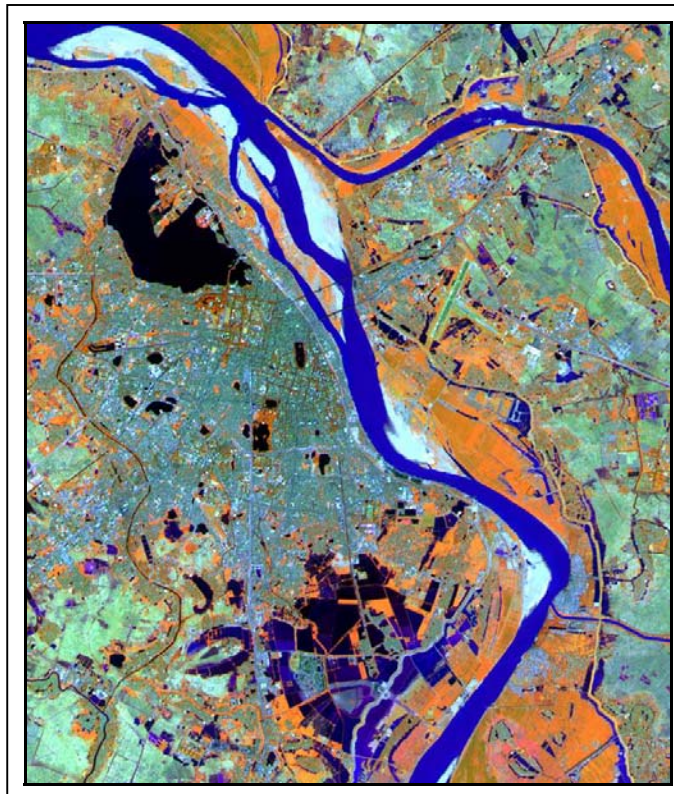


Planning for Revitalization of Existing Industrial Sites in Hanoi, Vietnam

A case study of Thuong Dinh Industrial Zone



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International Master Urban and Regional Planning and Development
2002 - 2004

Abstract

Since the promulgation of an “open economic” policy in 1986, Vietnam has experienced many beneficiaries in terms of high economic growth and quality of life improvement. Rapid industrialization and urbanization have occurred in many big cities of Vietnam, including Hanoi, the capital and the second largest city. However, arbitrary urbanization and industrialization without adequate planning have resulted in a chaotic allocation of industrial zones inside residential areas or vice versa. The consequences of such a chaotic allocation were the deterioration of the spatial and environmental quality of a specific area in particular and a city in general.

Although the authorities of big cities in Vietnam have signaled that problem and initiated various measures and plans to improve the spatial and environmental quality of many industrial zones, the efficiency of those projects and measures still has been limited. This research attempted to give recommendations regarding spatial planning for industrial sites to the involved actor to improve the shortcomings of the implemented measures and plans to deal with the degradation of environmental and spatial quality of a particular industrial site in Hanoi, the case study of this research. Besides, the thesis also discussed how those recommendations could be applied for other industrial sites of the city.

Thuong Dinh industrial zone was chosen as a case study of the research due to its representative nature in terms of its size, contribution to economic development of Hanoi, number of participated enterprises, etc. To reach the objective mentioned above, a combination between intensive information search about existing spatial and environmental quality of the zone, given spatial planning instruments, etc., analysis of the collected information and literature study about eco-industrial parks was carried out.

Collected statistic data demonstrated the degradation of spatial and environmental quality of Thuong Dinh industrial zone. This deterioration is shown through, for instance, the non-existence of safe distances between enterprises and residential areas, air, water and noise pollution caused by wastes discharge and operation of companies and factories inside the zone, rapid decrease of green areas. Although, a series of projects and measures were proposed and implemented to improve the situation of the zone, their efficiencies still have been limited. The main shortcoming of the implemented measures and projects was the absence of a designated unique authority (which can be called “Thuong Dinh industrial zone commission” – TDIZC) having power, for instance, to mobilize the participation of involved stakeholders, to solve various liability issues and to create an integrated policy for the re-development of Thuong Dinh industrial zone.

To mobilize the participation of all involved stakeholders in the re-development process, a strategy called “Sandwich Strategy” developed by Tjallingii (1996) can be applied. Sandwich strategy consists of three hierarchic layers represented for three major hierarchic stakeholders; each stakeholder has his own tasks. For the case of Thuong Dinh, the three main stakeholders are the local government of Hanoi city, the local government of Thanh Xuan district and the TDIZC.

In the long run, the re-development of the Thuong Dinh industrial zone should be steered in the way that is in harmonization with the sustainable development goals interpreted for the zone. To achieve this long-term objective, related theories about “Eco-industrial Park” should be considered and applied. These theories can either be used as a re-development tool in which three dimensions of sustainable development (social, economic and environmental aspects) are in balance) or be used as a prevention tool to avoid any inappropriate re-development process. Industrial Ecology related theories are more explicit

and applicable for Thuong Dinh industrial zone when investigating a good example of eco industrial park. An example of industrial symbiosis in Kalundborg (Denmark) gave many good lessons for Thuong Dinh industrial zone such as industry match, size match, close physical and mental distance and regulations create financial incentives.

Finally, it is highly recommended to the State of Hanoi that the formulation of Thuong Dinh industrial zone commission – TDIZC – is crucial for the re-development of Thuong Dinh. Participants of this organization should be selected stakeholders in the re-development of Thuong Dinh. The TDIZC should also consider the use of “Sandwich Strategy” as an efficient tool to mobilize the participation of involved stakeholders and the application of the concept “Industrial Ecology” as a guideline to steer the re-development of Thuong Dinh in the long term. Furthermore, good understanding about “Project Management” should also contribute to the success of the upcoming projects proposed for the re-development process.

Acknowledgement

Spatial planning, especially spatial planning in industrial sites in Vietnamese context is a field I am interested in recent years. I consider this research project as an initial opportunity to motivate my aspiration. At the end of this assignment, I believe the results are useful for my city.

During the period of executing this research project, I have received much assistance from many people that helps me to finish this research project. Here, I would like to mention those who played an essential role in the making of this report. The words can only touch the tip of the iceberg in adequately acknowledging my debts to others. Ir. Frans Bertels is the first person impressed me and drove me interested in the field of urban planning seriously. Other IMP lecturers have provided me relevant theories knowledge not only in my specialization but also in other disciplines such as Network and Project management, Negotiations, Research methodology, Problem solving in an interdisciplinary setting, Environmental Assessment Impact, Urban and Regional planning, Ecological conditions, Spatial and Environmental policies, Communication and Education. I am particularly thankful to Drs. Tsjikke Schippers, Ir. Nel van Wageningen, Drs. Bauke de Vries, Ir. Frans Bertels, and Drs. Henk Blokland, who have made a strong influence on me not only by their knowledge in the profession but also their enthusiasm to students.

I am very grateful to my supervisor, Drs. Harry van Bommel who has reviewed and commented on my paper work from the inception. He has spent precarious time on my draft and given me many frank discussion, thanks for that, the research has been improved day by day.

My sincere appreciation goes to friends and classmates, especially, Zumi Nguyen, Wouter Kersten, and Nguyen Song Nguyen, who are so kind to encourage me to overcome the trap of succumbing to massive difficulties.

Finally, I thank my wife, Tran Thuy Nga for her endurance, support and criticism.

The Netherlands

September 2004

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List of Abbreviations

BOD	Biological Oxygen Demand
CEETIA	Hanoi University of Civil Engineering Centre of Environmental Engineering of Towns and Industrial Areas
CO	Carbon monoxide
COD	Chemical Oxygen Demand
Cu ₂	Cooper
ECOH	Environmental Council of Hanoi city
JICA	Japanese International Cooperation Agency
HN DOC	Hanoi Department of Construction
HN DOI	Hanoi Department of Industry
HN DOSTE	Hanoi Department of Science, Technology and Environment
HN DOTUPWS	Hanoi Department of Transport and Urban Public Works Service
H ₂ S	Hydrogen Sulphide
INEST	Institute of Environmental Science and Technology
MARD	Ministry of Agriculture and Rural Development
MOC	Ministry of Construction
MOI	Ministry of Industry
MOSPI	Ministry of Spatial planning and Investment
MOSTE	Ministry of Science, Technology and Environment
m ³	Cubic metres
OCAOH	The Office of Chief Architects of Hanoi
PCOH	People's committee of Hanoi city
SO ₂	Sulfur dioxide
SOE	State owned Enterprise
TSS	Total suspended Solids
TUPWS	Transport and Urban Public Works Service
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
USEPA	US Environmental Protection Agency

Chapter 1: Introduction

1.1. Background to Industrial Development

Industrial Development has become an important concern in economic development, not only for specific countries, but also on global scale, from the Western industrial countries with its wide spread industrial and manufacturing scale to the Third world developing countries with its struggle to achieve economical and social balance. A global detailed solution for this issue is far from being real or practical where approached to develop industry with its environmental and economical diverse impacts may even vary within the same area in one country depending on the various circumstances and the severity of each issue in hand.

Vietnam remains a predominantly agrarian economy, but the role of industry has been at the core of the country's economic planning efforts dating back to the First Five Year Plan (1961 - 1966). The Eighth Five Year Plan (1996 - 2000) heralded "modernization and industrialization" as the backbone of Vietnam's efforts to advance socio - economic development and improve the welfare of the Vietnamese people (CIEM 2000b).

From a small base, the industrial sector has shown remarkable progress and between 1991 and 1998 has consistently registered annual growth in excess of 10%. According to statistics, there were 617, 806 industrial enterprises in Vietnam. Of these enterprises, 560 were under the control of the central government, 1283 were under the control of the local government, 669 received foreign investment, and the remaining 615,293 enterprises were made up mostly of small to medium private companies (Socialist Republic of Vietnam 2000). The industrial sector, which in 1990 accounted for 22.4% of the GDP, now accounts for over 33% and grew at a rate of 11% during 1990s, whereas the overall GDP grew just 7.25% (UNDP 1999; CIEM 2000b).

Hanoi - the capital of Vietnam - is one of the largest and most densely populated cities in the country and one of most important economic center of Northern Vietnam. At present, Hanoi has 20 major industries. The most important of which are chemicals, textiles, electrical goods, mechanical engineering and food processing (CEETIA 1996). Recently, new industries have emerged, such as automobile and motorcycle assembly plants, television parts production, and television assembly plants and consumer electronics (VCEP 1996). According to CEETIA in 1996, there were 5000 enterprises operating in Hanoi, of which 318 were state owned, 1000 were medium sized private enterprises, and the remaining 4000 were micro to small scale private enterprises. Except for some very old enterprises, most industries in Hanoi are located in industrial zones, such as Thuong Dinh, Minh Khai - Vinh Tuy, and Truong Dinh - Duoi Ca Industrial Zones. Industrial zones account for a large percent of the industrial output in Hanoi, and have been growing at a rapid rate in recent years. For example, Thuong Dinh Industrial Zone alone is responsible for 21% of Hanoi's industrial output (UNDP 2000).

After an open door economic policy of the Vietnamese government, the urbanization rate in Vietnam is quite high (around 20%), but that of Hanoi is even much higher (35.6%). (McCarty 1998, P.105) The urbanization process in Hanoi is accompanied by a remarkable inflow of investment (from both domestic and foreign sources) into housing, infrastructure, and factories (Hanoi Department of Planning and investment 1997). Up to the 1960s, Hanoi's urban areas had four districts. Those are Ba Dinh, Hoan Kiem, Hai Ba Trung, and Dong Da. Now Hanoi has expanded larger urban districts, such Thanh Xuan, Gia Lam, and Tu Liem. Some industrial zones were built in the 1960s in rural areas, now they have been turned into allocation in urban and sub-urban areas.

According to CEETIA (1996), there are 9 pre-existing industrial zones in Hanoi, namely Minh Khai - Vinh Tuy, Thuong Dinh, Dong Anh, Cau Dien - Nghia Do, Gia Lam - Yen Vien, Truong Dinh - Duoi Ca, Van Dien - Phap Van, Chem, and Cau Buou. These industrial

zones were built in the 1960s and were situated in the left and the right bank of the Red River.

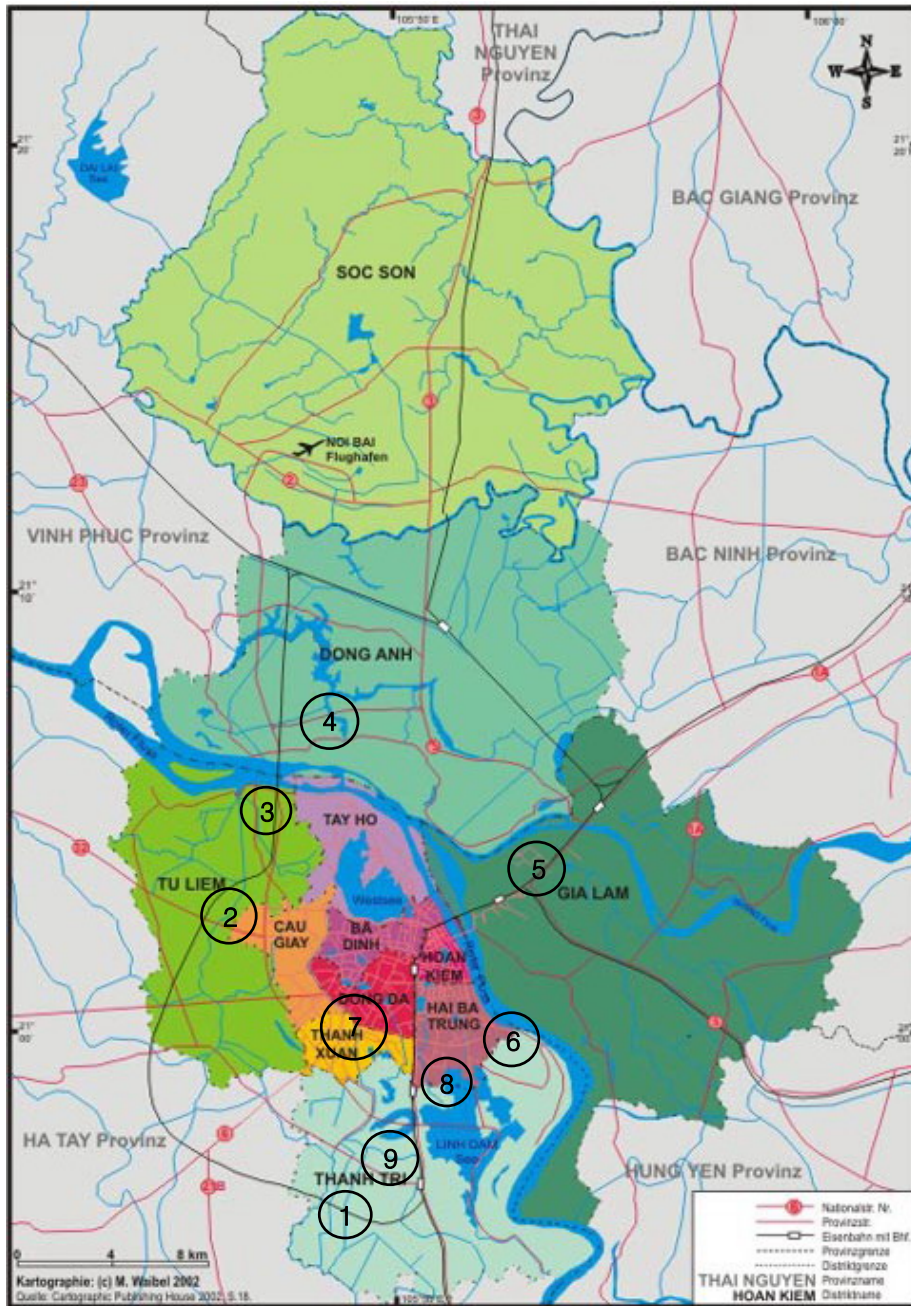


Figure 1: Locations of the pre-existing industrial zones in the city of Hanoi (Adapted from OCAOH, 2000)

Legend

- Circle No. 1: Cau Buou industrial zone;
- Circle No. 2: Cau Dien – Nghia Do industrial zone;
- Circle No. 3: Chem industrial zone;
- Circle No. 4: Dong Anh industrial zone;
- Circle No. 5: Gia Lam-Yen Vien industrial zone;
- Circle No. 6: Minh khai – Vinh Tuy industrial zone;
- Circle No. 7: Thuong Dinh industrial zone;
- Circle No. 8: Truong Dinh – Duoi Ca zone;
- Circle No. 9: Van Dien – Phap Van industrial zone;

Such industrial zones have occupied 452 ha, accounting for 44.3% of state owned enterprises (both central and local ones) in Hanoi city, attracting 39% of total industrial labor of the city. (UNDP 2000).

Table 1 shows the total area, number of enterprises, and number of employees of each pre – existing industrial zone.

