to the CETP. No article in the legislation for industries within CETP obliges them to connect to the existing CETP. The industry can choose to pre-treat its wastewater to obtain a WW discharge license. This leads to the following difficulties for infrastructure companies in charge of the IP:
    - Difficult to design WWTP (volume to treat and type of treatment) if the IC doesn't know if the industry will connect or not;
    - Less financial resources for IDC if some industries don't use the CETP;
    - It makes also the monitoring more difficult if within the IP there are several different effluents.

Table 11-1: Content of Wastewater Treatment Services Contract

Content of contract	Tan Binh IP TANIMEX Infrastructure Co HCMC	Nhon Trach III IP – Tin Nghia Infrastructure Co Dong Nai Province	Dong Van I IP Ha Nam Infrastructure Co Ha Nam Province
Contract object : wastewater treatment services (based on TCVN 5945- 2005)			
Pre-treatment requirement	- Industry should bring waste water at level C to the CETP		
	- Industry has to build separated drainage systems (rain water/waste water); industries cannot mix waste water with rain water		
	- Receive WW at level C (in a few specified cases; water over level C for COD 400-600 could be accepted) - In case over C level, Industry has to do pre-treatment measure to meet standard level C	- Receive WW at level C (mentioned in contract appendix)	- Receive WW at level C - Over C: ask for sanction for Environmental Protection Violation – under Article 10 Decree 81/2006
Effluent standard	- According to WW discharge permit (not specified in the contract), by interview: at level B		- Treated WW at CETP outlet/manhole is at level B
WW quality control/check	- CETP owner can take sample and analyze to control the industry effluent quality		
	- Industry also has to take samples and send results to CETP owner quarterly		- Industry takes samples and sends results to CETP owner before signing contract
Calculation of volume	- According to water supply flow meter: industrial waste water = 80% of volume of water supplied.		- By WW flow meter: installed at the connection point with sewage system to CETP
	- In case industry has underground water exploitation permit, CETP owner will install a water flow meter to calculate the underground water volume used.		
Adjustment of Wastewater Treatment Fee	- Changing of state policy or mechanism - Changing of prices which impact WW treatment cost - New investments in basic treatment technology, quality of services	- Government adjusts the standard level of CETP effluence	- Changing of state policy or mechanism - Changing of operation costs (chemical, power, salary) - New investments in basic treatment technology, quality of services
EP charge for WW	Collected by IDC for the Government	Not mentioned	
End of contract	- Contract ending in case: - Land leasing contract end - Authorities withdraw industry's business license or investment certificate	- Contract ending in case: - Land leasing contract ends - Industry doesn't install and operate strictly the separated drainage system, lets rain water mix	

Content of contract	Tan Binh IP TANIMEX Infrastructure Co HCMC	Nhon Trach III IP – Tin Nghia Infrastructure Co Dong Nai Province	Dong Van I IP Ha Nam Infrastructure Co Ha Nam Province
	- Authorities declare must stop activities in the contract provision - Court declares must cancel or stop the implementation of contract - Force majeure	with wastewater - Quality of pre-treated WW exceeding limit level of influence - Industry has broken provision of land leasing and infrastructure utilization contract - Violation with provision of Infrastructure protection and maintenance, EP regulation, IP sanitation	
Violation of the contract and sanctions taken	Internal Sanctions: - Interrupt the industry's right to use IP road system without fee - Interrupt WW receiving and providing water supply after 30 days of the first notice on the violation without any activities of industry to overcome problem For more serious environmental violations caused by polluted WW, send to authorities for administration sanction , withdraw the business licence or to criminal court	Violation of payment terms: - Doesn't pay monthly treatment service fee within 7 days: interrupt receiving of WW - Within 60 days: stop receiving WW and Tin Nghia IC will unilaterally terminate the contract and send the case to Dong Nai Court Violation of quality of pre-treatment provision after 3 times: Tin Nghia IC will unilaterally terminate the contract, interrupt supply of other relevant infrastructure services	Violation of payment terms - Doesn't pay monthly treatment service fee within 14 days: interrupt receiving WW - Violation for pre-treatment provision : - Interrupt WW receiving after 7 days from the second notice on the violation without any activities by the industry to overcome the problem (total: within 7x2 = 14 days) - For more serious polluted WW discharge: Ha Nam IP Infrastructure Co, will apply Article 10 of Decree 81/2006: Sanctions: 17 levels of fines with additional heavy measures: * - Interrupt supply, WW treatment services - postpone validity or withdraw discharge permit - request industry to treat polluted environment - Sanction for violation of WW collection system protection and utilization: applied Article 30, Decree 126/2004 on administration violations in construction, urban infrastructure and housing management
Responsibilities and Rights of Industry			

Content of contract	Tan Binh IP TANIMEX Infrastructure Co HCMC	Nhon Trach III IP – Tin Nghia Infrastructure Co Dong Nai Province	Dong Van I IP Ha Nam Infrastructure Co Ha Nam Province
Discharge WW	- Discharge WW at required standard into CETP system - Pre-treat WW to meet required standard before discharge to CETP - Right to use the drainage services in IP including providing information on drainage services	- Right to Increase or reduce the volume with 5 months of advance notice to CETP owner	- Interdiction to discharge diluted wastewater, solid and hazardous waste into the WW collection system of IP
Infrastructure & Environmental protection	- Connect the internal drainage system to IP collection system pursuant to negotiation/approved design by CETP owner - To complain and denounce any violation of drainage activities from CETP owner or others - Right to request CETP owner solve any incident caused by CETP operations	- To build a WW storage tank to reserve temporary WW in case of incident or CETP maintenance, repair - Control, maintain, repair to ensure the good condition of internal drainage system and to prevent any leakage or discharge of WW directly into environment without treatment - Provide to CETP owner drawing/design of internal drainage system	- To build manhole to take WW sampling - To install thermometer at the steam boiler and cooling facility to reduce high temperature of boiler wastewater - To build facilities to separate sand, oil or grease in WW before discharge of WW to CETP collection system
Liquidation of contract	- Pay service fee and all debt or interest rates caused by late payment - Pay compensation , fine, cost caused to CETP owner by contract violation of industry		
Damage Compensation	- Pay compensation to CETP owner caused by exceeding allowed receiving limit of influence - Pay compensation caused directly by the WW before discharge to CETP system - Be paid compensation for damage caused by CETP owner		
Responsibility and Rights of CETP Owner/IP Infrastructure Development Company			
Treatment system	- Ensure the effluent of the CETP will meet the required standards for waste water discharge - Comply with process, regulation on drainage system operations	- Regularly maintain the CETP system with 1 day in advance notice to industry - Continuously receive the WW of industry (even weekends and holidays)	- Manage, operate, upgrade and maintain the WW collection of CETP system
Environmental	- Comply with environmental protection regulations		- Comply with environmental protection regulations

Content of contract	Tan Binh IP TANIMEX Infrastructure Co HCMC	Nhon Trach III IP – Tin Nghia Infrastructure Co Dong Nai Province	Dong Van I IP Ha Nam Infrastructure Co Ha Nam Province
Protection	- Control Environmental protection relevant to discharge of industry and request industry to promptly comply and pay compensation if needed		
Infrastructure protection	- Supply required information and approve connection for industries discharging waste water		
	- Ensure the safe operation of the drainage system as legal provision	- Approve connection design prepared by industry before their construction of internal drainage system	- Ensure the good operation of the drainage system and CETP : - ensure the height of pipeline, the accessibility of sampling manhole and connection point - frequently check cover, sedimentation at connection point, outlet/manhole, culvert for scheduling activities of dredging and maintenance; - set up process of WW collection pursuant to operation's technical requirements
Control the quality of influence and handle violations of quality	- Without advance notice, take WW samples, analyze, check and control the quality and volume of influence as discharge to CETP system - Request industry to pre-treat WW before discharging WW into CETP system - Inform promptly of any excess in WW discharge based on agreed standards; - Request industry to pay for treatment services and compensation for damage caused by excess of WW discharge.		- Frequently check the pre-treatment works of industries
Damage compensation	- Have no responsibility to pay compensation if the WW of industry directly caused damage to the third party - Pay compensation caused by CETP system to industry		

11.1.2 Fees

Table 8-3 presents the different levels of fees charged to industries in 7 different industrial parks. There are 3 main types of fees:

- Land leasing fees
- Infrastructure fees: for maintenance (road, drainage system)
- Wastewater treatment fees[25] (if a CETP is available).

■ ***Low levels of fees***

The first remark is the very low rate of fees (both for infrastructure and for treatment). Infrastructure fees are around 4 000 VND/m² per year while wastewater treatment fees vary from 3 000 to 5 000 VND/m³.

Even if Decree 88/2007/ND-CP on urban and industrial park water drainage, opens the way for full cost recovery policy, according to all agencies met, the applied tariffs are far from sufficient to cover the operation and maintenance costs. The fees are proposed by the infrastructure development companies and have to be approved by the City/Province Peoples' Committees. PPC based the fees on the affordability to pay of industries and not on the investment, operation and maintenance costs.

Such a low level of fees does not incite infrastructure companies to invest in infrastructure works. It was reported that provinces are reluctant to raise fees because they are afraid to lose investors who will go in other IPs or in other provinces where the rates are lower.

There is not much difference between state-owned IPs and private IPs. It seems that lease land fees are lower in state owned IPs while infrastructure fees are lower in private IPs.

In addition, even with this low level of fees, industries often do not want to pay fees. In Ha Nam, several industries asked the infrastructure company to stop the payment since September 2008 due to the financial crisis. This creates additional problems for infrastructure companies to maintain infrastructure.

■ ***Fees according to the level of contamination***

For wastewater treatment fees, several provinces charge industries according to the level of contamination (level B, C based on TCVN 5945-2005). This is the polluter-payer approach; the most polluting companies will have to pay more. This is a good step forward.

Some IDC have difficulty identifying the volume of wastewater discharged by industries; most of the industries have no flow meters. Therefore, the volume is charged according to the water supplied to the industries (water volume is indentified by the water supply companies). The rate used is usually 80% of the water consumption is considered to be released as wastewater. In some industrial parks (Ha Nam in particular), some industries use underground water without a permit. Therefore, the infrastructure companies cannot identify this volume of water and are losing fees.

■ ***Collection of fees***

For state owned IPs, all the fees collected are sent to the Provincial Department of Finance. HIEPZA in HCMC keep 10% of the fees to cover management expenses. This creates a fund for IZA and helps to carry on their environmental responsibilities. Other IZA met (Dong Nai in particular) would like to get management fees. They need the approval of the Provincial/City Peoples' Committee.

[25] These fees are different form the fees collected by DONRE for environmental protection.

- ***Low Environmental Conscientiousness of Industries***

Several infrastructure companies also complain about the low level of knowledge and environmental conscientiousness of industries. Industries often prefer to pay fines than to invest in pre-treatment. Therefore, it is necessary to conduct awareness programs for industries within industrial parks.

11.1.3 Proposition of a Model Clause for Environmental Compliance

Even if the main purpose of contracts between industries and infrastructure companies is not directly linked to environmental protection, it establishes responsibility and rights for both industries and infrastructure development companies. Therefore, contract could be a good opportunity to include environmental requirement in particular for industries. Infrastructure companies are directly in contact with industries and could better control the compliance of industries with environmental requirements then exterior agencies. The following environmental requirement could be included in the contract between industry and Infrastructure Development Company:

- ***Obligation for industries to discharge waste water in a CETP***

As already indicated, there is actually no clear requirement in the existing regulation that an industry has to be connected to the CETP. Contracts should include this condition.

- ***Interdiction to use underground water without a valid permit***

To avoid the treatment of non-anticipated volume of wastewater and the loss of revenues, underground water exploitation is forbidden without an official permit from the relevant agency.

- ***Flow meters and sampling points should be installed at the waste water discharge outlets of all industries***

Actually the identification of volume of wastewater is based on the water supply (usually it is considered that 80% of the water supply will be discharged as wastewater). However, some industries are taking underground water, which is not controlled (see above), and are discharging more wastewater than planned by the CETP operator. Sampling points (manhole) should also be present at each industry wastewater outlet to facilitate sampling procedures by IDC and other monitoring agencies. Contracts should include this condition.

- ***Arrangement for restoration of sites when the company will stop operation***

Actually, there is no regulation on restoration of contaminated site. Each contract should include the responsibility of an industry to decontaminate its site after stopping operation. Some contracts reviewed include a deposit to cover cost of eventual decontamination or to cover the cost of any pollution incident.

- ***Management of hazardous waste***

In contracts between Infrastructure Companies and industries, hazardous waste is not identified. There should be mention of hazardous waste in contracts (requirement for storage, transport and treatment).

  - If hazardous waste storage and treatment facilities are present in the IP, industry producing hazardous waste has to use these facilities;
  - If no facilities are available, IDC should recommend to the industry a list of registered enterprises who have business licences to transport, store and treat solid and hazardous waste.

Table 11-2: Comparison of Fees in Different Industrial Parks

	Land lease fees/Infrastructure fees	WW treatment fees (based on (TCVN 5945-2005)	Calculation of Volume
Ha Nam (Ha Nam Infrastructure Company)	- Land lease fee - Infrastructure fee: 4 000 VND/m^2	- Rates according to level of contamination - Level B: 3 000 VND/m^3 - Level B: < < C 4 000 VND/m^3 - Level C: 5 500 VND/m^3 - Over C: asked for sanction for Environmental Protection Violation under Article 10 Decree 81/2006	- Based on flow meter installed at each outlet connected to the IP CETP system
Nam Dinh (Nam Dinh Infra-structure Company)	- Land lease fee - Infrastructure fee: 2 500 VND/m²	- Proposed 3 500 VND/m^3 (to be approved by PPC)	- Volume of industrial waste water equals 80% of volume of water supplied to the tenants' factory
Hanoi Ha Binh Phuong IP	- Land lease fee for 50 years: 80 USD/m^2 - Infrastructure fee: 0.2 USD/ m^2	- Before VAT VND 3 480/m³	
Hochiminh City Tan Binh IP		- Below Level C: 50% x 3 950 VND - Level C: 3 950 VND - Over Level C: 130% x 3 950 VND	- Volume of industrial waste water equals 80% of volume of water supplied to the tenants' factory.

Dong Nai
Tin Nghia – Nhon Trach 3 IP
	- Annual payment (excludes VAT):
	  - Land rental rate: 1 750 VND/m^2/year
	  - Infrastructure fee: 2.5 USD/m^2/year.
	- One payment
	  - 50 – 55 USD/m^2 /45 years (to 2053)
	  + Management fee: 0.5 USD/m^2/year
		- 4 830 VND/m^3 0.32 USD/m^3	- Volume of industrial waste water equals 80% of volume of water supplied to the tenants' factory.

Bien Hoa II Sonadezi	- Land lease: 2.25 USD/m^2/year - Infrastructure usage fee: 0.5 USD/m^2/year - Land rental (for foreign investors): 0.8 USD/m^2/year - Infrastructure using fee: 0.4 USD/m^2/year	- 4 820 VND/m³ Same price for Bien Hoa I, II, Go Dau	
Long Thanh Sonadezi	- Land lease: 0.05 USD/m^2/year - Infrastructure fee: 45-50 USD/m^2/leasing period (not exceeding the year 2053) - Management fee: 0.2 USD/m^2/year	0.32 USD/m³	
Binh Duong Tan Dong Hiep B		0.28 USD/m^3	- Being calculated as 80% of the consumed clean water

11.2 Financing of Environmental Infrastructures at Industrial Estates

Financing of wastewater projects within industrial parks is in most cases a problem. IP needs ODA fund or money from the state budget to be able to build wastewater treatment plant. Nevertheless, the government intervention in these projects is limited and therefore also their financial involvement.

Several IZA and IC reported that the fund available at the provincial level goes in priority for land clearance that is perceived as the main problems for industrial park development. Therefore, remaining funds, if any, after land clearance will go for the funding of wastewater treatment system.

In most cases, industries are responsible for the financing of their wastewater treatment system in order to obtain a wastewater discharge permit.

11.2.1 State-owned Industrial Parks

For state-owned industrial parks, the budget for infrastructure development comes from the provincial budget linked to infrastructures. As indicated above, the priority for PPC is to clear the land, not building CETP. The infrastructure development company manages the budget. The fees are decided by PPC. As indicated in section 8.1.2, the low level of fess can cover only the cost of operations.

11.2.2 Private Industrial Park

For private industrial park, the private investors is funding and managing the infrastructures within industrial parks. Most of IPs managed by private investors has a CETP

11.2.3 External financing or operation for environmental services

Most IDC invest and run themselves the wastewater treatment plant. IDCs mention difficulties to make profit from collecting wastewater fees that are very low. However in the South, there are few cases of external expertise being developed for investment and operation of WWTPs. In Tan Thoi Hiep IP, HCMC Quoc Viet Ltd (an environmental services company) was in joint-venture with Tan Thoi Hiep IDC to invest for the WWTP but the Tan Thoi Hiep IDC is the one running the WWTP and collect treatment fee. The IDC has to refund the Quoc Hiep Ltd invested capital through collected fee. In Dong Nai province, SONADEZI Corporation was etablished by Dong Nai province, a state-owned company, in investment and business services for Dong Nai Infrastructure system and running some big IPs in Dong Nai such as Bien Hoa 1-2 IPs, Long Thanh IPs...etc. Since they gained experience to operate WWTP, they have set up a services joint-stock company (Sonadezi services JSC) who invest for IPs and WWTPs. JSC will run business on the WWTP by themself (including: operation and maintenance, collecting fees, etc.). The JSC is now running business of WWTP of Bien Hoa 2, Long Thanh and Nhon Trach IPs. This model is then developed but still limited to the southern provinces.

11.3 Incentives to Industries to Comply with Environmental Regulations

Few incentives to industries to comply with environmental regulations are present in Vietnam. Most of the incentives given to industries are linked to the relocation of industries under Decision 64/2003.

11.3.1 Incentives for Relocation

Incentives for industries that have to be relocated exist as described in section in section 9.1.1.3. However not all relocated industries received incentives. For example, relocation of production activities from craft villages into industrial points did not receive ant financial incentive.

11.3.2 Vietnam Environmental Protection Fund[26]

The Vietnam Environmental Protection Fund (VEPF) was established under Decision No. 82/2002/QD-TTg. VEPF proposes several forms of assistance that could be used by industries and industrial park managers:

- Loan with offered rate;
- Assistance in loan rate
- Funding and co-funding
- Debt guarantees

However, some agencies met find difficult to apply for the VEPF due to the long and complicate process. A simplification of procedures to apply to the VEPF is needed. The above mentioned investment program, presented in the Task 3 report, will propose some measures to help industries to comply with environmental regulations.

11.4 Environmental Data Management for Industrial Zones

Environmental data management has been identified as an obstacle for the efficient environmental management of Industrial Parks. In particular no data are computerized which makes difficult for the relevant agencies to monitor and control environmental protection issues. Two projects have been implemented, one by SEMLA and the other by the Institute of Environment and Resources, and the HCMC Environmental Protection Agency. IZA or IDC can provide the data management services to industries within industrial parks.

11.4.1 Environmental Information Platform for Industrial Zones

SEMLA[27] proposed implementing an environmental information platform for industrial zones. Two pilot projects are currently ongoing: Tanh Long Industrial Park, Hanoi and Sonadezi Industrial Zone, Dong Nai. The objective of this platform is the following:

- To establish cooperation between all stakeholders by creating an information platform for environmental information in order to ensure efficient environmental management and dialogue between stakeholders.

According to SEMLA, the benefits of this platform for IZA and industries are the following:

- Modern and IT/ Internet-based approach resulting in direct and quick access to environmental information helping to speed up implementation of effective environmental management.
- Transparency and direct access to information for all stakeholders.
- Improved management of environmental information within an Industrial Zone and between IZA and individual industries and between industries resulting in time and cost savings.
- Having direct access to current information about environmental policy, legislation and standards.
- Strengthen the participation/ involvement of industries in development of new environmental policies/ standards/ regulations by e.g. commenting on drafts on the web-site.
- Improved interface between Industry and environmental authorities improving communication resulting in reduced time and cost for administration of permits, etc.
- More effective reporting and monitoring system for environmental performance of industry and IZs resulting in reduced time and costs.

[26] See http://vepf.vn/Home

[27] Per Bertilsson (2008) Chief Technical Adviser SEMLA Programme; Environmental Information Platform for Industrial Zones

- Simplification of inspection activities by environmental authorities and strengthening of self-monitoring by industry.
- Simplification of the reporting and monitoring of environmental performance of industry for e.g. VEPA and DONREs.
- A simple and cost-effective system ensuring all industries have direct access to current information about policy, laws and standards as well as trends and news in environmental monitoring.

Results of the two ongoing projects should be widespread to all IZAs.

11.4.2 Environmental Data Management within Industrial Estates

In order to improve the environmental data management within industrial zones, a program, the TISEMIZ (Tool for Improving Strength Environmental Management for Industrial Zone) has been established in HCMC. This project is conducted by the Institute of Environment and Resources, and the HCMC Environmental Protection Agency

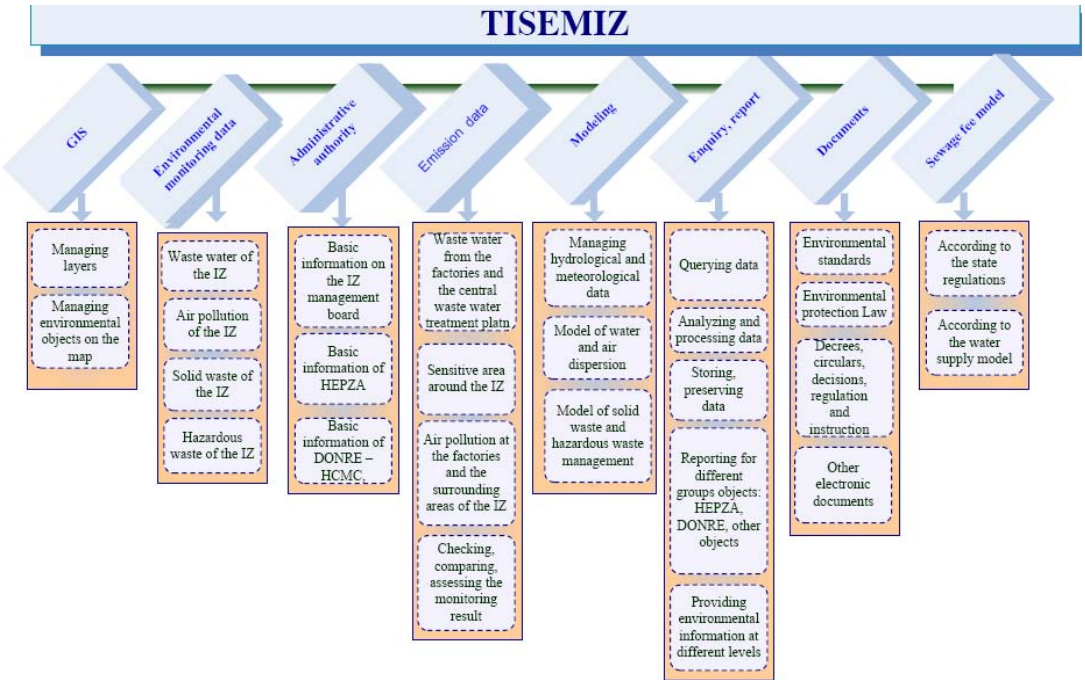
This program has the following objectives:

- Support the IZ and the local environmental management authorities in storing and seeking data on environmental management;
- Encourage the exchange of information and periodic report between the IZ and the local environmental management authorities.

The TISEMIZ program aims to integrate a variety of environmental data and to supply environmental information to the relevant agencies and organization.

This pilot program could constitute an interesting tool for IZA and DONRE for an efficient management and monitoring of environmental issue within IPs. Figure 11-1 presents the main functions of the program.

Figure 11-1: Detailed Diagram of Functions in TISEMIZ Program



Source: Developing Information System Supporting Environmental Management for Industrial Zones

12. IDENTIFICATION OF MOST POLLUTING INDUSTRIES AND RELOCATION OF INDUSTRIES

Cities in Vietnam have experienced a rapid path of urbanization and industrialization. Due to traditional location and a lack of city planning, many industries are located within the urban areas mixed with residential and commercial activities. The technology used by these industries is generally obsolete and generates a high level of pollution (air pollution, surface water and underground water pollution, smoke and dust, noise, etc.). The level of the pollution could affect the health and the living conditions of the population living around the industries. In addition, land use in cities' central districts has become more and more valuable and the industrial land use within the city is considered a waste of land by the authorities.

Therefore, the GoV and the main cities developed programs for the relocation of industries outside the centers in industrial parks and industrial clusters.

12.1 National Approach

Regulations have been issued by the GoV to facilitate the relocation of industries.

- Law on Environmental Protection (2005)
- Decision 64/2003/QD-TTG
- Decision 17/2008/CT-TTg
- Circular 07/2007/TT-BTNMT Criteria to Identify Most Polluted Industries

Details of these regulations are presented in Table 12-1 and in Annex B-2

12.1.1 Relocation of Polluting Industries

12.1.1.1 Plan to Relocate Polluting Industries

Viet Nam recognized the severity of the problem of polluting industries with the issuance of Decision No. 64/2003/QD-TTG on 22 April 2003, *approving the plan for thoroughly handling establishments which cause serious environmental pollution*. The plan includes not only factories but also toxic chemical storage zones, wartime bomb warehouses, chemical warehouses and rubbish dumps and hospitals. This plan first identified 4,295 polluting establishments with the most serious 439 to be processed in Stage 1 (2004 to 2007).

Results from Stage 1 showed that around 63% of these establishments were investigated[28]. Stage II (2008 - 2012) will continue to handle the remaining 3,856 establishments causing serious environmental pollution. To overcome these problems, the Government issued instructions 17/2008/CT-TTG to promote the implementation of Decision 64. This provides new targets up to 2012 and assigns specific tasks and deadlines to Ministries.

Table 13-1 shows, for 284 industries (among the 439 most serious cases handled in 2000-2002) identified in Appendix 1 of Decision 64, the proposed measures to solve industrial pollution.

Most of the correction measures proposed were waste water treatment plants (more than 70%) while closure was proposed for only 1 company and relocation for 10% of the total industries.

[28] Kellogg Brown & Root Pty Ltd in association with VICA Consultants (2008) ADB TA 4903-VIE Water Sector Review Project Status Report p12.

Table 12-1: List of Industries by Category and Measures Proposed

	Closure	Relocation	Upgrade/change Technology	Treatment plant
Electronic	0	3	0	2
Chemical	0	4	12	18
Heavy industry	0	2	8	18
Light industry	1	2	6	36
Food industry	0	9	6	78
Construction material	0	3	18	11
Handicraft	0	3	3	16
Others	0	2	2	21
Total	**1**	**28**	**55**	**200**
	0.35%	**9.86%**	**19.37%**	**70.42%**

Source: Appendix 1 of Decree 64

SEMLA made an evaluation of the implementation of Decree 64, 3 years after its issuance[29]. The main results are as follows:

- The implementation of Decision 64 has gained the active participation of ministries, sectors and provincial authorities, especially the Ministry of Construction, the Ministry of Industry, the Ministry of Agriculture and Rural Development, the Ministry of Health, the Ministry of Fishery, the Ministry of Transportation, the Ministry of Defense, and provincial/city People's Committees such as Hanoi, Hai Phong, Da Nang, Ho Chi Minh City and other provinces. The participants have deployed treatment plans and programs and have gained some results.
- Besides achievements, some shortcomings in the implementation have been caused by the difficulty with financial support from the Governmental budget (only 2 projects have been allotted 6 billion) Therefore, the progress for treating Hot Spots under Decision 64 is still beyond the planned schedule.
- There is a lack of regulations for penalizing enterprises who did not obey Decision 64.
- Delays are also due to the weak abilities of local environmental management authorities and limited coordination between pollution prevention measures and application of environmentally friendly technology.
- In order to increase the efficiency of activities under Decision 64, it is very important to organize training courses to improve awareness on Environmental protection, to enhance inspection activities, and to look for financial sources to implement projects under Decision 64.
- It is also important to ensure good coordination among Central management, provincial authorities and international organizations in order to support treatment activities in Hot Spots.

The issuance and implementation of Decision 64 could be considered as an important step for the GoV to solve pollution problems and to improve the environmental awareness of the population. This Decision has received strong support from communities in all provinces. It has also received the active participation of all ministries and all management levels. The implementation of Decision 64 has created movement in environmental protection in the whole country.

[29] Dr. Dang Kim Chi, INEST (November 2005) Situation Analysis Report on Management of "Hot Spots" ("Decision 64" entities) for SEMLA Programme.

12.1.1.2 Criteria to Identify Most Polluted Industries

To guide DONRE in identifying the list of polluting industries, the GoV issued Circular 07/2007/TT-BTNMT, dated providing guidance on classifying and making decisions with regard to polluting facilities that need to be treated.

The Circular identifies the criteria to determine the polluting industries. Two categories of establishments have been identified: i) the most polluting establishments; and ii) the polluting establishments. The criteria are presented in Annex B-2 (item 40).

12.1.1.3 Assistance to Industries

Several types of assistance (exemption from taxes and land lease, use of land use fees, use of compensation for construction, use of environmental protection fund) could be used for the relocating industries.

