



# **Promoting Cleaner Production in Vietnam:**

## **The Role of Training & Education in Strengthening Industry's Environmental Behaviour**

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## EXECUTIVE SUMMARY

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Increasing urbanization and industrialization have caused pollution to reach an all-time high in Vietnam. Cleaner Production (CP), a strategy companies can use to improve their economic and environmental performance at the same time, has recently gained appeal in developing countries. However, CP has yet to be widely accepted and implemented by industry in Vietnam, despite its promotion by government, research and academic institutions.

The purpose of this report is to understand why CP has not been widely embraced by Vietnamese industry and how effective training and education could help promote the CP concept. This is the first analytical study conducted of the experience of trainers and consultants directly involved in CP implementation and thus may provide new insights as to the role of training and education in CP dissemination and implementation.

Through a literature review and personal interviews, I determined that obstacles to CP implementation are part of systemic problems related to Vietnam's overall policy environment, the growing dependence of firms on outside financial and technical assistance, the traditional corporate culture and the internal management and accounting systems in companies. A number of targeted training and education programs could be developed to combat these problems. Specific recommendations in this report include: development of courses aimed at government officials to promote greater awareness of CP and to foster greater intra- and inter-governmental cooperation and communication; creation of courses directed at top management to transform traditional state-run management styles; initiation of pre-training courses to strengthen internal practices within companies; and, development of a sustainability component in all future training, such as introducing more CP courses in universities, to avoid dependence on outside assistance.

Findings from the questionnaires administered and the results of international CP projects suggest there are areas of CP training and education that could be strengthened. The Vietnam Cleaner Production Centre, the leading institution for CP research and dissemination in the country, should: commission a comprehensive study to evaluate the content of all CP training programs; actively pursue establishing a 'CP Network'; establish guidelines for all future CP training activities; and develop promotional material to distribute to industry. In addition, future CP training and education courses should attempt to create corporate-community partnerships, train all levels of workers within companies, ensure programs are relevant to the corporate structures of companies being trained and produce adequate program evaluations and follow-up procedures.

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## List of Acronyms and Abbreviations

ADB	Asian Development Bank
AUSAID	Australian Agency for International Development
CEFINEA	Institute for Environment and Resources
CIDA	Canadian International Development Agency
CP	Cleaner Production
DANIDA	Danish Development Agency
Doi Moi	The Communist Party's term for reform and renovation in the economy
DOSTE(s)	Department(s) of Science, Technology and the Environment
GDP	Gross Domestic Product
HCMC	Ho Chi Minh City
JV(s)	Joint Venture(s)
MLEs	Medium and Large Size Enterprises
MOSTE	Ministry of Science, Technology and the Environment
MPI	Ministry of Planning and Investment
MVND	Million Vietnamese Dong
NCPC(s)	National Cleaner Production Centre(s)
NEA	National Environmental Agency
NISTPASS	National Institute for Science & Technology Policy & Strategy Studies
SDC	Swiss Agency for Development Cooperation
SIDA	Swedish International Development Agency
SMEs	Small and Medium Size Enterprises
SOE(s)	State-Owned Enterprise(s)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
USD	United States Dollar
VCEP	Vietnam – Canada Environment Project
VNCPC	Vietnam Cleaner Production Centre
WTO	World Trade Organization

## 1.0 VIETNAM: ECONOMIC REALITIES & ENVIRONMENTAL CONSEQUENCES

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Many Southeast Asian countries have experienced rapid growth in recent years, and Vietnam is no exception. The transition from a centralized, planned economy towards a more market-based economy, under the *Doi Moi* economic reform package of 1986, has enabled Vietnam to grow at rapid rates, with impressive results. However, Vietnam's national strategy of promoting industrialization and modernization has caused serious problems for the natural environment. These problems are compounded by the limited financial and human capacity of environmental agencies to enforce environmental management standards<sup>1</sup>. The situation is especially problematic in Ho Chi Minh City where industry constitutes a major economic sector, contributing 30 per cent of the nation's total industrial production<sup>2</sup>.

Direct regulation, combined with monitoring and enforcement, has been the traditional policy tool used for industrial waste management in developing countries. However, as Vietnam has experienced, this type of control is difficult to balance with an economy focused on growth and lacking the regulatory and financial power to enforce legislation. As a result, government institutions and national and international research organizations in Vietnam are seeking simpler (and hence more cost effective) environmental measures for the industrial sector - one of the most popular being Cleaner Production (CP) - so that companies can survive financially, while at the same time reducing their negative environmental impacts. As a result, research has been conducted on the feasibility of introducing CP concepts to industries throughout the country<sup>3</sup>. Additionally, the Government of Vietnam listed CP as one of its key strategies for sustainability by signing the *International Declaration on Cleaner Production* in 1999 and drafting the *National Action Plan for Cleaner Production*<sup>4</sup>.