Pre-existing Industrial zone	Number of Enterprises	Total Area (ha)	Number of Employees
1. Cau Buou	5	4	1,390
2. Cau Dien - Nghia Do	29	76	2,000
3. Chem	13	14	2,310
4. Dong Anh	22	68	8,284
5. Gia Lam - Yen Vien	8	27	1,950
6. Minh Khai - Vinh Tuy	31	81	15,910
7. Thuong Dinh	63	94.3	17,270
8. Truong Dinh – Duoi Ca	21	38	10,230
9. Van Dien – Phap Van	22	68	8,280
TOTAL	198	452	67,624

Table 1: The data of Pre - Existing Industrial zones in Hanoi city
(Adapted from CEETIA. 1996)

Pre-existing Industrial zone	Year of establishment	Main types of industries
1. Cau Buou	1966	Mechanical, chemical, and construction material
2. Cau Dien - Nghia Do	1972	Chemical, engineering, construction material, foodstuff, and wood processing
3. Chem	1976	Textile, construction material, and packaging for export
4. Dong Anh	1976	Metallurgy, engineering, construction material, cereal and foodstuff processing, and printing industry
5. Gia Lam - Yen Vien	1972	Mechanical, chemical, and wood processing
6. Minh Khai - Vinh Tuy	1962	Mechanical, construction material, food processing, textile, footwear, printing, and stationery
7. Thuong Dinh	1958	Mechanical, chemical, food processing, textile, leather, tobacco, and Paper
8. Truong Dinh – Duoi Ca	1962	Engineering, cereals and foodstuff, glass and porcelain, wood processing
9. Van Dien – Phap Van	1968	Engineering, chemical and fertilizer, construction material, glass and porcelain, wood processing

Table 2: Main types of industries in Pre-existing industrial zones in Hanoi city
(Adapted from UNDP. 2000, CEETIA. 1996)

The main characteristic of most of the existing industrial zones is that 6 (Thuong Dinh, Minh Khai – Vinh Tuy, Cau Dine – Nghia Do, Gia Lam – Yen Vien, Truong Dinh – Duoi Ca, and Chem) among 9 zones have no land left for further expansion whereas the pace of urbanization is getting higher. The growth of city's population both naturally and physically (especially in the areas of high growth rate of industries and services) is now narrowing the

distance (that used to be not very large) between industries and residential areas. (CEETIA 1996)

Pre-existing industrial zones in Hanoi mostly in bad, unsynchronized infrastructure that is not up to the mark for operation and production. Almost all of them are unable to meet the specified environmental standards in terms of both ecological and economic-technical requirement.

Moreover, all of industrial zones are inserted into residential areas. While being constructed, they were quite separated away from housing. Gradually, in the process of urbanization, these zones have been encroached and occupied by increased population, even including state agencies for different purposes. The safety space and the necessary distance between industries and residential areas is getting smaller and smaller, even does disappear. This is not only threatening the existing industries, preventing their improvements, but also harming the lives and health of nearby residents. (UNDP. 2000)

Nowadays, compared with the other 9 pre-existing industrial zones in Hanoi, Thuong Dinh industrial zone has the most serious environmental and spatial problems. The following facts illustrate for the problems presented:

- The industrial zone where has largest total industrial land, highest the number of enterprises, and highest the number of employees,
- The zone where has the highest the number of industries which types can cause most serious industrial pollutant to the environment,
- Where the population of the citizens in the zone is highest,
- Where have no land left around for further expansion of industries,
- Where the safety space and the necessary distance between industries and residential areas is smallest, even does disappear,
- Where the To Lich river passes which may cause pollutant widely, especially water pollution, to the others,
- Where infrastructure is unsynchronized, not up to the mark for operation and production,
- Where there is no the cooperation among enterprises; between enterprises, communities, the government, and (Nguyen, Q. T. 2004),
- Where the current condition of machinery and equipments in enterprises is alarming: unsynchronized, patched up, too backward. Most of the machinery and equipments are originated form the former socialist countries (CEETIA. 1996).

For above reasons, to solve the problems related pre-existing industrial zones in Hanoi city, Thuong Dinh industrial zone was chosen as a good start to achieve the improvement for the whole existing industrial zones of the city.

1.4. Case study: Thuong Dinh industrial zone

1.4.1. Introduction

Thuong Dinh industrial zone (TDIZ) is the largest of the nine ones in Hanoi city, adjacent to the bend in the To Lich River (*Figure 2*). Construction of enterprises inside the zone started in 1958. Currently, the zone occupies a total area of 94.3 ha, there are 63 medium and large-scale enterprises in the zone, 41 of which are production companies, and the others 22 are office buildings (UNDP 2000).

Most enterprises are located in Thuong Dinh, Thanh Xuan Trung, Ha Dinh, and Nhan Chinh wards of Thanh Xuan district. Thanh Xuan district is a relatively new inner city district (1998) that covers an area of 16.22 km² (UNDP 2000).

Industrial production in Thuong Dinh accounts for 21% of the total in Hanoi. In addition to the 63 medium and large-scale enterprises in the zone, as of 1997 there were 862 small industrial enterprises in the form of private production groups, employing 6, 650 industrial and craft workers. In 1995, the output of these small companies was \$ 560, 000 CAD (amounting to 25% of the total turnover of private industrial production in Hanoi) (UNDP. 1997).



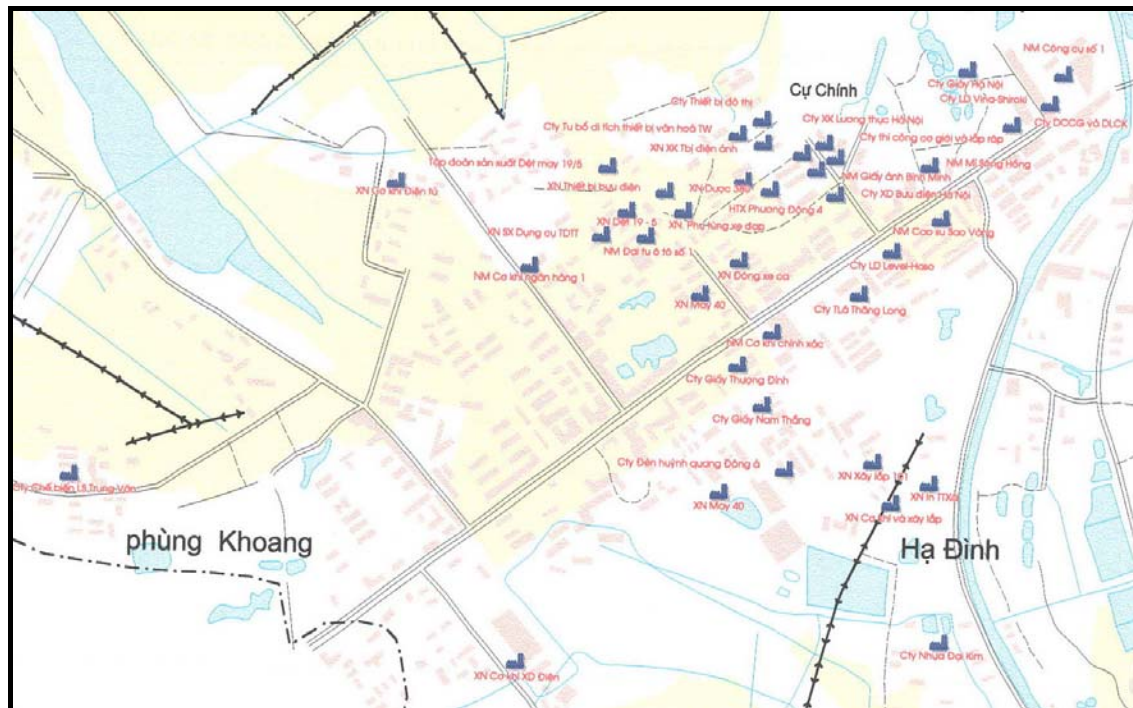
Figure 2: Location of Thuong Dinh industrial zone in Hanoi city
(Adapted from PCOH. 2004)

Legend: Circled is Thuong Dinh industrial zone

Forty years after the construction and development of Thuong Dinh industrial zone, the zone supports 63 enterprises from various industries (Table 11, Appendix 8). They are as follows (UNDP. 2000):

- 13 mechanical companies
- 7 chemical enterprises
- 7 textile, garment and footwear enterprises
- 3 construction companies
- 3 food processing and tobacco enterprises
- 8 other industries
- 22 offices

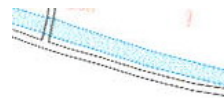
Locations of those enterprises in the zone are shown in the figure 3 below:



Legend:



Enterprise



To Lich River

Figure 3: Location of enterprises in Thuong Dinh industrial zone (INEST. 1988)

1.4.2. Situation in the zone

In the first two decades of operation, Thuong Dinh industrial zone consisted solely of industrial enterprises. There were no residential areas, offices or schools nearby (CEETIA 1996). Since 1980s, the process of urbanization began. With the investment from the State, the construction of a series of flats in the areas, surrounding the zone to meet rapidly increasing demand for housing from a growing population began. The Kim Giang and Thanh Xuan living quarters were developed at that time (CEETIA 1996). Other public buildings, such as kindergartens, schools, colleges, research institutions, infirmaries, administrative offices, shops, and hotels were also built as well. Private houses built at individual discretion between public buildings and enterprises. The zone today lies within a densely populated area containing thousands of inhabitants. In 1997, there were approximately 71, 600 inhabitants living in Thuong Dinh, Thanh Xuan and Thanh Xuan Trung sub-districts (presently, Thanh Xuan Bac, and Thanh Xuan Nam sub-districts) (UNDP 1997a).

1.4.3. Problem statement

Nowadays, together with existing condition mentioned above, the urban development in the zone has been facing a number of constraints: weak urban planning procedures; lack of management, policies and formally approved plans; an imbalance land use in the zone, such as infrastructure, housing, and industrial land; an imbalance between industrial development and the others. (UNDP 1997; CEETIA 1996). That leads to the Environmental and spatial quality degradation seriously day by day. Such as (UNDP 1997a; UNDP 2000):

- The safe and isolating space between industrial areas, housing and also public works now nearly dose not exist any longer;
- The natural and landscape elements, such as trees, plants, lakes, ponds...in this area are dramatically narrowing;
- Public works system and services are inadequate for the large population in the area. They are incomplete, improperly located and of a rudimentary nature;
- Incomplete and incomprehensive infrastructure in not adequate for the dense of population, and enterprises in the zone, it is also, to some extent, irrationally located and now deteriorating;
- Poor coordination and links among industries lead to the wasting of resources and the increasing of pollution;
- The system of water supply, drainage, energy supply are almost completely independent, thus wasting resources and increasing source of emission;

The consequences, the health and lives of a so large number of the residents are in great danger.

For the above reasons, improving the existing spatial and physical environmental quality is desired. This research aims to present an example on how spatial planning approaches can be used to take a more attractive regarding environment, health, social, and economically sound approach for the development of an existing industrial zone using the tools that are available on the local level. This approach can be later tailored to achieve similar results in areas facing the same challenges.

1.5. *The objectives of the research*

Main objective:

To improve the spatial and environmental quality of the existing industrial zones in Hanoi city, Vietnam through using spatial planning approach for industrial sites drawn from the specific case study of Thuong Dinh existing industrial zone.

Sub - objectives:

- Investigate the characteristics of the pre-existing industrial zones in Hanoi city;
- Investigate the current spatial and environment quality within and surrounding Thuong Dinh industrial zone;
- Review the efforts made so far in solving the spatial and environmental quality problems for the area;
- Apply the relevant knowledge regarding Urban planning to find out the way to improve the existing spatial and environmental quality of Thuong Dinh industrial zone;
- Propose recommendations concerning Urban planning approach to improve the spatial and environmental quality of Thuong Dinh existing industrial zone, and of the existing industrial zones in Hanoi city in general to the target groups of the research.

1.6. Main research question

What recommendations regarding Spatial planning for Industrial sites should be given to the State of Hanoi, Vietnam to improve the spatial quality as well as to improve physical environmental quality towards sustainable development of Thuong Dinh industrial zone up to 2010?

1.7. Target groups

This research has a target group:

People's committee of Hanoi (PCOH), because PCOH who has full control over all the state agencies operating in the city and in the field spatial planning of Hanoi city, the People's committee of Hanoi finds out, and enacts the policies on Urban planning and development for the whole city.

1.8. Definition major concepts and elements

Residents

People, who live or work within and surrounding Thuong Dinh industrial area, they are directly affected by pollutants from and employment in this industrial zone.

Sustainable development

Development that does not undermine resources in terms of Ecological and Economic resources and conforms to the Socio-cultural values and norms of the people in which development is taking place.

Sustainable industrial sites

Close cooperation between companies, residents, and governmental authorities at Industrial sites with each other, with the aim of achieving: better business results, better environmental performance, and more efficient use of space. (MOHSPE. 2000)

Existing spatial quality

Referring to current planning of functions in space of Thuong Dinh industrial zone, and the way in which these functions influence each other.

Existing physical environmental quality

The current status of, for instance water pollution, soil pollution, air pollution, noise pollution, and solid waste within and surrounding the zone, which are compared with the current environmental state standard.

Recommendations regarding Spatial planning

The recommendations given to the target groups of the research are mainly focused on what they should do or consider regarding a new spatial planning policy approach in Industrial sites so that the spatial and environmental quality of Thuong Dinh industrial zone can be improved up to 2010.

Spatial planning for industrial sites

Planning as an activity is the making of an orderly sequence of actions that will lead to the achievement of certain goals that are developments in the domain of Pre-existing industrial zones of Hanoi city aimed at improving the economical result, lowering the burden of the environment, and achieving sustainable development.

Existing spatial planning instruments

Spatial planning instruments in industrial sites to revitalize Thuong Dinh industrial zone made so far were enacted by People's committee of Hanoi city. For instance:

Plans;
Policy documents;
Directives;

Exemptions;
Approval;
Permits;

1.9. Research boundary

It is worth mentioning that the research did not attempt to give completely a new alternative to improve the existing spatial and environmental quality of Thuong Dinh industrial zone. To improve the existing spatial and environmental conditions of the zone, the State of Hanoi together with its agencies initiated some programs and projects. This study focused on, first, assessing the efficiency of those projects and programs, then, analyzing the reasons for their inefficiency. Derived from that, recommendations on how reasons led to the inefficiency of those projects and programs can be overcome. In addition, the study also presents the strategies that should be considered to implement the given recommendations.

To broaden the scope of the study, the author also discussed how the given recommendations to the State of Hanoi can be applied for other existing industrial sites so as to help this actor to be able to formulate an integrated policy on industrial sites re-development.

Chapter 2: The Research methodology

2.1. Introduction

This chapter outlines the methodology used in the research. Firstly, It starts with the formulation of the Research step scheme for the study. Secondly, three main phases of the study are presented to clarify the Research phase scheme. Lastly, some limitations and difficulties faced during the study are closed of this chapter.

2.2. The Research phase scheme

The research phase scheme is divided four phases. In each phase, activities were performed in orderly. This scheme also shows the links between the organized research questions and the detail activities of each phase of the research. (See Appendix 3)

2.3. Three main phases

This research project had three main phases. They are presented as follows:

2.3.1. Phase 1: Collection of data and information

The required data were collected from credible sources such as ministries, various departments of Hanoi city, universities, and institutes. Moreover, information was also gathered from site surveys and consultation with experts and professionals from relevant enterprises and institutions.

2.3.1.1. Types of data and information collection

Information and data on the followings topics were collected:

(A) Industry and development in Vietnam

- Industry and economic development;
- Industry and social development;
- Industry and environmental protection;

(B) Industry and development in Hanoi city

- Industry and economic development;
- Industry and social development;
- Industry and environmental protection;

(C) Pre-existing industrial sites in Hanoi city

- Characteristics: Geographical location, industrial type, existing land use forms, area, number of factories, number of employees.
- Socio-economic conditions;
- Environmental conditions;
- Urban planning process within and surrounding the area;

(D) Existing environmental conditions of Case study area – Thuong Dinh industrial zone

- Water pollution data;
- Air pollution data;
- Solid wastes data;
- Hazardous wastes data;
- The efforts made so far in solving those problems.

(E) Existing spatial conditions of Case study area – Thuong Dinh industrial zone

- Existing land use forms;
- Influences of existing land use forms;
- Influences of Urban planning process;
- The efforts made so far in solving those problems;

The purpose of collecting this baseline data is to get an understanding of pre-policy conditions in Hanoi, and in existing industrial sites, which enabled the study to assess the effectiveness of the current policy measures, which leads to the identification of policy improvements.

(F) Theories related to Sustainable Industrial Development

- Sustainable Development;
- Ecological Condition;
- Industrial Ecology;
- Eco-Industrial Parks;

(G) Standards and norms

Data about standards for environmental design, safety and operations, assessing the adequacy of policy measures proposed, e.g. was also collected.

- Policies and measures related to existing industrial sites development
 - State programs;
 - State laws and regulations;
 - Redevelopment financial aid standards;
- Planning process standards and norms
 - Hanoi sustainable planning agenda;
 - Thanh Xuan district land use planning;
 - Industrial zone and transportation connection data;

In addition, various examples of good existing industrial sites development practice were collected.

2.3.1.2. Methods of information and data collection

Information and data for the research were collected from literature sources such as textbooks, articles, internet pages, and the interviews. These literature sources are found through Picarta (Dutch library website), World Wide Webs, offered literature for the course, do interview and the interviews by email, fax, post.

The table 6 in the Appendix 2 shows the relation. For visual clarification of the links between Research question and Questionnaire, see the Research phase scheme in Appendix 3, the Organized research questions in Appendix 4, and the Questionnaire in Appendix 5.

(A) Database search

The database search included databases from the following agencies:

- The Ministry of Science, Technology and Environment;
- Hanoi's Department of Science, Technology and Environment;
- The Ministry of Construction;

- The Office of Chief Architects of Hanoi;
- The People' Committee of Hanoi city;
- Hanoi University of Civil Engineering Centre of Environmental Engineering of Towns and Industrial Areas;
- Japanese International Cooperation Agency;
- United Nations Development Program;
- US Environmental Protection Agency;

(B) The use of the World Wide Web

The internet was extensively used in the research. The availability of databases and almost every rule and regulation affecting the industrial development topic in the other regions on the internet was a great asset in accomplishing this task.