As indicated in the above-mentioned SEMLA study, to provide support for establishments, which cause serious environmental pollution, the GoV issued the following regulations:

- Under this Decision No 74/2005/QD-TTg, the cost of moving for relocated industries will be covered partially by using the sale of land use rights and of construction, and the transfer of fees. The level of support depends on the type of business and the investment projects approved by authorities. Money from dismantling construction (sale or compensation) could: i) be used by the State if it is a SOE, to build new infrastructure or to build new technology for the relocated industry; or ii) if it is not a SOE, the money will go to the State budget;
- The Land Law (Article 60.1) and subordinated Decrees 197/2004 ND-CP (Article 13.3), 142/2005 ND/CP (Article 14.4), 181/2004/ND-CP (Article 36) provide exemption and reduction of land use fees, land taxation, or land leases for relocated industries.

However, vey often no incentives for relocated industries are provided. It creates difficulties to implement Decree 64.

■ ***Vietnam Environmental Protection Fund***

As explained in section 8.3.2 an environmental protection fund was established under Decision No. 82/2002/QD-TTg of June 26, 2002, on the establishment, organization and operation of the Vietnam Environmental Protection Fund (VEPF). A new decision on the organization and operation of the VEPF was issued on May 19 2008.

The fund will provide financial support for projects aimed at protecting natural resources and biodiversity and solving environmental problems such as pollution. This fund could be used for the relocation of industries due to environmental pollution.

Projects listed in the “Plan for strictly penalizing enterprises who caused severe environmental pollution” as promulgated in association with Decision No. 64/2003/QD-TTg have priority to receive financial assistance from the VEPF.

Table 12-1: Regulatory and Institutional Framework for Most Polluting Industries and Relocation of Industries

Legislation	Agency responsible	Findings	Possible improvement
Inventory of Most Polluting Industries			
– Article 49 of the LEP handles the problems of polluting industries. Seriously polluting industries shall not only face sanctions but will have to solve their problem with one of the following measures: i) measures to remedy environmental pollution; ii) Forced relocation to a place far from residential areas and consistent with the load capacity of the environment; or iii) Ban from operation.	– MONRE will guide the inspection and supervision of the handling of polluting establishments. – DONRE is responsible to make a list of polluting industries within their territories. – Following this list, the Provincial People's Committees' Ministries shall decide on the type of solution for each establishment. – The commune-level People's Committees in the places where the establishments are located must be notified of the decision. The decision also has to be publicized so the population can follow the process.	– There is a lack of regulations for penalizing enterprises who did not obey Decision 64. –	– It will be important to organize training courses to improve awareness on Environmental protection, to enhance inspection activities,
Relocation of Industries			
– Decision No. 64/2003/QD-TTG on 22 April 2003, approving the plan for thoroughly handling establishments, which cause serious environmental pollution. – Decision No. 17/2008/CT-TTg dated 5 June 2008 on urgent measures for improved handling of establishments causing serious pollution in accordance with Decision 64/2003.	– DONREs are the main authorities to determine the list of polluting industries and to implement programs for relocation of industries. The budget, however, comes from the Provincial People's Committees – In HCMC, the City set up a «Steering Committee» under the management of the City People's Committee to implement the industry relocation	– The Plan proposes appropriate measures (e.g., renovating and upgrading technology, building wastewater treatment works or closing down some facilities) to minimize pollution, and establishes a systematic schedule to deal with such units from 2003 to 2012.	– There is a need for clarification and simplification for criteria of relocation of industries.

Legislation	Agency responsible	Findings	Possible improvement
– Circular 07/2007/TT-BTNMT, dated July 3, 2007, from the Ministry of Natural Resources and the Environment providing guidance on classifying and making decisions with regard to polluting facilities that need to be treated	program. Members of the Steering Committee come from district People's Committees, MOI, MONRE and MOC. –	– Some of the DONRE met found these criteria very complicated to use and implement. It is also not clear what the basis for the Vietnamese environmental standard is (TCVN? Other?).	
Assistance of Industries			
– Decision No 74/2005/QD-TTg, dated the 6th of April, 2005, guiding the use of land-use-right transfer fees, money earned from selling factories, and other projects after economic organizations must relocate head offices, production factories or trading offices following the planning. – Circular 66/2005/TT-BTC was issued on August 18, 2005, to provide guidelines for the implementation of Decision 74/2005/QD-TTg. – The Land Law (Article 60.1) and subordinated Decrees 197/2004 ND-CP (Article 13.3), 142/2005 ND/CP (Article 14.4), 181/2004/ND-CP (Article 36) provide exemption and reduction of land use fees, land taxation, or land leases for relocated industries. – Decision 164/2003/ND - CP dated 22 September 2003 (amended by Decision 152/2004/ND-CP of August 6, 2004).	– Provincial People's Committee will	– Very often, no incentives for relocated industries are provided. It creates difficulties to implement Decree 64.	– It will be important to look for financial sources to implement projects under Decision 64.

12.2 Provincial/City Relocation Approach

Cities and provinces also develop programs for relocation of industries.

- ***HCMC***

In 2002, the City carried out a survey to collect information on the environmental situation and wastewater management of industries. 6 745 among 12 075 questionnaires were collected (including 252 industries willing to relocate, 92 industries changing activities, 280 looking for financial support for treating pollution, and 222 industries which had prepared relocation studies with suggestions for financial support for relocation).

In order to support the relocation of industries, HCMC issued Decisions no. 80, 81 and 44:

- Decree 80/2002/QD-UB, dated July 08, 2002, on Project of relocation of polluting industries to IPs and outskirt areas:
- Decision 81/2002/QD-UB July 08, 2002, and Decision 99/2005/QD-UB June 13, 2005, on some financial support to relocate polluting industries to IP or IC;
- Decision 44/2005/QD-UB March 16, 2003, on Conditions, procedure and sequence to extend the deadline of relocation or to be removed from the list of relocating industries

The most comprehensive Relocation Program took place from 2002 to 2004, based on the Decision No. 80/2002/QĐ-UB by the city People's Committee: "Relocation of polluting Enterprises to Industrial Zones Program (hereafter called ROPETIZ program or Relocation Program). The city government from early 2002 to the end of 2004 carried out the program.

The program identified 260 most polluting industries located in the inner districts (out of 1200 critical industries from the survey) to be relocated to industrial zones during the program.

12.2.1 Institutional structure and procedures

The program was directed by a Steering Committee chaired by the vice-chairman of the People's Committee with the deputy directors of the Department of Industry (DOI) and DOSTE acting as vice-chairpersons. The Steering committee developed, monitored and supported the ROPETIZ program implementation. The committee held the final authority to decide whether a certain industry needs to be relocated.

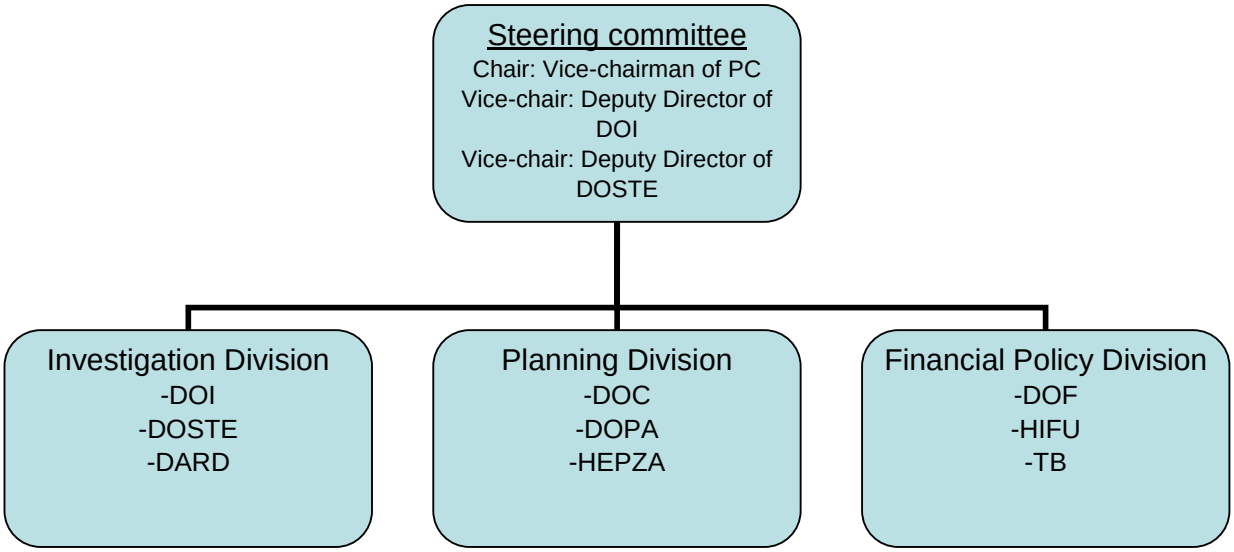


Figure 12-1: HCMC Relocation Program Management Structure

The Investigation division (composed of DOI, DOSTE and DARD) was responsible for the survey and the overall data collection. Following the pollution levels and the industrial sector, the division recommended a decision on the need to restructure, relocate or even close down the enterprises.
The criteria used to put industries up for relocation or closure were (mostly dictated by MOSTE, approved by the steering committee):

- Pollution: Failure to meet environmental standards;
- Location: Industry's location is not in line with general master plan of HCMC and district;
- Outdated technologies: Partly or completely operating with outdated technologies that cannot be improved through a feasible increase of investments;
- Not economically viable: Not making sufficient profit to be considered effective in economic and social terms.

Furthermore, the HCMC authorities announced a list of 14 heavy polluting industrial sectors that would no longer be allowed to operate in the inner districts (Van Khoa and Ho, 2006)[30] (see box 1).

[30] Le Van Khoa and Peter Ho. 2006. Greening Through Industrial Relocation in Vietnam. chapter in: *Greening Industries in Newly Industrializing Economies*. Edited by Peter Ho. Taylor and Francis.

Box 12-1: 14 restricted categories of production in the inner city

1. Chemical industry (production of batteries, pesticides, paints, etc.);
2. Waste recycling (paper, plastic and metal);
3. Textile bleaching and dyeing;
4. Rubber vulcanization;
5. Leather tanning;
6. Electroplating and metal forgery;
7. Building materials (pottery, porcelain and glass);
8. Tobacco processing;
9. Industrial breeding of livestock;
10. Slaughtering;
11. Coal processing;
12. Wood processing;
13. Pulp and paper.

Source: PC, 2002. Decision No.78/2002/QD-UB dated 08/06/2002 on announcement of the list of industrial sectors not to be issued new investment license or certificate of trading.

The Planning Division, composed of the Department of Planning (DoPA), the Department of Construction (DoC), is responsible for planning Industrial Zones throughout HCMC and for redirecting the industries to these zones. Once all the procedures for the relocation have been settled, HEPZA (HCMC Industrial and Export Processing Zones Authority) assists the industry in the actual resettlement in order to restart operations as soon as possible.

Finally, a third division, **the Financial Policy Division**, manages the implementation of incentives and support policies as designed by the Department of Finance (DoF). In practice, it largely comes down to HIFU (HCMC Investment Fund for Urban Development) giving financial advice to obtain loans from credit organization; the Tax Bureau (TB) advice on preferential tax-opportunities and some specific financial support funds found by DoF.

12.2.2 Relocation criteria and achievements

Within the program, a comprehensive DOSTE (former DONRE) survey updated the list of industries in HCMC that do no meet the pollution standards. Of the 3000 industries that did not meet the standards, 1200 had to be removed or relocated. The 260 most polluted industries were planned to be relocated within the program (2002-2004). The remaining industries had to plan for relocation in the 2nd phase of the program or apply on-site measures to reduce pollution.

In August 2003, 19 months after the program started, the Department of Industry published a progress-report stating that: 126 units had completed their relocation. The final figures for the total number of relocated industries during the whole program show great variation according to different sources. However, the program technical support and financial support has been available up to 2006.

In 2003, the DoF Investment Fund had allocated 250 billion (14,7M USD) during the program including:

- 194 billions (11,4M USD) for the relocation of 55 industries;
- 11 billions (650 000 USD) for infrastructure Investment Companies within Industrial Parks;

- 28,5 billions (1,7M USD) through district People's Committees to support small and medium enterprises (for support funds below 5 billions);
- 20 billions (1,2M USD) for an "Industrial Environmental Pollution Reduction Fund". (Le and Ho, 2003).

According to the Relocation Steering unit from the Ho Chi Minh department of industry, relocating industries have invested approximately VND 1 000 billion, including approximately VND 600 billion for basic construction and VND 400 billions for equipment, technology, and recruited thousands of new labours (Quach To Dung 2003)[31].

12.2.3 Main challenges and recommendations

Various external experts have published in deep critical evaluation of the program. The first obstacle to relocation pointed out by analysts is the lack of financial resources and incentives for small and medium-sized enterprises (SMEs), the majority of the industries on the list to be relocated.

In the ROPETIZ program, industries are expected to generate the major share of the capital needed for the relocation and/or site improvements, for instance, through the sale of real estates and obsolete machinery. However, most SMEs hardly own real estate or equipment, let alone property with a substantial market value. Only the large State Owned Enterprises appear in the position to generate capital by selling their property and by transferring their land-use rights. In practice, however, procedure for selling State Owned Enterprises property would be extremely complex, rendering it almost impossible to raise money in such a way. The only financial support is then the government support, when approved, to compensate for the interest loans contracted for the relocation as well as a small direct financial award (2 000-32 000USD). The Department of Finances has also developed a series of tax benefits and exemption of land rents in industrial parks for periods of 3 to 5 years.

Financial support and administrative procedure should then be more flexible and adapted for small and medium-sized enterprises. Administrative procedures should be simplified and industries should be supported in their procedures for applying for financial support. As capital access was limited, more variety of preferential loans could be made available by the authorities.

The second main issue pointed out by experts is that relocation of industries has not always automatically resulted in environmental benefits. Van Khoa & Ho (2003) have found that many industries located in Le Minh Xuan Industrial Zone were not connected to the wastewater treatment plant to avoid treatment fees. Many others were partly discharging into the water bodies via their sewers. One major environmental problem is that most industrial zones still do not have any wastewater treatment plant. The environment is still not a priority for the IZ managers or the relocated industries. Industries see the relocation as an opportunity to expand and modernize, as industrial zones managers do not see the environmental infrastructures as a productive investment.

The director of the Vietnamese Center of Environment Technology and Management, Nguyen Trung Viet, cited in Van Khoa & Ho (2003), stated that:

> "Almost all IZs have been planned and are being operated without scant regard for the environment and with no or very little interest in its protection. Thereby many of them have destroyed the environment in the surrounding areas (Dien dan Nghiep Magazine 2003)".

[31] Quach To Dung. 2003. Environmental Pollution Situation and Industrial Relocation Program in Ho Chi Minh city. *Proceedings of Kitakyushu Initiative Seminar on Industrial Relocation*. August 2003. Ho Chi Minh city, Vietnam

The main goal of the entire relocation program can be totally bypassed if the pollution is simply transferred from the urban district to an increased pollution in a rural area. There are plenty other examples to be found of cases where relocation programs merely resulted in increased pollution at a different places[32].

Ho Chi Minh City has since shown important reinforcement of the environmental regulation in industrial zones. Our review has shown that Southern provinces like Ho Chi Minh City and Dong Nai have gained experience with the recent development of numerous industrial zones. The relocation program included a regulation reinforcement concerning the construction of wastewater treatment plant. With implementation of Decree 29, IZAs have also seen their responsibility reinforced with environmental monitoring, reporting and fee collection for environmental management.

■ ***Hanoi***

To deal with industrial pollution issues, the Hanoi People's Committee issued Decision 74/2003/QD-UB on June 17, 2003, to remove factories that are not in conformity with the approved master plan for the City. This decision applied to the establishments located in the central districts of Hanoi, which are forced to move. Other Decisions have also been issued:

- Decision 115/2003/QD-UB dated 29/9/2003 assigns establishments that have material facilities unsuitable for the plan or that because pollution rewards for moving out of the central districts.
- Project 31-DA/TU dated 21/4/2004 by the Hanoi Committee of the Party on «Important objectives to improve the environment and society in 2004 and 2005» and plan number 42/KH-UB dated 26/5/2004 by the Hanoi People's Committee defines the goal of treating the severely polluting establishments listed in "Decision 64" timely.
- Decision 74/2003/QD-UB on June 17, 2003 to remove most polluting factories not in conformity with the approved master plan of the City.

DONRE Hanoi targets two types of industries for relocation:

- Most polluting industries (based on criteria from Circular 07);
- Industries violating land use plan;

To deal with the factories that are polluting Hanoi's environment, the Hanoi People's Committee issued DONRE Hanoi also has the following objectives for the relocation of industries:

- **Benefit for the industry**
  The industry should benefit from the relocation by expanding its production or by being able to improve/change technology (new processing line)
- **Community benefit**
  The community should benefit from the relocation through a better quality of life (improvement of air quality, in particular). In addition, the relocation of the industry should not move the pollution to another area, but should solve the pollution problem.
- **City benefit**

[32] Bai, X. 2002. Industrial Relocation in Asia. *Environment*. (January, 6) pp.8.
Dasgupta, N. 2000. Environmental Enforcement and Small Industries in India: Reworking the Problem in the Poverty Context. World Development. 28(5) pp.945-967.
Kwon C. and S.H. Lee. 2003. The Experiences of Industrial Relocation in Korean Cities with special reference on ULSAN Metropolitan City. Kitakyushu Initiative Seminar on Industrial Relocation. HCMC, Vietnam. Aug. 2003.

By relocating industries, the City aims to make better use of the land in the center of the city (see article below). The industrial land use within the city is perceived as a waste of land. The city aims to attract higher value activities; they will also get more taxes from the new occupation.

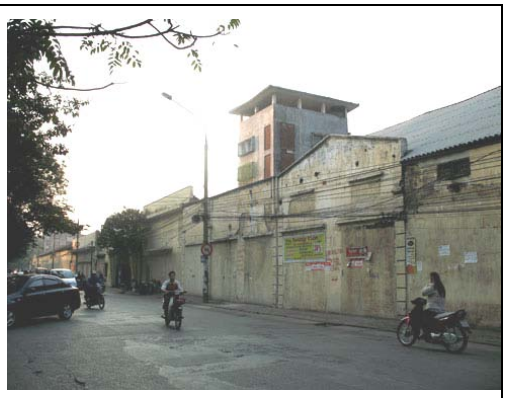
A case study of the relocation of a major industry (see Box 1), Hanoi Alcohol and Liquor Company (HALICO), illustrates the process of relocation and shows the benefit for the industry, the City and the community.

- ***Ha Nam province***

The Ha Nam People's Committee issued Decision 920/2004/QD-UB dated 7/7/2004 about regulations for financial support for establishments to innovate technology, mitigate environmental pollution, and improve product quality. Timely policies and local authorities' institutions help and encourage organizations to have good conditions to invest in production, pollution mitigation, and to implement Decision 64 in a serious and timely manner.

Box 12-2 : **Case Study: Relocation of Hanoi Alcohol and Liquor Company (HALICO)**

Hanoi Alcohol and Liquor Company (HALICO) 94 Lo Duc



This well known company is located in the center of the City (Hai Ba Trung District). It was founded over 100 years ago by Fontaine Distilleries of France in Hanoi. Today, HALICO controls nearly 40% of the spirits market in northern Vietnam, largely due to the popularity of its flagship product, Hanoi Vodka. The company is currently running at full capacity, 24 hours per day. The company has been listed in Annex 1 of Decision 64. Pollution came from air emissions, noise and waste water discharge. The option chosen to solve the environmental problem was the relocation of the industry outside the city. The relocation was planned in the first phase (2003-2005). DONRE representatives met the company owners to elaborate a strategy for relocation. The City made an evaluation of the cost of relocation. The costs were estimated at 700 billion VND (40M USD) including 350 billion VND (20M USD) for a new processing line. At the beginning, the company was reluctant to be relocated.

Relocation Site

The proposed relocation site was in Bac Ninh Industrial Park (outside of Hanoi City). In this new location, the Company could expand its activities and double its production. This will ensure a stable business environment for the company. The new site is 14 000 m^2 in comparison with 2 500 m^2 on Lo Duc Street. However, due to its brand and its history, the company wanted to keep its headquarters at its former site.

Strategy for Relocation and Incentives from the City

- The budget for relocation was divided in two: 50% for HALICO and 50% for Hanoi City.
- The current location, on Lo Duc Street, occupies 2 500 m^2. The city gave HALICO commercial land use rights for 600 m^2 (25%). On this area, the company was authorized to build an 8 to 9 storey building. The first storey will be kept for the headquarters of the company (administrative activities). This will ensure the company can preserve its brand and history. The other stories will be rented for offices. Revenue from the rental lease will help the company to reimburse the loan to the Bank.
- The City will transfer land use rights for the 75% of remaining land to other companies for residential or commercial purposes. The revenue anticipated is 275 billion VND (15 M USD). The City will also benefit from new taxes from the new offices and residences.

The 3 objectives of Hanoi DONRE were met:

- **Benefit for the industry;**
  HALICO could expand its activities; improve its technology in a stable environment (Industrial Park). The

company will get revenue from office rental and can keep its brand and its historical site.

- **Benefit for the City**
  The City got direct revenue from the selling of 75% of the former land and will get indirect revenue (taxes) from the new residential and commercial building. The new activities will be in conformity with the land use master plan.
- **Benefit for the Community**
  The community living around the former factory will benefit from a better environment (improved air quality and noise reduction). In addition, the pollution was not moved to another urban area but into an Industrial Park.

Comments
This solution is a good option in the centers of large cities (Hanoi, HCMC) where the price of land is high. The sale of the former industrial land generated high revenue and could cover part of the relocation for the City. The former location should also be attractive for residential/commercial and office purposes. The relocated company needs to be a strong company to absorb the cost of relocation. Even if new revenues are created, (office rental), an important financial effort is necessary from the company.
The issue linked to the contamination of the former location was not taken into account.

12.2.4 Relocation Issues in Craft Villages

12.2.4.1 Provinces' Experiences

Several provinces have developed programs to relocate production activities outside craft villages.

■ ***Former Ha Tay Province***

Before the merge with Hanoi, Ha Tay Province was the home of 1,116 craft villages accounting for 76% of Vietnam's total, including 160 recognized craft villages (more than 50% of the HH participating in the production). Currently, the management responsibility for craft villages is shared between DARD and DoIT. However, following the merge with Hanoi, all craft villages will be under the responsibility of DoIT.

Due to the importance of craft villages in the province, DoIT Ha Tay has prepared a program for relocation issues in craft villages. The purpose was to move business activities from craft villages into industrial points. Industrial points are only a concentration of artisanal production activities with only basic infrastructures (road, water, electricity, drainage system). 163 industrial points are planned. Currently, 10 are in complete operation (100% occupation) and 30 are under construction. No treatment systems have been installed or are planned up to now in the 40 existing or planned industrial points.

The main approach for the development of the industrial points is the following:

- Industrial points should concentrate all the production activities of one village in one place not far from the village (near the houses);
- Only production activities will move; no house will be allowed in the industrial points;
- HH are not forced to move; however, according to authorities, HH are willing to move to expand their business and to avoid pollution in residential areas;
- HH will lease land from District authorities;
- Investors (province, private, district) will provide infrastructures (road, electric line, telephone, line, separated drainage system);
- No assistance is given to the HH to move the business activities.

The building of industrial points also faces lack of funding for infrastructure.

Box 12-3 presents a relocation project planned in former Ha-Tay Province.

Box 12-3: **Case Study of Hoa Binh Commune Thuong Tin District Ha Tay/Hanoi City**

Hoa Binh commune is a traditional craft village with more than 50% of the HH involved in production activities.

- The village has 3 main production activities:
  - Tanning buffalo skin;
  - Production of handicrafts with buffalo horns;
  - Milling bones to produce food for animals
- These activities generate serious environmental problems (contaminated leaching, odors). DONRE at the district level conducts monitoring twice a year;
- In 2000, to reduce pollution in the village, the commune PC built a drainage system. A budget of 1.7 billion (100 000 USD) was obtained from Ha Tay Peoples' Committee through a program to improve infrastructures in craft villages. The Province transferred 300 M VND (18 000 USD) and then stopped the payment. A 1.6 km drainage system could have been built.
- However the effluent goes partly to a pond and partly to canals and rice fields. It leads to complaints from farmers.
- To definitely solve the problem, the Commune decided to establish an industrial point and to relocate production activities near the village.
- A plot of land of 6 ha was identified near the village satisfactory to the relocated business owners.
- The Commune faced severe resettlement problems in clearing the land. 18 farmers were affected at the planned industrial point. The compensation price issued by Ha Tay PC was 100 000 VND/ m² while farmers indicate that farmers in the adjacent commune received 5 000 000 VND/m² for a residential project. Farmers refused the compensation rates and refused to move.
- The Commune identified another plot of land to relocate industries to, however, the location was found to be too far from the village and business owners refused the site;
- The commune is now thinking of reducing the area of the industrial point (from 6 to 3 ha) and increasing compensation rates.

The resettlement issue was the main obstacle to the project. Relocation of production in the industrial point was a good option for the village. However, the pollution problem is not solved, just transferred to another area.

■ ***Nam Dinh Province***

Nam Dinh province is also the home of numerous craft villages. In this province, two others cases studies for solving environmental problems in craft villages were studied.

The first project aimed to treat the waste water from a bamboo craft village. However, even if the project was realized, the lack of funds for maintenance and operations stopped the project (see Box 9-3).

Box 12-4: Case Study of Yen Tien Commune, Y Yen District, and Nam Dinh Province

Y Yen District, Yen Tien Commune

- The commune is specialized in producing handicraft from bamboo; the village changed from lacquer production to bamboo production 50 years ago. The bamboo is coming from Thanh Hoa Province.
- The traditional process to increase the durability of bamboo is to soak bamboo in water for about three months. Treated bamboo becomes more resistant to borer attacks and also resistant to other parasites.
- However, during soaking, the leached out organic matters mostly undergo anaerobic decomposition and therefore cause water contamination, and consequently pollution of the surrounding environment.
- Underground and surface water is polluted; HH cannot use water for wells and the village has been connected to the district town (Lam) water supply.

- The commune benefited from a pilot treatment project from an institute to deal with the environmental pollution caused by waste water from the bamboo soaking ponds in the craft-village. A common pond was built. A specific treatment for waste water in the pond with selected microorganisms for discoloration and deodorization was applied. The total cost was 3 M USD.
- The objective was to oblige all HH to soak bamboo in the pond only and to charge fees to users. The solution was found satisfactory.
- However, no budget was planned for operations and, after a certain period of time, the Commune operating the pond didn't have any funds to buy the necessary chemical products; therefore, the treatment was stopped and HH continued to soak in their nearby water course.

Another relocation of production units into IPs was studied in this province. The Swiss Cooperation Agency (SDC) funded a project on hazardous waste management in Nam Dinh. Part of this project targeted craft villages. In a study published in 2006 on Van Chang craft village in Nam Dinh Province[33], problems linked to relocation of production activities are described: *The Nam Dinh PPC decided to build and industrial zone near Van Chang craft village. The local authorities encouraged the entrepreneurs to move their production lines to the park. The PPC provides funding for the construction of sewage and drained collection for the park but required the individual household to pay for new land and to build themselves. Few HH could afford the move. Most stayed in the old village and continues industrial operations. 59 facilities moved to the IP; however they also moved with their beds and kitchens because they were afraid that their equipment will be stolen. So the new industrial park village has the same mixed land use, industrial and residential patterns. This reduces the park floor and the human health risks persist.*

12.2.4.2 Issues Linked to Relocation in Craft Villages

Following the various experiences of relocation in craft villages, the following issues could be raised:

- **Land Acquisition Remains the Main Problem**

Resettlement remains the main barrier to craft villages' relocation. Compensation rates for agricultural land are most of the time too low and farmers refuse to cede their land. There is also actually high competition for affordable industrial lands. Some industrial points have seen small industries from neighbour districts establishing in newly operating industrial points.

- **Difficulties for Households to Separate Production and Living Activities**

Another problems met, is the separation for households of production activities and living activities. The origin of craft village is to combine those two activities, so changing these habits is not easy. Actually, households who move their production wants somebody to live there to protects their equipment. This reduces the area for production and recreates the same health problems.

- **No Incentives is Given to Households**

Households are not forced to move, however there is no incentive for them to move. With the result that few HH could afford the move. However, as small households do not have the financial capacities to lease land in industrial parks, industrial points should provide smaller pieces of land at cheaper price. Other financial incentives to households should also be prepared (see Task 3 report).

- **Industrial Points is a Good Option for Relocation if Well Planned**

[33] Nonita T. Yap, Markus Eggenberger, Nguyen Van Duyen, Gerry Glazier (2006) The Challenge of introducing cleaner production in small-scale enterprises: The case of Van Chang craft village in Vietnam.

The construction of industrial points is an interesting option to move polluting activities far from the residential areas. However, without wastewater treatment systems, the pollution is only moved to another place and there is the problem of resettlement. The industrial points are used to expand and modernize the industrial production. No environmental regulation clearly applies to industrial points yet and no financial support is available to build treatment systems.

As presented in the Task 3 report, Industrial points could be used as a central tool in a more comprehensive strategy to improve environmental management in the most polluting craft villages. By providing a clear environmental protection objective, the provincial people committee should work with the river basin committee to establish a clear strategy for the most polluting villages, and long-term financial support for common treatment facilities and maintenance of infrastructures jointly by the provincial PC and the River basin program. These strategic industrial points should be giving exclusively to the nearby craft village for production activity concentration. This concentration is necessary to be able to provide technically feasible treatment systems.