2.3.2. Phase 2: Data and Information Analysis

2.3.2.1. Assessing existing spatial, environmental condition and issues

The first stage of data analysis investigates the existing spatial and physical environmental quality of the study area.

2.3.2.2. Developing goals for sustainability

Goals of sustainable development for Thuong Dinh industrial zone were created through the interpretation of Sustainable environmental development goals for Hanoi up to 2010–Agenda including exposing those goals in the context of Thuong Dinh industrial zone.

2.3.2.3. Analysis of redevelopment efforts

The development of the research was conceived at the local level, along with the findings of the effecting policy plans, developments happening on the regional level, national level and other international developments.

This section included findings of the standards and norms search in the form of the existing spatial planning instruments. In addition, the overall inefficiency and the impact of the pre-existing industrial zone development measures were evaluated at this phase, the workability of these measures was evaluated and the findings were discussed regarding the inefficiency of the existing spatial planning instruments for Thuong Dinh industrial zone. This analysis serves as an initial step to give remedial considerations, which could later be incorporated into the final proposal to achieve the desired results.

2.3.2.4. Examining a new spatial planning approach

In this stage of the research process, the viable directions towards possible solutions for the problems are identified and simultaneously examined and considered. The effectiveness of various mitigation measures and the sustainable scheme are assessed to meet prescribed sustainable development criteria and requirements. This falls within much of the scope of the environmental and socio-economic impact analysis stage of the research process.

Directions given in this study are:

- Establish a new organization with focused and enough authorities to achieve a unified goals of redevelopment;
- The use of the Sandwich strategy as a guide the making of environmental policy plans at different levels;
- The use of the Eco-Industrial Parks as a design a pretension tool;

In this stage, also, a case study at local level is described to illustrate the effectiveness of the alternative. The lessons learned from this case are examined and to be transferred to the following stage.

2.3.3. Phase 3: Drawing conclusions, recommendations and implementation

Based on the findings of the description and analysis of past redevelopments and initial examination, the analysis made recommendations on suitable remedial measures and how to implement them. This phase will lay down the philosophy of the recommended approach using the examined a new spatial planning approach.

Chapter 3: Assessing existing spatial, environmental condition and issues

3.1. Existing spatial quality

Thuong Dinh industrial zone, the largest, was established in 1958-1960, when there was no residential housing or university nearby. Since the 1980s the State Government started to invest in surrounding residential blocks and other buildings like kindergartens, schools, universities, research institutes, offices, hotels. Also there have been a great number of private houses built at individual discretion between factories and public buildings. The zone's population has amounted to about 72,000 persons, equivalent to 20% that of Dong Da district. By 1997, the total area of Thuong Dinh zone is 128.2 ha in which 94.3 ha is occupied for industrial land, 14.5 ha for residential purpose, and the rest for offices and public works. (Nguyen, T.T. 2002)

An overview of the existing land use of the study area is shown in the figure 4.



Notation:

	Industry areas		Ancient village areas
	Office, public works areas		Green space areas
	New residential areas		Water surface areas

Figure 4: Current land use of Thuong Dinh industrial zone
(Adapted from MOC. 1998)

Table 3 further specifies the ratio of the land use pattern in the zone from 1987 to 1997.

Existing use	1987		1997	
	Area (Ha)	Ratio (%)	Area (Ha)	Ratio (%)
Industrial	81.5	63.6	94.3	73.5
Vacant	18.6	14.5	9.1	7.1
Residential	11.8	9.2	14.5	11.3
Other	16.3	12.7	10.3	8.0

Table 3: Existing condition land use of Thuong Dinh in 1987 and 1997 (MOC. 1998)

Figure 5, an aerial view of one part of Thuong Dinh industrial zone – An example illustrates a visible spatial quality of the area. Obviously, industries, residential areas and public works are mixed altogether, side by side. The health and lives of a large number of people are in enormous danger.



Figure 5: Air photograph of one part of Thuong Dinh industrial zone¹ – From the view A in the Figure 4

The existing condition of functions in space of Thuong Dinh industrial zone, and the way in which these functions influence each other which can be summarized the outlines as follows:

- The safe and isolating space between industrial areas, housing and also public works now nearly does not exist any longer;
- The natural and environmental factors such as green trees, lakes, ponds...in this area are dramatically decreasing;
- The system of water supply, drainage, energy supply are almost completely independent, thus wasting resources and increasing sources of emission;
- Due to bad management and inadequate maintenance in operation, the efficiency of drainage systems is quickly degrading. Notefully, almost all factories have no stations for treating for waster from daily activities. The operative efficiency for hazardous waste treating facilities (if any) is seriously deteriorating, even some do not even work at all. (UNDP 1997a; UNDP 2000).

¹ The photograph was taken by the author on 21st June 2004

The besides the lowly effective treating facilities, the outstanding point is the intensive blending of industries and residential houses in an industrial zone that is located right in the most densely populated inner district of Hanoi. This is a question of land use and land recycling rigidity after nearly 40 years in use with the context of so many changes around.

3.2. Existing physical environmental quality

For the reasons mentioned above, the consequences of spatial quality and industrial activities in the zone for the environmental quality are as follows:

- Water pollution:

Studies and measurements on the quality of ground water in the area have confirmed that the chemical, physical and biological criteria of To Lich River's water have been dramatically altered due to the liquid wastes emitted. *Table 12 in Appendix 9* shows that water quality in the To Lich River is greatly impaired. In particular, TSS, BOD5 and COD are 4 to 27 times higher than the surface water standard for category A, and TSS and COD are 2 to 9 times higher than the permitted standard for category B (Dang 1998, JICA 2000a).

For shallow underground water, the total level of total iron, manganese, and coliform, for example, frequently exceed the national pollutants groundwater standard (*Table 13, Appendix 9*).

- Air pollution:

Air pollution by industrial activities can also be evidenced across the industrial zone. It is found that the content of dust and some hazardous gases in the air in the zone has been 2 – 3 times higher in comparison to permitted standards issued by Vietnam's Ministry of health in 1979. The main air pollution in Thuong Dinh industrial zone is due to dust and SO₂ whereas other gases are also as nearly high as specified by permitted standard. The average of dust content in the air is 0.64 mg/m³ (3 times above standard), SO₂ content: 0.4 mg/m³ (above standard too), and CO content 2 – 6 mg/m³. (Nguyen, T.T. 2002)

- Noise pollution:

When designed and established, measures to prevent and mitigate noises or vibrations were not taken into account in most of the factories and industrial enterprises. The equipment now (after decades in use) has been getting older, thus making much noise. Moreover, manual work, which is popular in many engineering activities, has created even more noises and vibrations that exceed permissible limits. In Thuong Dinh, many of the surveyed workshops (37.2%) have made noise at a level 1 – 14.5 dBA higher than the standard. In general, 40 – 50% surveyed industrial enterprises are suffering from noise pollution. (Nguyen, T.T. 2002)

- Solid wastes:

Litter and rubbish of all kinds are important sources that contribute to Hanoi's pollution. On average, interviewed firms reported generating 1042 tones of solid waster per year. (Angela, L.P. 2000)

The table 14 in Appendix 9 shows solid waste generation of interview firms at 6 enterprises in Thuong Dinh.

- Hazardous wastes:

Many industrial wastes contain heavy metals like Zn, Cu, Pb, Ni, and Hg... (mainly discharged by metallurgy and electronic industries). Other wastes have many dangerous characteristics such as erosive, explosive, and inflammable...with a large proportion of hazardous wastes, the factories discarding hazardous waster in Hanoi are often dangerously located among residential areas and other industries of

consumer goods, rather than gathered in one location of concentration. (Nguyen, T.T. 2002)

For visual illustration water pollution, air pollution, and wastes, the figure 8, 9, 10 and 11 are shown in appendix 10.

3.3. Conclusion

The chapter assesses the existing spatial and environmental condition and issues within and surrounding of Thuong Dinh industrial zone as well as on the region. The results illustrate the threat that existing industrial zone have on the environmental and socio-economic structure of the Hanoi city. Spatial sprawl, water, air, noise, and solid waste pollution, deterioration of the natural environment, decrease in property values, and human health impacts are the obvious consequences linked to the old industrial sites.

To deal with the spatial and environmental problems presented in this chapter, firstly, the next chapter will be presented the goals of the future needs of Thuong Dinh industrial zone through using the concept "Sustainable development" in general and goals for sustainable development for Hanoi city up to 2010 - Agenda in particular.

Chapter 4: Developing goals for sustainability

4.1. Identifying sustainable goals:

The concept of “sustainable development” (APA. 2004) is derived from a concern whether the Earth’s resources will be able to meet the demands of a growing population which results in rising aspirations for consumption and quality of life, while maintaining the rich diversity of the natural environment. In general sustainable development is interpreted as “the capability to equitably meet the vital human needs of the present without compromising the ability of future generations to meet their own needs by preserving and protecting the area ecosystem and natural resources”.

To be more concrete, a community that is directed towards sustainable development should be organized/managed in such a way that promotes the balance between social-economic and environmental aspects. For instance:

- A good place to live that offer economic and other opportunities for their inhabitants,
- Values of the society are maintained, e.g. individual liberty, democracy,
- Sustained bio-diversity of the natural environment, both for the contribution that it makes to the quality of human life and for its own inherent value,

How to apply “sustainable development” concept depends largely on the socio-economic and environmental conditions of a community or a country. Nowadays, the concept of “sustainable development” is widely used as a guideline, through formation of sustainability-related goals, for various socio-economic and environmental projects. Following that trend, this study attempts to look for sustainability-related goals set up by the involved authorities. These sustainability-related goals should be used as a guideline for improvement of existing measures given to solve the problems of Thuong Dinh industrial area.

4.2. Overview goals for sustainable development of Hanoi city

With regards to sustainable development for Hanoi city up to 2010, the Hanoi People Committee, with the assistance of the involved sub-departments, formulated sustainability related goals which are based on the three main dimensions: Economy, Environment, Society and Culture. Each dimension has its own sub-goals. They are as follows. (ECOH. 2002)

4.2.1. The Economy

No community can sustain itself unless it is able to provide employment and income for its residents, and generate tax revenues sufficient to provide an appropriate level of public service. It should also develop in ways that maintain the value of the existing built environment and preserve those aspects of the community valued by residents. It is important that new development complement existing community resources, and that it provide of sustainable economic development, and that its public policies encourage desirable development and discourage that which is not desirable.

Goals

- Support and sustain office, retail and industrial nodes inside of Hanoi city.
- Protect and utilize the historical character of the city.
- Develop Hanoi as a high technology research and manufacturing area.
- Support and sustain existing local businesses.

- Encourage economic growth, development and redevelopment in the community that sustains or improves upon the quality of life; encourage mutually beneficial cooperative endeavors with other political subdivisions.
- Utilize tax abatement judiciously, to attract businesses with “high quality” jobs that are likely to remain in the area and contribute to economic health after abatement expires.
- Sustain an adequate and fair standard of living for all citizens.

4.2.2. The Environmental

All life is part of and dependent upon our physical environment. As modern industrial culture has created a wealth of goods that enhance our lives, how we manufacture, use, and dispose of those products has become of critical importance. As a community, we will have opportunities to make choices that will determine the extent to which processes used will minimize ecological disturbance and maximize the likelihood that the industrial culture that has served us well will survive into the indefinite future. The goals that follow are based on the assumption that conservation is an appropriate and conservative approach.

Goals

- Establish and continue to promote and expand programs designed to reduce, reuse and/or recycle waste materials and to dispose of hazardous waste properly.
- Encourage increased consumption of products made from recycled materials.
- Improve and sustain the quality of the To Lich, Kim Nguu River.
- Improve and sustain the quality of the Ho Tay, Truc Bacn, Bay Mau, Ba Mau, Thuyen Quang Lake.
- Protect presently used and potentially useable aquifers and other water sources from degradation.
- Promote the use of less-polluting methods of transportation.
- Encourage energy conservation.
- Promote aesthetic integration of developed areas with the surrounding natural landscape; enhancement of the city’s public spaces, parks and recreation facilities, river banks & streams and natural areas; improved accessibility of all citizens.

4.2.3. Society and Culture

The most important element in a city is its people. A sustainable community is also a stable community. It must have at its core a society of productive individuals and families who are able to live in dignity. Hence, the employment available, insofar as it can be influenced by public policy, should earn any society at a given time what is considered to be “a living wage”. Those who cannot provide for themselves must be provided for at a level consistent with human health and dignity. Communities that work toward social stability as part of environmental sustainability ought to reduce the extent of social dislocation and diminish the costs of dislocation.

Goals

- Increase citizen awareness of public laws and policies and encourage citizen participation.
- Increase neighborhood interaction, develop the “sense” of neighborhood and improve community relationship.
- Reduce discrimination, harassment or assaults based upon racial, ethnic or other attributes typically associated with biased behavior.

- Enhance physical safety and a sense of a secure community of all members and encourage the prevention of violence.
- Encourage community-based life-long learning for an enhanced quality of life.
- Increase and maintain community resources, which support basic human needs while encouraging self-sufficiency.

4.3. Developing goals for Thuong Dinh industrial zone development

Based on analysis and desire to revitalize Thuong Dinh industrial zone presented above, In the case of ***Thuong Dinh industrial zone***, the three sustainability-related dimensions are developed as follows:

4.3.1. The economy

The following goals regarding economic development should be set for Thuong Dinh industrial zone:

- Maintain the leading position of Thuong Dinh industrial zone in terms of economic out-put
- Promote the increase of economic efficiency of enterprises by means of efficient resource uses, technological innovations, etc.
- Establish an efficient industrial land use plan that maximizes the economic benefits as well as contributes to attracting other enterprises.

4.3.2. The Society, Culture

- Increase the awareness of the inhabitants towards industrial development and its associated issues,
- Promote the participation of citizens in the decision-making process on some issues of Thuong Dinh industrial zone such as land use planning,
- Provide educations on professional skills to the residents so as to provide skilled labor for the industrial estate. This also helps to partly solve the un-employment problem,

4.3.3. The environment

Environmental pollution from industries is now the most serious problem of Thuong Dinh industrial zone. The following goals related to environmental protection should be considered.

- Using legislation as a tool to force enterprises to comply with regulations regarding pollutants discharge,
- Promote enterprises in the zone to use resources efficiently so as to maximize economic benefits as well as to reduce the discharge,
- Create an information network and provide education about environmentally friendly technologies, environmental management systems for enterprises in the zone,

3.4. Conclusion

The concept "Sustainable development" in general and goals for sustainable growth for Hanoi city given by the People's Committee of Hanoi offer the guidelines for a sustainable framework that stresses the redevelopment of Thuong Dinh industrial zone. Its steps can stand as the principles for a new sustainable planning process that systematically would include the redevelopment as one of its targeted goals.

Chapter 5: Analysis of redevelopment efforts

There are available spatial planning instruments such as Plans, Policy documents, Directives, Exemptions, Approval, and Permits in Planning system in Vietnam. The number of current administrative levels where spatial planning decisions take place are 3 levels. Those are national level, provincial level, and Local level. In the case study – Thuong Dinh industrial zone, is the local level. There have been many measures and projects given to revitalize the zone after “economic innovation” in the 1990s of the country. The following chapter will review of the existing conditions, measures, and projects impacting Thuong Dinh industrial zone redevelopment. The first few sections review the state programs aimed at facilitating the redevelopment and how were those programs working? The next sections define the reasons why existing measures and projects are inefficiency. The last section concludes with a summary what can be used to solve problems to the next chapter.

5.1. Existing Measures and Projects made so far

The People's committee of Hanoi and its agencies along with the government agencies have developed a series of programs and projects related to redeveloping Thuong Dinh industrial zone from the 1990s. This section reviews the major of these measures and projects based on their impact magnitude on the process of redevelopment as assessed by this report's view of sustainability, which will be explained in a later chapter.

5.1.1. Improve the internal road systems of Thuong Dinh

Improvement of the internal road systems of Thuong Dinh was carried out by the Department of Transport and Public works and Truong Son Construction Company, a company belongs to the Ministry of Defense under the approval of the People Committee of Hanoi. The following objectives were set for this project:

- Upgrade all existing road systems;
- Establish new roads to meet the increasing transport demand in the zone. The total area for new roads was 14.2 ha

This project was sponsored by the Government and the estimated cost was 1200 billions Dong (approx 80 millions US Dollar) (PCOH. 2003). The assigned period for the project was 1996-2000

Until now, the project has not been finished due to many difficulties it has encountered which led to the adjustment of the plan. The following difficulties were reported (TUPWS. 2004):

- Removing the planned dwellings for the construction of new roads has not finished due to difficulty in negotiating the compensations;
- The real cost of the project exceed considerably the estimated one;
- Lack of participation of involved stakeholders to complete the rests of the project, such as assistance for the removal of some buildings locate in the areas of construction, financial support for the completion of the project

Currently, the road systems still have not met the transport demands, especially the transport demands in the zone. Traffic congestion usually occurs in rush hours (also see figure 8, appendix 10) (PCOH. 2003 & Ho, N. C. 2004).

5.1.2. Surface waters clean-up and dredging programs

In 2000, under the approval of the People Committee of Hanoi, the Hanoi Urban environment company executed dredging and cleaning up programs for To Lich River and other artificial surface waters systems to reduce the extent of pollution caused by inappropriate wastes discharge (PCOH. 1999). These programs were carried out in a period

of 2 years (2000-2002). Funding for the programs was provided by the World Bank as a loan.