12.3 Black Lists and Public Information

Based on the criteria issued under Circular 07, all DONRE at the provincial and city level are now establishing a list of the most polluting industries and are publicizing this list, called the black list.

- In HCMC, they started to establish such a black list in 1994; in 1996, 44 industries were listed. Due to the large increase in industries, it is now difficult to identify all the industries. They also established a green list to highlight the efforts of companies to comply with environmental standards. The black list is sent to newspapers and posted in communes and offices.

  Following an inspection report made by DONRE in February 2009, the HCMC Export Processing and Industrial Zones Authority (HEPZA) published the names of the companies operating in industrial parks in the city, which are not complying with the environmental standards or their commitments on its website[34]. We should note that on this list, not only is the violation of environmental standards indicated but also the non compliance with regulations; for example: i) industries which have not registered for environmental protection commitments; ii) industries which don't separate rain water drainage from waste water drainage; industries which didn't send their monitoring report, etc. This shows a good relationship between DONRE and HEPZA in identifying the most polluting industries.

- In Ha Nam, DONRE also published the black list through the mass media. To involve the population in the supervision of environmental pollution, a 24-hour hotline has been set up for citizens. Citizens can report any case of pollution of the environment (mainly unauthorized wastewater discharge). However, because DONRE staff answers the line only during business hours, and because most of the discharge takes place during the night, the inspectors from DONRE cannot intervene in the act and sanction the polluting industry.

- In Dong Nai Province, the list from DONRE is published on the local TV every day.

More and more local newspapers publish these black lists or articles about industries that violate the Law. According to all DONRE staff and other informants met, this list creates a significant effect. It makes the community more concerned about the situation, leads the community to participate in the

[34] See HEPZA website : http://www.hepza.gov.vn/newscontent.aspx?cateid=576

surveillance of industries, and it gives bad publicity to the companies that violate the regulations and pollute the environment.

As indicated above, the LEP in Article 49, clause 5 clearly indicates that the list and decisions concerning the most polluting establishments has to be made public in order for the population to help supervise. There is a clear intention to involve the public in this process of identification of the most polluting industries and to put pressure on the polluting industries.

As is the case in HCMC, in addition to publishing the names of industries, which cause serious environmental pollution through the mass media, there should also be motivating and rewarding policies for industries that reduce their level of pollution.

Box 12-5: **The Case of Vedan Company**

In 2008 and 2009 a case of environmental violation by the Vedan Company in Dong Nai Province has been extremely publicized throughout Vietnam.

Vedan plant is producing monosodium glutamate. In September 2008, the Dong Nai plant has been under investigation by Dong Nai DONRE for having discharged wastewater into the Thi Vai River via purpose built pipes concealed 9 m under the water. The company was dumping 5 000 m^3 of untreated wastewater daily. The company was in operation since 1994. This pollution scandal shocks Vietnam.

The wastewater caused heavy damage on aquaculture farms located downstream the discharge outlet. The Vietnamese Government ordered the company to install wastewater treatment facilities or to stop operation.

In December 2008, Vedan has been completing the construction of a pipeline system for collecting wastewater discharged from its factories to the common wastewater facility, upgrading three present wastewater treatment systems and building two other new wastewater facilities. The company had also to pay 65 billions VND (3, 7 M) of fines in particular for arrear environmental protection fees. All the fees were transferred to the Vietnam Environmental Protection Fund.

7 000 farmers along the Thi Vai River demanded compensation for over 11, 1 M USD. The company offered compensation to farmers and installed. In April 2009, the company proposed to compensate farmers up to 1, 1 M USD.

The GoV and Dong Nai Province wanted to make a clear example with the high exposure through media of this case.

12.4 Contamination of Former Site

The Law on Environmental Protection, Article 93.3, stipulates that Organizations and individuals causing environmental pollution shall be responsible for decontamination.

However, no regulation was issued to implement this article of the LEP. All the informants met confirmed that no decontamination is carried out on the former sites. Once the land has been transferred to new land users, they do not pay attention to the decontamination. The only possibility of decontamination should be the preparation of an EIA for a new project at the former site. In this case, the EIA can identify the pollution and ask for decontamination.

Vietnam will soon face problems linked to the absence of soil decontamination. Therefore, it is necessary to address this issue in the regulatory framework. The LEP provided the basis, but new

regulations have to be issued to address this issue. Part of the funds for relocating industries should be used for decontamination if necessary.

As indicated earlier, restoration of former site could also be included in the contract between the industry and the infrastructure development company.

13. RIVER BASIN MANAGEMENT

River basin planning is now internationally recognized as a mechanism to coordinate activities that use, and impact upon, water resources and water related environments.

The Law on Water Resources (1999) introduced the principle of exploitation and use of water resources through river basin (Chapter III, articles 20 and 21).

The LEP (2005) also adopted this principle (Chapter VII, Section, Articles, 59 to 62). The LEP requires that river basin pollution sources must be investigated, quantified and assessed and applied with control and treatment measures before being discharged into rivers. The LEP also ask for coordination between provinces located in the same river basin for investigating and identifying river water pollution sources and applying remedies.

With the GoV approval of a new river basin management decree, (Decree 120/2008) GoV of Vietnam embarked in the river basin planning strategy. River basin planning is setting the framework and context within which sectors and provinces must operate. It allows impacts between sectors, and between sectors and the environment to be managed. It also provides opportunities for optimizing the use of (most often) public funded infrastructure to meet various needs.

This Decree provides for the management of river basins in order to protect the water environment, cope with water environmental incidents, regulate and distribute water resources, etc.

The Decree further provides for: principles for and contents of river basin management; lists of river basins; investment policies for sustainable development of river basins; basic surveys of the river basin environment and water resources; river basin planning; control of polluting sources and protection of river basin water quality; regulation and allocation of water resources and transfer of river basin water; international cooperation and implementation of treaties on river basins; river basin coordinating organizations; river basin management responsibilities; and inspection, examination and handling of violations

Plans on Environmental Protection have been prepared for three River Basins: two in the North: Cau and Nhue – Day rivers basins; and one in the South: Dong Nai river basin.

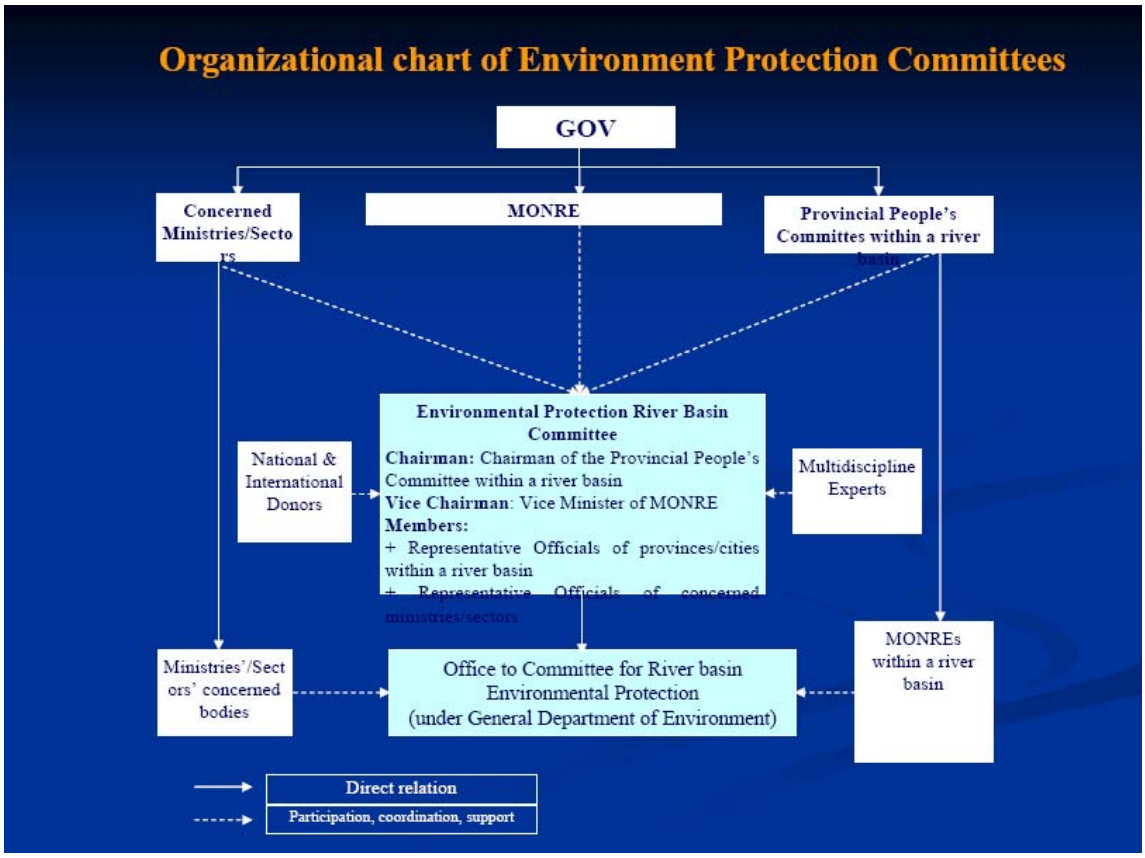
Actually, the Cau River basin environmental protection plan is the most advanced.

Annex B-5 presents the main characteristics of Decision No. 57/2008 and Decision No. 187/2007 on respectively the Nhue Day River Basin and the Dong Nai River Basin.

The Figure below presents the structure of the river basin management[35].

[35] MONRE Agency for waste management & Environmental Promotion, General Department for Environment Policy; Current status of management of water quality in Viet Nam (December 2008)

Figure 13-1: Organizational Chart for River Basin Management



Source: Agency for waste management & Environmental Promotion, General Department for Environment MONRE (December 2008).

According to the Water Sector Review report, river basin planning, in setting the framework and context within which sectors and provinces must operate, not only allows impacts between sectors, and between sectors and the environment to be managed, but provides opportunities for optimizing the use of (most often) public funded infrastructure to meet various needs.

The River Basin Committees could be the good body to manage the proposed 10-20 years investment program to build infrastructures.

14. FINDINGS AND RECOMMENDATIONS

14.1 Main Findings

14.1.1 General Comments on Regulatory Framework

- ***Regulatory framework for environmental protection is changing rapidly and is complex.*** Following the amendment of the LEP in 2005, a huge number of new decrees, circulars and decisions have been issued which makes the implementation of environmental protection linked to industrial estates and craft villages complex. The different regulation often overlaps which creates confusion for investors and differences of interpretation among implementing agencies.

  The central government and local authorities have issued a number of regulations on water pollution control and waste management (including hazardous waste). They have also designed a framework for industrial estate organization so as to enable strict control over environmental pollution. The challenge will now be the implementation of this framework

- ***Issuance of regulations by provinces/cities.*** With the decentralization process, provinces and cities are issuing regulations on environmental protection and industrial parks or clusters. However, these regulations have to be based on national regulations (Laws, Decrees and Circulars). However, some provisions of local regulations could be different from national ones. There is a risk that environmental management varies from one province/city to another. Provincial regulations can also go further than the national' ones. This is the case for several provinces which impose the building of a CETP to start operating an Industrial Park.

14.1.2 Permit Issuance

- ***Environmental permits issued are comprehensive and well developed but too demanding for Capacity of DONRE and other issuing agencies.*** The regulatory framework concerning the EIA process and the other types of permits and commitments is now very detailed. However, due to the fast industrialization process and the lack of capacity and staff, especially at the DONRE level, the implementation of these permits is lacking. Less than 10% of WWDPs, in particular, have been issued, and even with all the environmental protection regulations, most of the industrial estates still do not have a CETP. Most of the recent reports published have identified the poor enforcement of environmental regulations as one of the main obstacles to environmental control. This is often attributed to a lack of funds as well as to a lack of trained personnel and lack of data management systems in environmental agencies to carry out policy objectives.

- ***The EIA process for new industries and industrial parks is now well integrated and well in place***. A huge number of EIA have been approved and reviewed (27,000 between 1994 and 2004). The approval process is now decentralized for most cases (except large industries that are approved at the national level). However, EIA compliance is weak, and implementation of mitigation measures prescribed in the EIA reports is often ignored. In particular, post-EIA activity requirements (once the industry has obtained the approval) such as (building of treatment works, testing, etc.) are often not followed. There is also poor follow-up on EIA activities by both project owners and environmental authorities.

- ***Potential Conflict between EIA and WWDP As*** identified in the Water Sector Review, there is a potential conflict between the EIA and the WWDP. The guidelines for EIA applications require industries or IP to submit only limited information on pollution impacts (estimated volume of waste water discharge, type of pollutant anticipated in waste water, type of treatment proposed).

In most cases, this is insufficient for adequate environmental assessment. Therefore, it is difficult at the EIA stage, for DONRE especially, to provide advice in the absence of adequate information on the scale and impact of wastewater discharge. When the EIA is approved based on available information, it is found to be extremely difficult for DONRE to add some additional measures or controls for waste water treatment. In addition, because the WWDP is given once the industry has been built; it appears difficult for an industry to comply with new regulation.

- ***Few Impacts linked to Waste Water Discharge Permit*** The regulatory framework for the issuance of waste water discharge is comprehensive. It requires all discharge of wastewater from HH and industries, from industrial clusters to industrial parks, to have a WWDP. The WWDPs issued clearly identify the responsibilities of owners concerning waste water discharge.

  However, based on meetings with various agencies and on reviewing of other studies, this framework has to date proved ineffective in addressing serious pollution due to the absence of adequate mechanisms for assessment and enforcement.

  While a level of guidance is provided by central authorities, the responsibility for assessing, issuing and enforcing wastewater discharge licenses falls almost exclusively to regional PPCs under the advice of local DONRE. Capacity varies from one DONRE to another. While in cities, capacity is generally good; in provinces, the capacity is generally low.

14.1.3 Collection of Fees

- ***GOV adopted the polluter-pay principle.*** With the adoption of Decrees on environmental protection charges, 67/2003 on waste water and 174/2007 for solid waste, and accompanying circulars, the GoV clearly embarked on the use of economic instruments for pollution control. This constitutes an important step forward.

- ***DONRE lacks technical and human capacity to implement Decrees 67 and 174 given both the number of industries to control and the number of targeted pollutants.*** Binh Duong Province can collect fees for only 600 among 5000 industries due to the lack of human resources. In addition, for Decree 67, the capacity to monitor heavy metal concentrations in effluent discharge is extremely limited. Such measurement is also very costly.

- ***Double collection of fees for waste water (by infrastructure companies when a CETP is present and by DONRE under Decree 67) leads to a lack of clarity and overlapping of responsibilities between DONRE and infrastructure companies for collecting wastewater fees.*** Even if infrastructure companies usually collect the two types of fees, it creates confusion among industries, which don't always understand why they have to pay twice for waste water discharge. More information on the purposes of the two fees is necessary (fees to operate the CETP and fees for environmental protection through the EP fund).

- ***Waste water fees are too low.*** For fee collection by DONRE, most of the time, the industries are too small to produce significant quantities of pollutants and, therefore, the costs of fee assessment and fee collection exceed the revenues collected from the pollution fees. For fee collection by infrastructure companies, the fees don't even cover the costs of operation and maintenance of CETP. The fees are determined by PPC who want to keep low fees to attract industries.

- ***Even with low rates, industries are often reluctant to pay any type of fees.*** Even though infrastructure fees (without CETP) are only 4,000 VND/m^2 annually, industries are reluctant to pay especially in this period of economic crisis.

- ***Costs of management environmental monitoring and fee collection have to be identified for IZA.*** Currently, only HIEPZA (HCMC) collects 10% of fees for management. This model should be spread to other IZA in order to build stronger environmental teams.

- ***The creation of the Vietnam Environmental Protection fund is also a good tool to implement environmental protection measures.*** Part of this fund comes from the fees collected under Decree 67. Problems to collect fees lead to less revenue for the environmental protection fund.

14.1.4 Sanctions

- ***Sanctions for environmental violations are too low to constitute strong disincentives for environmental violations.*** Industries often prefer to pay fines than to solve the environmental problem. The current revision of Decree 81/2006 ND-CP, to increase the level of fines is welcome.

- ***Lack of enforcement of environmental sanctions also leads to disincentive for industries to comply with environmental regulations.*** Due to both a lack of human resources and also to an absence of will to implement strict sanctions identified in the regulations (stopping operations until remediation of environmental violation, deprivation of certificates or permits, etc.), a number of industries, even if they have been recognized as polluting the environment, will take little or no action to remedy their problems.

14.1.5 Most Polluting Industries

- ***The issuance and implementation of Decision 64 on handling establishments creating serious pollution is an important step for the GoV to solve pollution problems and to improve the environmental awareness of the population.*** This Decision has received strong support from communities in all provinces. It has also received the active participation of all ministries and all management levels. The implementation of Decision 64 has created movement in environmental protection in the whole country.

- ***Criteria for determining the most polluting industries have been issued by MONRE (Circular 07/2007).*** This will facilitate and harmonize the identification of the most polluting industries for the whole country. However, DONRE finds these criteria difficult to apply.

- ***Relocation of most polluting industries has been happening since 2003.*** Several polluting industries have been displaced, most of the time, out of urban areas. Creative and original patterns for relocation have been developed in cities and provinces. However, the lack of budget often hampered the relocation of industries.

- ***List of most polluting industries (black lists) are now issued by DONRE and published through various mass-media (newspapers, websites, TV, etc.).*** This contributes to the environmental consciousness of the population and creates bad publicity and pressure on black-listed industries to remedy their environmental pollution. Country-wide diffusion of the most serious cases, like the strong water pollution of the Thi Vai River by the Vedan Industry, obliged industries to take their impacts on the environment into account.

14.1.6 Hazardous Wastes

- ***Hazardous waste is not really managed by DONRE and IZA due to the absence of clear regulations***. In contracts between infrastructure companies and industries, hazardous waste is also not identified. Therefore management of hazardous waste is not a priority for IZA/DONRE.

- ***Industries in industrial estate and households, small enterprises in craft villages in industrial estates and craft-villages and DONREs staff at district level have low awareness of hazardous wastes.*** Significant effort has to be provided by VEPA to inform all stakeholders.

14.1.7 Restoration of Former Sites

- ***No restoration of the former site is planned when an industry is relocated.*** No clear regulation exists about the restoration of former industrial sites. The LEP indicates that: Organizations and individuals causing environmental pollution shall be responsible for decontamination. However, no regulation implementing this article has been issued. For relocation of industries, for example, once the land has been transferred to new land users, nobody pays attention to the decontamination of the site. Only if an EIA is required for the new project taking place at the former location will this issue be addressed.

- ***Arrangements for site restoration when the company stops operations should also be part of the contract.*** Currently, there is no regulation on restoration of contaminated sites. Each contract should include the responsibility of an industry to decontaminate its site after stopping operations.

14.1.8 Industrial Parks

- ***According to the existing regulation, a CETP does not need to be built before the start of operations of an Industrial Park***. In the new Decree 29/2008 on industrial parks, building a CETP is required only in the case of expansion of the IP. Former decision 62/2002 from MONRE on the protection of the environment in industrial parks required a CETP before the operation of an IP. However, this decision has not been implemented. New Circular 08/2009 specifies that: Industrial Estates and Industrial Clusters must have concentrated wastewater treatment plants. In addition, Industrial Estates and Industrial Clusters which have operated without concentrated wastewater treatment plants shall build and commission such plants before December 31, 2010.

- **No article in the legislation for industries within CETPs to oblige them to connect to the existing CETP*.*** The industry can choose to pre-treat its waste water to obtain a WW discharge license instead of discharging into the CETP. This makes the situation of infrastructure companies in charge of IPs difficult. Without being sure that industry will connect, it is difficult to design CETP. It also means less financial resources for infrastructure companies. It makes also it difficult for MONRE to monitor effluents if there are several effluents in an IP. Therefore, a clear clause is required, in contract or in regulation, so that when a CETP is present in an IP, all the industries have to be connected. However, as indicated above, several provinces issued regulations (Binh Duong, Dong Nai) which impose the building of a CETP to start operating an Industrial Park.

- ***Overlapping and Inconsistency of Regulations and Responsibilities*** Due to the number of regulations issued and the number of agencies involved in the field of industrial development,

there are inevitably overlaps and inconsistency with requirements. For example, for industrial parks, 3 regulations cover the waste water infrastructure requirements:

- Decree 29/2008/ND-CP, March 14, 2008, providing for Industrial Parks, Export-Processing Zones and Economic Zones (from MPI)
- Decree No. 88/2007/ND-CP of May 28, 2007, on urban and industrial park water drainage (from MOC)
- Decision No. 62/2002/QD-BKHCNMT, August 9, 2002. Regulation of the Protection of the Environment in Industrial Parks (from MOSTE, former MONRE) replaced by Circular No. 08/2009/TT-BTNMT of July 15, 2009, providing for the environmental management and protection of economic zones, hi-tech parks, industrial parks and industrial complexes (MONRE).

The three regulations issued at the proposal of 3 different ministries (MPI, MOC, MONRE) do not have the same requirements regarding waste water treatment. While former Decree 62 and new Circular 2008 required a CETP as a condition to establish an IP, for Decree 29 and Decree 88, it is not a requirement. As indicated above, it seems now that Decree 29/2008 from MPI supersedes all other regulations.

14.1.9 Contracts

- ***Contracts between industries and infrastructure companies are generally well prepared.*** The purpose of contracts, however, is not directly for environmental protection but for establishing the rights and responsibilities of both partners regarding various issues (including waste water discharge if a CETP is available). Therefore, contracts could be a good way to strengthen the environmental responsibilities of industries. Infrastructure companies are directly in contact with industries and could control the compliance of industries with environmental requirements.

- ***The contract should indicate that if a CETP is available, the industry is obliged to discharge waste water in the CETP.*** As indicated above, there is currently no clear requirement in the regulations that an industry has to be connected to the CETP. Contracts should include this condition.

14.1.10 Craft Villages

- ***Craft villages currently have almost no environmental management and control.*** There is no or little control on waste water discharge and very few treatment systems are installed. There is still no environmental planning in almost all craft villages. No information or prevention campaigns are conducted. Craft villages are under the management of district authorities (environmental offices) who have limited budgets. One staff is usually in charge of all craft villages. No waste water discharge permits are issued to HH in CV due to the difficulty in measuring discharged waste water.

- ***Some DoITs issued relocation strategies for craft villages.*** These relocation plans are well prepared (especially in the former Ha Tay Province). However, these relocation strategies have not been approved and a national strategy is under preparation.

- ***DoIT have also established environmental departments.*** However, in most of the cases (except Hanoi/Ha Tay), environmental departments met were very weak and lacked specific tasks to do. Their only identified task is participation in EIA evaluation. DoIT only conduct general data collection on craft villages (listing of industries and craft activities).

- ***Relocation of polluting activities in industrial points has been realized in former Ha Tay Province.*** However, even if this relocation may improve the health situation in former residential areas, no treatment system has been implemented and the pollution has just been moved outside the residential area. It should be noted that in the 2008 list of most polluting establishments in Hanoi, an industrial point was identified.

- ***The GoV seems to have moved the responsibility for all craft villages from MOIT/DOIT to MARD/DARD based on Decree 66/2006 and Directive 28/2007.*** However, there is little capacity in environmental management and prevention within DARD. DOIT have developed an expertise for craft villages, especially for relocation to industrial points. It is important to clarify the roles between MOIT/DOIT and MARD/DARD. If MARD/DARD takes responsibility, strong cooperation will be necessary between the two ministries to ensure consistency in environmental management and control.

14.1.11 Institutional Framework

- ***Lack of human resources and funds prevents DONRE from fulfilling all their tasks related to environmental protection within industrial estates.*** According to some DONRE met, DONREs have only 10% of the budget necessary to fulfill their tasks. Some DONRE have to choose among their tasks. For example, for collection of fees, Binh Duong's DONRE can focus only on the biggest ones and collects fees from only 600 among 5000 industries due to a lack of funds and human resources. The big challenge in the coming years will therefore be to improve the capacity of environmental management at the provincial, district and commune level.

- ***The capacity to implement the regulatory framework varies from one province/city to another.*** The provinces/cities are applying strong efforts to implement the new environmental legislation. However, there are big differences in the capacity to implement the legislation from one province/city to another, in particular due to the lack of human resources and funds. The difference is even larger at the lower levels (district and commune).

- ***Decree 29 gives IZA a larger role for management of IPs and also for environmental control within IPs.*** IZA has the function of direct state management of IPs. IZA are also in charge of organizing the evaluation and approval of environmental impact assessments in lieu of PPCs and collecting all types of fees. IZA is becoming the main gate for environmental assessment and monitoring for industries within IPs. However, IZA currently has a lack of human resources to fulfill their tasks. It is, nevertheless, the right body to implement and control environmental protection measures due to their proximity and authority with industries. If their environmental capacity is strengthened, they can play an important role in pollution reduction within IPs.

- ***Guidelines for the implementation of Decree 29 have to be issued quickly.*** Currently, there are different interpretations of Decree 29 by DONRE and IZA. Some IZA consider that they now have all the powers of DONRE within IPs while DONRE has said they will keep some responsibilities (issuance of permits, monitoring, etc.). Currently, some IZA/DONRE is waiting for the issuance of these guidelines to take action.

- ***All IZA have now established their own environmental departments.*** The number of staff is still quite low (3 to 10). Currently, their main tasks are the reviewing and approval of EIA. Some IZA (Ha Nam IZA) are doing all the tasks of DONRE within IPs (issuance of permits, etc.). The place of IZA in environmental control and management is likely to expand in the future. However, good cooperation between DONRE and IZA is necessary to harmonize environmental control measures within the different types of industries.

- ***Infrastructure companies and large industries should have at least one qualified staff in charge of environmentally-related issues.*** Industries and infrastructure companies are on the front line for environmental protection within industrial parks. Therefore, they need qualified staff in order to comply with all the environmental requirements.

- ***GoV of Vietnam embarked in the river basin planning strategy for environmental reduction.*** Some rive basin committees have been already established. These committees, with their role of coordination and exchange of information, should play a key role in the environmental management of industrial estates and craft villages.

14.1.12 Monitoring

- ***DONRE has to send written notice to industries 7 days in advance of monitoring.*** This practice makes it impossible for DONRE to catch regulation violations because the industry will temporary stop the discharge or take temporary measures during the monitoring.

- ***Difficulties in DONRE monitoring state-owned industrial parks.*** SOIP are under the management of PPCs through IZA. Therefore, taking restricting actions against industries in the park is not easy for DONRE since they are also under PCs. For private industrial parks, monitoring is easier when DONRE has full authority.

- ***Few industries fulfill their monitoring requirements.*** Most of the time, they don't transfer data and the results of sampling to IZA. Only industries with ISO certificates fulfill their requirements.

- ***Environmental monitoring reports by IDC and Industries for DONRE/IZA are required but are frequently not prepared.*** Reporting should be required. This will allow DONRE/IZA to better manage environmental protection and compliance from industries.

- ***Currently, there is no organized environmental data management system for industries.*** Actually very few data are computerized and available for environmental management by relevant agencies within industrial zones. Pilot program by SEMLA and HEPA in HCMC (TISEMIZ) are currently implemented to build an environmental database and to share relevant environmental data between the different agencies.

- ***Flow meters and sampling points should also be installed at the waste water discharge outlets of all industries.*** Currently, the identification of volume of waste water is based on the water supply (usually it is considered that 80% of the water supply will be discharged as waste water). However, some industries are taking underground water which is not controlled and are discharging more waste water than expected.

- ***Several agencies have some responsibilities for monitoring (DONRE, IZA, IDC, police).*** This creates confusion, overlap and a difficult understanding from industrials.

14.1.13 Resettlement

- ***Resettlement issues are hampering the development of new industrial estates, relocation of industries, and construction of industrial points.*** However, this is not a problem linked to industries but to all project development in Vietnam. The PPC are well aware of the issues and give priority for funding to land clearance. Once the land is cleared, the industrial estates can at least be developed. Funding for infrastructures is therefore not the priority and it results in delays and the absence of CETP in most IPs.

14.1.14 State-Owned Parks and Private Parks

- ***No significant difference, concerning environmental management and control, has been noticed between state-owned IPs and private IPs.*** They are managed by the same authority (IZA) and industries have to comply with the same regulation. It is likely that private IPs usually have more financial capacity, in particular, to install CETP. Some DONRE noticed difficulties in monitoring state-owned IPs because IPs belongs to PPCs and DONRE is under PPC.

14.2 Recommendations

The proposed recommendations are based on the findings presented above. They aim to improve the environmental control and management for industrial estates and craft villages.

14.2.1 Regulatory Framework for Industrial Estates

- ***The GoV should issue guidelines for the implementation of Decree 29 quickly.*** This will clarify the roles and responsibilities of each agency and IZA/IDC. Currently, some IZAs and DONREs have different interpretations.
- ***The national regulation on Industrial Parks should confirm the dispositions of the LEP and clearly mention that a CETP needs to be built before the start of operations of an Industrial Park.*** Without this clear declaration, it will be difficult for Infrastructure Development Companies to build and operate CETPs; industries with WWDP will not be interested in connecting to the CETP. Even if some provinces already included this clause in their own regulation, a clear signal from the national level is needed.
- ***The regulation and the dispositions of the contract should clearly state that when a CETP is present in an industrial estate, all the industries have to be connected***. It will facilitate the task of Infrastructure Development Companies in designing CETPs, and it will also guarantee more financial resources for infrastructure companies. In addition, it will also facilitate the monitoring of effluent for MONRE (only one effluent per industrial estate with a CETP).
- ***Manholes and flow meters should be installed for all effluent from industries.*** In order to facilitate monitoring and to really control the quantity and quality of effluent, all industries should be equipped with flow meters and manholes.