Until now, only the dredging of To Lich River has been completed. The quality of other surface waters systems, however, has not yet been improved. It is noticeable that the area planned for surface waters like lakes, pools have been being occupied for domestic purposes. (CEETIA. 1996)

5.1.3. Improve the drainage system for Thuong Dinh industrial zone

This project was executed by the Hanoi Water supply and Drainage Company in 1998. The project aimed at improving the drainage systems for some areas in Thuong Dinh industrial zone. The estimated total investment cost was approximately 8 millions US dollar and this cost was shared between the government and local residents. The government covers cost of constructions of main drainage pipes while local residents and enterprises in the zone cover the construction costs of sub-drainage pipes for their places connected to the main pipes. Currently, the project has not yet been finished due to the overlaps in constructions of different items, for instance, drainage pipes construction. Besides, inefficient cooperation between the company responsible for this project and local residents, factories, enterprises in the zone is also a reason that hampers the completion of the project. (POCH. 2002 & CEETIA. 1996)

5.1.4. Improve and upgrade the quality of green and public areas programs

These programs have been carried out by a company belongs to the Department of Science, Technology and Environment. The objectives were to enlarge the green areas for local residents, to minimize the negative impacts caused by pollution by industrial activities and transport. However, the efficiency of these programs was still limited. The total area for trees and public activities is still too small compared to that mentioned in Vietnamese construction standards. (CEETIA, 1996)

5.1.5. Thuong Dinh public transport (TDPT)

In an effort to reduce the quantity of private transport means, to minimize air pollution caused by transport, and to prevent traffic congestion, the Department of Transport and Public Works, with the approval of the People Committee of Hanoi, started to establish specific roads for buses. The investment cost was covered by this Department. However, due to financial constraints, some bus routes were already cut-off. There are worries that the whole project will be cancelled unless there are financial support from the government and willingness of local residents to use public transport in the zone (PCOH. 2004).

5.2. The Inefficiency of the Existing spatial planning instruments

With the efforts to revitalize for Thuong Dinh industrial zone, a variety of state programs have been given to solve those issue as discussed above. Studying the statistics of the operating industrial facilities, the potential polluters and the old industrial sites, clearly reveals that these efforts where inefficient in redeveloping the old industrial zone numbers in a satisfying manner consistent with the required levels of sustainability.

It was this research conclusion that the causes for the inefficiency of spatial planning instruments can be traced back to the following reasons.

5.2.1. Liability issues

Several authorities on the city and local level are dealing or affecting the existing industrial zones redevelopment with one magnitude or another. Each of these authorities has its own set of rules and regulations that in their contents do not only overlap but, in many cases, also conflict, leaving a tangled bureaucratic mess, that holds the developer unwilling to participate or causing them to rise their price tag caused by time loss. An example of

conflicting authorities is the re-opener. Although a developer can be granted a letter of satisfaction clearing him from the environmental liability after a existing redevelopment issued by the government of the city, the PCOH can reopen the site investigation during construction or even after project completion that can put the project and the developer in a financial dilemma. The uncertainty of the developing process and the increase in the financial risk is a clear obstacle and a drawback for which this research will suggest ways to resolve.

5.2.2. Lack of focused authority

There is a lack of a unique authority responsible for industrial areas-related development. Each aspect of industrial areas development or revitalization is managed by separated authorities or departments. It is the poor cooperation between involved stakeholders that makes the process of problems solving for industry-related issues inefficient. There is actually a need for a focused authority responsible for industrial areas development. Such an one organization should have the focused authority to modify and to take the initiative adjustment in local land use plans and projects to the areas with the most contaminated sites, zoning, permits, and work to enhance other state agencies or departments projected plans to the purpose of facilitating the redevelopment of existing industrial zone, and stimulate the private sector investments in the process along with optimizing the use of budget.

5.2.3. Lack of participation of involved stakeholders in Spatial planning decision making process

Insufficient participation of the involved stakeholders in the planning process as well as the decision making process is a common shortcoming in developing countries. Like other developing countries, planning as well as decision making is rather process centralized. The government plays a major role in making the final decision on the solutions given by accredited planners. Planners are central actors during the whole planning process, from problems definition to solutions formation. Other stakeholders within the political context of planners are not involved in the planning process. This weakens the efficiency of the planning process.

The case of Thuong Dinh industrial zone is an outstanding example of the weakened planning process. Opinions from local residents and companies about spatial planning for an industrial site close to residential areas are ignored. Inappropriate spatial planning instruments leading to lack of a agreement of residents and enterprises in industrial sites caused a chaotic existence of residential areas factories, and companies inside the zone (figure 4). Furthermore, as the size of the industrial area continues to expand, there are difficulties in acquiring land legally granted to local residents. The main difficulty is the disagreement about compensation for acquiring land that belongs to the local residents.

5.2.4. Lack of public awareness

Pre-existing industrial zones are often located in areas where existing low-income residents are living within and in the surroundings. These residents have little or no participation in the decision-making mechanism. Awareness of the residents about the danger caused by within and surrounding industrial zones is usually non-existent due to many reasons, but mostly due to the low education levels. The lack of awareness and participation of the affected citizens in the redevelopment issue is a major deficiency to achieve the sustainability goals. The effective participation of a well informed resident is an essential value for the success of the suggested measures laid down by this research.

5.2.5. Enforcement problems

The laws and regulations concerning spatial planning and environmental protection in Vietnam are still in the process of being supplemented and perfected. Thus, there is a variety of problems in putting them into effect, especially with regards to enforcement.

First of all, that is the general low consciousness of people in complying with laws and regulation in Vietnam. With respect to industrial activities, legally regulated administrative penalty is too low and rarely collected.

Second, that is the problem of moral hazard as mentioned above. The “command and control” does not seem to be effective in the case of Vietnam’s industrial in general and in Hanoi’s industries in particular: The command made by the state tends to tolerate or wink at SOEs’ behavior. Then, the environmental impact assessment (EIA) has been neither fully compulsory nor enforced, thus enterprises are not forced to submit their EIA along with compensation after emissions, also meaning no actual penalty at all.

5.2.6. Financial problems

Due to the existence of the conflicts between different authorities in making plans for the improvement of Thuong Dinh industrial zone, there are a lot of difficulties in attracting funds from the government and from the other investors. Particularly, the Vietnamese government cannot afford to give financial supports for many small and overlap projects in the zone. They just want to focus on the big project with concrete plan of actions.

5.2.7. The unbalance between environmental, economic and social, cultural aspects in the plans

Up to now, many authorities have had power to decide the issues related to the industrial zone, i.e., each authority gets control either a part of the zone or one among many aspects (environmental, economic, social or cultural). To create the balance between all of mentioned aspects and to solve the potential conflicts between enterprises in the zone before carrying out important projects in the area, agreements among involved authorities are required. These requirements are however still far to be obtained in Thuong Dinh industrial zone.

5.3. Conclusion

The Analysis of past redevelopment efforts discovers that the existing measures and plans aimed to the revitalization of Thuong Dinh industrial zone are inefficiency. It is a handicap in achieving the desired goals.

Of all the reasons for the in-efficiency of the existing projects and plans, the lack of a focused authority responsible for the re-development of the whole Thuong Dinh industrial zone appears to be the most important reason. Providing that such a designated authority exists with sufficient power and instruments, the reasons such as enforcement, financial problems, lack of participation, etc., will probably be solved. Besides, that authority should also develop a policy approach guiding the re-development of Thuong Dinh industrial zone. Such policy approach should be in harmonization with the sustainable development goals for Thuong Dinh industrial zone presented in chapter 4. The next chapter, chapter 6, presents the related knowledge about “Industrial Ecology” which, later, is suggested to be used as a guideline for the re-development of Thuong Dinh industrial zone.

Chapter 6: Examining a new spatial planning approach

6.1. Introduction

In previous chapter, we reviewed the existing measures and projects have made so far to revitalize Thuong Dinh industrial zone in Hanoi city, evaluated the existing measures and projects and identified the weaknesses of the current spatial planning instruments. In short and in logical order, the needed enhancements to overcome those weaknesses, a new policy approach is necessary to formulate are as follows:

- Establish a new organization with focused and enough authorities to achieve a unified goals of redevelopment;
- Using the Sandwich Strategy as a guide to the making of environmental policy plans;
- Using the Industrial ecology and Eco-Industrial Packs as a design tool to facilitate the redevelopment;

In this section, new potential measures are presented to facilitate those enhancements.

6.2. The Authority

State government has an important role to play in old industrial sites revitalization. In many respects, they are the innovators. Old industrial sites redevelopment success stories, typically are found in areas that have adopted their own site characterization and reuse tools, and creatively built on the foundation provided by a variety of programs and policies. The state and local jurisdictions have to craft innovative mechanisms to help businesses and communities establish finance programs that ease the cost or term of borrowing, fill funding gaps that the private sector will not bridge, or adapt environmental cleanup programs to the special needs of contaminated sites.

The desired achievements can be accomplished by integration between the planning process and its sub-systems through a dedicated authority initiated by the state government (Nguyen. Q. T, 2004). That organization should focus on old industrial sites redevelopment as one of its main targets. In the case of Thuong Dinh industrial zone, such an organization can be called Thuong Dinh industrial zone commission (TDIZC). The TDIZC will be created with the assistance of the state agencies and must be given enough authorities to achieve its goals. The commission will be facilitated by the state government with the following functions:

- Establish Thuong Dinh existing industrial zone redevelopment benchmark,
- Create and maintain databases for the existing and potential Thuong Dinh industrial zone;
- Use innovative tools to assess and evaluate the collected data;
- Review the developments projects proposed by different state agencies and have the authority to recommend and in certain cases mandate alteration to such projects;
- Directing state funds according to its prioritized goals set by its benchmarks;
- Have the authority to propose new policies and measures to facilitate reaching its set goals;
- Have the authority to grant economic incentives to developers to encourage the private sectors involvement.

The TDIZC will operate according to the following philosophies (Nguyen. Q. T, 2004):

- There is no single “one-size-fits-all” model for planning for the old industrial sites redevelopments.
- The state agencies are increasingly shaping their statutes to address problems that were unique to their circumstances. Consequently, planning for old industrial sites redevelopments have to be drafted to give users alternative ways of approaching redevelopment issues, be it planning that is permissive, encouraged with incentives, required with sanctions, or completely integrated.
- Old industrial sites redevelopment should provide for planning that goes beyond the shaping and guidance of physical development.
- State agencies and local governments are engaging in a broader type of planning that expressly deals with social and economic issues. For example, developing plans to address job creation, natural disasters and hazards, education, government efficiency, and public safety.
- Old industrial sites redevelopment should build on the strings of existing organizations that undertake and implement planning, and not create new planning organizations.
- Planning statute reform should not look just at regulation but also at the provision of infrastructure and property taxation.
- Old industrial sites redevelopment should account for the intergovernmental dimension of planning and development control.

The previous statement of philosophy acknowledges that planning and development decisions are affected by and affect a variety of government units. The planning system must therefore contain mechanisms to ensure that plans and policies that have intergovernmental consequences are reviewed and assessed in a manner that addresses their multi-jurisdictional impacts.

- Old industrial sites redevelopment should expressly provide for citizen involvement.

The operation of the TDIZC under its philosophy statements would improve the integration between the planning process and its sub-systems resolve the authority overlap and efficiently utilize the available measures and funds towards a smarted redevelopment. The TDIZC can allow a better public participation in the decision-making mechanism, as we will discuss later.

6.3. The Sandwich Strategy as a guide to the making of environmental policy plans

The Sandwich Strategy is a concept that was developed by Sybrand Tjallingii in 1996. Tjallingii provided a scientific foundation for guiding the making of environmental policy plans at different levels. The strategy emerged from an analysis of problems and opportunities for the water, energy, waste and traffic flows (Tjallingii, S. 1996). Applying to make environmental policy plans, the participation of involved stakeholders in spatial planning decision-making process in Thuong Dinh industrial zone is required. In the context of Hanoi city, this strategic guiding model is illustrated in the figure 6 below.

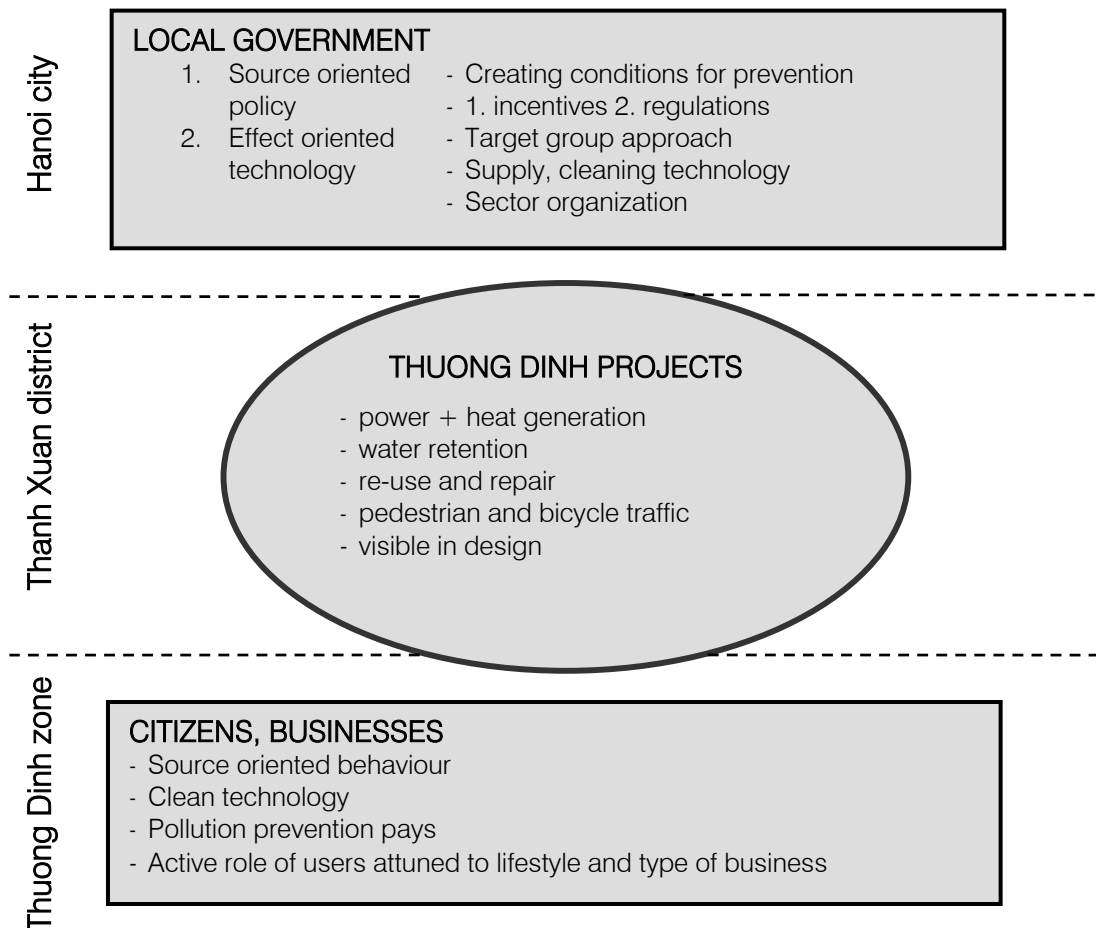


Figure 6: The Sandwich Strategy
(Adapted from Tjallingii, S. 1996)

The top layer

The primary task of the top layer, local government, representing the municipal and higher authorities is to create technical, economic and organizational conditions for prevention and other source-directed measures. In an active target group policy, incentives, regulations, and physical conditions must be created which fit the different lifestyles and types of business in Thuong Dinh industrial zone. Supply and discharge facilities only follow as a second task, to be organized in a way that enhances the performance of the first task².

The basic layer

Under the influence of this policy, the basic layer of individual citizens and enterprises in the zone develops behaviour and suitable measures for saving water, energy and resources, for the separation of waster and for environmentally sound mobility.

Sometimes old and tested techniques, such as the bicycle, should be given a fresh chance, sometimes new techniques such as photo-voltaic cells and telematics are appropriate.

² This is not only a master of roads and rules to be created by the central government. In a discussion of the Sandwich Strategy, Ter Heide Berends (1994, p. 122) emphasize the need to create conditions for solving dilemmas resulting from conflicting responsibilities. They use the example of school children being brought to school by car for safety reasons. By creating safe routes to school, the local authority may also create conditions for reducing car-use and, in so doing, enhance safety even more.

The intermediate layer

The intermediate layer is the area for initiatives at the neighbourhood, city and regional levels of the scale. Many projects can be realized here, for example in the fields of wind-energy production, district heating with combined power and heat production, rainwater retention, return and secondhand shops, and attractive and safe cycle routes. This is where ecologically sound urban development is given its spatial and visible shape.

6.4. Designing Eco – Industrial Parks

The next century will give rise to a new kind of industrial development that uses resources dramatically more effectively and refines the manufacturing economy (Rosenthal, E. C. 1995). Current trends in sustainable development and business management and business management are converging on a new model of industrial operation exemplified by the discussion of Eco – Industrial Parks (EIPs) in the United States and Canada.