14.2.2 Institutional Framework for Industrial Estates and Stand Alone Industries

- ***IZA should become the main environmental monitoring agency in industrial parks.*** IZA, if its environmental capacity is strengthened, is the right body to implement and control environmental protection measures in Industrial Parks due to their proximity to and authority with the Infrastructure Development Companies and industries. Actually too much agencies are involved in the management of IPs. Decree 29 started to give IZA more environmental responsibilities. In particular, IZA should issue and monitor EIA, WWDP, EPC for all industries within IPs. IZA/IDC should also be responsible in the management of hazardous wastes and should issue registration books for HW. IZA will have to report all activities to DONREs. Without the direct responsibilities on IPs, DONREs could concentrate on the management of stand-alone industries, industrial clusters and craft villages.
- ***IZA should have responsibilities on industrial clusters.*** As it is the case in Ha Nam and in Hanoi where most of the industrial clusters are managed by IZA, IZA should also manage industrial clusters. Actually clusters are under the management of DOIT and Districts authorities who are not well resourced to manage industrial clusters. In addition it will ensure a

harmonization of practice and environmental management for all concentration of industries. Actual some industrial clusters look like industrial parks.

- ***Large Stand*-alone industries should be managed at the provincial level.** Actually large stand alone industries are under the management of ministries at the national level. It leads to delays in the implementation of measures when an environmental problem is arising. Local authorities have no authorities on large stand-alone industries. DONREs should be responsible for the environmental management of large stand-alone industries.

14.2.3 Craft Villages

- ***MOIT/DOIT should keep some responsibilities for craft village instead of a full transfer of responsibilities to MARD/DARD as it is planned.*** Due to the expertise they developed for craft villages, MOIT/DOIT should keep responsibility, in particular, for relocation in industrial points, which is a major strategy to improve environmental conditions within craft villages.
- ***Management plans for the most seriously polluting craft villages should be prepared.*** This plan will include options for waste water collective treatments and financial measures for implementation of the pollution and waste treatment plans in the most polluted craft villages.[36] Such plans should be under the responsibility of the provincial DONREs.
- ***Craft villages should obtain a wastewater discharge permit as an entity.*** As it is not realistic to have a WWDP for individual HH within a craft village, due in particular to the difficulty in assessing the discharge volume of each HH, each Craft Village with a common drainage system should obtain a WWDP for all the HH activities. The study on the water review sector recommended that MARD and MONRE develop a program to ensure that craft villages obtain licenses for their point source wastewater discharge.
- ***Industrial points could be used as a central tool in a more comprehensive strategy to improve environmental management in the most polluting craft villages*** In particular; all industrial points established to relocate business activities from craft villages need a common drainage system and a common treatment. Without a common drainage and treatment system, the pollution will just be moved outside the residential areas and the objective of pollution reduction will not be met.

14.2.4 Issuance of permits

- ***All WWDP should be issued by MONRE/DONRE even for wastewater discharged into an irrigation canal.*** Currently, MARD/DARD and MONRE/DONRE issue WWDPs. It means that each of the departments has to have its own division for issuing permits and monitoring wastewater discharge. For better efficiency, all WWDP issuance and monitoring should be done by DONRE.
- ***An inventory of existing industrial estates and industries without WWDPs should be done.*** In many industrial zones, other businesses and individuals discharge wastewater directly into a water source such as a river, lake or other water body. As indicated above, 7% of the industries have such a permit. There is a need to identify the industries and industrial estates without permits. These businesses should be required to obtain wastewater discharge permits. The importance of such permits is to clearly identify the owners' right to discharge wastewater,

[36] Recommendation also proposed by ICEM/2007

to construct works for the purpose of discharging wastewater, and to publicize the conditions or responsibilities attached to such rights.[37]

- ***Better information on waste water management should be provided in the EIA.*** Once the EIA has been approved, it is extremely difficult to change. Therefore, the EIA should give more details on the type of waste water, the volume, and the anticipated contaminants in order for the WWDP to have the same requirements as the EIA.
- ***The implementation of Decree 149 (issuance of waste water discharge permits) should be strongly supported by MONRE.*** While WWDP are a key measure for pollution reduction, there is limited capacity at the provincial level to implement this Decree. Therefore, it is essential to strengthen DONRE's capacity for the issuance and monitoring of such permits.
- ***DONRE/IZA should put more effort on post EIA-activities.*** Actually most of the efforts are put on EIA approval due to lack of staff and budget. The monitoring of the compliance of industries with approved EIA measure is essential
- ***Industrial sectors differ greatly in terms of their pollution intensity.*** Therefore, significant reduction in discharges of industrial pollution could be achieved by targeting a limited number of industrial sectors instead of targeting all industries. This targeting would greatly facilitate the task of all DONREs to implement successfully Decree 67.

14.2.5 Sanctions

- ***The sanctions for environmental violations and non-compliance should be strengthened***[38]***:*** Stronger penalties will need to be applied to recalcitrant enterprises. As indicated by the ICEM/2007 report, the current compliance system is not providing strong disincentives for poor environmental performances, in part because the sanctions are not adequately severe and in part because they are not being enforced. Stronger penalties will need to be accompanied by appropriate empowerment and institutional development of the environmental regulators. Power should also be given to the EPA to impose and collect fines from recalcitrant companies.

14.2.6 Most Polluting Industries

- ***MONRE should provide guidelines for the implementation of Circular 07/2007 related to criteria to identify the most polluting industries.*** This will ensure good comprehension and harmonization of the most polluting industries for the whole country.

14.2.7 Contracts between Industries and Infrastructure Development Companies

- ***Each contract between industries and Infrastructure Development Companies should include an environmental clause.*** This environmental clause should cover: i) waste water discharge and treatment; ii) interdiction to use underground water without a permit; iii) solid waste and hazardous waste management; iv) decontamination of site if the industry stops operations or has to be relocated; v) various sanctions and fines for non-compliance. A standard form should be prepared by MONRE.
- ***DONRE/IZA should develop data management and analysis capacity.*** Most pollution information (including the requirements of various permits and commitments) remains in paper form and is not used for analysis, for example, for comparing self reported levels of emissions with inspections or for linking information from point-source discharges with ambient

[37] Recommendations also proposed in the Water Sector Review Report
[38] Recommendation also proposed by ICEM/2007

concentration measures. All DONREs should be equipped with appropriate facilities and expertise for this purpose. Data management system based on the pilot projects proposed by SEMLA (environmental information platform for industrial zones) and by the HCMC EPA and the Institute of Environment and Resources program (Tool for Improving Strength Environmental Management for Industrial Zone (TISEMIZ)) should be established.

- ***Environmental awareness program should be conducted for industries managers.*** Actually the environment consciousness of most of the industries is very low. DONRE/IZA/IDC should explain clearly the role and responsibilities of industries related to environmental protection. In order to be successful in managing environmental issues, DONRE/IZA/IDC need to develop a broad range of manuals, guidelines and protocols for industries.

14.2.8 Fees for Environmental Protection

- ***Waste water fees for environmental protection should be increased.*** Currently, the cost of assessment and collection often exceeds the revenues collected. Therefore, it doesn't create enough revenue for the environmental fund and monopolizes DONRE staff.
- ***All fees should be assessed and collected by the IDC.*** This will clarify the situation with industries and will save costs and time for DONRE. More information on the purposes of the two fees is necessary (fees to operate the CETP and fees for environmental protection through the EP fund). In addition. DONRE most of the time calculate the fees based on the EIA data which is simpler but not accurate. IDC calculate fees based on the real effluent in the CETP. IDC could collect both fees on the same basis.
  - For each industrial park under its management, the IDC should collect all fees from individual industries and pay back DONRE, on behalf of industries, as per Decree 67; Arrangement should be found between DONRE and IDC to cover some administrative costs to IDC due to the supplementary works.
  - For industrial clusters and stand alone industries, DONRE should continue to collect fees under Decree 67;
- ***IZA should keep a part of the fees collected for management environmental monitoring.*** This will help IZA to create a strong environmental unit. Currently, only HIEPZA (HCMC) collects 10% of fees for management.

14.2.9 Monitoring

- ***Monitoring should be conducted without notice by various agencies (DONRE/IZA).*** Giving several days notice to industry could result in temporary remediation by industries (temporary re-starting-up of waste water treatment systems, for example) and therefore the objectives of monitoring will not be met.
- ***Within Industrial Parks, monitoring of industries should be transferred to IZA and IDC.*** DONRE will keep the monitoring for industries discharging directly in the environment and for the effluent of the CETP. IZA and IDC have more authority and relationships with industries to allow them to carry out all environmental monitoring within IPs. However, this share of responsibilities will require good coordination between IZA/IDC and DONRE to sanction industries violating environmental regulations. To fulfill this role, IZA/IDC will need to:
  - Develop a data management and analysis system
  - Increase in the number of staff, and resources devoted to monitoring environmental performance.

14.2.10 Restoration of contaminated sites after relocation

- ***A legal basis should be developed for assessing liability and cleanup of former sites after an industry has stopped operations or has been relocated.*** Currently, the eventual contamination of former sites is never managed due to the absence of regulation and also the high cost of decontamination. The process of environmental assessment, in case of relocation or stopping of operation, should be described in the regulation such as:
  - Phase One Environmental Site Assessment (ESA) to be conducted when an industry has stopped operation or has been relocated at the charge of the owners.
  - If contamination is anticipated, a Phase Two ESA with analysis of soil sampling should be conducted.
  - Preparation of remediation plan if necessary.
  - The former owner should be responsible for the preparation of ESA and for all costs of decontamination.

PART C: INTERVENTIONS AT INDUSTRIAL ESTATES AND CRAFT VILLAGES: RECOMMENDATIONS FOR AN INVESTMENT PROGRAM

This Part C presents our main recommendations of interventions to reduce industrial pollution in industrial estates and craft villages in Vietnam. The recommendations include: regulatory reforms and policies, organizational structure for an intervention program, industry relocation guidelines to industrial estates, cost assessment for infrastructure development and the recommended financing mechanisms. Complimentary to from the Vietnamese fieldwork, the analysis included a focused review of international experiences in pollution management policies and financing pollution reduction.

15. RECOMMENDATIONS FOR PLANNING AN INTERVENTION PROGRAM FOR POLLUTION CONTROL

The recommended intervention program will take place in a context of a newly industrialized economy emerging from centralized economy, a poorly developed private sector, and an environmental regulation poorly applied. The country's main priorities are still largely centered on a strong economic development.

No comprehensive municipal wastewater treatment infrastructure program will be set up in parallel to the industrial program. Municipal wastewater treatment plants are being built progressively in the country but the priority investment are most likely to serve densely populated urban areas while polluting industries are more present in suburban districts and suburban industrial zones.

A relocation program of highly polluting urban industries to industrial zones is most likely to be hold in parallel to the industrial program in Hanoi and Ho Chi Minh city. According to this present Scope of Work defined by the World Bank and the Ministry of Planning and Investment, the River Basin approach is advocated and the program may first be implemented in the Nhue-Day River basin where pressing needs have been expressed

15.1 Step 1: Institutional Structure

We recommend an important technical assistance program to finance the activities of a National Steering committee and two River basins committees.

15.1.1 National Steering committee

A National Steering committee should be set up under the Prime Minister to approve clear guidelines for the **Industrial Pollution Control Program**. This structure is necessary to ensure political validity of the program at all government levels. Composed of all relevant Ministries representatives, this decision structure is common and readily accepted in the public sector in Vietnam. The steering committee should be also composed of dedicated full-time experts from:

- Pollution control experts (MONRE) to lead the committee and establish intervention criteria.
- Industrial Management experts (MPI, MoIT) to complete deep inventories and to develop financial and fiscal tools for industries.
- Financial experts : (VDB, M of Finance) to establish economic viability evaluation procedures, train local banks and process financing

The Steering Committee Mandate should be:

- Plan the program implementation schedule and define responsibilities
- Responsible to define and coordinate institutional and regulatory reforms and enforcements
- Advocate the Industrial Pollution Control Program as a National Priority
- Plan and support a public awareness campaign
- Defines guidelines for specific sectoral programs (craft villages, industrial clusters, intense monitoring, pulp and paper, mining, etc.)
- Establish capital financing criteria and procedure
- Approve regional river basin committee's Scope of work
- Follow-up on Regional implementation
- Divide the implementation budget between both River Basin Committee on *pro rata* of polluting load or investment requirement assessments.

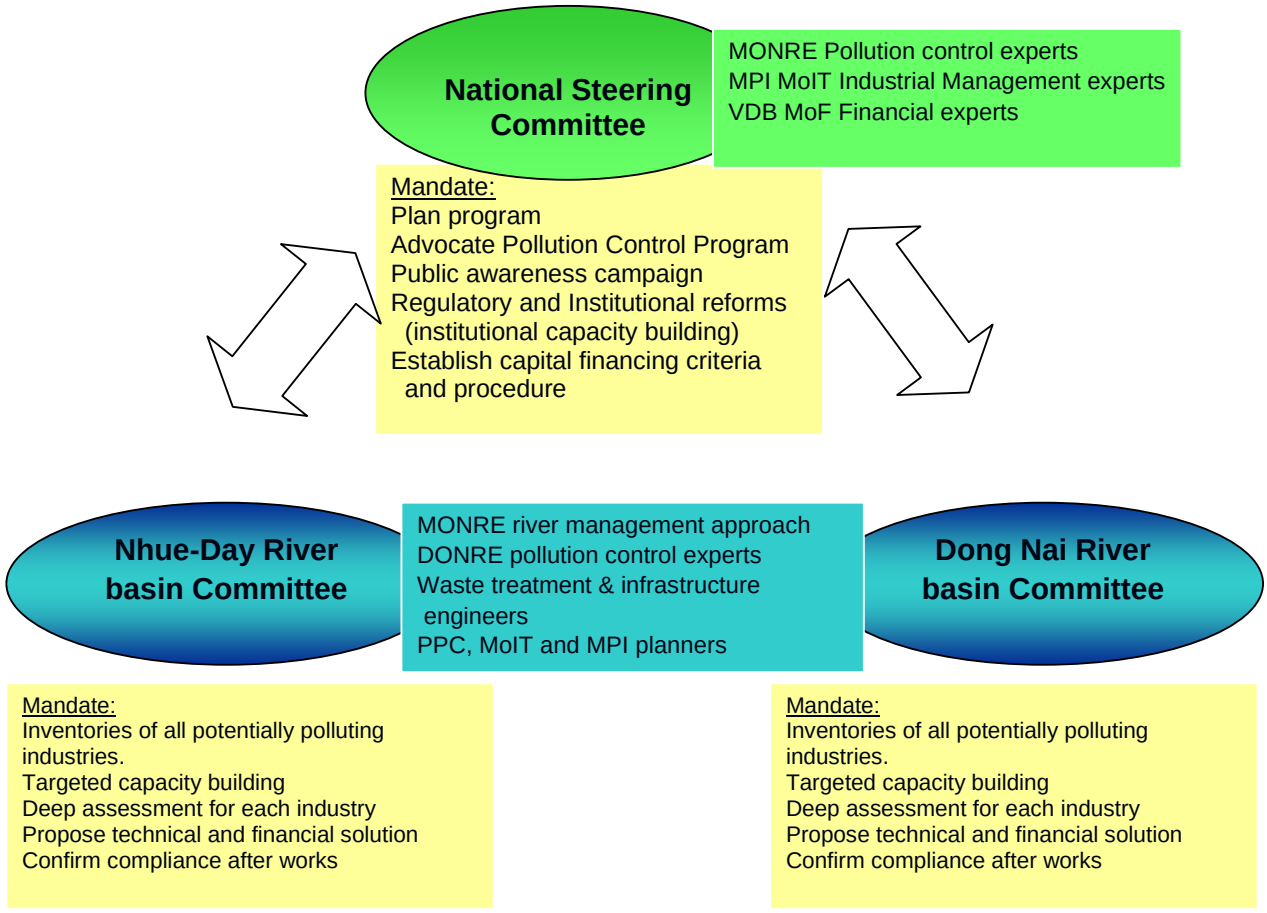


Figure 15-1: Recommended Program Institutional framework and mandates

15.1.2 River Basin Committees

The River basin management approach has been accepted by most stakeholders as the best management approach to tackle the issue of surface water and ground water contamination. The Nhue-Day river basin and the Dong Nai river basin are two major sources of water supply and irrigation water for the most populated provinces in Vietnam. Nhue-Day and Dong Nai river basins each host one of the two biggest urban areas of the country. The river basin conditions are so degraded that water supply schemes often have to stop operating due to the poor surface water quality.

Environmental monitoring has shown that the major source of water pollution in the river basins is the domestic wastewater, followed by industrial wastewater. As municipal wastewater is progressively being tackled through urban sanitation and urban drainage programs, industrial wastewater management should be handled at the pollution source. Furthermore, most polluting industries are located outside urban areas, so less likely to be sewered over the short to medium term.

We recommend that the implementation of the industrial program should use the River Basin Management approach in order to maintain the ultimate goal of overall water quality as the main driving force over other political or economic concerns. In order to do so, the implementation of local measures should be managed by a River Basin committee that will implement intervention measures based on the integrated river basin environment priority. The financial and technical resources for interventions can thus be distributed according to environmental and regional priorities.

Comprehensive plans on Environmental Protection have already been prepared in three river basins (Nhue-Day, Cau and Dong Nai)[39], including the establishment of a river basin committee. MONRE is the leading agency in the committee establishment and the plan implementation.

We recommend the creation of **one Industrial Pollution Committee for Nhue-Day river basin** and **one Industrial Pollution Committee for Dong Nai river basin**. The intervention budget should be shared between both river basin committees at pro rata of pollution load established by MONRE and the National Steering Committee.

Both river basin committees can work in a similar fashion. The river basin committee is responsible for implementing the intervention program in the River Basin. The committee has latitude to establish the Technical Support needs according to the specific conditions and needs. According to the specific river basin pollution situation, the committee can establish specific programs based on the National guidelines.

The committee's main tasks are:

- To supervise in deep inventories of potentially polluting industries in the river basin;
- to make individual technical assessment for each potentially polluting industry;
- to organize targeted capacity building activities and training in industrial environmental management for local officers and managers;

[39] Ambient Water Quality Management in the Nhue-Day River Bain Framework Plan (ADB TA 3892-VIE) (Decision 57/2008/QD-TTg). Dong Nai River Basin Committee Establishment (Decision 157/2008/QD-TTg)

- to define a technical solution to reach environmental compliance with financing options based on program criteria;
- to confirm environmental compliance once the works are completed.

Each committee should hire permanent staffs to work on the program implementation. The committee should not be composed of Ministry or Department "representatives" standing part time on the committee. As a comparison, the province of Quebec in Canada, with a population of 6 millions inhabitants, hired 30 permanent technical staff for a period of ten years to complete its technical assistance program for industrial pollution control in the 1980s.

River Basin Industrial Pollution Committees should be composed of the following:

- MONRE water management experts to supervise the application of the River Basin Management approach and supervise the implementation of regulatory and institutional reforms;
- A team of pollution control experts (from DONRE) to lead committee, establish local environmental priorities, complete inventories and assess industrial pollution from individual industries;
- A team of wastewater treatment engineers to evaluate source reduction and end-of-pipe treatment options for each industry;
- Regional and Urban planners (PPCs, MoIT and MPI) to ensure coherence with industrial development plans, to manage Industrial Zones programs and link with urban relocation programs;
- Infrastructure engineers (DoC or urban SADCOs) to assess industries located on the urban sewer network, to propose technologies consequent with the municipal network.

The recommended program components are presented below as 4 main implementation steps.

15.2 Step 2: Standardizing and Reinforcing regulation

The National Steering committee should use this technical assistance program for the following activities

15.2.1 Regulatory framework

The regulatory and institutional assessment produced detailed recommendations to improve industrial environmental management.

The review of international experience in pollution abatement programs (refer to Annex C-1) has shown that direct financing of wastewater treatment is not the optimal strategy for reducing industrial pollution. Instead, the gradual introduction of an appropriate regime of pollution fees that moves industry to internalize the costs associated with pollution has been shown to be highly successful in a number of environments. Incentive-based regulation experiences from Columbia[40]

[40] Ambrus, Steven. 2000. Columbia tries a new way to fight water pollution… and it works. EcoAmericas.

and China[41] have shown great promise in creating environment that fosters firms to invest in their own wastewater treatment programs.

The regulatory framework in Vietnam is complex but is progressively being integrated by local officials. The main weakness is the enforcement implementation. The assessment has shown that human resources to seriously implement the regulatory framework are insufficient in provincial DONREs (for example, only 7% of polluting establishments would have a Waste Water Discharge Permit). The city of Dalian in China, when implementing its reform, has increased its environmental staff from 100 in 1995 to 1000 staffs in 2000.

Some differences do appear clearly in regard to practical implementation and enforcement of regulations in the different regions and provinces. Some good experience from some provinces could be used as technical assistance to other provinces to upgrade their practical implementation. As an example, Southern provinces have better results then Northern provinces in terms of environmental monitoring of industries and management of industrial estates.

One good practice to improve implementation of sustainable monitoring and enforcement at the local level is to retain locally a part of pollution fees to improve financing of local environmental management. This refers to DONRE fees for environmental protection (sent to Vietnam Environmental Protection Fund) and Industrial Parks management fees for State-Owned parks (usually sent to the Provincial Department of Finance). For example, HIEPZA in HCMC keeps 10% of the Industrial Park fees charged to industries to cover management expenses. This creates a fund for the Industrial Zones Authority and helps to carry on their environmental responsibilities.

The regulatory framework still needs to be updated in order to respond to the issue environmental liabilities of relocated industries and their former sites. The Law on Environmental Protection, Article 93.3, stipulates that Organizations and individuals causing environmental pollution shall be responsible for decontamination. However, no regulation exists to ensure the enforcement this article of the LEP. All the informants met confirmed that no decontamination is carried out on the former sites. A new regulation should include an obligation for decontamination for newly established industries. This should be included in the contract between the industry and the infrastructure development company. It should also be included in the civil contract of buying land. The owner should be responsible for decontamination before selling the land after use.

15.2.2 Public awareness campaign

Mobilizing public concern about pollution can represent an interesting incentive for industries to reduce their pollution and for local officials to apply stricter regulation enforcement. Indonesia PROPER program[42] achieved a 40% abatement of industrial pollutants through a single program of voluntary ratings, at once shaming polluting factories and praising those factories that showed good results.

Blacklisting and praising good citizens are well integrated into Vietnamese culture and is still considered as a powerful tool by the Government at central and local level. The effects of the

[41] Wang, Hua and Mung Chen. 1999. How the Chinese system of charges and subsidies affects pollution control efforts by China's top polluters. World Bank Policy Research Paper 2198.
[42] Afsah,S. and J.Vincent. 1997. Putting Pressure on Polluters: Indonesia's PROPER Program. A Case Study for the HIID 1997 Asia Environmental Economics Seminar.

local community concerns on polluting enterprises in Vietnam have also been well documented[43] and represent a promising approach for the Vietnamese context.

We recommend that the National Steering committee should develop a national public awareness campaign about the environment, industrial and domestic pollution. National and local media should be used to remind the importance of protecting environmental fragile resources, and the importance of a greener industrial development for the country as an international competitive asset. The National Steering committee should also design an award program with green awards ceremonies for deserving small and big industries and support upgrading the impact of industries blacklisting. As this kind of reputation program is more efficient at a local and regional level, the implementation should be applied by the river basin committees or provincial PC, Department of Commerce or Industry and Trade.

15.2.3 National Technology Development

A program announcing an imminent and massive investment in industrial wastewater treatment technologies is very likely to attract all major international players to the Vietnamese market. The Vietnamese sector of water treatment technology is still very weak but such program is a great opportunity to develop a national sector of expertise. The only option of international expertise and technology would definitely be extremely expensive for most industries in the country. The program should include a comprehensive study of the Vietnamese expertise and wastewater treatment sector in order to establish targeted technical assistance[44].

The program should support the development of a National expertise in the field of water treatment. The program could request the big international technology manufacturer to provide open technical trainings in Hanoi and Ho Chi Minh.

Pilot demonstrations of technologies should also be implemented to evaluate the performance in the Vietnamese conditions as well as customize the technologies and train Vietnamese technicians and engineers. It is most likely that design conditions and operation & maintenance conditions will be very different from developing countries or neighbour China.

The pilot demonstrations should be financed partly by the program (60%), the manufacturer (25%) and the beneficiary industry (15%). This typical share of costs has been the one used in Canada at the time of the Industrial Wastewater treatment program. The program officers should make sure to share the piloting funds within a fair mix of international and local (regional) manufacturers, big and small companies, high-tech and low-tech technologies. The funding program could be complemented by subsidies to research and business development.

Finally, the program could also recommend some technology implementation rules to ensure training of Vietnamese engineers and partnerships with Vietnamese engineering firms.

[43] O'Rourke, D. 2004. Community-Driven Regulation : Balancing Development and the Environment in Vietnam. MIT Press, Cambridge.
[44] Similar to: EVD and Netherland Ministry of Economy. 2008. Marktverkenning (*Market research*) Vietnam-Wastewater.

15.3 Step 3: Deep inventories of polluting industries in each province

A first general inventory should first be completed to identify potential industries for the different categories of intervention options and required support. The inventory data presented in this study can be used as a basis to go into details for each districts and provinces.

As a second step for according technical support, clear incentives must be used for industries to participate in the database. For example it should be publicized that in order to be eligible for the consideration of support, each industry must be responsible to provide their data to the database management office.

15.4 Step 4: Defining intervention options and criteria for polluting industries:

Inventories should allow a detailed classification on industries and their pollution. In order to produce the best results in terms of sustainable pollution reduction in the river basin, intervention options should reflects the particularities of each industrial category. Industrial zones, individual factories and craft villages can all produce some level of industrial pollution but their economic and production situations are very different. Figure 15-2 presents the recommended intervention options according to their pollution level and industry type. The financial support for construction costs will be recommended by the river basin committee based on criteria established by the National Steering committee. The funds to the industry (loans or grants) will however be managed by the Vietnam Development Bank, the main financial intermediary for the lending and grant program for capital costs. See the last chapter “Financing options” for details.

15.4.1 Most polluting industries:

The Government has already issued national legislation for handling establishments which cause serious environmental pollution. Decision 64/203/QD-TTG plan’s identified 4 295 polluting establishments in the country with the most serious (439 industries) to be processed from 2004 to 2007. Implementation of Decision 64 has created the most important program of activities to fight industrial pollution so far in the country, but interventions planned for the identified establishments were still far beyond schedule three years after the issuance of the decision[45]. The main reasons identified by analysts were the lack of “carrot and stick”: lack of financial support from the Government budget and the lack of regulation for penalizing enterprises who did not obey Decision 64.

In 2008, in order to overcome phase 1 problems and handle the remaining 3 856 establishments the Government issues instructions 17/2008/CT-TTG to promote implementation of Decision 64. This provides new targets up to 2012 and assigns specific tasks and deadlines to Ministries. However, in 2007, the Government issued Circular 07/2007/TT-BTNMT to clarify criteria to guide DONREs in identifying further polluting industries to be treated. The circular identifies criteria as the number of exceeding environmental parameters. We should note that some of the DONRE representatives met found these criteria very complicated to use and implement.

We recommend that Circular 07 should be clarified into a *TCVN-style standards* for easier classification by DONRE officials.

[45] Dr Dang Kim Chi. November 2005. Situation Analysis Report on Management of « Hot Spots » (Decision 64) for SEMLA Programme.

We should also note that this method of differentiating two categories of polluting industries as (1) “Most seriously polluting industries” and (2) “polluting industries” may seem very complex and seem to add up some bureaucracy work. However, in a context where there is a very high number of polluting industries to be handled with limited resources, **this process of identifying the most seriously polluting industries will definitely increase the efficiency of pollution abatement by prioritizing interventions at the most polluting factories**.

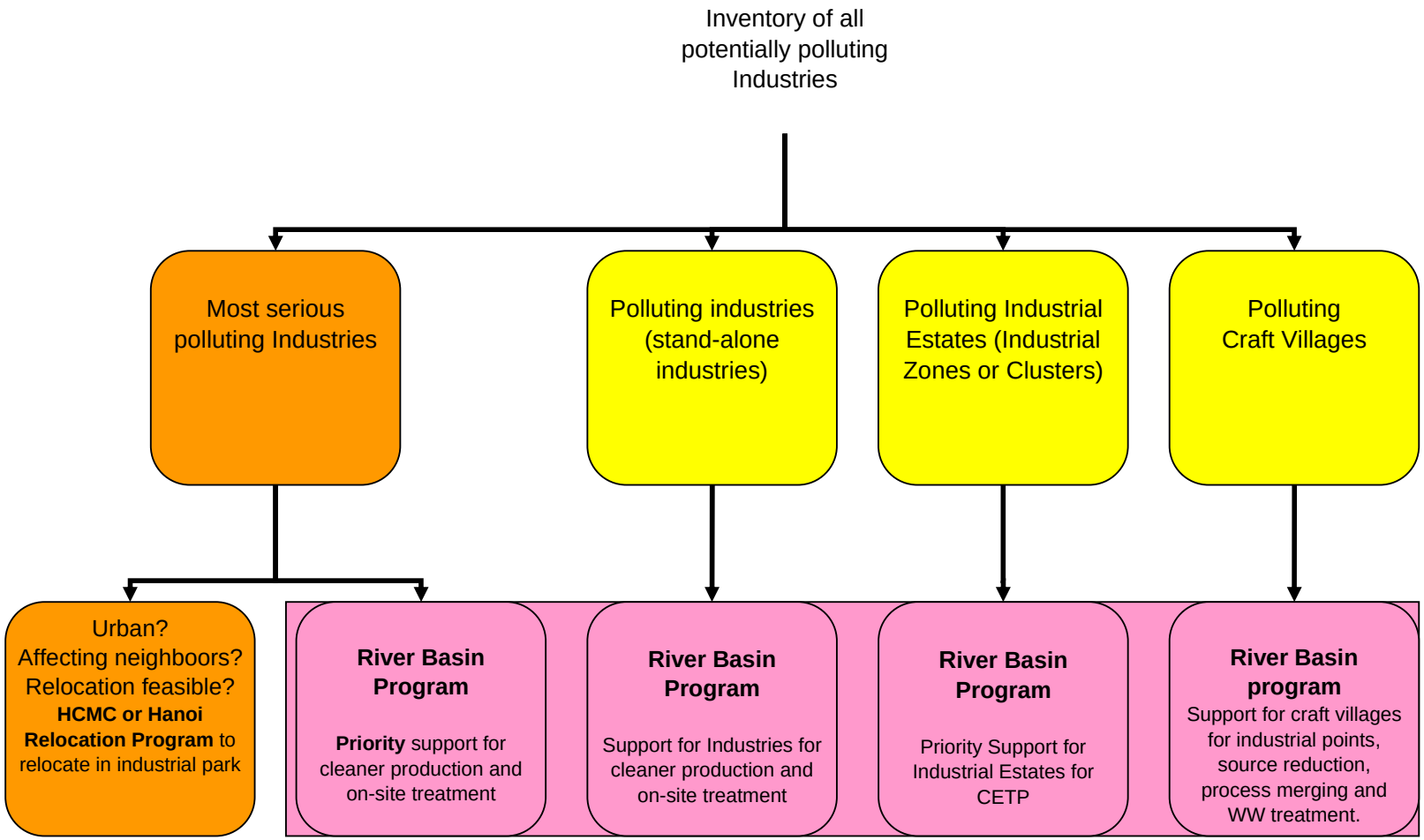


Figure 15-2: Interventions options for industrial pollution control

- **A) Urban relocation program**

Ho Chi Minh city and Hanoi People Committee have both established an Urban Relocation Program. The objective of the program is to reduce the burden of most polluting industries located inside densely occupied inner city districts. Each program has established specific objectives, criteria for relocation and step-by-step procedures. ***Our detailed recommendations for improving these programs are presented in Annex C-2: Step-by-Step relocation guidelines.***

- **B) Priority handling but no relocation**

Industries identified as most seriously polluters that are not considered for relocation should definitely be considered for priority evaluation and intervention by the River Basin Committee. Intervention options include: pollution source reduction, cleaner production (technology upgrade) and on-site waste treatment.

15.4.2 Stand-alone industries:

For individual industries, stand-alone and industries within industrial estates, we recommend targeting a limited number of high polluting industrial sectors, rather than supporting all industries. The priority interventions (relocation, closure or treatment) should go to the industries with the most toxic discharge in terms of toxicity [46]**:** :

- Fertilizer;
- Pesticides;
- Paper and paperboard,;
- Plastics and;
- Leather sectors.
-

All these polluting industries should be able to get some technical support to make a clear overview of cleaner production opportunities and end-of-pipe treatment options.

Apart from the most toxic industries, **we recommend targeting a limited number of high polluting sectors where cleaner production has already demonstrated good results**. Cleaner production has demonstrated to be an efficient method of reducing pollution and increasing the efficiency of the production process. Those methods, also called “source reduction”, involve reducing or eliminating the creation of pollutants through increased efficiency in the use of raw materials, energy, water or other resources. Application of cleaner production process, however, is complex to implement because it requires a long assessment and changes to the production process, which may seem more complex than just adding some end-of-pipe waste treatment. No cleaner production solution can be applied to all industries. And cleaner production alone usually cannot reduce pollution enough to reach all environmental standards.

Vietnamese expertise in the cleaner production field is still being built. In order to optimise sustainable cleaner production results, we recommend that **a clean production expert team should be financed within the River basin committee** to focus their assessment and implementation in:

- Pulp and paper;
- Food processing;
- And Textile dyeing.

[46] As found as the top manufacturing sectors in Vietnam producing the highest relative toxic hazard by: Giovanna Dore, Philip Brylski, Jostein Nygard, and Phuong Thi Thanh Tran. 2008. *Review and Analysis of the Pollution Impacts from Vietnamese Manufacturing Sectors*; EASRE, The World Bank; Washington, D.C.

The clean production expert teams should be financed as Technical assistance by the Industrial control program for each individual factory. **The implementation and process of modification costs inside industries will be self-financed.** Many publications on pilot trials have shown cost recovery in a period of less than one year by reducing production costs and waste treatment costs. Education workshops and activities about cleaner production should also be organized for industry managers and technicians to raise awareness about the benefits of cleaner production.

End-of-pipe treatment should also be provided with some financial support to industries, according to their needs, technical feasibility, and technology prices.

The financial support for construction costs will be recommended by the river basin committee based on criteria established by the National Steering committee. The funds to the industry (loans or grants) will however be managed by the Vietnam Development Bank or the Vietnam Environmental Funds for the lending and grant program for capital costs.

15.4.3 Industrial Estates

Industrial estates have been a key element of the Government promotion of modernization and industrial growth in the country. Industrial estates (industrial parks and clusters) provide strategic industrial locations for resources and shared infrastructures for transportation, electricity, water supply, and waste and wastewater management.

Industrial estates should receive priority financial support to build Centralized treatment plants (CETP). They represent a sustainable concept to reduce overall pollution by organizing industries on a concentrated site where waste treatment, infrastructure management, and environmental monitoring can be facilitated. Industrial zones and clusters should be evaluated by the River Basin committee as an individual entity (represented by the Infrastructure development company) eligible for CETP support AND as multiple individual industries eligible for source reduction and pre-treatment support.

15.4.4 Craft villages

Craft villages present a very particular industrial situation. The villages include multiple micro-production units located in the owner-household's houses. Most craft villages present a mono-production (majority of households execute the same production process) as some craft villages present multiple production (multiple production processes in the village but still at micro-scale).

The multiple micro-scale production lines present a difficult context to design efficient end-of-pipe systems. Most craft villages present weak infrastructures for drainage, sewers, electricity, transportation and little available land for future waste treatment. Furthermore, the micro-industries/households have limited economic resources and can hardly absorb any waste treatment costs. Most craft villages are traditionally organized informally, but from an industrial and commercial point of view, they are not institutionally recognized by the government.

In order to establish improved environmental practices, we have already recommended that craft villages should be considered as one polluting entity by DONRE and they should receive one wastewater discharge permit (WWDP).

The river basin committee should prepare detailed environmental management plans for the most polluted craft villages. The plans should include options for cleaner production training, low-cost options for communal wastewater treatment and financial measures for implementation.

The Industrial pollution control program should take in consideration the fragile economical and institutional situation of craft villages and should first offer technical assistance as management and technical education trainings in order to improve industrial process and organization for resources and pollution management. Many craft village use very archaic process and they could reduce their pollution by using some simple and cheap technical solutions.

Most craft village leaders met agree that pollution control is a major issue but end-of-pipe treatment to each households is not realistic, technically and economically. Any investment into pollution control should be carefully monitored because capital funds and even operation and maintenance funds are very limited. The proposed solutions in many of the most polluting villages were to merge some of the most polluting processes to control pollution discharge and build common treatment system.

Relocation of production units to a nearby industrial point has also been considered by former Ha Tay and Nam Dinh provinces. This represented an interesting approach for households to expand their business in an affordable location with better infrastructures. The main recurrent problem faced by villages and officials is the difficulty to find cheap land for treatment or Industrial points.

15.5 Relocation of Craft Villages to Industrial Points

Former province of Ha Tay is the home of 76% of Vietnam's craft villages. With the merge with Hanoi province, the management of craft villages is now being transferred from Ha Tay DARD to Hanoi-HaTay DOIT. DOIT has prepared a program for relocation of problematic craft villages. The objective is to move business activities from the village to nearby industrial points. Industrial points (with road, water, electricity and drainage system) concentrate artisanal production from the craft village. Only the production process moves, not the household. It is seen as a way to allow business expansion and better management for industrial households. 163 industrial points are planned in former Ha Tay. In 2009, 10 are in complete operation (100% occupation) and 30 are under construction. No treatment system has been installed or is planned so far.

According to our investigation, the households are not forced to relocate, they are willing to move to enjoy better production conditions and expand their businesses. So far households were not given assistance to move. Most industrial points investors are the district authorities who invest for the land and provide infrastructure (road, electric line, telephone, drainage) and the households lease the land to the district authorities.

However, as small households don't have the financial capacities to lease land in industrial parks, industrial points should provide smaller pieces of land at cheaper price. So far one of the major barriers to the craft villages' relocation to industrial points is the difficulty to clear land to establish industrial points. District authorities are facing strong negotiation with farmers about land clearing compensations (See the case study of two craft villages' relocation to industrial points, box 12-3 and 12-4).

The relocation of craft villages' production units to a nearby industrial point may be a good solution to move the polluting activities far from the residences. The industrial points also gives the option of common treatment of wastewater by a merge option of the polluting process or end-of-pipe treatment

system at the end of the common drainage system. However, no industrial point have planned treatment systems because neither the district neither the households face incentives to treat the pollution. No environmental regulation clearly applies to industrial points yet and no financial support is available to build treatment systems.

Another barrier to the relocation of craft villages' relocation has been the high competition for affordable industrial lands. Some industrial points have seen small industries from neighbour districts establishing in newly operating industrial points.

We recommend that the industrial points should be used as a central tool in a more comprehensive strategy to improve environmental management in the most polluting craft villages. The industrial points so far have been used to expand and modernize the industrial production. By providing a clear environmental protection objective, the provincial people committee should work with the river basin committee to establish a clear strategy for the most polluting villages, and **long-term financial support for common treatment facilities and maintenance of infrastructures jointly by the provincial PC and the River basin program.** These strategic industrial points should be giving exclusively to the nearby craft village for production activity concentration. This concentration is necessary to be able to provide technically feasible treatment systems.

16. COSTS EVALUATION FOR INFRASTRUCTURE REQUIREMENTS

While industrial estates are expected to provide environmental management services such as wastewater treatment facilities, our inventories indicate that very few industrial parks have constructed wastewater facilities and many of these facilities are not operational yet. The situation is even worst in smaller industrial clusters and industrial points where treatment facilities are almost non-existent.

Based on the developed inventories, a preliminary cost assessment of the required infrastructures for environmental compliance can be completed by using typical technological scheme and assumptions.

However, it is important to note that infrastructure requirements for managing the industrial wastewater are very complex to define precisely. Each industry requires a detailed engineering assessment of their industrial process and their pollutant loads. The assessment industrial estates also present specific site conditions, specialized industrial production sector an economic and management specific conditions.

As discussed in the previous chapter on the investment program, a detailed evaluation of each individual industries and industrial estates will be required at the time of evaluating their financial needs for infrastructure. However, we present here a first budgetary cost assessment that will help the Government of Vietnam and the donor community to plan their support program for industrial pollution reduction.

The budgetary cost assessment uses the updated inventory of polluting industries and industrial estates to estimate the costs of pollution reduction. The methodology estimates the pollution reduction costs by considering different options of pollution reduction: at the industry level (1) through Cleaner production methods and (2) by end-of-pipe wastewater treatment, and at the industrial estate level (3) by common wastewater treatment facilities.

16.1 Cleaner production at Industry level

Cleaner production helps reducing industrial pollution by improving the production processes. A more efficient process uses fewer raw materials and energy for production and produces less waste at the end of the process. In pollution reduction methods, cleaner production is a *source reduction* method, in opposition to *end-of-pipe* treatment like wastewater treatment facilities.

UNEP defines cleaner production as
....the continuous application of an integrated preventive environmental strategy applied to processes, products, and services in order to increase Eco-efficiency and reduce risks to humans and the environment:

- **For production processes**: conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes;
- **For products**: Cleaner Production includes the reduction of negative impacts along the life cycle of a product, from raw material extraction to its ultimate disposal; and
- **For services**: Cleaner Production is to incorporate environmental concerns into designing and delivering services.

As cleaner production minimises the environmental impact, improves production efficiency, and reduces costs, it is now being integrated in developed and developing countries as a more sustainable industrial development.

In Vietnam, the *Vietnam Cleaner Production Center* (VNCPC) Hanoi is implementing cleaner production processes and research. The United Nations Industrial Development Organization (UNIDO) in cooperation with the United Nations Environment Programme (UNEP) are the supporting agencies. Both VNCPCs are doing research, implementing pilot projects and provide industries with training and consulting services in cleaner production processes.

Cleaner production programs in Vietnam are still in its early age, but cleaner production program supported by UNIDO have shown good results in the sectors of textile-dyeing, pulp and paper and food processing. The following table presents some results from the 1999-2003 cleaner production program in HCMC.

Table 16-1: Results from the 1999-2003 Cleaner production program in HCMC[47]

Industry	Sector	No. of CP options	Waste-water discharge	WW pollution load	Financial analysis		
					CP Investment (in US$)	Savings (in US$/year)	Payback period
Thien Huong[1]	Noodle	24	-58 %	-37%	62 000	633 700	< 2 months
Vissan[1]	Slaughtering	9		- 33%	10 000	28 000	< 5 months
Xuan Duc[1]	Pulp & paper	21	- 33%	- 20%	15 000	96 000	< 2 months
Linh Xuan[1]	Pulp & paper	19	- 44%	- 40%	50 000	100 000	6 months
Phuoc Long[1]	Textile dyeing	19	- 25%	- 30%	4 400	40 000	< 2 months
Thuan Thein[1]	Textile dyeing	14	- 33%	- 14%	100 000	75 000	> 1.5 year
Ninh Binh Beer Factory[2]	Beer		- 25%		1685$	353,920,000 VND	< 1 month
Hai Long Co., Ltd[2]	Agar		- 20%		25 027$	243,320,000 VND	1.8 years
The HCMC Textile Company[2]	Thread, zipper		- 21%		5500$	1,153,400,000 VND	< 1 month
Rang Dong Company[2]	Packing, loo paper		- 39%		21442$	3,002,000,000 VND	1.5 months
Binh Khanh Frozen Vegetables And Fruits Factory	Frozen vegetables and fruits		- 30%				
AFIEX Seafood Industry	Seafood		- 254 m^3/day				

1 Dhakal, Shobhakar, 2005
2 ETM center research (HCMC), various sources

[47] Dhakal, Shobhakar. 2005. *Successful and Transferable Practices in Ho Chi Minh (Vietnam): Promotion of Clean Production*. Kitakyushu Initiative for a Clean Environment.

Only low-costs cleaner production options were considered in this HCMC program. Another cleaner production program[48] focusing on 12 textile-dyeing industries in HCMC also shown results of wastewater discharge reduction (between 10 and 50%), chemicals consumption (5 to 30%) and overall pollution load reduction (COD, BOD and SS content reduction between 30 to 45%). The savings were mainly achieved through the costs reduction of: wastewater treatment, clean water consumption, chemicals and energy.

The researchers conclude that these cleaner production programs consisted of the first serious research of cleaner production implementation in Vietnam. All subsequent projects would inevitably enforce the capacity and knowledge base into more efficient cleaner production options. Cleaner production consulting service can now be offered by both VNCPCs. An assessment requires an extensive analysis of the production process and technologies (between 20 and 40 days of work per industry).

16.1.1 Cleaner production interventions and costs

Cleaner production interventions options and costs vary greatly as they are very case-specific. Intervention options applied to the textile-dyeing sector, for example, is presented in the following figure. The average cost per textile-dyeing industry for this program was about 58 000US$ with a payback period of less than one year (2 to 6 months in average). The assessment and interventions lasted between one and two months per industry.

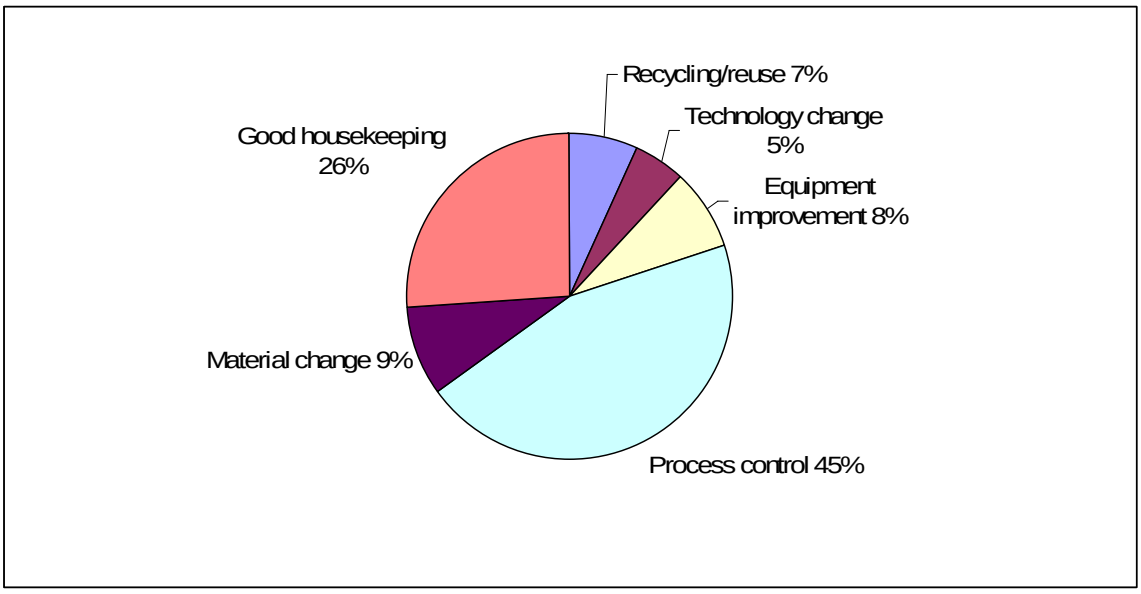


Figure 16-1: Cleaner production interventions applied to textile-dyeing industries [49]

The Vietnamese experience is still very young to be able to guarantee success in all industries. Furthermore, the resulting production process may still produce pollution that will exceed environmental

[48] Tran Van Nhan, 2005. *Cleaner Production - a Cost-Effective Tool for Textile Industrial Wastewater Management in Vietnam*. Science Council of Asia, May 12th, 2005.

compliance. In most cases treatment facilities would still be necessary but the cost would much cheaper to build and operate.

Since cleaner production results are building up on previous experiences and knowledge of the detailed engineering process, interventions in targeted manufacturing sectors are preferred to ensure better overall results. Experience in Vietnam is still pretty light, but the targeted sectors have been: Textile-dyeing, pulp & paper and food processing.

16.1.2 Recommendations and costs evaluation:

Cleaner production should be considered seriously before planning any end-of-pipe wastewater treatment. It is a prevention method that will seriously reduce production costs and waste treatment costs over time.

We recommend that the future investment program works closely with the Vietnam National Center for Cleaner Production to strategically establish a list of industries that would potentially benefit from Cleaner Production methods. Cleaner production centers should benefit from *Technical Assistance* to choose the industries and potential methods. Pilot testing could be integrated. The Technical Assistance funds would represent about 12 man*months of work for VNCPCs specialists working with the updated inventory staff to establish potential industries.

However, **industries should pay for the cleaner production interventions**. The short payback period will be a good incentive for participation. Participating industries could also benefit from preferential treatment (delay with complete compliance with environmental standards or reduced fines).

16.2 Infrastructure requirements and cost for industrial estates.

Generally, industrial estates host several types of industries whose effluents can be totally different in terms of pollution. The usual procedure is to build a central wastewater treatment plant (WWTP) that can remove a *typical general pollution* and connect all industries to a centralized sewer system. However, individual industries exceeding a pre-determined pollution load are required to provide pre-treatment to their wastewater before discharging to the centralized sewer system.

16.2.1 Common treatment facilities at Industrial Estate level

Common wastewater treatment facilities are recommended for all industrial estates and clusters. As mentioned before, the final choice of treatment technology is specific for each estate, depending on available land space, pollution load and capital and operation budget.

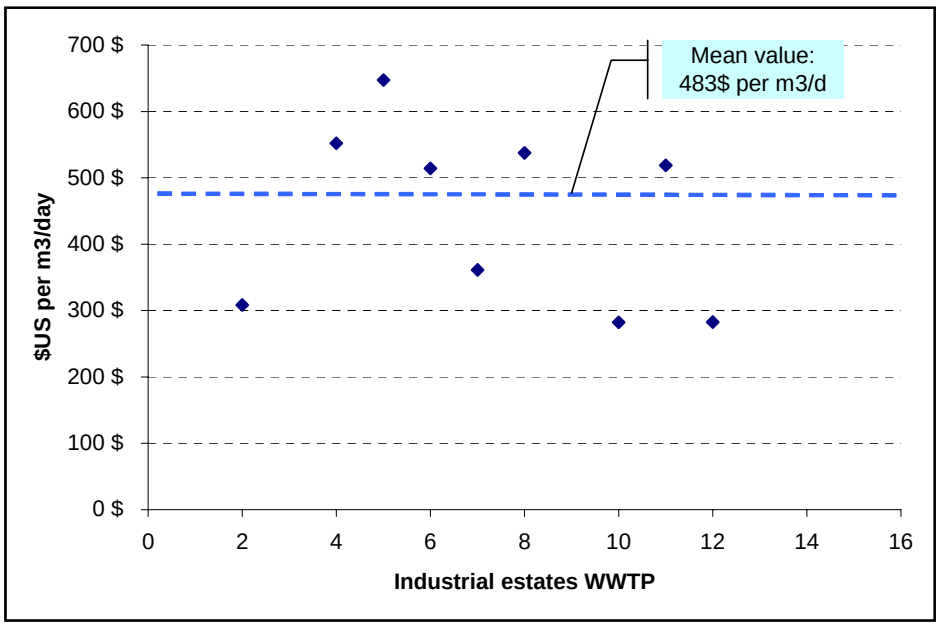
In order to establish a budgetary estimate for all industrial estates-points, we have chosen to calculate our budgetary estimates based on the most common wastewater treatment process used in industrial estates in Vietnam right now. The following table presents some of the wastewater treatment operational processes used in industrial estates in the Dong Nai river basin.

Table 16-2: Sample of existing wastewater treatment operational processes used in Industrial estates in Vietnam

No.	Name of Industrial estate	CETP treated flow (m^3/d)	Pretreatment	Chemical	Biological	Disinfection	Sludge	
1	KCX Tân Thuận	10 000	Screen-Grit-Equal	Clarifier		Chlorination	Dewatering	Storage
2	KCX Linh Trung 1	4 000	Screen-Equal		SBR + Ads.		Dewatering syst. + drying bed	Landfill
3	KCX Linh Trung 2	2 500	Screen-Equal		SBR + Ads.		Dewatering syst. + drying bed	Landfill
4	KCN Lê Minh Xuân	2 000	Screen - Oil removal	Clarifier-1	Activated Sludge		Thickening + dewatering syst.	
5	KCN Tân Bình	1 500	Screen - Oil removal - Equal		SBR		Thickening + dewatering syst.	
6	KCN Tân Thới Hiệp	1 500		Chemical DAF	Aerated lagoon		Storage	
7	KCN Tây Bắc Củ Chi	3 000	Screen - Oil removal - Equal		SBR		Digestion + thickening + dewatering syst.	
8	KCN Hiệp Phước	3 000	Screening	Clarifier	Activated sludge + Maturation pond		Storage + Dewastering syst.	
9	KCN Cát Lái 2	500			Activated sludge		Storage + Dewastering syst.	
10	KCN Vĩnh Lộc	6 000	Screen - Oil removal - Equal		SBR		Storage+ thickening + dewatering syst.	
11	KCN Bình Chiểu	1 500						
12	KCN Tân Phú Trung	4 000	Screen + Equal	Clarifier	Activated sludge			
13	KCN Tân Tạo	6 000	Equal.	Clarifier	Activated sludge		Dewatering syst.	

Table 16-3: Investment costs for industrial estates WWTP in Vietnam

No.	Name of Industrial estate	CETP treated flow (m^3/d)	Investment Cost (VNĐ)	Completion year	Inflation Factor	Investment Cost (USĐ)	Construction company	Sources	Unit cost (USD per m^3/d)
1	KCX Tân Thuận	10,000	7,050,000,000 VND	1992	3.00	1,208,571 $		HEPZA	
2	KCX Linh Trung 1	4,000	18,000,000,000 VND	2008	1.20	1,234,286 $		*estimated by ETM Center*	309 $
3	KCX Linh Trung 2	2,500	11,250,000,000 VND			642,857 $		*estimated by ETM Center*	
4	KCN Lê Minh Xuân	2,000	12,880,000,000 VND	2001	1.50	1,104,000 $	*Glowtec Co.*	HEPZA	552 $
5	KCN Tân Bình	1,500	13,071,071,000 VND	2006	1.30	970,994 $	*Glowte Co.*	HEPZA	647 $
6	KCN Tân Thới Hiệp	1,500	11,250,000,000 VND	2008	1.20	771,429 $		*estimated by ETM Center*	514 $
7	KCN Tây Bắc Củ Chi	3,000	15,803,290,000 VND	2008	1.20	1,083,654 $	*Seen Co.*	HEPZA	361 $
8	KCN Hiệp Phước	3,000	23,514,597,400 VND	2008	1.20	1,612,430 $	*Seen Co.*	HEPZA	537 $
9	KCN Cát Lái 2	500	2,250,000,000 VND			128,571 $		*estimated by ETM Center*	
10	KCN Vĩnh Lộc	6,000	24,680,749,000 VND	2008	1.20	1,692,394 $	*ECO Co.*	HEPZA	282 $
11	KCN Bình Chiểu	1,500	11,350,624,000 VND	2008	1.20	778,329 $	*Tanimex Co.*	HEPZA	519 $
12	KCN Tân Phú Trung	4,000	19,796,589,000 VND	2009	1.00	1,131,234 $	*Thăng Long Co.*	HEPZA	283 $
13	KCN Tân Tạo	6,000	27,000,000,000 VND			1,542,857 $		*estimated by ETM Center*	
14	Saigon High-Tech park	5,000		2009		4,130,000 $	*South Koreans*	*Thanh Nien news*	826 $
								Mean value	483 $



The table shows that activated sludge processes and SBR technology are the most common treatment chain applied in Vietnam (and worldwide when land availability is limited). It is also what we would recommend for treating industrial wastewater. SBR is a more recent adaptation of activated sludge that requires less infrastructures and a lower construction cost since no settling basin is required. Aeration and sedimentation are taking place in the same basin. The technology is now well known and experimented in Vietnam and is more likely to be the most common technology chosen in the future for industrial estates.

The following tables present a 2009 process comparison that was established by LBCD for the project of Dong Hoi City Sub-project, Viet Nam Coastal Cities Environmental Sanitation Project. The project is a 10 000 m^3/day WWTP. The combined process is a combination of aerated lagoons and facultative ponds. The study has established a detailed estimate for the Vietnamese context, including detailed construction and equipment costs. The operation and maintenance costs are also presented.

Table 16-4: Technologies comparison for Centralized treatment plant for industrial estates

Technology	Space require-ment (ha)**	Construc-tion investment cost (no land) ($ US)*	Operation & Maintenance Cost ($ US/year)	Unit cost for construc-tion investment ($ US/m^3 per d)	Unit cost for opera-tion ($ US/m^3)	Other requirements: operation skill – smell risk (%) – sustainable development
Oxidation ditches (AS)	1,35	8 819 234	412 525	881	0,11	Mixed liquor, aeration & sludge control – 30% - high energy & sludge issue
SBR (AS)	1,35	7 580 829	263 051	758	0,07	Mixed liquor, aeration & sludge control – 10% - mid energy & sludge issue
Aerated lagoons	8,5	3 883 230	299 846	388	0,08	Aeration control – 15% - mid energy
Facultative lagoons	22	5 006 300	14 400	500	0,00	No control - 20% - zero energy
Combined lagoons	11	5 260 288	144 860	526	0,04	Low aeration control - 5% - Low energy

Note:
(*) Reference for cost calculations:
Year 2009 – Dong Hoi City study case - Flowrate of 10 000 m^3/d – Polluting strength of 300 mg/L (BOD_5) – Objective of compliance with TCVN-7222:2002 – Including: land procurement and population resettlement compensation due to large 300-m buffer area required.
(**) Not including 150 or 300-m buffer area (odour control) but including areas for auxiliary facilities.