At its core, an EIPs simultaneously increases business success while reducing pollution and waste. Rooted in the emerging discipline of industrial ecology, an EIP mirrors natural systems. As single organisms can be view alone or in larger ecology, single enterprises can organize themselves in more complex business ecologies. When we refer to EIPs it is more than a share plot of land. By moving to higher levels of interdependent organization quantum level improvements can be realized in resiliency, flexibility and resource conservation. This pay off for the business and environment. Why is this concept so appealing? Inherently the challenge of reconciling the demands for business and environmental excellence is a strong attraction. There are many elements of EIP activities that have already proven themselves. Table 4 lists some of the potential benefits to communities, the environment, and businesses). It is common for two companies and even more to develop mutually advantageous relationships where the waste products of one company forms a valued input product for another. For example, one Nestles plant in New York State turned toxic chocolate oil into an input for cosmetic manufacture (Rosenthal, E. C. 1995).

EIP proponents suggest that these connections can be more prevalent, purposeful and expansive. Networked manufacturing has proven a success where a common connection increases market responsiveness and reduces overhead and cost. The notions of “lean and clean” have documented that smart environmental and energy policies can lead to significant advantages (Romm, J. 1994). EIP advocates contend that an intelligent mixture of these manufacturing policies combined with favorable regulatory and community support mechanisms should be formula for success.

Communities	Environment	Business
Expanded local business opportunities	Continuous environmental improvement	Higher profitability
Larger tax base	Better resource use	Enhanced market image
Community pride	Reduced waste	High performance workplaces
Reduced waste disposal costs	Innovative environmental solutions	Improved environmental efficiency
Improved environmental health	Increased protection of natural ecosystems	Access to financing
Recruitment of higher quality companies	More efficient use of natural resources	Regulatory flexibility
Improved health for employees and community		Higher value for developers
Improved environment and habitat		Reduction of operating costs

habitat		(energy, materials and water)
Partnership with businesses		Reduction in disposal costs
Minimise impact on infrastructure		Income from sale of byproducts
Improved tax base		Reduction of environmental liability
Enhanced quality of life in areas near eco-industrial development		Improved public image
Improved aesthetics		Increased employee productivity
Good jobs		

Table 4: Potential benefits of Eco-Industrial development
(Edward. C. R. 1999)

<p>Quality of Life/ Community Connections Integrating Work and Recreation Cooperative Education opportunities Volunteer and Community Programs Involvement in Regional Planning</p>	<p>Information/Communication Systems Internal Communications External Information Exchange Monitoring Systems Computer Compatibility Joint Management Information System for Park Management</p>
<p>Materials Common Buying Customer/Supplier Relations By-product Connections Creating New material markets</p>	<p>Marketing Green labeling Accessing Green markets Joint Promotion (e.g. advertising, trade shows) Joint Ventures Recruiting New Value-Added Companies</p>
<p>Transportation Shared Commuting Shared Shipping Common Vehicle maintenance Alternative Packaging Intra-park transportation Integrated Logistics</p>	<p>Production Process Pollution Prevention Scrap Reduction and Reuse Production Design Common Subcontractors Common Equipment Technology Sharing and Integration</p>
<p>Environment, Health & Safety Accident Prevention Emergency Response Waster Minimization Multi-media Planning Design for Environment Shared Environmental Information Systems Joint Regulatory permitting</p>	<p>Human Resources Human Resources Recruiting Joint Benefits Packages Wellness programs Common Needs (payroll, maintenance, security) Training Flexible Employee Assignments</p>
<p>Energy Green Buildings Energy Auditing Cogeneration Spin-off Energy Firms Alternative Fuels</p>	

Table 5: Potential Areas of Eco – Industrial networking
(Edward, C. R & T. McGalliard. 1996)

6.4.1. What is an Eco - Industrial Park?

The concept of Eco-Industrial Parks tries to mirror-in an industrial context-the inter-linkages and material / substance flows observed between organisms in natural ecosystems.

There are different definitions describing EIPs and similar structure, distinguished by the level of geographic concentration and field / complexity of co-operation:

Eco-Industrial Park “...a community of manufacturing and service businesses seeking enhanced environmental and economic performance through collaboration in managing environmental and resource issues including energy, water, and materials. By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realize if it optimized its individual performance only” (Lowe, E. A. 1998).

Use of the term Eco-Industrial Park usually encompasses geographic co-location of the collaborating companies (compare “virtual Eco-Industrial Park”). Thus, the main differences between Eco-Industrial Parks and “usual” industrial parks are:

- Enhanced co-operation / exchange between companies, park management and local / region decision makers.
- These actors’ common striving towards a vision of industrial activities which are of utmost sustainability in terms of economic, ecological and social aspects.

The understanding of how companies in Eco-Industrial Parks should interact as well as the resulting strategies cover a wide range of features. While some authors merely refer to connecting material and energy flow, others go far beyond that, addressing e.g. integration into the surroundings, construction technologies and the management. Others additionally include the social factor, pointing out the fact that “valuing natural resources means also valuing human resources” (Côté, R. P et al. 1998), thus arguing in line with the three components of sustainability outlined in the Agenda 21 – the economic, ecological, and social components. (Anja, K.F. 2000)

6.5.4. Eco-Industrial Parks and Thuong Dinh industrial zone redevelopment

The planning process can use the principle of EIPs in two diminutions:

As a redevelopment tool:

EIPs on old industrial sites as an appealing redevelopment option for Thuong Dinh industrial zone because they often offer industry proximity to existing industrial centers and access to transportation. At the same token EIPs offer the community sustainability, economic growth, and lower environmental impact than traditional industry (see table 4, 5). EIPs are likely candidates for many redeveloped properties.

As a prevention tool

EIPs in principle regulate the operations of its industrial enterprises to higher standards of sustainable sensitivity. This mechanism will prevent the creation of old industrial sites on the long run if proper and periodic evaluation of the environmental impact old an industry is performed and corrective measures are enforced.

The EIP - A menu of opportunities of Thuong Dinh industrial zone

- Integration into Natural System
- Energy system
- Materials Flows and “Waste” management for the Whole Site
- Water flows
- Park management and Support services

- Construction and Rehabilitation
- Integration into the host community

6.5.5. Lessons from the Industrial Symbiosis at Kalundborg, Denmark

a) Introduction

One of the favorite cases presented by industrial ecologists is the story of the spontaneous but slow evolution of the “industrial symbiosis” at Kalundborg, Denmark³. This web of materials and energy exchanges among companies and with the community has developed over the last 25 years in a small industrial zone on the coast, 75 miles west of Copenhagen. Originally, the motivation behind most of the exchanges was to reduce costs by seeking income-producing uses for “waste products. The last numbers from Kalundborg indicate that the firms have saved \$ 160 Million to date (\$ 15 Million in annual savings) as return on total investments of \$75 Million. (Noel Brings Jacobsen, Symbiosis Institute. Personal communication in January 2001). Gradually, the managers and town residents realized their transactions were generating significant environmental benefits as well.

The Kalundborg system now includes six core partners:

- Asnaes Power Station-Denmark’s largest power station, coal-fired, 1,500 megawatts capacity;
- STATOIL Refinery-Denmark’s largest, with a capacity of 3.2 million tons/yr (increasing to 4.8 million tons/yr);
- Gyproc-a plasterboard factory, making 14 million square meters of gypsum wallboard annually (roughly enough to build all the houses in 6 towns the size of Kalundborg);
- Novo-Nordisk-an international biotechnological company, with annual sales over \$2 billion. The plant at Kalundborg is their largest, and produces pharmaceuticals (including 40% of the world’s supply of insulin) and industrial enzymes;
- A-S Bioteknisk Jordrens, a soil remediation company (a new addition in the late 90s);
- The City of Kalundborg-supplies district heating to the 20,000 residents, as well as water to the homes and industries.

Over the last two and a half decade, these partners spontaneously developed a series of bilateral exchanges, which also include a number of other companies. There was no initial planning of the overall network; it simply evolved as a collection of one-to-one deals that made economic sense for the pairs of participants in each. This suggests that EIP teams seeking to recruit companies to form a similar by product exchange network must not over-plan. Conceive a strategy, that respects current market forces, and then use industrial databases and information networks to let companies know what you have to offer.

We illustrate the gradual development of the symbiosis in Figure 10, 11, and 12 in Appendix 11, showing the extent of the material and energy exchanges in 1975, 1985, and 1995, respectively. (Ernest, A.L. 2001)

³ “Industrial symbiosis. A cooperation between different industries by which the presence of each increases the viability/profitability of the other(s), and by which the demands of society for resource savings and environmental protection are considered. Symbiosis is the living together of dissimilar organisms in any of various mutually beneficial relationships. Here the term is used to mean industrial cooperation with mutual utilization of residual products.” From *Industrial Symbiosis*, a publication of the Kalundborg companies. No date.

The beginning of the Kalundborg Symbiosis

The symbiosis started when Gyproc located its facility in Kalundborg to take advantage of the butane gas available from Statoil (which enabled the refinery to stop flaring this gas). Today, Gyproc is still the only company to have located there to take advantage of an available supply.

Ten years later

As illustrated in the next chart, the second by product flow from the pharmaceutical plant to farms, became the largest single exchange. Novo Nordisk provides without charge 1.1 million tons/year of sludge (containing nitrogen and phosphorus) to about 1,000 farms. This began in 1976, four years after the Statoil – Gyproc contract. This was the least cost solution after the Danish government prohibited dumping of this material into the sea.

Another three years passed before Asnaes began to supply fly ash to the Aalborg Portland cement company, the first contract involving a company not even in Kalundborg. Finally, in 1981-82, more exchanges developed: Asnaes began supplying steam to the city, to Statoil, and to Novo Nordisk. Hence, the first decade encompassed the evolution from one contract to the beginnings of the real “food web” with each of the three largest companies involved in two or more separate contracts. (Ernest, A.L. 2001)

Ten years later, the web had developed further

Between 1985 and 2000 the Symbiosis at Kalundborg became even richer in its flows of by-products.

- 1987 Statoil pipes cooling water to Asnaes for use as raw boiler feed water
- 1989 Fish production begins at Asnaes site using waste heat in salt cooling water
- 1990 Statoil sells molten sulfur to Kemira in Juland (ends 1992)
- 1991 Statoil sends treated waste water to Asnaes for utility use
- 1992 Statoil sends desulfurized waste gas to Asnaes; begins to use by-product to produce liquid fertilizer
- 1993 Asnaes completes flue gas desulfurization project and supplies gypsum to Gyproc
- 1995 Asnaes constructs reuse basin to capture water flows for internal use and to reduce dependency on Lake Tisso
- 1997 Asnaes switches half of capacity from coal to orimulsion; begins sending out fly ash for recovery of vanadium and nickel
- 1999 A/S Bioteknisk Jordens uses sewage sludge from the Municipality of Kalundborg as a bioremediation nutrient for contaminated soil

Around 1990 high school students charted the network of exchanges and for the first time the plant managers saw what they have unwittingly created. (Ernest, A.L. 2001)

b) Lessons from Kalundborg

What can be learned from the Danes' experience over the past two decades? Here are some comments from those directly involved:

- All contracts have been negotiated on a bilateral basis;
- Each contract has resulted from the conclusion by both companies involved that the project would be economically attractive. It made, in other words, good business sense to do it.
- Opportunities not within a company's core business, no matter how environmentally attractive, have not been acted upon.
- Each partner does its best to ensure that risks are minimized.

- Each company evaluates their own deals independently; there is no system-wide evaluation of performance, and they all seem to feel this would be difficult to achieve.

Without a conscious intent at the beginning to develop an industrial ecosystem, a very effective, and environmentally beneficial symbiosis among half a dozen companies has evolved, albeit slowly.

Jorgen Christensen, Vice president of Novo Nordisk at Kalundborg, identifies several conditions that are desirable for a similar web of exchanges to develop:

- Industries must be different and yet must fit each other.
- Arrangements must be commercially sound and profitable.
- Development must be voluntary, in close collaboration with regulatory agencies.
- A short physical distance between the partners is necessary for economy of transportation (many transfers are not economically or technically feasible over long distances).
- At Kalundborg, the managers at different plants all know each other. (This was a big help but may not be absolutely necessary at other locations.)

c) Applying these lessons

Industry Match

One of the important factors contributing to the success of the Kalundborg symbiosis has been the match between industries in terms of industrial inputs and outputs. Since the five majors enterprises in the zone are different industries which result in different requirements of inputs and by-products, possibilities for exchanging products are therefore, enhanced. Opportunities to create a symbiotic relationship might be more limited if the companies involved are in the same type of industry, requiring similar inputs and producing similar by-products. As in nature, diversity seems to have its advantages, providing both stability and resilience. (However, in some cases plants in the same industry might be able to cascade materials through firms needing different levels of quality, i.e. plastics.)

Size Match

Besides industry match, size match between enterprises is also essential for the success of industrial symbiosis. The companies in Kalundborg are compatible in terms of material flows. Thus, single agreement between 2 companies to utilize a significant proportion of the by-products from the supplier and to meet a large proportion of the demand on the part of buyer is achievable. Where large size differences exist between enterprises, the complexity of the agreements may increase.

Furthermore, in an E.I.P, it is necessary to have a party acting as a broker. This party can be the park management company or an off-site broker. Such a broker is responsible for collecting by-products which are not suitable for exchange such as scrap metals, fly ash. . If internal supply and demand are mismatched, the broker can go outside of the bounds of the EIP to find other sources or customers for suitable materials. We observe that several companies in Kalundborg have successfully found distant customers for some of their available by-products: Asnaes, fly ash; Statoil, sulfur; Novo Nordisk, sludge.

Close physical distance

Close physical distance is one of the important elements contributing to the economic benefits of the exchange network. As distance between plants increases, the transaction costs increase. Where the exchanges include transfers by pipeline, the capital costs of construction increase; where they involve trucks, or other wheeled transport, the initial costs are reduced; but operating costs become more important when concerning the

environmental consequences of noise, dust, traffic and fuel usage. When exchanging heat in the form of steam or hot water, distance proximity is extremely important in minimizing transmission losses

There is no single answer to the question of how close is close enough, as the answer involves a complex analysis of the site specific characteristics of the individual transactions. The following questions should be addressed by the parties to the proposed transaction:

- What material or energy flow is involved?
- What is the cost of obtaining existing or alternative materials or energy?
- What material disposal costs could be eliminated or reduced by finding a willing user, even if you have to pay them to take the material?
- Do you need to change corporate financial or tax factors that tend to block capital spending to reduce operating costs? (Changes in equipment or new infrastructure may be required to supply or use by-products.)

Close mental distance

Agreements between companies are crucial in establishing an exchange network. In discussing the conditions that enabled the Kalundborg symbiosis, Jorgen Christensen of Novo Nordisk stresses the importance of what he calls the “close mental distance”. There exists a commonality of mind among the leaders of the local companies and the city of Kalundborg. The city is small, with a population of about 20,000, surrounded by a farming region, and at some distance from other urban centers. All the managers in this small city have, more or less, a relatively close relation. For example, they are of about the same age, having children of similar age attending the same schools, members of the same clubs and attend the same churches. The symbiosis among their companies thus grew out of personal relationships of shared values, understanding, and trust.

From the case of Kalundborg symbiosis, it can be concluded that close interaction at all levels in the companies can be an important ingredient of success. The Danes found that good, trust-based communication at senior levels is essential to establishing the exchanges, close interaction among employees at all levels is essential for optimal implementation.

Regulations create financial incentives

The successful story of industrial symbiosis shows two important aspects about the contribution of the government. The first one is that the government can be very effective forcing industries to recognize and pay some of the so-called societal or “externality” costs associated with their products. The second one is that the proper role of the government is to establish requirements and goals, but not to specify how to meet them

Regarding the first aspect, the government first restricted emissions of certain materials, such as sludge, to the fjord and sulfur dioxide to the air. Second, they banned certain practices, e.g., discharging hot water “thermal pollution” to the fjord. And third, they compelled certain industries to do specific things, but then provided subsidies to help defray some of the costs, e.g. the district heating program for Kalundborg.

Although the government has established requirements, they did not specify technological solutions to meet these requirements. Thus, companies have to be very creative in finding effective, economically feasible solutions. Once these externalities became costs to the firm, they were quick to find ways of lowering costs. In many cases the solutions have had unanticipated side-benefits that increased profits, or reduced total resource utilization.

The mandated reduction in allowable level of SO₂ emissions is but one example. Asnaes Power Plant was able to find a scrubber technology that produced commercial-grade

gypsum as a by-product. Sale of the gypsum to Gyproc resulted in a reduced demand for imported mineral gypsum, thereby lowering Gyproc's costs while improving the Danish balance of trade. This success required extensive collaboration between Asnaes and Gyproc and others, such as the scrubber manufacturer.

But, where the government has stipulated the specific implementation for the companies to follow, the results have been much less successful. Asnaes was required by the government to initiate a fish-farming operation as a way to consume excess sludge. The operation was a money-loser until the government permitted sale of the fish-farm to an independent operator who has converted it into a profitable venture. (Fish farming just didn't "fit" into Asnaes' kind of business.) The government also was in favor of greenhouse operations, but these plans were finally abandoned after growers elsewhere in the country complained of unfair competition; the greenhouses in Kalundborg would have enjoyed especially low heating costs, and the government was not willing to subsidize all the other growers enough to compensate them for their potential losses.

Negotiations at a Local level are more effective

The companies at Kalundborg, most of which are branch operations with headquarters elsewhere (Statoil is a Norwegian firm, and Gyproc is now owned by a British company) have found that the successful exchanges making up the symbiosis have been negotiated at the local level. In many cases, the success of the negotiations has depended on knowledge of the local situation that was not available to staff at corporate headquarters.