Table 16-5: Technology comparison for operating costs (LBCD) (for a 10 000 m^3/day CETP)

Technology	O & M Cost ($ US/year)	HP investment (hp)	kW-h /d	Chlorine for disinfection ($US/year)	Man-power (employee)	Sludge (kd/d, dry basis)	Sludge disposal cost ($US/year)
Oxidation ditches (AS)	412 525	562	10 049	125 000	16	2 160	23 652
SBR (AS)	263 051	250	3 740	125 000	16	1 374	15 045
Aerated lagoons	299 846	711	12 079	0	6	0	0*
Facultative lagoons	14 400	0	0	0	6	0	0*
Combined lagoons	144 860	313	5 595	0	8	0	0*

HP **Horse-power requirements for daily operation**
O&M **Operation and maintenance**
M-P **Man-power requirements for daily operation, man-day**
Total US$/year over 10-year = (Total capital cost/10) + Annual operation

* The operating costs are detailed in table 18-5. In the case of aerated lagoons and facultative ponds, the price of sludge disposal may vary. The theory suggests that sludge should be removed from the lagoons (or ponds) after 10 years. This is done with a siphon-cistern truck and sludge can be disposed in dewatering beds and then to landfills. However, experience has shown that lagoons and ponds that maintain a retention time of 10 days or over (rather than the design retention time of 7 days) can digest the sludge much better. The sludge removal is then required only after 20 to 25 years of operations.

The sludge disposal costs are based on the landfill disposal method. This is the most common method of disposal in Vietnam and worldwide for sludge and ashes. Landfilling is also the cheapest method of disposal. The cost of landfilling in Vietnam is **30$/ton of sludge (based on a dry basis)**. A digested sludge, dewatered sludge or incinerated ashes reduces the weight greatly and hence the final cost of disposal. Safe, long-term impermeable cells techniques are a cheap option for safe disposal that can be applied in landfills. Information about landfills in Vietnam are that impermeable cells techniques are still not common but a strict regulation for WWTP disposal could improve demand and financing of improved techniques. Safe cells could increase the price of disposal by 100% but this technique may remain the cheaper safe disposal of heavy metals.

16.2.2 Technology recommendations for industrial estates

Table 16-6: Technology recommendation for each type of industrial estate

<table>
<tr><td>Industrial Parks.</td><td colspan="2">Biological: SBR</td><td>-high flow
-limited space</td></tr>
<tr><td>Industrial clusters</td><td colspan="2">Aerated lagoons</td><td>- lower cost
- but space required.</td></tr>
<tr><td rowspan="3">Industrial Points and craft villages</td><td colspan="2">Facultative ponds</td><td>-low costs (capital &OM)
but space required</td></tr>
<tr><td>Bionest</td><td>For organic industries</td><td rowspan="2">- For single enterprise or combination of “same production” small enterprises.
- Low space
- O&M costs</td></tr>
<tr><td>DAF</td><td>For physical-chemical industries</td></tr>
</table>

High-tech biological treatment plants are recommended to industrial parks which present higher flow and less land. For this stage of a preliminary budget evaluation, a single type of technology (SBR) is suggested to simplify the analysis. Furthermore, The SBR technology has been used most commonly in Vietnam due to its smaller land requirement and easier operation than secondary clarifier used with activated sludge.

Smaller industrial clusters and industrial clusters, however, present lower discharge of wastewater and lower economic capacities. Cheaper technologies (capital and operation costs) are then proposed, but they require more land area. It is assumed that these clusters and points located in rural areas and managed by local authorities can find the required land. It is estimated that natural technologies can easily cost 2 to 3 times less than high-tech technologies (and very cheap operating costs) but use 2 to 3 times the land area.

In case land is not available, some specialized treatment equipment as Bionest or DAF (Dissolved Air Flotation System) could be purchased for each industry, or to combined wastewater from the same industrial sector. Theses systems use very few land are, but they have to be operated carefully by skilled operators and are more expensive to operate as they require electricity and chemicals.

For more details about each technology and the decision criteria, see the annex *C-4: Overview of wastewater treatment technologies*.

Table 16-7: Technological options and costs according to flow

Type of Process	Capacity	Budget Price	Land (ha)	Price
	m^3/day	US$	Requirements	$ US/m^3 per day
Sequential Batch Reactor	3 000 to 7 500	4,200,000	Up to 0,8 ha	± 700$
	7 500	4,610,000	Up to 1,25 ha	± 615 $
	10000	5,488,000	1,25 ha	± 549 $
Oxidation Ditch	7 500	9,214,000	Up to 1,25 ha	± 1,229 $
	10 000	11,508,000	1,25 ha	±1,151 $
Aerated Lagoons	100 – 400	± 260 000	± 1 ha	± 650 $
	400 to 3 000	Up to 1 650 000	Up to 2,4	± 550 $
Facultative ponds	100 - 400	± 200 000	± 1 ha	± 500 $
	400 to 3 000	Up to 1 500 000	Up to 6,6	± 500 $

16.2.3 Budgetary cost estimates for each industrial estates in the most polluting provinces of Nhue-Day river basin

It would be very inaccurate to establish budgetary estimates for individual industrial estates based on the inventory data only. Detailed data about the exact flow and production would be required. However, as the data sample is pretty large, the following estimate will bring a realistic budgetary cost for an investment program.

The following assumptions were made to establish the WWTP technology requirements for each industrial estate. These assumptions were established based on: detailed 2009 budget for different WWTP technologies in Vietnam and a list of various case studies of existing WWTP in IZ in Vietnam. The list of case studies and detailed budgeting estimates are presented in Annex C-6. For each proposed WWTP technological process, the process flow is presented in Annex C-3.

Table 16-2: Assumptions for infrastructure costs

Variable	Assumption	Reference
Estimated Wastewater flow per estate (if not specified by local survey)	Area (ha) X 17.6 m^3/day per ha	Metcalf & Eddy and ETM Center (Vietnam) for a fully operating estate in Vietnam
Area per industrial park (if not specified by local survey)	Average of 225 ha/park under construction	Hanoi IZA
Area per industrial cluster	Average of 40 ha/cluster planned	Hanoi Times/Investment in Hanoi webpage
Technology in Ind Parks	SBR because of high flow and limited space.	LBCD
Technology in Ind clusters	Aerated lagoons because of lower cost but space required.	LBCD
Technology in Ind Points	Facultative ponds for low capital and operating costs but space required	LBCD
Unit price for capital cost calculations ($/m3/day)	SBR 15000 m3: 500$/$m^3$ SBR 3000-4500 m3 700$/$m^3$ Lagoons 400-1400 m3: 550$/$m^3$ Lagoons 150-300m3: 650$/$m^3$ Facultative Lagoons (or DAF) 100m^3 for ind points : 650$/$m^3$	Above demonstrations including: -Vietnam existing WWTP -Detailed LBCD estimates
Operation and Maintenance costs	SBR: 0.07$/$m^3$ Aerated Lagoons: 0.08$/$m^3$ (for big) Small lagoons: 0,076$/$m^3$ + 4800$ for man-power Facultative ponds for ind points: Min 4800$/yr for man power	
Sludge disposal costs	Aerated lagoons: 0$ Facultative ponds: 0$ SBR: 4.12$/ 1000$m^3$ WW	

High-tech biological treatment plants are recommended to industrial parks that present higher flow and less land. Smaller industrial clusters and industrial clusters, however, present lower discharge of wastewater and lower economic capacities. Cheaper technologies (capital and operation costs) are then proposed, but they require more land area. It is assumed that these clusters and points located in rural areas and managed by local authorities can find the required land. It is estimated that natural technologies can easily cost 2 to 3 times less than high-tech technologies (and very cheap operating costs) but use 2 to 3 times the land area.

In case land is not available, some specialized treatment equipment as Bionest or DAF (Dissolved Air Flotation System) could be purchased for each industry, or to combined wastewater from the same industrial sector. Theses systems use very few land are, but they have to be operated carefully by skilled operators and are more expensive to operate, as they require electricity and chemicals.

As recommended in the previous section, detailed cost assessment was developed for the required centralized wastewater treatment plants for industrial zones, clusters and industrial points. In order to give a budgetary assessment for each industrial estate, the following list of assumptions were used.

The operating costs are detailed in table 16-5. In the case of aerated lagoons and facultative ponds, the price of sludge disposal may vary. The theory suggests that sludge should be removed from the lagoons (or ponds) after 10 years. This is done with a siphon-cistern truck and sludge can be disposed in dewatering beds and then to landfills. However, experience has shown that lagoons and ponds that maintain a retention time of 10 days or over (rather than the design retention time of 7 days) can digest the sludge much better. The sludge removal is then required only after 20 to 25 years of operations.

Table 16-8: Cost estimates for each industrial estate of the most polluting provinces of Nhue-Day river basin

In province: HaNoi-HaTay | ***Underline value*** **: assumption**

IE	Name of Industrial estate	Address	Area (ha)	Number of operating companies	Lưu lượng/Total WW Flow (m3/day)	Recommended Process	CETP capacity (m3/d)	Unit price for Cost calculation ($/m3/day)	Total Investment Capital costs (US$)	Total Operating costs ($/year)	Sludge disposal costs (US$/year
I	**Hi-Tech area**										
	Hoa Lac Hi-Tech area	Thach That	793	under const	13 957	SBR	15000	$500	$7 500 000	$394 650	$22 500
I	**Industrial Park (18 IP)**	6846 ha total		380 ha each							
1	KCN Nam Thăng Long	Từ Liêm district		21	810	SBR	800	$800	$640 000	$21 048	$1 200
2	KCN Thạch Thất - Quốc Oai	Thạch Thất district	***225***	26	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
3	KCN Phú Nghĩa	Chương Mỹ district		34	4 480	SBR	4500	$700	$3 150 000	$118 395	$6 750
4	KCN Phụng Hiệp	Thường Tín district		27	9 000	**already**	16500				
5	Thanh My-xuan Son	Son Tay city	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
6	Hong Ha	Dan Phuong district	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
7	Dong Mai	Ha Dong city	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
8	Mieu Mon-Xuan Mai	Chuong My district	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
9	North Thuong Tin	Thuong Tin district	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
10	Phu Xuyen	Phu Xuyen district	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
11	Khu Chay	Ung Hoa district	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
12	Phu Cat	Thach That- Quoc Oai	***225***	under const	***3 960***	SBR	3500	$700	$2 450 000	$92 085	$5 250
II	**Industrial Cluster**	45 IC planned total 2400 ha				average 40 ha each					
1	CCN Cầu Giấy	Cầu Giấy District	8,29	36	***146***	**already**	256				
2	CCN Phụng Châu	Chương Mỹ district	***40***	7	***704***	Lagoons	700	$550	$385 000	$20 986	$0
3	CCN Tiên Phương	Chương Mỹ district	***40***	6	***704***	Lagoons	700	$550	$385 000	$20 986	$0
4	CCN Đông Phương Yên	Chương Mỹ district	***40***	3	***704***	Lagoons	700	$550	$385 000	$20 986	$0
5	CCN Ngọc Hòa	Chương Mỹ district	***40***	7	***704***	Lagoons	700	$550	$385 000	$20 986	$0
6	CCN Thị trấn Chúc Sơn	Chương Mỹ district	***40***	22	***704***	Lagoons	700	$550	$385 000	$20 986	$0
7	CCN Thanh Oai	Thanh Oai District	16,1	26	***283***	Lagoons	300	$550	$165 000	$8 994	$0
8	CCN Bích Hòa	Thanh Oai District	***40***	6	***704***	Lagoons	700	$550	$385 000	$20 986	$0
9	CCN Bình Minh	Thanh Oai District	20,42	2	***359***	Lagoons	400	$550	$220 000	$11 992	$0
10	CCN Ngọc Hồi	Thanh Trì District	56,41	38	1 800	**already**	3200				
11	CCN Hoàng Mai	Hoàng Mai District	***40***	33	***704***	Lagoons	700	$550	$385 000	$20 986	$0
12	CCN Vĩnh Tuy I	Hoàng Mai District	***40***	19	***704***	Lagoons	700	$550	$385 000	$20 986	$0
13	CCN Thượng Đình	Thanh Xuân District	76		***1 338***	Lagoons	1300	$550	$715 000	$38 974	$0
14	CCN Giáp Bát - Phương Liệt	Thanh Xuân District	81		***1 426***	Lagoons	1400	$550	$770 000	$41 972	$0
15	CCN An Khánh - Đức Thượng	Hoài Đức District	34,6		***609***	Lagoons	600	$550	$330 000	$17 988	$0
16	CCN Lại Yên - An Ninh	Hoài Đức District	26,1		***459***	Lagoons	400	$550	$220 000	$11 992	$0
17	CCN Trường An - Đông La	Hoài Đức District	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
18	CCN Lai Xá - Kim Chung	Hoài Đức District	31,5		***554***	Lagoons	500	$550	$275 000	$14 990	$0
19	CCN Thị trấn Phúc Thọ	Phúc Thọ district	***40***	9	***704***	Lagoons	700	$550	$385 000	$20 986	$0
20	CCN Thị trấn Phùng	Đan Phượng district	35,8	22	***630***	Lagoons	600	$550	$330 000	$17 988	$0
21	CCN Thạch Thất - Quốc Oai	Thạch Thất district	***40***	12	***704***	Lagoons	700	$550	$385 000	$20 986	$0
22	CCN Bắc Phú Cát	Thạch Thất district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
23	CCN Hòa Lạc	Thạch Thất district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
24	CCN Bình Phú	Thạch Thất district	9,7		***171***	Lagoons	200	$650	$130 000	$10 075	$0
25	CCN Thị trấn Quốc Oai	Quốc Oai district	72	31	***1 267***	Lagoons	1300	$550	$715 000	$38 974	$0
26	CCN Yên Sơn	Quốc Oai district	7,7	3	***136***	Lagoons	150	$650	$97 500	$8 756	$0
27	CCN Ngọc Liệp	Quốc Oai district	***40***	11	***704***	Lagoons	700	$150	$105 000	$20 986	$0
28	CCN Phú Minh	Từ Liêm district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
29	CCN Từ Liêm	Từ Liêm district	45,84	85	15 045	SBR	15000	$500	$7 500 000	$394 650	$22 500
30	CCN Liên Phương	Thường Tín district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
31	CCN Duyên Thái	Thường Tín district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
32	CCN Lưu Xá	Thường Tín district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
33	CCN Quất Động	Thường Tín district	***40***		***704***	Lagoons	700	$550	$385 000	$20 986	$0
34	CCN Phú Lãm	Hà Đông district	5		***88***	F ponds	100	$650	$65 000	$7 437	$0
35	CCN Biên Giang	Hà Đông district	2,2	40	***39***	F ponds	100	$650	$65 000	$7 437	$0
36	CCN Yên Nghĩa	Hà Đông district	5,2	22	***92***	F ponds	100	$650	$65 000	$7 437	$0
37	CCN Bắc Vân Đình	Ứng Hòa district	3	1	***53***	F ponds	100	$650	$65 000	$7 437	$0

III	**Industrial Points**	**171 ind points planned on 1265 ha total**									
1	ĐCN Hợp Đồng	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
2	ĐCN Đại Yên	Chương Mỹ district	7	3	123	F ponds	100	$650	$65 000	$4 800	$0
3	ĐCN Lam Điền	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
4	ĐCN Đông Sơn	Chương Mỹ district	7	5	123	F ponds	100	$650	$65 000	$4 800	$0
5	ĐCN Đồng Phú	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
6	ĐCN Tân Tiến	Chương Mỹ district	7	6	123	F ponds	100	$650	$65 000	$4 800	$0
7	ĐCN Hoàng Văn Thụ	Chương Mỹ district	7	2	123	F ponds	100	$650	$65 000	$4 800	$0
8	ĐCN Trần Phú	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
9	ĐCN Trường Yên	Chương Mỹ district	7	8	123	F ponds	100	$650	$65 000	$4 800	$0
10	ĐCN Nam Phương Tiến	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
11	ĐCN Thủy Xuân Tiên	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
12	ĐCN Hữu Văn	Chương Mỹ district	7	1	123	F ponds	100	$650	$65 000	$4 800	$0
13	ĐCN TT Xuân Mai	Chương Mỹ district	7	2	123	F ponds	100	$650	$65 000	$4 800	$0
14	ĐCN Phùng Xá	Thạch Thất district		360	1 000	F ponds	1000	$550	$550 000	$4 800	$0
15	ĐCN Bình Phú	Thạch Thất district	7	14	123	F ponds	100	$650	$65 000	$4 800	$0
16	ĐCN Đại Đồng	Thạch Thất district	7	17	123	F ponds	100	$650	$65 000	$4 800	$0
17	ĐCN Hương Ngải	Thạch Thất district	7	11	123	F ponds	100	$650	$65 000	$4 800	$0
18	ĐCN Dị Nậu	Thạch Thất district	7	26	123	F ponds	100	$650	$65 000	$4 800	$0
19	ĐCN Chàng Sơn	Thạch Thất district	7	200	123	F ponds	100	$650	$65 000	$4 800	$0
20	ĐCN Kim Quan	Thạch Thất district	7	0	123	F ponds	100	$650	$65 000	$4 800	$0
21	ĐTTCN Cầu Bươu	Thanh Trì District	7		123	F ponds	100	$650	$65 000	$4 800	$0
22	ĐTTCN Văn Điển - Pháp Vân	Thanh Trì District	7		123	F ponds	100	$650	$65 000	$4 800	$0
23	ĐCN Dương Liễu	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
24	ĐCN Minh Khai	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
25	ĐCN La Phù	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
26	ĐCN Đông La	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
27	ĐCN An Thượng	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
28	ĐCN Cầu Nối - Vân Canh	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
29	ĐCN Đắc Sở	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
30	ĐCN Di Trạch	Hoài Đức District	7		123	F ponds	100	$650	$65 000	$4 800	$0
31	ĐCN Liên Hà	Đan Phượng district	7	0	123	F ponds	100	$650	$65 000	$4 800	$0
32	ĐCN Đan Phượng	Đan Phượng district	7	68	123	F ponds	100	$650	$65 000	$4 800	$0
33	ĐCN Sông Cùng	Đan Phượng district	7	9	123	F ponds	100	$650	$65 000	$4 800	$0
34	ĐCN Thọ Lộc	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
35	ĐCN Phúc Hòa	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
36	ĐCN Tích Giang	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
37	ĐCN Liên Hiệp	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
38	ĐCN Võng Xuyên	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
39	ĐCN Vân Phúc	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
40	ĐCN Thị trấn Phúc Thọ	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
41	ĐCN Hiệp Thuận	Phúc Thọ district	7		123	F ponds	100	$650	$65 000	$4 800	$0
42	ĐCN Mỹ Đức	Mỹ Đức district	7		123	F ponds	100	$650	$65 000	$4 800	$0
43	ĐCN Thanh Thùy	Thanh Oai District	7		123	F ponds	100	$650	$65 000	$4 800	$0
	TOTAL										
								Total:	$55 382 500	2 615 087 $	

In province: NAM DINH Nam Dinh

IE	Name of Industrial estate	Address	Are (ha)	Number of operating companies	Lưu lượng/Total WW Flow (m^3/day)	Recommended process	CETP capacity (m^3/d)	Unit price for Cost calculation ($/ m^3/day)	Total Investment Capital costs (US$)	Total Operating costs ($/year)	Sludge disposal costs (US$/year
Industrial parks											
1	Hoa Xa Industrial Park	Nam Dinh city	300	96		under const	4500	$700	$3 150 000	$118 395	$6 750
2	My Trung Industrial Park	My Loc district	150	under constr	***2 640***	SBR	2500	$700	$1 750 000	$65 775	$3 750
3	Thanh An Industrial Park	Nam Dinh city	105	under constr	3560	SBR	3500	$700	$2 450 000	$92 085	$5 250
4	Bao Minh Industrial Park	Vu Ban district	150		***2 640***	SBR	2500	$700	$1 750 000	$65 775	$3 750
5	Hong Tien Industrial Park (Y Yen I)	Y Yen district	150		***2 640***	SBR	2500	$700	$1 750 000	$65 775	$3 750
6	Trung Thanh Industrial Park (Y Yen II)	Y Yen district	200		***3 520***	SBR	3500	$700	$2 450 000	$92 085	$5 250
7	Nghia An Industrial Park	Nam Truc district	150		***2 640***	SBR	2500	$700	$1 750 000	$65 775	$3 750
8	Vinashin	Xuan Truong district	***150***		***2 640***	SBR	2500	$700	$1 750 000	$65 775	$3 750
9	KCN Xuan Kien (planned)		200		***3 520***	SBR	3500	$700	$2 450 000	$92 085	$5 250
10	KCN Viet Hai (planned)		100		***1 760***	SBR	1500	$700	$1 050 000	$39 465	$2 250
11	KCN My Thuan (planned)		200		***3 520***	SBR	3500	$700	$2 450 000	$92 085	$5 250
Industrial clusters											
12	An Xa Industrial cluster	Nam Dinh city	45	45	***792***	planned in Feasibility study	3500		3 500 000 $	$92 085	$5 250
13	Xuan Hung Industrial cluster	Xuan Truong district	***40***	13	***704***	Lagoon	700	$550	$385 000	$20 986	$0
14	Xuan Tien Industrial cluster	Xuan Truong district	***40***	11	***704***	Lagoon	700	$550	$385 000	$20 986	$0
15	Xuan Truong Town Industrial cluster	Xuan Truong district	***40***	4	***704***	Lagoon	700	$550	$385 000	$20 986	$0
16	Xuan Bac Industrial cluster	Xuan Truong district	***40***	4	***704***	Lagoon	700	$550	$385 000	$20 986	$0
17	Trung Thanh Industrial cluster	Vu Ban district	***40***	7	***704***	Lagoon	700	$550	$385 000	$20 986	$0
18	Lam Town Industrial cluster	Lam Town - Y Yen district	7	4	***123***	Lagoon	125	$650	$81 250	$8 097	$0
19	LA Xuyen Industrial cluster	Yen Ninh - Y Yen district	7	47	***123***	Lagoon	125	$650	$81 250	$8 097	$0
20	Yen xa Industrial cluster	Y Yen district	7	24	***123***	Lagoon	125	$650	$81 250	$8 097	$0
21	Van Chang Industrial cluster	Nam Truc district	***40***	72	***704***	Lagoon	700	$550	$385 000	$20 986	$0
22	Nghia Son Industrial Cluster	Nghia Hung district	***40***	4	***704***	Lagoon	700	$550	$385 000	$20 986	$0
23	Truc Hung Industrial cluster	Truc Ninh district	***40***	8	***704***	Lagoon	700	$550	$385 000	$20 986	$0
24	Co Le Industrial cluster	Truc Ninh district	***40***	18	***704***	Lagoon	700	$550	$385 000	$20 986	$0
25	Thinh Lam Industrial cluster	Giao Thuy district	***40***	1	***704***	Lagoon	700	$550	$385 000	$20 986	$0
26	Hai Minh Industrial cluster	Hai Hau district	***40***	2	***704***	Lagoon	700	$550	$385 000	$20 986	$0
27	Thinh Long Industrial cluster	Hai Hau district	***40***	2	***704***	Lagoon	700	$550	$385 000	$20 986	$0
								Total:	$31 113 750	$1 223 283	

In province: Ha Nam

IE	Name of Industrial estate	Address	Industrial park, export processing zone,	Area (ha)	Number of operating companies	Lưu lượng/Tot Flow(m3/ day)	Recommended process	CETP capacity (m3/d)	Unit price for Cost calculation ($/ m^3/day)	Total Investment Capital costs (US$)	Total Operating costs ($/year)	Sludge disposal costs (US$/year
Industrial Parks												
1	Dong Van 1 IP	Duy Tien	IP	210	53		Biological	5000				
2	Dong Van 2 IP	Dong Van district	IP	263	7	***4628,8***	SBR	4500	700	3 150 000 $	163 395,00 $	6 750 $
3	Chau Son IP	Phu Ly town	IP	169	2	***2974,4***	SBR	3000	700	2 100 000 $	108 930,00 $	4 500 $
4	Hoa Mac IP	Duy Tien district	IP	140	under const	***2464***	SBR	3000	700	2 100 000 $	108 930,00 $	4 500 $
5	Hoang Dong IP	Kim Bang district	IP	***150***	under const	***2640***	SBR	3000	700	2 100 000 $	108 930,00 $	4 500 $
Industrial clusters												
6	Tay Nai IC		IC	***25***		***440***	Lagoons	400	550	220 000 $	15 933,96 $	0 $
7	Nam Chau Son	Phu Ly town	IC	10		***176***	Lagoons	200	650	130 000 $	10 366,98 $	0 $
8	Bien Hoa	Kim Bang	IC	8		***140,8***	Lagoons	150	650	97 500 $	8 975,24 $	0 $
9	Cau Giat	Duy Tien	IC	17		***299,2***	Lagoons	300	550	165 000 $	13 150,47 $	0 $
10	Trung Luong	Binh Luc	IC	***25***		***440***	Lagoons	400	550	220 000 $	15 933,96 $	0 $
11	Hoa Hau	Ly Nhan	IC	10		***176***	Lagoons	150	650	97 500 $	8 975,24 $	0 $
Industrial points												
12	Hoang Dong TTCN-C		I Point	***7***		***123,2***	F ponds	100	650	65 000 $	4 800,00 $	0 $
13	Ngoc Dong (Cane and Bamboo)	Duy Tien dist	I Point	6		***105,6***	F ponds	100	650	65 000 $	4 800,00 $	0 $
14	Thanh Luu		I Point	6		***105,6***	F ponds	100	650	65 000 $	4 800,00 $	0 $
15	Nhat Tan(Textile and Wood)	Kim Bang	I Point	***7***		***123,2***	F ponds	100	650	65 000 $	4 800,00 $	0 $
16	Thanh Ha (Spade industry)	Thanh Liem district	I Point	***7***		***123,2***	F ponds	100	650	65 000 $	4 800,00 $	0 $
									TOTAL:	10 705 000,00 $	587 520,84 $	

16.2.4 Resulting costs for common infrastructures

Each industrial park in the province of Hanoi will require a capital investment of 2.5 millions $US up to 7.5 millions US$, plus annual operation costs of around 100 000$/year. Each smaller industrial cluster will also require centralized wastewater facilities. Technological options are available to provide a good quality treatment for a smaller cost (as lagoons and ponds) but they require more land space and close follow-up of its operation and maintenance by full-time qualified staff. The following table presents the summary of the total required investment costs for central WWT industrial estates of the most polluting provinces of Nhue-Day river basin.

Table 16-9: Total Capital Investment costs required for WWTP in industrial estates of Nhue-Day basin and Dong Nai basin

	Industrial Parks			Industrial Clusters			Ind Points		
	Total	w/o CETP	Cost	Total	w/o CETP	Cost	Total	w/o CETP	Cost
Hanoi	13	12	33 340 000 $	37	35	18 762 500 $	43	43	3 280 000 $
Ha Nam	5	4	9 450 000 $	6	6	930 000 $	5	5	325 000 $
Nam Dinh	11	10	22 750 000 $	16	16	8 363 750 $	n/a	n/a	n/a
TOTAL NORTH	29	26	65 540 000 $	59	57	28 056 250 $	48	48	3 605 000 $

	Industrial Parks			Industrial Clusters		
	Total	w/o CETP	Cost	Total	w/o CETP	Cost
Ho Chi Minh	15	2	4 900 000 $	30	28	16 847 500 $
Dong Nai	29	20	57 610 000 $	43	42	22 980 000 $
Binh Duong	28	9	17 150 000 $	9	8	6 820 000 $
Binh Phuoc	19	18	60 307 500 $	17	17	11 440 000 $
BR-VT	14	14	46 480 000 $	30	30	23 100 000 $
SOUTH	105	63	186 447 500 $	129	125	81 187 500 $

* This cost is only for known IE listed in the inventories. Many new IE are under planning in Vietnam and may not have been considered. These costs only include capital for construction and equipment and do not include design, feasibility studies, administrative fees, taxes, and management fees.

16.2.5 Pre-treatment at industry level

The following table presents the estimated number of industries that would need some pre-treatment

Industrial Sectors	Wastewater characteristics	Recommended pre-treatment
Chemicals Plastics Petroleum Pharmaceutical textile	High Chemical Oxygen Demand	Chemical treatment (chemical-added)
Mining Ceramic	High in inorganic easy to settle solids	Physical treatment
Food	High in BOD and grease	DAF for grease removal
Metals works and machinery	Heavy metals and grease	DAF

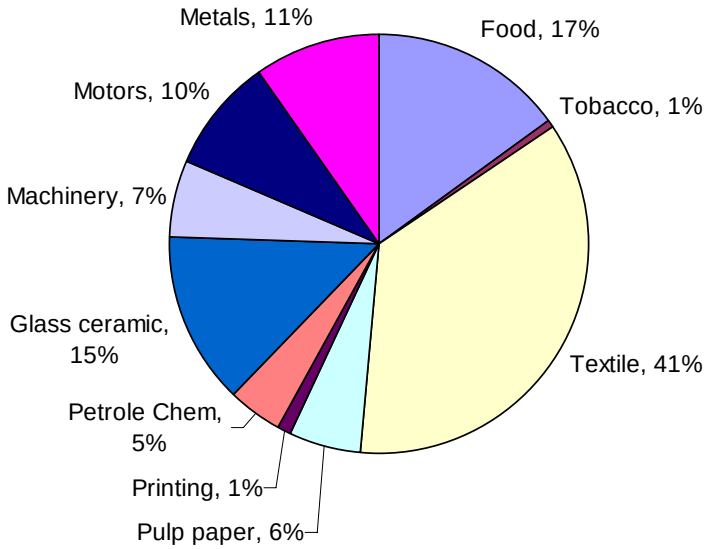


Figure 16-3: Distribution of industrial sectors in Hanoi (by number of employees) (UNIDO Stats, 2000)

Pre-treatment systems are very specific to the flow, the specific pollutant available space and financial resources of the industry. Let's remember that over the medium term, the pre-treatment cost should be assimilated by the industries as a production cost.

Our inventories of industrial estates have listed 640 industries in 45 industrial estates. We estimate that more than twice that number of industries could establish within the 101 industrial estates of the most polluted provinces of Nhue-Day river basin. In Hanoi, there are 2754 registered manufactures with

245 000 workers (Dore et al. 2008). The following table presents the estimate for pre-treatment investment requirements in the province of Hanoi. The next table present the basis used for unit price evaluation based on equipment manufacturer budgetary proposal and implementation for Vietnam.

Table 16-10: Rough estimate of Investment requirement from the industrial sector for wastewater pre-treatment

Industrial Sectors	Estimated number of factories in Hanoi	Pre-treatment technology	Average factory size (m3/day)	Unit price for treatment (US$)	Total estimated investment requirement
Chemicals Plastics Petroleum Pharmaceutical textile	1294	Chemical treatment	60 m^3/day	85 000$	110 millions$
Mining Ceramic	413	Physical treatment	80 m^3/day	78 000$	32 millions$
Food Pulp and paper	633	DAF for grease removal	500 m^3/day	136 500$	86 millions$
Metals works and machinery	771	DAF	10 m^3/day	50 000$	38 millions$

Table 16-11: LBCD investment cost calculations for DAF in Vietnam.

	TYPE	***CAPACITY***	***Price***
		m^3/day	$US
1	**DAF**	0 to 3	39 000,00 $
2	**DAF**	5	52 000,00 $
3	**DAF**	10	50 000,00 $
4	**DAF**	15	71 500,00 $
5	**DAF**	20	78 000,00 $
6	**DAF**	100	65 000,00 $
7	**DAF**	200	91 000,00 $
8	**DAF**	300	75 000,00 $
9	**DAF**	400	110 500,00 $
10	**DAF**	500	136 500,00 $
11	**DAF**	1 000	273 000,00 $
12	**DAF**	2 000	546 000,00 $
13	**DAF**	3 000	819 000,00 $
14	**DAF**	4 000	1 092 000,00 $
15	**DAF**	5 000	1 300 000,00 $

16.3 Hazardous waste management

According to a research on scientific basis of cost determination of industrial solid waste (Dieu and Dinh, 2008), most of the function companies that are responsible for hazardous waste delivery, collection and treatment within HCM City are applying waste treatment method with seven typical technologies, for example, stabilization and solidification, incineration, sanitary landfill, aerobic treatment, anaerobic treatment, lubricant recovery and recycle, solvent recover and recycle.

Hazardous waste is complex to treat because treatment methods are very specific of chemical content. Waste material that is mixed with other type of waste, or “contaminated” reduce the efficiency of any

treatment process. This is the reason why hazardous wastes are not managed centrally by Industrial zones. A central treatment plant for hazardous waste in each industrial estate is not technically feasible.

Specialized external companies use the following **processes to treat specific hazardous wastes:**

Stabilization and solidification: it is a process that can stabilize pollutants by mixing all of them together with other additives to restrict their move or reduce their speed into surrounding area, simultaneously decrease their toxicity on environment and human. This method focuses on reducing toxicity and dispersion of pollutants into surrounding area as well as improving their characteristics forwards environmental advantages. There are many stabilization and solidification methods: pour concrete (only cement), solidification by lime and pozzolane, solidification by macromolecule hydrocarbon, solidification by technique of making particle with plastic at high temperature, and glass transition. All kinds of sludge, semi-solid waste and liquid waste can potentially be treated by this method. Holcim in Kieng Giang is now offering the treatment of pesticides wastes using cement kilns and has obtained authorization. Prices between 2 000 and 3 000 USD/ton are currently charged for the disposal of these products.

Incineration: it was established long time ago and applied fairly popular in Vietnam. This is an effective treatment method for organic hazardous wastes (OHW). However, generation of fine dust (5 – 120 µm in size) and toxic emissions (dioxide) from incineration process are the most concern if they are not controlled appropriately. As a result, it is required to install additionally emission treatment system in order to control strictly waste incineration process. URENCO-Hanoi owns an incinerator for organic hazardous waste in its Nam Son facility and can treat 4 tons of organic hazardous waste per day. The capacity is not sufficient for the organic hazardous waste produced in the great Hanoi region and a growing amount of OHW are being stored in the Hanoi region. CITENCO-HoChiMinh city has the only other incinerator in Vietnam with capacity for 16 tons/day. The price for treating the waste at the Nam Son URENCO facility in Hanoi is 375 to 438 US$/ton, including transportation from the greater Hanoi region.

Figure 16-4: Hazardous waste stored at Nam Son facility (URENCO-Hanoi)

Figure 16-5: Transformers filled with PBCs at Nam Son facility (URENCO-Hanoi)

Landfill: Due to the low capacity of safe disposal facilities, and absence of strict enforcement, the majority of hazardous waste is suspected to be disposed unsafely into landfills along with other solid waste. Landfills in Vietnam are still not considered as sanitary landfills because they still don't control very well the potential soil and groundwater contamination. Nevertheless, safe landfills disposal can be considered as a low cost option when sanitary closed cells are built, to avoid contamination of the surroundings.

Secure landfills charge 826,000VND/ton or 45US$/ton for dry industrial waste or wastewater sludge. Safer sanitary closed (impermeable) cells would cost 2,360,000 VND or 131US$/ton to treat sludge or waste containing heavy metals.

16.3.1 Volume of hazardous waste to be treated and costs

A World Bank surveys shows that from the 1.9 M tonnes of industrial wastes produced in Vietnam urban area, 160 000 tonnes are hazardous (2003), which represents 8.4% of industrial wastes generated. Current collection data from URENCO show that 25% of the industrial waste is classified as hazardous and 3.2% of the industrial waste can be incinerated. Using those figures, the daily generation of OHW in Vietnam varies from 60 tonnes/day up to 200 t/day. As the regulation is not reinforced, we estimate that the current market may be under estimated, so we will consider that the OHW market for the industrial sector represents a conservative 7.5% of industrial wastes, which represents 132 tonnes/day for the country.

Table 16-12: URENCO estimates for hazardous waste production for the great Hanoi region

Component	Quantity (ton/day)			
	2005	2010	2015	2020
PCBs	0,4	0,4	0,6	0,6
Heavy metal-containing waste	14,9	17,4	22,4	23,9
Halogenated solvents	3,3	3,9	5	5,3
Not-halogenated solvents	6	7	9	9,6
Waste from pesticides	4,4	5,1	6,6	7
Organic compounds-containing waste	6,9	8,1	10,4	11,1
Coloring and aromatic flavour additives	0,1	0,1	0,1	0,1
Paint and glue plastics	2,7	3,1	4	4,3
Plastics	2,9	3,4	4,3	4,6
Ag-containing solvents	0,1	0,1	0,1	0,1
Acids and bases	3,5	4,1	5,3	5,6
Detergents and cleaning solvents	0	0	0	0
Toxic organic waste	5,7	6,7	8,6	9,3
degradable toxic organic waste	5,1	5,9	7,7	6,2
Textile, weaving materials	1,4	1,6	2,1	2,2
Hairy materials	0,4	0,4	0,5	0,3
Oils and fatty materials	1	1,2	1,5	1,6
Oil-containing waste	2,8	3,2	2,6	4,4
Wasted oils	1,7	2	10,8	2,7
Total	63,1	73	94,9	100

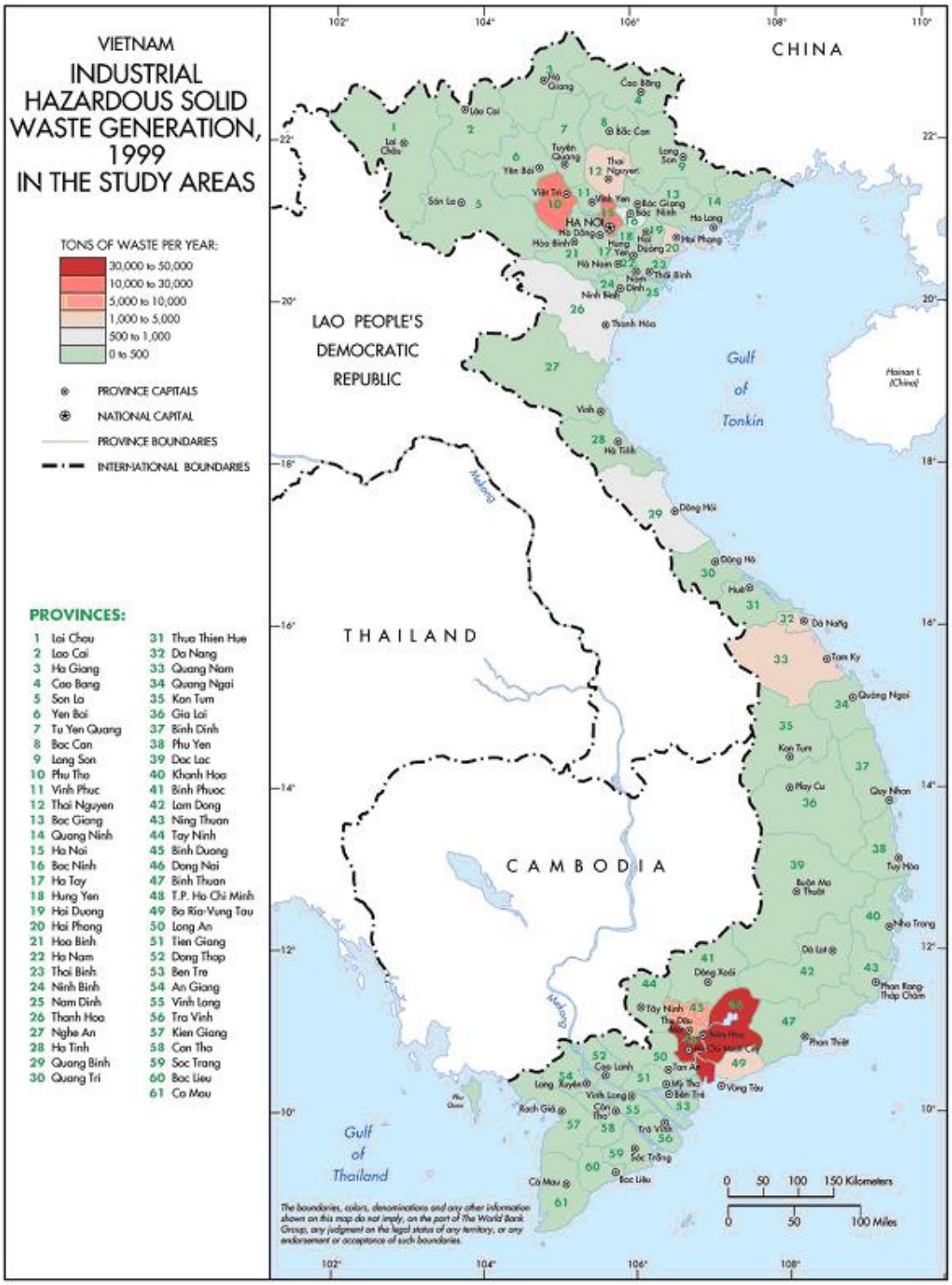

VIETNAM
INDUSTRIAL HAZARDOUS SOLID WASTE GENERATION, 1999 IN THE STUDY AREAS
TONS OF WASTE PER YEAR:
30,000 to 50,000
10,000 to 30,000
5,000 to 10,000
1,000 to 5,000
500 to 1,000
0 to 500
PROVINCE CAPITALS
NATIONAL CAPITAL
PROVINCE BOUNDARIES
INTERNATIONAL BOUNDARIES
PROVINCES:
1 Lai Chau
2 Lao Cai
3 Ha Giang
4 Cao Bang
5 Son La
6 Yen Bai
7 Tu Yen Quang
8 Bac Can
9 Lang Son
10 Phu Tho
11 Vinh Phuc
12 Thai Nguyen
13 Bac Giang
14 Quang Ninh
15 Ha Noi
16 Bac Ninh
17 Ha Tay
18 Hung Yen
19 Hai Duong
20 Hai Phong
21 Hoa Binh
22 Ha Nam
23 Thai Binh
24 Ninh Binh
25 Nam Dinh
26 Thanh Hoa
27 Nghe An
28 Ha Tinh
29 Quang Binh
30 Quang Tri
31 Thua Thien Hue
32 Da Nang
33 Quang Nam
34 Quang Ngai
35 Kon Tum
36 Gia Lai
37 Binh Dinh
38 Phu Yen
39 Dac Lac
40 Khanh Hoa
41 Binh Phuoc
42 Lam Dong
43 Ning Thuan
44 Tay Ninh
45 Binh Duong
46 Dong Nai
47 Binh Thuan
48 T.P. Ho Chi Minh
49 Ba Ria-Vung Tau
50 Long An
51 Tien Giang
52 Dong Thap
53 Ben Tre
54 An Giang
55 Vinh Long
56 Tra Vinh
57 Kien Giang
58 Can Tho
59 Soc Trang
60 Bac Lieu
61 Ca Mau
CHINA
LAO PEOPLE'S DEMOCRATIC REPUBLIC
THAILAND
CAMBODIA
Gulf of Tonkin
Gulf of Thailand
HA NOI
Hainan I. (China)
0 50 100 150 Kilometers
0 50 100 Miles
The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Figure 16-6: Hanoi URENCO existing incinerator facility for hazardous waste: capacity of 4 tons/day

**Figure 16-7: Considered facility for Hanoi Organic Hazardous Wastes:
High Tech fluid Bed Incinerator (24 tons/day capacity; 6 millions US$ total cost for implementation in Hanoi)**

LBCD has worked with URENCO Hanoi in 2008[49] to oversee the possibility to establish a performing incinerator in Hanoi to increase the treatment capacity of hazardous wastes. The cost for establishing and reffiting the Circulating Fluidized Bed Combustor (CFBC) was established at 6 millions US$ (see table below) that would have a 24 tons/day capacity. A complete business plan was established for a joint-venture for URENCO and a canadian company. The estimated cost for treating hazardous waste at this efficient incinerator (including pesticides and most toxic wastes) would be 370 US$ /ton. The

[49] *Hazardous waste incinerator facility for Hanoi- Project viability evaluation.* Study undertaken for the Canadian International Development Agency and URENCO-Hanoi. 2008

incinerator process flow in shown in Annex C-2. The treatment would have an atmospheric emission with a performance of 99.9999%

Table 16-13: Hanoi CFBC facility construction costs (estimated)

Description	Total (USD)	Total (USD)
Equipment		
Incinerator	5 000 000	
Technical support	100 000	
Exportation of equipments	300 000	
Other material	100 000	
Equipment upgrade / refit**	300 000	5 800 000
Infrastructure		
Land	0	
Building	100 000	
Engineering	100 000	200 000
Total estimated cost		6 000 000

Table 16-14: Summary of treatment costs for industrial and hazardous wastes in Vietnam in 2008

No.	Treatment alternatives	Types of waste	Unit price (VND/ton)
1	Secure landfill	Sludge and waste containing heavy metals in impermeable cells Dry industrial waste (Ash, glass light bulb, battery)	2,360,000 or 131US$/ton 826,000 or 45$/ton
2	Incineration (and landfilling of ash)	- Organic hazardous waste - Cloths contaminated by chemical, lubricant, solvent; - Broken and out-of-date products; - Under-quality, out-of-date medicines; - Sludge.	375 to 438US$/ton
4	Stabilisation and solidification	Chemicals, pesticides	2000-3000 US$/ton

Source: *Various sources, URENCO, Dieu and Dinh, 2008.*

In conclusion, we estimate that specialized waste treatment companies like public URENCO are better established to manage and treat and dispose hazardous waste in specialized facilities that industrial estates. The low level of secure disposal of hazardous waste at the moment appears to be based on low capacities in the region rather than high costs.

16.4 Summary of costs estimations

We have evaluated the infrastructure requirements for managing the industrial wastewaters, wastewater treatment sludge and hazardous wastes for the most polluting provinces. Results for each estate are presented in tables 18-6. A summary of these costs per province are below.

Table 16-15: Total Capital Investment costs required in industrial estates of Nhue-Day basin

	Number of Estates lacking WWTP (in Nhue-Day)	Investment Capital Costs required (2009 US$)	Annual operating costs (US$/year)
Ha Noi-HaTay	101	55 382 500$	2 615 087$
Nam Dinh	38	31 113 750$	1 223 283$
Ha Nam	16	10 705 000$	587 529$
TOTAL*	155	**97 201 250$**	**4 425 899$**

Wastewater treatment sludge
The costs of managing and disposal of wastewater treatment sludge have also been considered presented in the same table because they are based on the type of wastewater treatment technology and the WW flow treated at the treatment plant. Wastewater treatment sludge costs in Vietnam are around 30$ US to 45USD a ton for landfill disposal, and up to 131USD a ton when the sludge contains a high concentration of heavy metals.

We have also demonstrated that natural choice of technologies (as aerated lagoons or facultative ponds) can greatly reduce the operating cost and the sludge disposal costs as they produce almost no sludge.

Hazardous wastes
We have demonstrated that specialized infrastructures will be required in Vietnam in order to manage and dispose safely all hazardous wastes produced. Hazardous wastes have to be well separated and treated by highly specialized process in order to minimise the pollution. Industrial estates are not the best entity to treat hazardous waste but they could represent a key entity in order to improve control, management and storage of hazardous wastes. At the moment, Industrial Zones Authorities are not aware of the volume of hazardous wastes produced in their zones.

The capacity for safe treatment is way under the actual production level in Vietnam and production level is planned to increase in the next years as industrialization increases. We have presented the case of an incinerator that has been considered for Hanoi URENCO in order to increase the safe disposal capacity in the region. Of the over 63 tons/day of produced hazardous wastes in the great Hanoi (most of which is estimated to be produced out of industrial estates), 24 tons/day could be treated at this safe incinerator for 370USD/ton.

Sensibility analysis
Sensibility analysis is a process that can detail some costs reductions due to various factors. The terms of reference specifically required to establish some sensitivity analysis by assuming reduction on the wastewater flow. The overall cost reduction is easy to calculate for a wastewater flow reduction of 20 or 40%. In order for the client to establish various cost reduction scenarios, our methodology for capital AND operation cost evaluation is precisely based on the wastewater flow. The table synthesizing the assumptions provides base material for any future costs estimations.

However, the reduction of wastewater discharge by industries should not dictate the reduction of wastewater treatment plant capacity at this moment. Treatment capacity at industrial estates is so low at the moment in Vietnam that common facilities should use the scale factor to reduce the unit cost of treatment and increase its offer for treatment. At the moment, as regulation is enforced, demand for treatment will increase and capacity will still be low to meet demand for the next decades as industrial estates get more occupied by the increased industrialization. It is easier to connect more industries to a well working treatment plant than building new treatment plants.

However, the following approaches should be followed to maintain high cost-efficiency in the wastewater treatment plants.It has been demonstrated that cleaner production interventions can reduce the wastewater (and hence the treatment costs), but other important procedures should be taken in consideration when planning for cost-efficient pollution treatment.

In the case of pollution control, wastewater treatment costs (capital and operating) could be reduced if:

- wastewater flow is reduced
- good pre-treatment is done at each industry
- cleaner production interventions at industries to reduce the pollution loads
- Natural technologies are chosen (lagoons, ponds) instead of high-tech.
- Good operation and maintenance of the WWTP and regular sampling and analysis of incoming raw wastewater to adapt the treatment.
- Economic incentives (like fines or strict regulation) for industries to comply with discharge requirements.

All these interventions have been demonstrated in the international literature to reduce the cost of planned infrastructures. Even once the wastewater plant has been built, improved methods within the industrial estate can produced reduced operating costs and better treated water quality. This should be taken in consideration when bids for common wastewater treatment plants are sent out.

17. FINANCING OPTIONS: IS THERE A POTENTIAL MODEL FOR ODA INVESTMENT IN VIETNAM?

In the context where the World Bank has shown some interest in financing an investment program in the sector, some recommendations are drawn in terms of fundamental project design for potential IDA investment in Vietnam. This section evaluates alternative approaches for financing wastewater and waste management facility investments at industrial estates/points. The recommendations include financing modality, financial intermediary, and draft criteria to select recipients.

17.1 Review of international wastewater projects funded through ODA

A review of international ODA serves as basis material for the main recommendations. The objective was to determine the lessons learned in the modality of infrastructures financing from a review of similar operations financed by multilateral or bilateral agencies. Focus has been on bilateral and multilateral industrial wastewater treatment, with a smaller number of examples that include both domestic and industrial wastewater and hazardous waste management. A small number of relevant Technical Assistance projects have been included to elucidate how strong policies and enforcement mechanisms can support infrastructure investment.

The reviewed projects are listed in the following table and the Annex C-5 presents the project descriptions and a summary of results and lessons from each projects.

Table 17-1: Reviewed projects

No.	Project	Country	Year	Donor
1	Apatlaco River Basin Environmental Recovery project	Mexico	2008	World Bank
2	Waste Disposal Project	Korea	1993	World Bank
3	Industrial Pollution Control Project	Algeria	1996-2005	World Bank
4	Industrial Pollution Control Project	India	1991-1999	World Bank
5	Industrial Pollution Prevention	India	1994-2002	World Bank
6	Chongqung Industrial Pollution Control Project	China	1996-2003	World Bank
7	Pollution Abatement Program I	Egypt	1996-2004	World Bank
8	Pollution Abatement Program II	Egypt	2005	World Bank
9	PROPER PROKASIH	Indonesia	1993-2000	World Bank (various others)
10	Guadalajara Environment Program	Mexico	1996	World Bank
11	Ethanol Plant Wastewater Biogas Project	Philippines	2008	World Bank
12	Songhua River Basin Water Pollution Control and Management Program	China	2008	World Bank
13	Anhui Environmental Improvement Project	China	2004	ADB
14	Dalian: Removal and Modification of Polluted Enterprises	China	1995-2000	National project
15	Environmental Infrastructure Support Credit I	Philippines	2004	OECF
16	Environmentally Friendly Solutions Fund (E-FRIENDS)	Sri Lanka	2004	JBIC
17	Small Scale Industry and Pollution Abatement	Indonesia	1992-1998	JIBC
18	Industrial Pollution Control Project II	Philippines	2001-2006	KfW
19	Samut Prakarn Wastewater Management	Thailand	1995-2005	ADB, JBIC

20	Waste Disposal Project	Korea	1993	World Bank
21	Environmental Sanitation Program for Metropolitan Belo Horizonte (PROSAM/MG)	Mexico		World Bank
22	Pollution Management Program	Columbia	2000	World Bank
23	Industrial Pollution and Assessment in Town and Village Enterprises	China	1996	ADB
24	Capacity Building for Pollution Taxation and Resource Mobilization for Environmental and National Resource Sectors	Thailand	2005-2008	ADB
25	Coastal Cities Pollution Control Project 2	Croatia	2008	World Bank

17.2 Lessons Learned from ODA financing of industrial wastewater treatment

17.2.1 Linking regulation with financing through a carrot and stick

While the scope of this report is primarily on financing mechanisms, it is important to note that generally accepted best practice confirms that direct financing of wastewater treatment and other pollution abatement mechanisms from governments or donors is not the optimal strategy for reducing industrial pollution (World Bank, 2000). Instead, the gradual introduction of an appropriate regime of pollution fees that moves industry to internalize the costs associated with pollution has been showed to be highly successful in a number of environments. Experiments in incentive-based regulation, such as in Columbia (Ambrus, 2000), have shown great promise in creating an environment that fosters firms to invest in their own wastewater treatment programs. Further evidence from China (Wang and Chen, 1999) indicates that pollution fees can be used to subsidize wastewater treatment on a localized level. The key financial lesson learned is that, quite contrary to traditional public finance theory, allowing local regulators to retain pollution fees rather than remitting them to national governments can provide a means to finance local regulation enforcement and small scale pilots.

An appropriate 'stick' can come from properly graduated pollution fees, but can also come through mobilizing public concerns about pollution. Indonesia's PROPER (Afsah and Vincent, 1997) program reviewed above achieved a 40% abatement of industrial pollutants through a program of voluntary ratings, at once shaming polluting factories and praising those factories that showed good results.

Demand for financing thus emergences when industry needs to meet environmental standards by either end of pipe investments or modernizing industrial production processes. Combinations of financial incentives through subsidies, technical assistance and better enforcement have been shown to create an appropriate carrot and stick to achieve pollution reductions.

While these institutional reforms and measures lie outside of the scope of this financial report, it is important to note these successes in regulation for two reasons: first, they come at a far lower cost than direct financing of abatement mechanisms, and second, practice has shown that, in the absence of appropriate regulation, direct financing of pollution abatement mechanisms can lead to misallocation of funds and limited success. Evidence from projects in Indonesia and elsewhere indentify areas where loans have been used to finance non-pollution related expenses.

17.2.2 Role of subsidies

The case studies reviewed above indicate a mix of low-interest loans and lending at market rates to industries for the purchase and installation of wastewater treatment facilities. The degree to which subsidies are applied is contextual. In general, concessional financing can provide an effective

incentive for pollution abatement. Particularly in environments where regulations are weak or applied inconsistently, loan subsidies can offer an important incentive for industries to install wastewater treatment facilities. There is some evidence that access to subsidized loans can be a powerful incentive to improve environmental performance. It is also important to note that there are very few examples in the developing world of industrial wastewater treatment that has been operated on a full cost-recovery or for-profit basis.

Due to the inherent risks involved in the development of wastewater facilities and the limited opportunities for cost recovery, it is advisable that foreign exchange risk be taken on by the World Bank. This is particularly the case when lending to State Owned Enterprises that may carry high loads of debt and have underdeveloped risk management systems.

In some cases, particularly SMEs, the access to finance alone can be an appropriate incentive for investing in wastewater treatment. It is likely, however, that the kinds of loans envisioned for any World Bank investment in the sector will not be appropriate for the needs of SMEs, who often have weak management systems and little collateral to offer. Should the WB be interested in pursuing SME lending for wastewater treatment, it is advisable that it work through existing channels of small business lending in Vietnam.

Small grants have been found to be an effective incentive for firms to invest in pollution abatement activities. Such grants should be capped at a relatively low percentage of total investment costs (up to 20%). As with subsidized loans, grants must be directed towards viable industries. In some cases, a case can be made to further subsidize the establishment of treatment facilities that carry a significant risk and/or pilot new and innovative initiatives.

In some cases, such as Vietnam, a weak regulatory environment and limited access to finance can lead to an environment whereby there are limited incentives for industries to invest in “non-productive” activities such as wastewater treatment. Subsidized loans and technical assistance can go a long way towards reducing water pollution in these cases.

17.2.3 Need for simplified and streamline regulations to target private sector

General experience of ODA involvement in industrial wastewater treatment points to the specific challenges of lending to private enterprises. World Bank lending procedures and oversight mechanisms are often inappropriate for industries in the more dynamic sectors of the economy. Paradoxically, it is often these very industries that have the highest opportunities for success. Any potential investment should think carefully about streamlining loan procedures, perhaps through developing the capacity of loan intermediaries such as State Owned Commercial Banks and Joint Stock Banks to take on some of the evaluation and due diligence processes associated with sub-loans.

17.2.4 Careful selection of companies in the public sector

It is expected that any investment in wastewater treatment will direct itself at least partially towards State-owned enterprises. Bank experience lending to State-owned enterprises for similar projects has been mixed. In countries were SOEs are less efficient than the private sector and hampered with large debts, targeting this sector (often a priority for governments and state development banks) may not be a viable approach. Past projects in both China and Egypt have led to large investments in companies with questionable long term viability. In the Vietnamese case, there is some evidence that SOEs are in better financial and economic shape than is typically assumed (World Bank 2008). At the same time, any investment in this area should proceed carefully.

In some cases, investment in wastewater treatment and other pollution abatement activities can be a draw to private finance. This confirms the general finding (see Mexico, Indonesia, Egypt) that larger factories that are more directly integrated into global supply chains are generally much better able to finance wastewater treatment – both through concessional financing and through direct access to financial markets. Furthermore, there are economies of scale associated with wastewater treatment that makes it more viable in large enterprises and in industrial parks.

It is advised that, following best practices, industries be selected based not only on potential for pollution abatement but also on financial and economic viability. A clear focus on private industries would best be discussed during the project design phase. It is suggested that at least 50% of loans and potential grants be targeted towards privately invested industrial parks and private businesses.

17.3 Financial Sector Approach

17.3.1 A Transforming Sector

This section offers a short overview of the Vietnamese banking sector in order to further contextualize some of the lessons learned from case study research.

The Vietnamese banking sector has undergone a significant transformation in the past 15 years. The reforms introduced by Politburo in 2005 and made policy in May 2006 finalized the move to create of a modern central bank and strengthen the commercial orientation of the State Owned Commercial banks.

Vietnamese state-owned and private enterprises alike consistently list lack of access to capital as a key constraint. The World Bank Investment Climate Survey claims that access to finance is a significant constraint to Vietnamese enterprises, more so, in fact than in neighboring other countries. Small and Medium Sized Enterprises find it particularly difficult to access loans given the highly risk-averse lending practices of most Vietnamese Banks.

According to IFC statistics, new credits in 2007 accounted for 22% of GDP, while new investments stood at 40.4% of GDP (IFC, 2008). Banks are meeting approximately half of the financing needs for investment, with most available loans in the market being short to medium term, as banks generally lack access to long-term capital. Access to credit is constrained in large part due to the low levels of liquidity in the Vietnamese banking sector. Vietnam's loan deposit ratio stood at 95% in 2008, much lower than the 80% average for Asia.