6.5.6. The lessons for Thuong Dinh industrial zone

From the Kalundborg experience - the style of Eco-Industrial Parks, The following points should be learned for the case study to achieve goals for sustainable growth:

- Integrate traditionally disassociated land uses to increase the efficiency of energy and material use and reduce automobile dependence and urban sprawl,
- Exchanges materials and energy among companies and with the communities should be developed,
- Suggest that EIP teams seeking to recruit companies to form a similar by product exchange network must not over-plan,
- Use industrial databases and information networks to let companies know what they have to offer,
- Development must be voluntary, in close collaboration with regulatory agencies,
- The match between industries in terms of industrial inputs and outputs,
- The companies in the zone must be compatible in terms of material flows,
- In an EIP, it is necessary to have a party acting as a broker,
- Close physical distance should be concerned of the exchange network, (many transfers are not economically or technically feasible over long distances),
- Agreements between companies are crucial in establishing an exchange network,
- Close interaction at all levels in the companies can be an important ingredient of success,
- A good, trust-based communication at senior levels is essential to establishing the exchanges,
- Close interaction among employees at all levels is essential for optimal implementation,

- The government can be very effective forcing industries to recognize and pay some of the so-called societal or “externality” costs associated with their products,
- The proper role of the government is to establish requirements and goals,
- The successful exchanges making up the symbiosis have been negotiated at the local level,

6.6. Summary

In this chapter, a new option is examined and enhancement to the planning process is presented that can be summed up in the following terms:

- Decision-making framework: The creation of a new and dedicated authority (TDIZC);
- Making of environmental policy plans: Use of the guide from the Sandwich Strategy;
- Design and prevention tool: The use of Eco-Industrial Parks as a redevelopment and prevention option;
- Lessons for old industrial sites redevelopment: The analysis experiences of the Industrial Symbiosis at Kalundborg, Denmark.

Chapter 7: Conclusions, Recommendations, and implementation

7.1. Conclusions

Through data collection and analysis, it can be concluded that the spatial and environmental quality of Thuong Dinh industrial zone have degraded and the situation is getting worse unless adequate actions are to be taken. The degradation of spatial and environmental quality of the zone resulted from a chaotic allocation of enterprises and dwellings in the zone, in-appropriate handling of industrial wastes and the occupation of green areas for different purposes.

Although there have been measures, plans launched by various involved stakeholders to improve the spatial and environmental quality of the zone, their overall efficiency is still limited. The reasons for their inefficiency were as follows:

- Lack of participation of involved stakeholders in spatial planning decision making process
- Serious overlap in terms of liability among many stakeholders
- Lack of public awareness;
- Lack of compliance to environmental laws or regulations;
- Lack of financial support for efforts to improve the situation;
- Unbalance between environmental, economic, social and cultural aspects in measures and plan;
- Lack of a focused authority responsible for the whole re-development process;

Among the reasons, the lack of a focused authority responsible for the whole re-development process appears to be the most important reason led to the in-efficiency of current measures, plans. It is recognized that such a designated authority, with sufficient power and instruments is essential for: (1) calling for participation of different stakeholders in the re-developing process; (2) mobilizing the financial support from various sources; (3) solving liability and enforcement issues, etc. Moreover, it is also suggested that this authority create an integrated policy for the re-development of Thuong Dinh industrial zone.

It is essential to apply a strategy to mobilize the participation of all involved stakeholder in the re-development of Thuong Dinh industrial zone. The Sandwich Strategy developed by Tjallingii (1996) may be useful. This strategy includes three major stakeholders allocated three hierarchic layers and determines different tasks or each stakeholder. In the case of Thuong Dinh, the hierarchic stakeholders are the local government of Hanoi, the local government of Thanh Xuan district, the TDIZC, citizens, and enterprises within and surrounding Thuong Dinh zone.

Finally, it is obvious that the concepts of "industrial Ecology, Eco-industrial Parks" and their related knowledge can be used as a guideline to create an integrated policy guiding the re-development of Thuong Dinh industrial zone. In addition, lessons withdrawn from a good example of industrial symbiosis in Denmark such as close physical and mental distance, size and industry match, apparently, are useful for the re-development of Thuong Dinh.

7.2. Recommendations

In previous section, we showed the conclusions of the study after reviewing the available data about the old industrial sites redevelopment in Hanoi. In light of these conclusions, the following recommendation will be presented to the target groups of this study; The People's committee of Hanoi city. By means of these recommendations, the Main Research Question is answered.

7.2.1. For the specific existing industrial zone - Thuong Dinh

Based on the conclusions given in section 7.1, it is highly recommended that the State of Hanoi should establish a focused authority responsible for the whole re-development of Thuong Dinh industrial zone. Such an authority may be called "Thuong Dinh industrial zone commission". The following activities and functions should be associated.

- 1) The TDIZC is formed with the participation of all the involved stakeholders: Hanoi, Thanh Xuan government, companies and enterprises in the zone, and communities of Thuong Dinh, Thanh Xuan Trung, Ha Dinh, Nhan Chinh and non-Government organizations.
- 2) Collaborate with other state agencies to link cleanup measures and projects with the needs of the local planning for Thuong Dinh industrial zone.
- 3) The TDIZC could also be a center of the network of relations between Thuong Dinh industrial zone and other external industries, universities, research institutes.
- 4) Improve coordination between and among multiple levels of government (central, city, local) to enable an integrated approach to develop Thuong Dinh industrial zone as part of overall community revitalization efforts.
- 5) Develop a strategy to coalesce a unified state strategy consisting of all relevant state agencies to meet the challenge of revitalizing urban Hanoi.
- 6) Support and develop strategies to finance local cleanup, including direct funding, incentives, private sector investment, and innovative public financing.
- 7) Support community-based efforts to link old industrial sites projects to other redevelopment and community enhancement strategies such as "Empowerment Zones/Enterprise Communities, workforce development and job training, transportation infrastructure development, city facility cleanup, and other".
- 8) An education and communication should be created. Education and communication are an important part of successful planning and implementation of policies.

In order to steer the re-development of Thuong Dinh industrial zone to the way that is in harmonization with the set sustainable development goals presented in chapter 4, the TDIZC should consider the establishment of an integrated spatial policy for this zone. The TDIZC should refer to the concept "industrial Ecology" and its related knowledge as a guideline to create the integrated spatial policy for the zone. Furthermore, the following points should also be considered when making that spatial policy:

- 1) The primary task of Hanoi government is to create technical, economic and organization conditions for prevention and other source-directed measures.
- 2) In an active target group policy, incentives, regulations, and physical conditions must be created by Hanoi government, which fit the different lifestyles and types of business.
- 3) Under the influence of this policy, citizens and companies in the zone develop behaviour and suitable measures for saving water, energy and resources, for the separation of waste and for environmentally sound mobility.

- 4) Spatial aspects such as traffic system, water system, and more municipal services must be concerned with projects in the zone.
- 5) The establishment or design of projects should take into account the interests of the companies, communities and involve it in the design process;
- 6) Best solutions or relationships between participating firms to reduce the environmental impact or ecological footprint should be sought. Some possible solutions can be the substitution of toxic materials, material exchanges and integrated treatment of wastes;
- 7) Eco-parks should seek to maximize energy efficiency through facility design and construction, co-generation and cascading;
- 8) An eco-park should link or network companies with suppliers and customers in the wider community in which it is situated;
- 9) Continuously improving the environmental performance of participating industries through technological innovations or management ideas to reduce costs and enhance competitiveness should always be encouraged;
- 10) To attract industries to participate in the industrial community, it is necessary to have a regulatory system which permits some flexibility while encouraging companies to meet performance goals;
- 11) An information system which facilitates the flow of energy and materials within a more or less closed loop should be considered;
- 12) Economic benefits of an eco-industrial park should be clearly determined. It serves as a tool to attract companies or industries.

7.2.2. For the whole existing industrial zones in Hanoi city

- 1) Involve the impacted community in clarifying the environmental risk issues associated with old industrial sites, in developing a framework for understanding and addressing the public concerns as part of any redevelopment strategy; support right-to-know, enforcement and compliance activity in impacted communities.
- 2) Encourage and support the involvement of non-traditional stakeholder (such as community-based organizations) in government process, such as zoning issues.
- 3) Urge local governments to review their planning and land use review and permitting processes to address old industrial sites issues; offer assistance to local governments for incorporating public participation and accountability in formulating policies and plans and in local decision-making.
- 4) Assist local governments to identify and target environmentally sound industries and incorporate pollution prevention in old industrial sites redevelopment projects.
- 5) Work with local governments to promote community-based environmental protection.
- 6) Provide opportunities for communities to systematically engage state agencies in ways in which they can coordinate programs, pool resources, and tap into expertise.

7.2.3. Recommendations for further research

- 1) Making better-informed decision about Thuong Dinh redevelopment strategies and alternative proposals requires that planners have access to information that is applicable and accurate, and at the same time have the proper tools to analyze it and translate the results of such analysis to plans or proposal. Geographical

- Information System (GIS) is available tool to achieve this goal. The research should study the database sets necessary, the tools for data/information discovery and access and the capacity for customization. The outcome of the research should be the requirements for the system, which can be used by developers as the basis for creating such system and the analytical methods. It will have for data analysis and output customization.
- 2) At present, research on Thuong Dinh industrial zone is limited to analysis of the economic merits of the approach (i.e. promoting and encouraging trade, foreign investment, and economic growth). But industrial zone, because of proximity and concentration of industries, offer several environmental advantages. Research into the environmental benefits, measures required for the successful adoption of this approach, and case study of its successes and failures are needed to fill the information gap, and will be especially useful if governments hope take advantage of the benefits of this approach.
 - 3) The main aims of environmental education are being able to succeed in making individuals and communities understand the complex nature of natural and built environments resulting from the interaction of their biological, physical, social, economic, cultural aspects, and acquire the knowledge value, attitudes, and practical skills in a responsible and effective way in participating and solving environmental problems, and the management of the quality of the environment. Having an informed and aware population is important in dealing with a complex environmental problem where there is lack of ownership for problem that every people is responsible for. Sensitization then comes to play in achieving an informed and aware population. This can only be got through effective education and communication, which is needed in a situation where the awareness and participation of the various stakeholders is required. Education and communication then become an important working and policy instruments. The further research should develop the using of Education and Communication in the planning process.

7.3. Implementation strategy

Previous chapters concluded that old industrial zone revitalization can be a costly proposition. The complicated process and legal hurdles can be expensive in terms of expenses and fees, and costly in terms of time delays. Site evaluation process, testing, possible legal liabilities, and other factors often deter private-sector efforts to revitalize old industrial sites.

This section will discuss what should be done to solve existing conditions mentioned above.

7.3.1. Establish Thuong Dinh industrial zone commission

Thuong Dinh industrial zone commission (TDIZC) is the decision-making unit of our mechanism, it interacts with the different outside state agencies unifying their efforts and utilizing the strengths of their measures and projects. The TDIZC decisions are based on the environmental and socio economic analysis, which prioritize the agencies targets. The TDIZC also communicate its list with the different local and state planning agencies (land use, zoning, transportation, energy, etc...) to consider it within their process.

Before this strategy can be implemented or operational, a solid collective database for Thuong Dinh in Hanoi has to be established. Such a database should include (in short) socio-economic data for the areas within and surrounding the contaminated site, magnitude of contamination (some of this data is not currently available or not complete for all contaminated sites). The TDIZC will maintain this database and update it constantly. The data will be made available to the public, other agencies and to risk assessors.

The TDIZC performs an initial environmental and socio-economic analysis of Thuong Dinh zone. Goals for sustainable development for Hanoi are applied to the analyses and translated into required projects and measures, which are communicated as primary guidelines to be integrated with the various agencies anticipated. These initial analyses are done using the baseline database along with the input from the stakeholders.

The TDIZC at the same time communicates with the other state agencies and channel their measures and projects into the same process to ensure a unified vision and maximizing all agencies effort to using the available funds. Finally, using education and communication in the planning process, through education and communication stakeholders interact, share ideas and together take part in the solving of the problem they face.

7.3.2. Making Measures and Projects

The use of The Sandwich Strategy

Applying to make environmental policy plans, the participation of involved stakeholders in spatial planning decision-making process in Thuong Dinh industrial zone is required.

The use of Eco-Industrial Parks

Pre-existing industrial sites are located in inner city and thus cause community concerns about pollution and potential revitalization plans. Eco-industrial development is ideal for these conditions because it provides a forum for economic development planning that addresses the inner, neighborhood and environmental concerns of the site.

In addition, Eco-industrial development is a practical approach in developing a sustainable development strategy. It can bring the various stakeholders groups together to identify common goals and discuss how they might be able to find common ground in area that they differ. This approach requires up front planning, but in the end it can create new partnerships in economic development activities within a community. An Eco-industrial development strategy can be incorporated into other revitalization tools used.

7.3.3. Project management

To be a successful project, TDIZC must manage with care and forethought – in ways that ensure that all of this “doing” is carried out efficiently and effectively and focused toward a common endpoint. If they fail to do this then their projects will finish late, generate outcomes that are incomplete or inadequate and do so at costs that exceed our planned expenditure. These sorts of project – the failures of the project – have ill – defined tasks and deliverables, and inappropriate communication. They are poorly led, with ineffective communication systems and isolated project teams. Their plans are inflexible and inadequate. Successful projects plan and track measurable tasks and goals. They build on success in short term deliverables to generate further success in complex long term outcome. They look for result now, rather than later. Their problems are detected early; the creativity, commitment and energy of their teams drive their projects to success.

To make those things happen in their projects they need a map to help them steer their way, an image that tells them about the project process. The diagram in figure 14 answer all these needs.

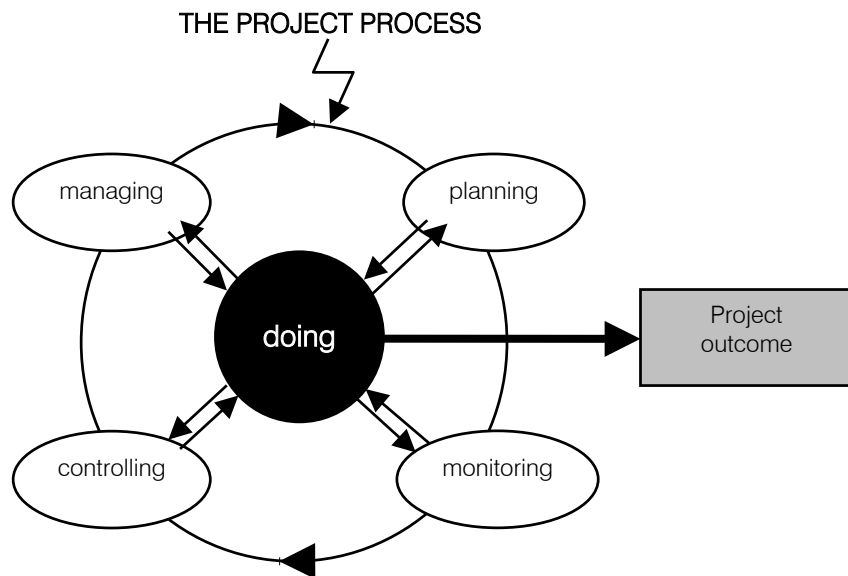


Figure 7: The project process
(Adapted from Baguley, P. 1999)

Chapter 8: Discussion

Chapter 9 gives the discussions for the whole study. The following points are discussed in the chapter: research method, limitations and validity of the study. For the research method, primary attention is put on describing difficulties the author encountered when collecting information. For the limitations of the study, the author discussed mainly the expected outcomes of the study. Finally, the validity of the research is presented and justified.

8.1. Research method

The clear and reasonable determination of the research boundary contributed significantly to the completion of this research. Within the limited time assigned for the thesis, the author decided to adjust the expected outcome of this study. Since there have been measures and plans given to improve the existing spatial and environmental quality of the zone but their overall efficiency was still limited, the author decided to focus on determining reasons for the failure of those measures and plans. From those reasons, combined with related theories about industrial Ecology, recommendations regarding spatial planning in industrial sites were given to the State of Hanoi.

The research steps design also contributed considerably to achieving the expected outcome of the study. Initially, focus was placed on the information search about the existing spatial and environmental quality in Thuong Dinh industrial zone. This helped to demonstrate the degradation of spatial and environmental quality caused by inappropriate planning of industrial development in the zone. Then, special attention was put on the existing measures and plans launched so far to improve the situation in the zone and the outcomes of those plans and measures. Also, reasons for the failure of those plans and measures were collected through intensive interviews with expert, professionals in the field of industrial development. Next, the author started to investigate the theory of "Industrial Ecology" and some good examples applying this theory. Theories of "Industrial Ecology" and good examples were expected to be used as a guideline to create an integrated spatial policy to steer the development of the which is in harmonization with the sustainable development goals set for Thuong Dinh industrial zone. Finally, recommendations were given to the State of Hanoi based on the collected information.

Data collection for analysis was an important activity affecting significantly the outcomes of the research. Since the main topic of the research is improving spatial and environmental quality of industrial sites, a relatively sensitive issue, collecting information encountered some difficulties. One of the main difficulties was the willingness to provide information of interviewed people, involved agencies. Information regarding spatial and environmental situation is not always officially available to researchers due to the fear that such information may be publicly disclosed. To get that information, the author, sometimes had to call for the helps of friends working for the involved agencies.

Doing interview with the selected involved people was also carried out intensively to gather information for the study. Derived from the recognition that interviewed people prefer to avoid answering questions they considered sensitive, the strategy used for the interviews was changed. Interview questions were mainly focused on solutions made so far to improve the spatial and environmental quality of the zone, opinions about the efficiency of those solutions and recommendations could be given.