Table 17.2: Financial institutions in Vietnam – Ministry of Finance data 2008

	2004	2005	2006	2008
Number of Banks:	*69*	*71*	*78*	*86*
Joint Stock Banks	36	35	34	36
Foreign Banks	28	30	31	37
State-owned commercial banks	5	5	5	5
Joint venture banks	Na	Na	6	6
Policy banks	Na	1	2	2
People's Credit Funds	900	900	926	998
Total	*1,088*	*1,102*	*1,152*	*1,170*

The largest players in Vietnam's banking sector are currently the five State-Owned Commercial Banks (SOCBs), which together operate more than 3,800 branches and transaction centers. These SOCBs account for 54% and 59% of the market share of loans and deposits, respectively.

Joint Stock Banks (JSBs) have been growing at a fast pace over the past decade. It is generally thought that JSBs have better management systems and are generally more customer-oriented than the SOCBs. The Asian Development Bank divides joint-stock banks into three groups:

- The five large urban banks, including Techcombank, Saigon Thuong Tin Commercial Joint Stock Bank , the Vietnam International Bank, and the East Asia Commercial Bank.
- Approximately nineteen smaller banks, which are growing rapidly or have established a niche market (including Hanoi Building Commercial JSB and Viet A Commercial JSB);
- Twelve previously small rural joint-stock banks, eleven of which have transformed into urban JSBs in 2007. These relatively small banks have private majority shareholdings, with registered capital per bank varying between US$ 40-500 million at the end of 2007.

Joint Stock Banks, like their state-owned competitors, suffer from relatively undiversified product lines, with even products such as mortgages remaining relatively undeveloped. A compelling case can be made for targeting a lending program through carefully selected JSBs, both as a capacity building measure and a means to target private sector industries that may be missed through a focus on direct lending from state Policy Banks or Commercial Banks.

Recent years have also seen the entrance of state-owned non-bank financial institutions into retail banking. The entrance of Bao Vietnam and other state organs such as the military have added considerable liquidity to the financial sector. At the same time, there is evidence that many of these organs have already overextended themselves through investments in the booming housing and land markets. It is possible that the banking sector could provide additional capital.

17.3.2 Policy Lending

A major success of the current era of transformation in Vietnam's financial sector has been the separation of policy and commercial lending in the SOCBs. The removing of policy lending functions from the SOCBs has led to the creation of the Vietnam Development Bank (VDB) and the Vietnam Bank for Social Policies (VBSP).

The Hanoi-based VDB was established in 2006, and has a total chartered capital of VND 5,000 billion, and runs on a non-profit model. It reports to Ministry of Finance but is under the responsibility of the Prime Minister, who appraises policies, and provides operational guidance. The VDB has an obligatory reserve proportion is 0%, does not have to join deposit insurance, and is ensured by the State for payment ability. The VDB has three primary tasks: (A) mobilizing funds to finance state development; (B) implementing development investment policy; and (C) managing ODA on-lending funds.

Lessons from the Philippines and Egypt have pointed to the beneficial role that a strong State Development Bank can play in commercializing products for pollution abatement finance. The use of the VDB as an Apex Institution to offer wholesale financing to JSBs and SOCBs is an option in the Vietnamese case as well. That said, there remain concerns regarding the capacity of the VDB to manage the form of innovative product envisioned by the World Bank, and the political will to work with Joint Stock Banks as an intermediary. While the VDB may serve as an Apex institution to on-lend

funds, it is suggested here that technical assistance be targeted towards the retail banks involved in the program.

Successful ODA infrastructure interventions in pollution abatement take a financial sector approach to the problem, through assisting financial intermediaries to develop specialized loan products for pollution abatement. State Development Banks, such as the Philippine Development Bank has shown itself to be able to play a role not only in commercializing the loan product but also providing technical assistance on a ongoing basis to participating enterprises.

17.3.3 Selection of banks

It is difficult at this point to offer clear guidelines on the selection of banks to operate as intermediaries. It is suggested here that the Vietnam Development Bank be used as an Apex Institution to manage on-lending to SOCBs and Joint Stock Banks. Key criteria in the selection of banks should include not only the technical capacity to manage a targeted loan program, but also the potential capacity to manage a technical assistance and advice component in unison with the lending program. A comprehensive TA to program to develop the capacity of both the VDB and intermediary banks in environmental management would need to be a central component of any intervention.

17.3.4 Carbon Finance

The opportunities for carbon finance in Vietnam are great, particularly in the energy sector.

The Government of Vietnam, through MONRE, has identified the following possible industries have been identified as potential sectors for the development of Clean Development Mechanism (CDM) projects in Vietnam:

- Energy efficiency, conservation and saving
- Fuel switching
- Methane (CH4) recovery and utilization from waste disposal sites and coal mining
- Application of renewable energy sources
- Associated gas recovery and utilization by oil production activities
- Forestation and reforestation
- In the energy sector, the Vietnamese government has pursued CDM projects in biogas collection for energy generation.

While there are a large number of pipeline CDM projects in Vietnam, only two projects have been through the whole CDM cycle and been registered at the UN – the Rang Dong Oil Field Associated Gas Recovery and Utilization Project in Vung Tau, and the Song Muc Small Hydro Power Station Rehabilitation Project in Thanh Hoa. As of January 2009, 78 CDM projects have received a Letter of Approval from the Government of Vietnam, the majority of which are in the renewable energy sector.

CDM financing in Vietnam remains hampered by unclear government regulations and difficulty in assessing baseline data through which to calculate carbon abatement. There are currently a number of donor and privately funding capacity building programs in the government and private sector to develop the necessary institutions and skills to better access carbon funding.

It is likely not feasible to access CDM or voluntary carbon markets for the financing of wastewater treatment in existing enterprises. Where such finance may exist, it is expected that the low levels of

carbon abatement that would be provided by such investments would likely not overcome the potentially high transaction costs involved in securing carbon financing.

On the other hand, there is room for potentially innovative use of carbon finance to finance innovative investments in the wastewater sector, which would likely entail the construction of new facilities on a large scale. These could include the potential of anaerobic digestion and the creation of biogas facilities. It could also include aerated pond activated by a wind farm. These investments will be quite large, as they may involve the development of whole new facilities rather than the retrofitting of older facilities.

In some cases, such as an innovative World Bank project in the Philippines, the Bank has operated as a purchaser of carbon credits through the CDM for a new wastewater and biogas facility. In interviews in March 2009, the consultant team was made aware of a yeast factory in Dong Hoi that is currently appraising the possibility of CDM financing for wastewater treatment and biogas generation. Such projects could be quite feasible in the agri-food sector, but would require large scale investments. The Bank should further explore the financing of a small and carefully selected number of such projects as a component of any loan program.

17.4 ODA options in wastewater and hazardous waste treatment

ODA projects have shown a mix of loans at concessional and market rates and grants. Each of these modalities has seen success and failure. General practice to date of World Bank investment in this sector has been through subsidized loans to provide an incentive to firms to invest in treatment facilities. There is also a trend towards offering grants to private industries of up to 20% of the capital cost associated with the installation of wastewater treatment systems. The choice of mechanism depends on a number of factors, including:

- The quality of the current regulatory environment. In the absence of appropriate disincentives to invest in wastewater treatment, incentives in the form of subsidy are an important tool.
- The goal of the investment project. Is there an interest in piloting new and risky initiatives that warrant subsidy, or is there a need to broaden outreach through the use of market mechanisms.

Beyond the financing of specific infrastructure projects, the World Bank should take into account the potential benefit of approaching environmental finance as a capacity building issue. There is potential, though not without risk, of developing sustainable and innovative pollution abatement products. Doing so in Vietnam will require working through the rapidly emerging banking sector, including both the SOCBs and the emerging Joint Stock Banks. An IBRD loan managed through the Vietnam Development Bank and on-lent at concessional rates to individual banks is suggested.

17.4.1 Carbon Finance

There is a role for carbon financing for a sub-component of any wastewater treatment intervention, likely through the financing of biogas generation in the agri-food processing sector. Such a project should be approached with caution. The rapidly developing national framework to support the Clean Development Mechanism could provide the basis for accessing carbon finance for wastewater treatment facilities, and there is at least one example of a Vietnamese enterprise that is currently applying to enter the CDM approval stream. At the same time, the World Bank should proceed with

caution in such a program. It will necessarily be a small component of a much larger intervention in wastewater treatment, and would by necessity also follow a dramatically different modality.

17.4.2 Financial Intermediaries

This report offers a tentative recommendation to pursue a program of lending that works through carefully selected Joint Stock Banks (JSBs) and State Owned Commercial Banks (SOCBs). We are unable at this point to offer detailed criteria on-which to choose potential intermediaries. However, criteria should include not only current financial health and capacity, but also a diverse lending portfolio for business including room for the development of new products. A desire to offer some financing through their own resources would be an important means through which to select banks. The potential for such private sector financing could add immensely the scale and impact of any World Bank initiative in this sector.

We suggest that the Vietnam Development Bank be used as an Apex institution to manage on-lending to industries and industrial parks through their provincial branches (see figure 2). Participation of local SOCBs and JSBs is suggested to facilitate the access to financing by private and small-and-medium-sized enterprises who have often weak management system to comply with complex ODA procedures.

A comprehensive Technical Assistance program to develop the capacity of both the VDB and intermediary banks in environmental management and micro-economic viability evaluation would need to be a central component of any intervention.

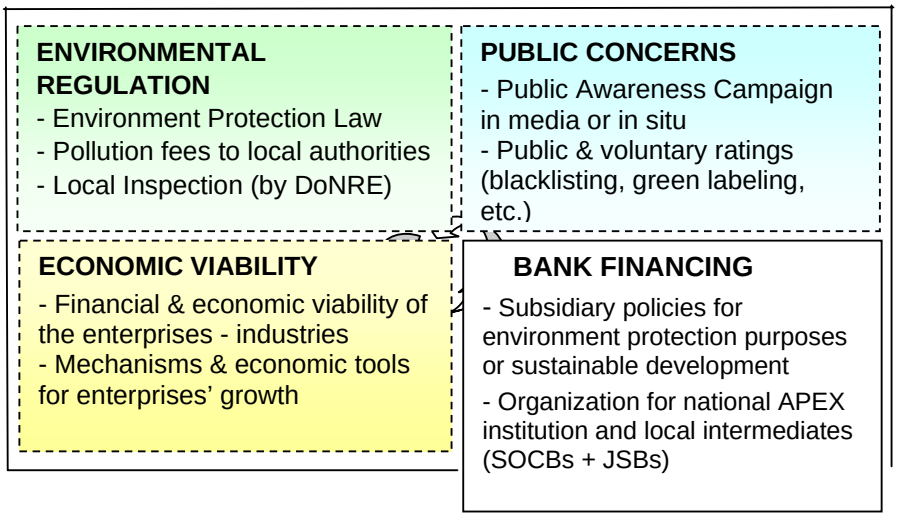


Figure 17.1: Conceptual Approach Proposal for Financing

17.4.3 Conceptual Approach Proposal: an hybrid approach

Both the lessons learnt from previous programs and the specific Vietnamese context show that a unilateral approach of financing will not produce the expected industrial pollution reduction. The recent projects presenting good results have used a combined approach of the four following components: (1)

environmental regulation enforcement, (2) a campaign for raising public concerns, (3) evaluation and support for economic viability of enterprises and (4) Financing for infrastructures (see figure 7).

1. Environmental regulation enforcement: Institutional reform for enforcement of strict regulation and the introduction of an appropriate regime of pollution fees that moves the industry to internalize the costs associated with pollution. The regulation should represent a strong incentive for enterprises to invest in hazardous waste and wastewater treatment ;
2. Campaign for raising public concerns: Mobilizing public concern about pollution by increasing public awareness, blacklisting polluting enterprises and praising factories that showed good results. Blacklisting and praising good citizens are well integrated into Vietnamese culture and still considered as a powerful tool by the Government at central and local levels. The results from the Indonesian PROPER program (40% reduction of organic pollution without any direct financing of infrastructure) and the local community concerns in Vietnam (O'Rourke, 2004) are well documented and represent promising approaches for the Vietnamese context ;
3. Focusing on the economic viability of enterprises: Practice indicates that enterprises targeted via any World Bank loan must be carefully screened for both potential environmental performance and economic viability during the design stage of the project. While a focus on State-Owned Enterprises (SOEs) will likely be a priority for government, the Bank should approach SOEs with some caution. While they are likely among the largest polluters, questionable economic viability and high levels of debt may create high levels of risk. As we recommend that at least 50% of financing should be directed towards the private sector, simplified lending mechanisms should be developed and the loan intermediaries should receive technical assistance in order to be able to provide evaluation and micro-economic tools to the selected enterprises.
4. Financing for infrastructures: In Vietnam where regulations are pretty weak and applied inconsistently and where access to credit is difficult, loan subsidies and small grants (up to 20% of total investment costs) towards viable industries can be powerful incentives to improve environmental performance. Foreign exchange risk should be taken by the World Bank as State-Owned Enterprises and State-Owned Banks may have under developed risk management systems.

17.5 Financial mechanisms for infrastructure capital costs

The first sections of the report discussed in details the recommendations about the program's implementation. This first section (program planning, management, regulatory reforms, inventories and technical assessments, etc.) consisted in a Technical Assistance Fund that is planned to be implemented in the first phase of the program. Each industry will undergo a comprehensive technical assessment that will recommend financial support for infrastructure capital costs.

The review of international experiences of ODA for financing pollution abatement confirms that direct financing of wastewater treatment alone is not the optimal strategy: it should be joined with strict regulatory enforcement that will move the industry to gradually internalize the treatment costs.

The review has also confirmed that loan subsidies and partial grants can offer an important incentive for industries to install wastewater treatment facilities, particularly in environments similar to Vietnam where regulations are still weak or applied inconsistently. Incentives are important because there has been no example in the developing world of industrial wastewater treatment that has been operated on a full cost-recovery or for-profit basis. In some particular cases, particularly SMEs, the access to finance alone can be an appropriate incentive for investing in wastewater treatment.

The following *figure 8: Investment Program proposal* illustrates the clear division between the two program components: Technical Assistance and Infrastructure capital funding. We recommend that the Vietnam Development Bank (VDB) serves as an Apex financial intermediary to distribute loans and grants to the industries. The VDB has experience implementing development investment policy and managing ODA on-lending funds. The VDB also owns regional branches in all provinces, which can facilitate the funding process directly with industries.

We recommend that the World Bank program should provide funds for infrastructures as an incentive to build wastewater treatment and cleaner production processes. These funds should be managed by the Vietnam Development Bank according to guidelines established by the National Steering Committee.

Each industry should undergo a technical assessment with the River Basin Committee which emits a recommendation for funding under the program.

In order to simplify the procedure, the guidelines should include an option for industries who want to submit a simplified-proposal without the comprehensive technical assessment that could recommend financial support through grants or bigger loan subsidies. Preferential lending should be accessible to all polluting industries which submit a proposal. The VDB regional branches can process directly with a micro-economic viability evaluation. That option may lead to a reduced loan but some industries may be interested in simplified procedures and overall it will accelerate the program activities.

We also recommend that local financial intermediaries receive Technical Assistance in order to provide training to industries about micro-economic tools. The objective is to improve industries' financial capacities and improve the reimbursement level for this program at the same time.

17.5.1 Recommendations of financial mechanisms

We recommended that one of the program's first steps will be the completion of detailed inventories of all potentially polluting industries in the river basin. This inventory will give some indications to calculate the total requirements in terms of costs and total investments needs for infrastructures.

Financial support should be granted to industries according to their economic needs (access to credit), micro-economic viability (reimbursement capacity), technical feasibility of the pollution reduction and technology prices. The support can be a preferential loan managed by the VDB and/or some partial grants to the maximum value of 20% of the construction costs

We recommend that at least 50% of the loan should go to the private sector, including privately owned industrial parks and private industries.

Industrial Parks and Clusters should be able to receive loans at the condition of presenting a viable cost recovery plan by (partly or not) transferring the wastewater treatment cost to their industries. Industrial

estates should present a serious management plan including regulation for wastewater treatment fees collection and environmental monitoring and management, as suggested by Decree 29.

17.5.2 Financial mechanisms for small and medium enterprises SMEs

The Vietnamese financial sector review has shown that SMEs in Vietnam have difficult access to credit. The problem of lack of access over the long-term is difficult to solve and it is definitely not the objective of this program. However, the access to preferential loan and grants through this program will definitely be an incentive to invest in wastewater treatment system. Furthermore, the successful reimbursement of this subsidies loan with the VDB will improve their credit line.

Small and medium sized enterprises with bad access to credit should also be able to receive the training (as Technical Assistance) about financial tools by the VDB in priority. The 20% grant element should also be used in priority to SMEs and craft villages. They both have a more difficult access to market finance.

17.5.3 Financial mechanism for craft villages

The particular situation of craft villages requires more than financial support. As mentioned in section 0 when defining the recommended intervention, the craft villages present difficult conditions to design efficient end-of-pipe systems. Furthermore, most micro-industries/households have limited economic resources and can hardly absorb any waste treatment costs. A case-study of a craft village benefiting from a granted (3 millions USD) treatment system in Nam Dinh province (see box 4, Institutional Assessment) has even showed that the craft village could not find the budget for operation and maintenance and the system was stopped.

A combination of grants and subsidies loans is recommended for carefully selected craft villages that show interest in pursuing a deeper training and organization process by obtaining other sources of funding. Craft villages with a relocation plan to industrial points provide an interesting option for both economic viability and technical feasibility of wastewater treatment over the long-term.

The following figure presents a summary of the recommended investment program.

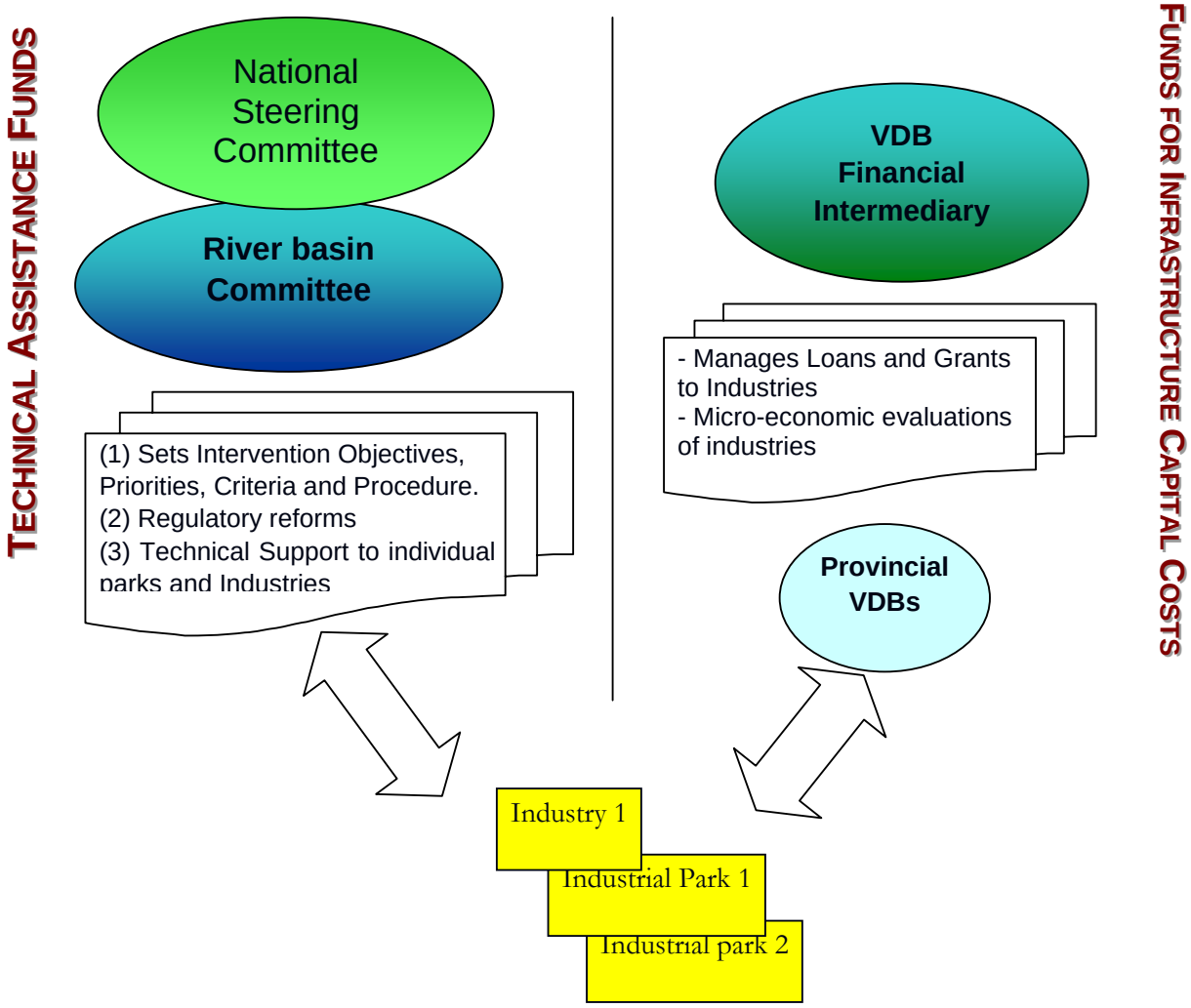


Figure 17.2: Investment program proposal

18. CONCLUSION

In recent years the Government of Vietnam has been committed to the development of an environmental agenda that includes various significant institutional and regulatory guidelines for addressing and reducing the environmental pollution and degradation associated with its industries. The Government is now prepared to initiate the planning and creation of a concrete financial assistance program for the industrial sector with the support of the World Bank.

The industrial land-use inventories provided an accurate and up-to-date portrait of industry's role and contribution to water pollution in both river basins. From this, important trends as well as potential problem areas were identified. The first is the emergence of a pattern, where industrial firms are leaving densely populated areas and relocating to settings that are more rural. A main factor behind this seems to be the abundance of inexpensive land that allows for the clustering of high-tech industries, related services, and infrastructure into strategic industrial zones, which can increase productivity while at the same time help to improve environmental conditions in urban areas.

The second finding is the presence of the state-owned manufacturing sectors, such as textile, agri-food, chemicals, metals, etc., and the significant amount of pollution they cause mostly due to the implementation of very few pollution abatement technologies. Even though the actual impact and quantity of the pollution attributed to these sectors has yet to be measured, theoretical modelling has shown it to be a significant amount and highly toxic. The privately owned industries also lack the presence of pollution abatement controls and infrastructure due to their limited capacity to afford such technological tools. The size of their operations were smaller in scale than those of state-owned enterprises, and as a result so was their role as polluters but there still exists an urgent need to address and rectify these issues.

The institutional regulatory framework currently in place to monitor and control industry's impact on the environment is complex and extensive. The accelerated rate of development and implementation of these policies has led to issues that need to be addressed such as the cross-regulation of different Ministry Departments who are responsible for the environmental compliance of the same industrial estates. However, despite some of these weaknesses, an overhaul of the entire institutional regulatory framework is not necessary. The current rules and sanctions already in place are structured and well defined, it is the enforcement, and monitoring components of these rules that is excessively weak and needs immediate attention. From the list of recommendations created to address the improvement of the institutional framework, the first priority should be to increase the overall capacity effectiveness of certain organizations, like the DONRE, DOIT, and DARD. To accomplish this, an ample budget will allow for the training and hiring of qualified individuals who will ensure the proper management of these organizations. This monetary aspect must be coupled with a firm commitment from the government to instil these organizations with the political power necessary to protect and prioritize environmental concerns.

Next, focus needs to be placed on the technical and organizational intervention options available that will help industries reach and comply with rigorous environmental standards. The control and prevention of industry discharging high loads of pollution directly into the environment must be closely monitored to ensure the disposal that poses the least risk for pollution is followed. Consequently the discharge of wastewater to municipal centralized treatment plants is not considered as an adequate option, even in bigger urban areas the municipal wastewater treatment infrastructure is insufficient and unable to properly cope with the actual conditions. In response, within the regulatory framework for industrial zones has made the construction of a centralized wastewater treatment plant compulsory when the occupation of the zone reaches a certain size or percentage.

The recommendation of centralized wastewater treatment plants for industrial zones and estates should be considered as the top priority intervention because the organizational structure and authority of industrial estates already provide the necessary tools and technologies required for cost-recovery and ensuring the accountability of industries

The integrated river basin approach still has its place and could still play a significant role as the best approach to integrate the manage all stand-alone industries, those in agriculture non-point source polluters, as well as any institutional or domestic polluters.

Based on our recommendations, a complete financial and detailed investment program is essential if industries and industrial estates wish to achieve and maintain environmental compliance.

Recommended activities part of a Technical Assistance program:

1. We recommend investing into data management equipment and training to increase capacity in industrial environmental management for officers at Industrial Zones Authorities and provincial departments (DOIT, DONRE, DARD) officers in charge of environmental management and monitoring.
2. We recommend investing in a program of Environmental Management Plans for the most polluting craft-villages. The most polluted craft villages need financial and technical support to modernize their production process.
3. We recommend investing in technical support for a Cleaner production program for some identified industrial sectors.

Recommended priority interventions for each category of industrial estates and industries.:

Category	Environmental Management framework	Policy interventions	Financing Mechanisms
Industrial zones	- Industrial Zones authorities should be clearly responsible for monitoring and reporting	- Implementation of Decree 29 and Circular 08/2009 - CETP be compulsory - All industries should be connected to CETP	- Parks apply for support as private entities, or as part of provincial IZA application - Should get financial support for CETP as well as monitoring equipment - Access to preferential grants (20%) and loans at the condition of presenting cost recovery plan by transferring (partly or not) the infrastructure cost to their industries.
Industrial clusters	- Should be monitored by DONRE in partnership with DOIT -Managing district authorities should respond for clusters	- Partnership between DONRE and DOIT should be clarified for environmental monitoring	-Clusters apply for support through provincial financing PPC. - Access to preferential grants (20%) and loans at the condition of presenting cost recovery plan by transferring (partly or not) the infrastructure cost to their industries.
Stand-alone industries	- Should be clearly monitored by DONRE	- Should report to provincial DONRE (instead of national MONRE)	-Industries invest into clean production -Industries apply for support as private entities (private financing)
Industrial points	- Should be monitored by DONRE in partnership with DOIT.	- Small Industrial points could obtain DONRE WWDP as a craft village entity.	- Based on its environmental management plan, craft villages households should access public funds for cleaner production training.

		- Development of industrial points should be a key solution for sustainable development of craft villages.	- CV and Ind points can apply for both private financing (for treatment capital costs) and public financing with commune for sewers and centralized low-cost treatment. - Access to preferential grants (more than 20%) and loans at the condition of presenting an appropriate plan for operation and maintenance costs recovery by transferring the operating costs to the industrial households.
Craft villages	- Env. Management plan should be prepared by DONRE with commune or district authorities and DARD.	- Craft villages should obtain a DONRE WWD permit as an entity. - DARD should cooperate with DOIT for Industrial points planning and CV management	

Technical recommendations and costs

Category	**Technical options**	**Centralized Treatment Technology (CETP)**	**Costs**		**Land requirement for CETP**
			Unit cost (US $ per m^3/d	**Typical cost/ estate US$**	
Industrial zones	Pre-treatment requirement at industry level (C level) Compulsory connection to CETP	Compact biological aerobic technologies (Activated sludge or SBR)	800	2-7 millions US$	0,8 ha
Industrial cluster	- Sewer network available - Pre-treatment required for certain industries	UASB or aerated lagoons	500	100 000-1 million	1 ha, max 2 ha
Stand-alone industries (and pre-treatment for industries within estates)	- Cleaner production for: pulp&paper, food processing and Textile dyeing study	Pre-treatment technologies: Depending: Physical, chemical treatment, DAF, etc.	500 - 800		Inside industry
Industrial points	- Cleaner production training through Technical assistance - Sewer network connecting similar productions to common treatment - CETP with low-cost technologies	UASB, Bionest, DAF, BASTAF	500	50 000 – 500 000	1 ha
Craft villages			300		<1 ha

Note: UASB = Upflow Anaerobic Sludge Blanket ; DAF = Dissolved air flotation (Vietnam technology); BASTAF = Baffled septic tank (Vietnam technology)

This process highlighted by the issue of inaccessibility to credit by private industries and medium to smaller enterprises. Concessional aid is directed mostly to the large state-owned bodies such as

industrial zones and governmental companies. Private industries, which consist mainly of SMEs, are limited in their ability to obtain financial credit. A much higher percentage of privately owned industrial parks and clusters in the South of Vietnam have established wastewater treatment plants than publicly owned-parks. Informally, they are also subject to enforcement that is more rigid then large, historical state-owned industries.

To alleviate some of these issues we recommend that at least 50% of international financial support should be directed towards the private sector, along with simplified lending procedures and financial intermediaries. Of course, every project falling under the scope of the World Bank would have to comply with the state concession-type of support (OP 8.30). A future analysis however should also investigate the possibility of existing programs providing credit and/or finance to the private sector in Vietnam.

Finally, the ownership and operational model in use by industrial estates is embodied by the “Infrastructure Development Company” and currently government owned engineering consulting firms dominant the small national infrastructure market. As a result, it is our opinion that new investment programs should aspire to build and foster an industry with an intentionally recognized knowledge and expertise in the field of wastewater treatment. The prospect of the fruition of these recommended wastewater treatment plants could allow for the creation of an emerging market associated with the selling of new technologies, innovative designs, operation and construction related to these plants.

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