The quality of information provided was another concern of the author since this factor could affect negatively the quality of the study. For the analysis of the spatial quality of Thuong Dinh, a number of maps were collected. However, the quality of land use maps made by involved agencies is still limited so that the accuracy of the spatial analysis and assessment can be affected. The author had to make contacts with those agencies to verify the quality as well as to clarify the missing points of those maps. In addition, not up-

to-date information regarding environmental pollution caused by wastes discharge from enterprises, to some extent, influenced the quality of the environmental assessment made in the study.

Due to the limited of time available, when assessing the past development efforts for Thuong Dinh industrial zone, the author did not put much effort on analyzing in detail existing measures and projects applied to improve the spatial and environmental quality of the zone. In the thesis, the main contents of those projects and measures were presented while their efficiency assessments were collected through assessment reports on the results of those plans submitted by involved authorities combined with opinions from professionals, experts in industrial development. Those information combined with interpretations of related theories on Eco- industrial development helped to give recommendations to the State of Hanoi.

8.2. Limitations

Looking for good examples and withdrawing lessons from those examples for the case of Thuong Dinh industrial zone contributed partly to the formulation of recommendations to be given to the main target group (the State of Hanoi). To be able to do that, careful selection of good examples is crucial. Those good examples should be, more or less, similar in social and economic context with Thuong Dinh industrial zone. Within the limited of time and available information regarding good examples of eco-industrial parks, however, the selection process was not carried out as expected. The strategy of giving good examples was adjusted. By giving an example and lessons withdrawn from it, the author attempted to suggest that those lessons should be taken into account by the TDIZC when implementing any solutions to improve the spatial and environmental quality of Thuong Dinh industrial zone.

It is worth mentioning that the study did not attempt to give a “complete package of solutions” to solve all the problems mentioned. To be able to do that, it is essential that different disciplines such as spatial and environmental planning, policy-making science, etc. be integrated as well as efficient cooperation of involved actors be required. Within the limited time assigned for the study, the author only attempted to present possible alternatives, formulated as recommendations to the target group, to solve the problems that should be considered by the State of Hanoi. Those alternatives were derived from interpretations of Eco-industrial development-related theories. In conclusion, the study was an initial effort towards the redevelopment of Thuong Dinh industrial zone in particular and other industrial sites having similar nature in general.

8.3. Validity

The validity as well as the reliability of the research depended largely on the quantity and quality of information provided. Since all information, including information from interviews, was collected from governmental agencies involved in the establishment and development of Thuong Dinh industrial zone, the validity of the collected information was assured. However, the reliability of such information was not completely ensured. This is obvious when concerning the willingness to provide precise and up-to-date information of involved people and agencies. In general, it can be concluded that the study is valid within the reliability of the information the author collected and presented.

Appendices

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Appendix 2: The methods of data collection

Search engine List of Organized research questions	Access Internet	Seeking at Saxion library or via Picarta, offered literature of the course	Do interviews	Interview by email, fax, post	Field-work	Notes
1	X	X				Data can be found by internet pages, articles, and books
2	X	X				
3	X	X				
4	X	X				
5	X			X		To answer these questions, the question 1 - 3 in the questionnaire will be asked
6	X		X	X		
9	X		X	X	X	<ul style="list-style-type: none"> To answer this question, the question 10 - 15 in the questionnaire will be asked; To verify the result, field work will be carried out;
10	X		X	X		<ul style="list-style-type: none"> To answer this question, the question 16 - 18 in the questionnaire will be asked;
11			X	X		
12			X	X		
13			X	X		
14	X		X	X		<ul style="list-style-type: none"> To answer this question, the question 19 - 24 in the questionnaire will be asked;
15	X		X	X		
16	X		X	X		
17	X		X	X		
18	X	X				
19	X		X	X		
20	X		X			
21	X	X				
22			X	X		<ul style="list-style-type: none"> To answer this question, the question 25, 26 in the questionnaire will be asked;
24	X	X				
25	X	X				

Table 6: The Method of the data collection and the links between Research questions and Questionnaire

Appendix 3: The Research phase scheme

To carry out the research project, the order of the study will follow the research phases formulated in the table 6 below:

Phase	Step	Activities	Result	Actual period
Preparation Phase	1	Proposing the Research proposal <ul style="list-style-type: none"> • Situation review; • Main research question; • Definitions major concepts and elements; • Research problem model; 	<ul style="list-style-type: none"> • Having an overview of the study; • Basis for next step, 	March
	2	Formulating Research plan <ul style="list-style-type: none"> • Discussion main research question; research boundary; • Formulating research questions; • Discussion the research methodology; • Receiving feedbacks from supervisor, 	<ul style="list-style-type: none"> • Changes main research question, research boundary; • Input for interview questions; • Changes to Methodology. 	April
Phase 1 (Data & Information collection)	3	Gathering relevant data and information <ul style="list-style-type: none"> • Literature study (content); • Literature study (influencing); • Interview external experts; • Own additions; • Discussion with supervisor; • Receiving feedbacks from supervisor, 	<ul style="list-style-type: none"> • Input for introduction (theory), Result and interview questions; • Input for result, research questions from 1 to 23 will be answered; 	May – Start of June
Phase 2 (Information analysis)	4	Analyzing data and information <ul style="list-style-type: none"> • Correcting , and interpreting information, and data gathering; • Analyzing the information, and data collection; • Discussion with supervisor; 	<ul style="list-style-type: none"> • Input for conclusions and recommendations; • 	End of June - Start of August
Phase 3 (Draw up conclusions & recommendations)	5	<ul style="list-style-type: none"> • Drawing conclusions; • Elaborating recommendations; • Drawing implementation strategy; • Discussion with supervisor; • Receiving feedbacks from supervisor; 	<ul style="list-style-type: none"> • The research questions from 24 to 28 will be answered; • Suggested improvements of S, E quality; • Suggestion towards sustainability, 	End of August. Final deadline : 03/09/04
	6	<ul style="list-style-type: none"> • Gathering the separated chapters into a draft report; • Discussing a draft with supervisor; • Receiving final feedbacks; 	<ul style="list-style-type: none"> • Full draft report, including Methodology, Discussion, Conclusions and Recommendations; • Last feedback of supervisor incorporated, 	
	7	<ul style="list-style-type: none"> • Produce final report; • Submitting in final report, 	<ul style="list-style-type: none"> • Approval of supervisor after final draft, 	

Table 7: Research phase scheme and links with final result

Appendix 4: The Organized Research Question

In order to further explanation the research problem model, the cores of the research and to show how to answer the main research question, the following list of organized research questions are formulated.

Elaborating the industrial estate concept

1. What are the characteristics of an industrial estate?
2. What are the stakeholders in an industrial estate?
3. What are the advantages that an industrial estate can offer a company that install its activities there?
4. What are the advantages that an industrial estate can offer local residents who live there?
5. What are the characteristics of an industrial estate described that allow us to distinguish it from other forms such as industrial zone or industrial area?

Investigating the characteristics of the pre-existing industrial zones in Hanoi city

6. What are the characteristics of each zone?
 - 6.1. Where is location of the zone?
 - 6.2. When was the zone established?
 - 6.3. How much and what main types of industries are in the zone?
 - 6.4. How many employees do enterprises employ in the zone?
7. What are the main differences among the nine ones?
8. What are the main similarities among the nine ones?

Investigating the existing spatial quality within and surrounding Thuong Dinh industrial zone

9. How is the existing spatial quality?
 - 9.1. How is efficient of the land use?
 - 9.2. How are the infrastructures (road system, water supply, drainage, ...)?
 - 9.3. How is the transport system?
 - 9.4. How are green and public paces?
 - 9.5. How are the facilities of public works and services for the population in the area?
 - 9.6. How are isolation wards between industrial and residential areas compared with the current state standards?

Investigating the existing physical environmental within and surrounding Thuong Dinh industrial zone

10. How is the existing physical environmental quality?
 - 10.1. How is the quality of the water compared with the current state standards?
 - 10.2. How is the quality of the air compared with the current state standards?
 - 10.3. How is the quality of the soil compared with the current state standards?
 - 10.4. How is the noise pollution in the residential areas compared with the current state standards?

- 10.5. How is the solid waster pollution compared with the current state standards?

Current status of a co-operation among stakeholders of Thuong Dinh industrial zone

11. How is cooperation regarding energy supply, water supply, wastewater, material flow among enterprises?
12. How is cooperation regarding employment, environmental protection activities between companies and residents?
13. How is cooperation regarding economic, environmental protection activities among companies, residents, and local government?

Survey the existing measures and projects from Hanoi's people committee, which already used in Thuong Dinh pre-existing industrial zone

14. Which measures and projects are already used in this situation?
15. How is efficiency of the existing measures and projects?
16. Why are they not fulfilled with environmental, spatial quality, which we would like to have?
17. What are the reasons caused the current status of existing measures and projects?

Elaborating the concepts of sustainable development for industrial sites

18. What is the concept "sustainable development" in general?
19. What are the sustainable development goals for Hanoi up to 2010?
20. What is the Industrial ecology concept?
21. How is the concept of Eco-industrial Park" defined?

Sustainability options for Thuong Dinh industrial zone

22. What aspect are the most important can improved the existing condition?
23. How can the EIPs be applied for Thuong Dinh?

Investigating the policy measures examples of a good practice

24. What are the criteria for example chosen?
25. Which measures are already used?
26. Why are existing policy measures effective?
27. What lessons can be drawn for Thuong Dinh?

Drawing a new approach to solve the existing problems

28. What is a new approach can solved existing problem?
29. Why can this approach can solved above problem?

Suggesting recommendations to improve the existing spatial, and environmental quality for Thuong Dinh industrial zone

30. Based on the above analyses, what should be done to improve the existing spatial and environmental quality?

Suggesting recommendations to improve the existing spatial, and environmental quality for pre-existing industrial zones of Hanoi in general

31. What directions can be used for other existing industrial zones?

Implementation strategy

32. How can be implemented the recommendations?

Appendix 5: The Questionnaire**Questions for Research question 6, 7, 8 and their sub question**

1. What are the characteristics of each zone?
 - 1.1. Where is location of the zone?
 - 1.2. When was the zone established?
 - 1.3. How much and what main types of industries are in the zone?
 - 1.4. How many employees do enterprises employ in the zone?
2. What are the main differences among the nine ones?
3. What are the main similarities among the nine ones?

These questions to

- *Pham Ngoc Dang, who is project leader of the project on the Changing Environmental taking Status of Hanoi city up to 2020-National Program. KHCN-07-1. CEETIA (Hanoi University of Civil Engineering Centre of Environmental Engineering of Towns and Industrial areas) (1998)*
- *Le Van Nai, who is secretary the project on the Changing Environmental taking Status of Hanoi city up to 2020-National Program. KHCN-07-1. CEETIA*
- *The Head of the Management broad of Industrial zones of the Hanoi city;*

Questions for Research question 10, and its sub questions

4. What are the results of the survey regarding the quality of the water (surface water, ground water, and waste water) in Thuong Dinh industrial zone in recent year?
5. What are the results of the survey regarding the quality of the air in the zone in recent year?
6. What are the results of the survey regarding the quality of the soil in the zone in recent year?
7. What are the results of the survey regarding the noise pollution in the zone in recent year?
8. What are the results of the survey regarding the solid waste pollution in the zone in recent year?
9. Could you show me the report on paper?

These questions to:

- *Pham Ngoc Dang, who is project leader of the project on the Changing Environmental taking Status of Hanoi city up to 2020-National Program. KHCN-07-1. CEETIA (Hanoi University of Civil Engineering Centre of Environmental Engineering of Towns and Industrial areas) (1998)*
- *Le Van Nai, who is secretary the project on the Changing Environmental taking Status of Hanoi city up to 2020-National Program. KHCN-07-1. CEETIA*

Questions for Research question 9, and its sub questions

10. What are the functions of the current land use form (Industrial, residential, road, green, water and public area, land reserved for industrial development...) in Thuong Dinh industrial zone?

11. How are the ratio and the location of each type of land use form in the zone?
12. How are the transport system features (frequency, time...) in the zone?
13. What is the current status of public transport in the zone?
14. What is the current status of private transport in the zone?
15. How are the ratio and facilities of public works and services for population in the zone?

These questions to:

- *The director of Hanoi Department of Transport and Urban Public Work Service,*
- *The director of Hanoi Spatial Planning Institute*
- *The Head of the Management board of Industrial zones of the Hanoi city;*

Questions for Research question 11, 12, and 13

16. How is the cooperation regarding energy, water and materials among companies?
17. How is the relation regarding employment, environmental activities between enterprises, residents?
18. How is the cooperation regarding economic, environmental protection activities between enterprises, residents and local government?

These question to:

- *The Head of the Management board of Industrial zones of the Hanoi city;*
- *The Heads of the Local communities;*

Questions for Research question 14, 15, 16 and 17

19. What are the measures and projects made from the 1990s to develop Thuong Dinh industrial zone?
20. What are the results of those measures and projects made so far?
21. Before implementing the projects or plans, do the residents and enterprises know about them?
22. What are the powers of those policy instruments?
23. How is the enforcement (severe enforcement policy or substantial tolerance to violation of rules) in during the implementation of those policies?
24. What reasons bring above results?

These questions to

- *The Head of the Management board of Industrial zones of the Hanoi city;*
- *The Heads of the Local communities;*
- *The Directors of the companies which are oldest constructed and biggest scale inside the zone those are Gold Star Rubber Company, Hanoi Leather and Shoe Company, Lever - Haso (chemical company), Vina - Shiroki (tobacco company), and Hanoi Mechanical Company.*

Questions for Research question 22

25. In your opinion, what aspects cause the inefficiency of the measures and plans made so far to develop Thuong Dinh industrial zone? and

26. What most important things should be done to improve existing measures and plans?

These questions to

- *Nguyen Van Thai, is an expert in Urban planning of Hanoi Spatial Planning Institute;*
- *Nguyen Minh Thai, is a expert of Center for application of scientific achievement, Hanoi.*
- *The Head of the Management board of Industrial zones of Hanoi city;*

Appendix 6: List of selected people

6.1. List of selected people for doing interview

T.T	Name	Function	Organization	Interview questions will be requested
1	Ho Nguyen Cuong	Project leader	Hanoi Department of Transport and Urban Public Works Service	Interview questions: 10, 11, 12, 13, 14 and 15
2	Nguyen Manh Hung	Director	Vina-Shiroki (tobacco company)	Interview questions: 19, 20, 21, 22 and 23
3	Nguyen Hoang	Director	Hanoi Leather and Shoe Company	Interview questions: 19, 20, 21, 22, and 23
4	Nguyen Van Phuong	Head	People's committee of Thanh Xuan Trung commune	Interview questions: 19, 20, 21, 22 and 23
6	Nguyen Minh Thai	Expert in Urban planning	Hanoi center for application of scientific achievement, Hanoi	Interview questions: 25, 26
7	Nguyen Quang Thai	Expert in Urban planning	Hanoi Spatial Planning Institute	Interview questions: 25, 26
7	Nguyen Trong Chien	Head	People's committee of Thuong Dinh commune	Interview questions: 19, 20, 21, 22, and 23
8	Tran Dieu Van	Chairman	People's committee of Nhan Chinh commune	Interview questions: 19, 20, 21, 22, and 23

Table 8: List of selected people for doing interview

6.2. List of selected people for the interviews by email, fax, and post

T.T	Name	Position	Organization	Interview questions will be requested
1	Ho Nguyen Hai	Head	Management board of Industrial zones of Hanoi city	Interview questions: 10, 11, 12, 13, 14, and 15
2	Nguyen Dung	Head	People's committee of Ha Dinh commune	Interview questions: 19, 20, 21, 22, and 23
3	Le Van Nai	Secretary	Hanoi University of Civil Engineering	Interview questions: 1, 2, 3, 4, 5, 6, 7, 8, and 9
4	Le Vinh	Director	Gold Rubber Company	Interview questions: 19, 20, 21, 22, and 23
5	Pham Ngoc Dang	Project leader of the project Survey and Evaluation of Environmental Pollution Caused by industries in Hanoi city, He is also the director of CEETIA	Hanoi University of Civil Engineering Centre of Environmental Engineering of Towns and Industrial Areas (CEETIA)	Interview questions: 1, 2, 3, 4, 5, 6, 7, 8 and 9
6	Pham Van Tu	Director	Lever-Haso (chemical company)	Interview questions: 19, 20, 21, 22, and 23
7	Tran Van Tuan	Director	Hanoi Mechanical Company	Interview questions: 19, 20, 21, 22, and 23

Table 9: List of selected people for the interviews by email, fax, and post

Appendix 7: The Research budget

Item	Cost/unit	Amount	Total cost (Euro)
Air ticket to Vietnam	950,0 E/ return ticket	1 ticket	950,0
Internal transportation, residency, etc	150,0 E	4 months	600,0
Buying, copying of books, literature,			300,0
Preparing slide, transparency,			20,0
Postage, telephone, Fax, E-mail, etc.			100,0
Preparing 7 copy of Final research	5,5 E	7 copies	45,0
Total			2015,0 E

Table 10: Research Budget**Appendix 8: List of current enterprises in Thuong Dinh Industrial zone**

* Enterprise present in the zone in 1996

No	Name of Enterprise	Industrial Sector	Ownership
1	Hanoi Mechanical company*	Mechanical	State owned – MOI
2	Vina – Shiroki Joint Venture	Mechanical	Joint Venture – MOI
3	Cutting and Measuring Factory*	Mechanical	State owned – MOI
4	Hanoi leather and Shoe company*	Footwear	State owned – MOI
5	Song Hong Instant noodle Company*	Food Processing	State owned – MOI
6	Gold Start Rubber Company*	Mechanical	State owned – MOI
7	Hanoi Soap Company*	Mechanical	State owned – MOI
8	Lever - Haso*	Mechanical	Joint Venture – MOI
9	Thang Long Tobacco factory*	Tobacco	State owned – MOI
10	Tobacco Mechanical Workshop*	Mechanical	State owned – MOI
11	Optical Glass Enterprise	Chemical	State owned – MOI
12	Precision Mechanical Engineering Factory*	Mechanical	State owned – MOI
13	Thuong Dinh Footwear Factory*	Footwear	State owned – HN DOI
14	Nam Thang Company	Footwear	State owned – HN DOI
15	Rang Dong Bulb and Thermos Company*	Chemical	State owned – MOI
16	Mechanical Construction Company*	Construction	State owned – MOC
17	Cadastral Survey Company	Office	State owned – General Dept. of Land
18	CTN 195 Mechanical and Assembling Factory*	Office	State owned – MOC
19	Electrical Warehouse of Electrical Co.	Warehouse	State owned
20	Vietnam New Agency Printing Enterprise*	Office	State owned – MOCC
21	Material Procurement Company	Office	State owned – MOTC
22	X 49 Garment Enterprise*	Garment	State owned – MOI
23	Food processing Research Institute	Office	State owned – MARD
24	Electrical Installation and mechanical Factory*	Office	Hanoi TUPWS
25	Hoa Binh Car Factory*	Mechanical	State owned – MOI
26	Hoa Binh Car Joint Venture*	Mechanical	State owned – MOI
27	Mua Dong Woolen Textile Company*	Textile	State owned – MOI
28	Car Major Repair Factory No. 1*	Mechanical	State owned – MO Interior
29	Light Construction Company*	Construction	Hanoi TUPWS
30	Bach Dang Enterprise	Office	State owned – MO Interior

31	Bus Factory*	Office	Hanoi TUPWS
32	Phuong Dong Industrial Comparative*	Mechanical	Cooperative – Thanh Xuan people's committee
33	Bicycle Spare Part factory*	Mechanical	State owned – HN DOI
34	TOCAN Export Goods*	Goods	State owned – MO Interior
35	Chemical – Pharmaceutical Warehouse*	Warehouse	State owned – MOH
36	Cinema Equipment Enterprise*	Mechanical	State owned – MOH
37	Binh Minh Plastic – Paper Factory*	Chemical	State owned – MOCC
38	Hanoi Food Export Company*	Office	State owned – HN DOI
39	Dai Lal Contraction Material Factory*	construction	State owned – HN DOI
40	Postal Facility Enterprise*	Office	State owned – General Dept. of Communication
41	Transport Procurement Enterprise	Office	State owned – MOC
42	Urban Lighting Company*	Office	Hanoi TUPWS
43	Bohemia - Hanoi*	Chemical	Joint Venture – HN DOI
44	Car Repair Workshop No. 14	Office	State owned - MOTC
45	Thanh Xuan Company*	Paper	State owned – Hanoi Dept. of Labour, Invalid and Social Works
46	Glass and Porcelain Research Center*	Office	State owned – MOI
47	Postal Equipment Enterprise	Office	State owned – Dept. of Communication
48	Sea Food processing Enterprise*	Food Processing	State owned – MOI
49	Electrical Procurement Enterprise	Warehouse	State owned – MOI
50	VAC service Company	Office	State owned – HN Depart. Of Agricultural and Rural
51	19/5 Singapore Textile Joint Venture	Garment	State owned – HN DOI
52	19/5 Singapore Textile Joint Venture*	Garment	Joint Venture – HN DOI
53	19/5 knitting Workshop*	Garment	State owned – HN DOI
54	Ha Dinh Water Treatment Plant	Water supply	Hanoi TUPWS
55	Thong Nhat Printing Enterprise	Printing	State owned – MOCC
56	Sportive Equipment Enterprise*	Sport tools	State owned – HN Dept. of Sport
57	Transportation Work Company No. 2*	Office	State owned – MOC
58	Bank Mechanical Factory*	Mechanical	State owned – State Bank
59	Cement Materials Company	Office	State owned – MOC
60	Government Car Division	Office	State owned – Government Dept.
61	Cement material Supplying Company	Office	State owned – MOC
62	Mechanical Construction Company No. 13	Office	State owned – MOC
63	Electronic Mechanical Enterprise*	Mechanical	State owned – HN DOI

Table 11: List of current enterprises in Thuong Dinh Industrial zone
(Source: UNDP. 2000)

Appendix 9: Thuong Dinh industrial zone tables of data

PARAMETERS	WATER MONITORING SITES			SUEFACE WATER QUALITY	
	Cau Moi	Kim Giang	Nghia Do	A	B
pH	7.7 – 8.2	8.5	7.5	6 – 8.5	5.5 – 9
Total suspended Solids	230 – 570	545	211	20	80
COD (mg/l)	183 – 325	242	149	10	35
BOD5 (mg/l)	21 – 120	17.25	40.20	4	25
NO3 (mg/l)	0.39	0.66	0.61	10	15
Do (mg/l)	2 – 2.6	3	0.18	6	2

Table 12: Water quality of To Lich Rive, Hanoi

(Source: Adapted from Do et al 1998, and JICA 2000a)

* Category A: applied to surface water used for domestic water supply

* Category B: applied to surface water used for purposes other than domestic water supply

Parameter	Max. Allowable Concentrations in Groundwater Standard: TCVN 5944 - 1995	FACTORIES		
		Lever - Haso	Gold Star Rubber Company	Ha Dinh Water Plant
pH	6.5 – 8.5	7.6	7.5	7.3
Total Iron (mg/l)	1 – 5	0,04	9.21	0.19
Manganese (mg/l)	0.1 – 0.5	12.0	19.48	0.15
Hardness (mg/l)	3000 – 500	310	190	200
Coliforms (MPN/100ml)	3	75	29	14.2

Table 13: Groundwater quality in three factories in Thuong Dinh industrial zone, 1996

(Source: Adapted from JICA 2000a and UNDP 2000)

Industrial Firm	Solid waster (tonnes per year)
Gold Start Rubber Company	6000
Hanoi leather and Shoe company	0.4
Hanoi Mechanical company	1200
Hoa Binh Joint Venture Company	3.4
Lever - Haso	1800
Vina – Shiroki	216

Table 14: Solid waste generation of interview firms

(Source: UNDP. 2000)

Appendix 10: Industrial pollution data

Figure 8: One branch of To Lich River⁴



Figure 9: Waster water from Enterprises in Thuong Dinh industrial zone⁵

^{4, 5} The photograph was taken by the author on 22nd June 2004



Figure 10: A rush-hour in Thuong Dinh industrial zone⁶



Figure 11: Wastes in Thuong Dinh industrial zone⁷

⁶ The photograph was taken by the author on 21st June 2004

⁷ The photograph was taken by the author on 22nd June 2004

Appendix 11: The gradual development of the symbiosis, Industrial symbiosis, Kalundborg, Denmark

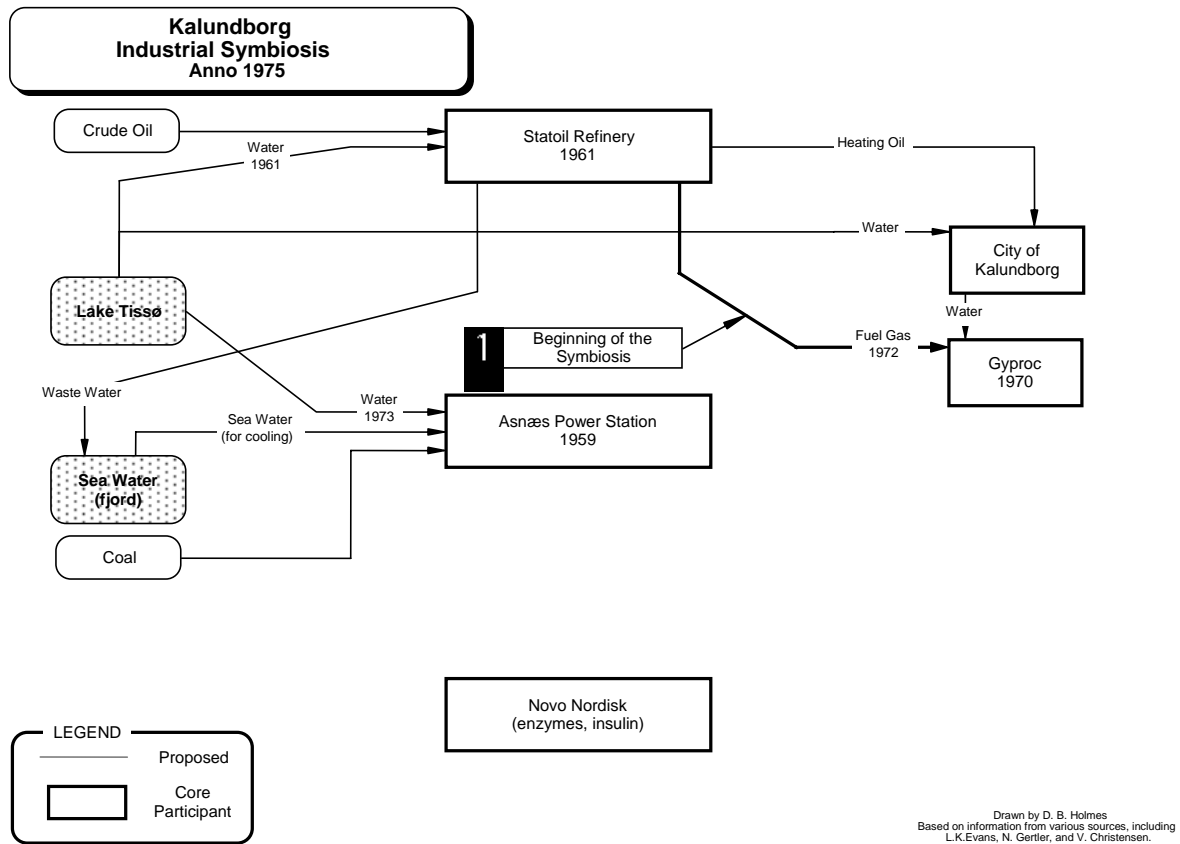


Figure 12: The symbiosis in 1975 (Ernest, A.L. 2001)

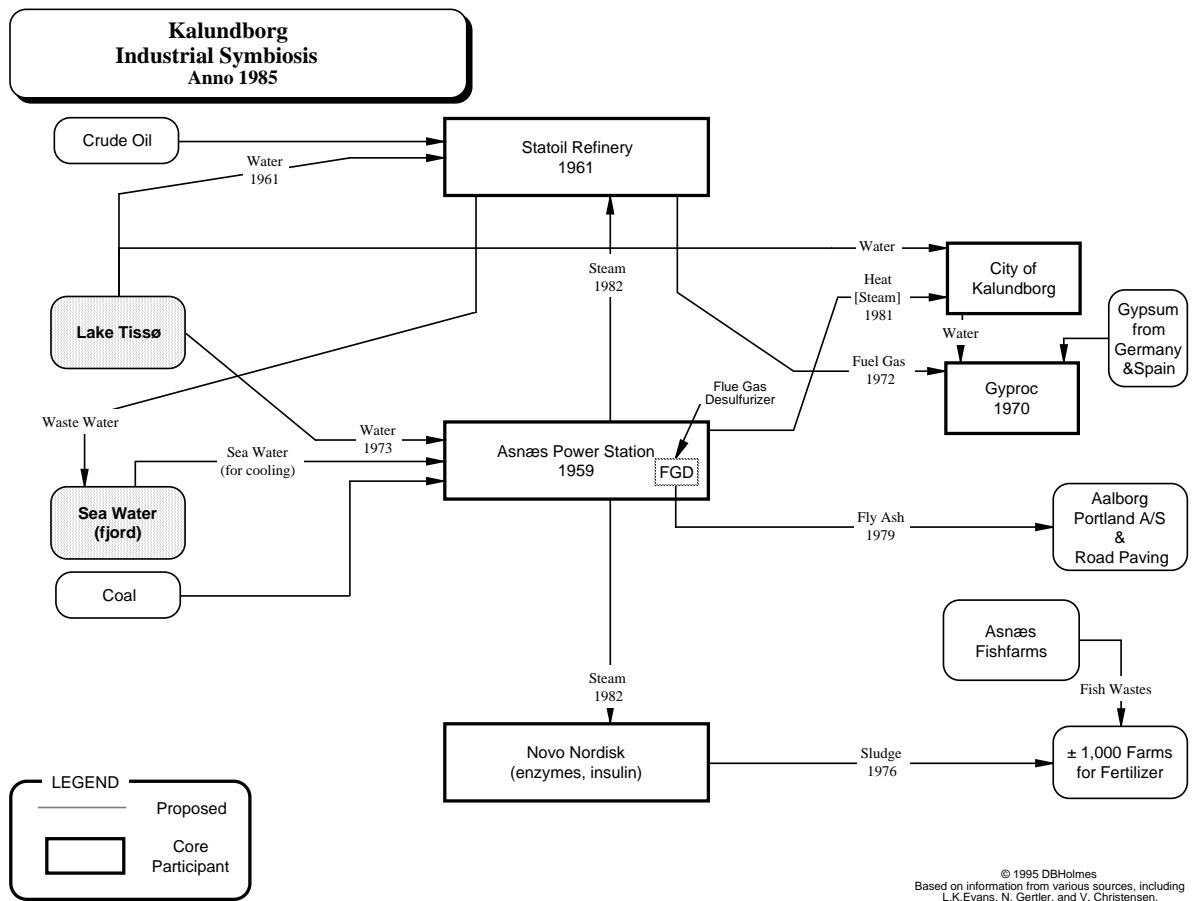


Figure 13: The symbiosis at Kalundborg in 1985 (Ernest, A.L. 2001)

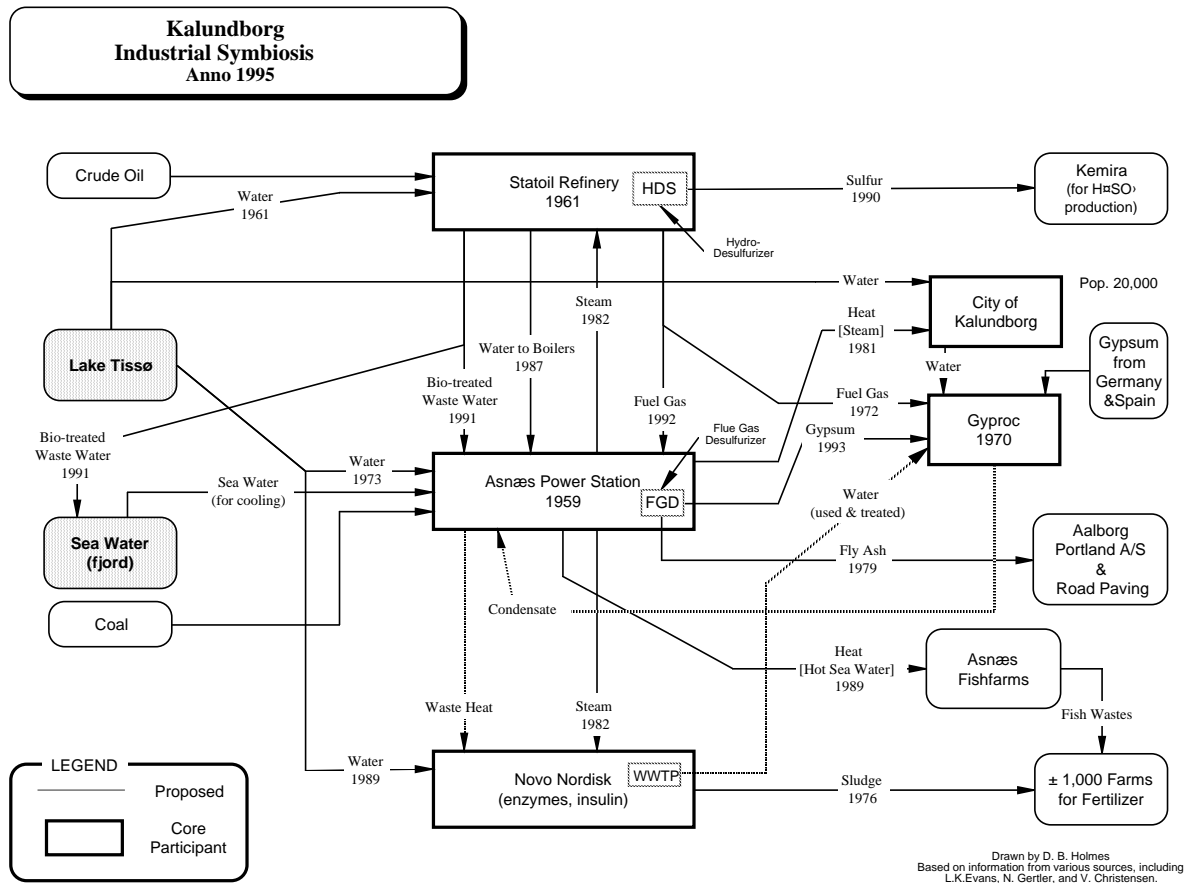


Figure 14: The web exchanges in 1995: about 3 million tons per year (Ernest, A.L. 2001)