These studies have shown that CP can be a successful pollution prevention tool in Vietnam, and that the Government of Vietnam is supportive of CP, both politically and financially. However, the reality is that despite the promotion of CP by government, academia and research institutions in the past few years, only a small number of companies have adopted it. In this report I will explore why CP practices have not been widely adopted by examining some of the main obstacles to effective CP implementation faced by industry in Vietnam. Following this analysis, I will illustrate how more effective training courses and educational programs could facilitate better CP promotion and mitigate and/or eliminate the current obstacles to successful implementation of CP.

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<sup>1</sup> Frijns, Jos. (2000). Pollution Control of Small-Scale Industry in Ho Chi Minh City: To Relocate or to Renovate? *International Conference on Industry and Environment in Vietnam*, 80 – 96.

<sup>2</sup> Dieu, T.T.M and N.T. Viet. (2000). Status of Industrial Development in the South Key Economic Regions of Vietnam and Environmental Implications. *International Conference on Industry and Environment in Vietnam*, 132 – 144.

<sup>3</sup> See articles by Frijns, Leuenberger, Mango and Nhue in *International Conference on Industry and Environment in Vietnam (2000)*.

<sup>4</sup> MOSTE/NEA. (2000). National Action Plan of Cleaner Production 2001 – 2005 (draft). Available from the Vietnam Cleaner Production Centre (VNCPC).



## 1.1 Report Rationale and Goals

While the importance of effective training for the successful promotion and adoption of CP in industry has been noted<sup>5</sup>, few analytical studies have been conducted on the subject in Vietnam. Typically, training programs have been developed and implemented based on existing international programs and often neglect to factor in the particular characteristics and implementation obstacles inherent to the industrial sector in Vietnam. Additionally, while studies that seek input from trainers, consultants and company representatives have been conducted in Europe, no such work has been undertaken in Vietnam to date. This research is timely, as many of the national and international CP projects are now moving into the second phase of their projects and evaluating their performances to determine the scope of future initiatives.

The goals of this report are to:

1. Examine the industrial sector in Vietnam, focusing on the characteristics of companies, the current trends in export markets and specific environmental problems most generally associated with industrial production;
2. Explore the obstacles to effective CP implementation faced by industry as a whole in Vietnam; and
3. Finally, determine the most effective training methods to promote positive environmental behaviour in industry by:
  - Investigating the strengths and weaknesses of existing training courses in Vietnam;
  - Evaluating the responses of CP trainers and consultants; and,
  - Exploring best practices from around the world.

## 1.2 Report Outline

In the first three sections I will briefly outline my research method; detail the concepts and applications of CP; and highlight the characteristics, trends and environmental concerns of the industrial sector in Vietnam. Following this introduction I will examine the obstacles to CP implementation in Vietnam and identify their root causes. In the final sections of the report I will detail the training and education programs currently available and explore their strengths and weaknesses, describe the findings from my questionnaires and examine the best CP practices from around the world. I will conclude the report by consolidating my findings from each of these sections and make recommendations for strengthening positive environmental behaviour through CP training and education in the industrial sector.

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<sup>5</sup> For examples see the MOSTE/NEA report (2000) and the Vietnam Cleaner Production Centre's annual report (2001).

## **2.0 RESEARCH METHOD**

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I conducted my research in Ho Chi Minh City (HCMC) and Hanoi, Vietnam between May and August 2002. The research tools I used in this study included the following:

1. Literature review
2. Key informant interviews
3. Questionnaire for CP trainers and consultants

### **2.1 Literature Review**

In Vietnam, my literature review consisted of acquiring documents and reports that would allow me to gain a better understanding of the current CP activities in the country. I collected documents from international donor organizations' websites and office libraries. I also examined environmental reports issued by government and national research institutions. Additionally, I acquired relevant journal articles and other web sources.

In Canada I continued my literature review, focusing on specific obstacles to pollution prevention in industrial waste management and researching training models used both in Vietnam and elsewhere to promote successful uptake of CP measures in industry.

### **2.2 Key Informant Interviews**

My research method also included 20 personal interviews (9 structured and 11 semi-structured) with CP experts from both governmental and non-governmental organizations; academics and researchers in related fields; and representatives from relevant donor organizations. Additionally, I participated in a 'Cleaner Production Roundtable' where industry, government and academia met to discuss the state of CP in Vietnam. See Appendix 1 for a comprehensive list of key informants.

### **2.3 Questionnaire**

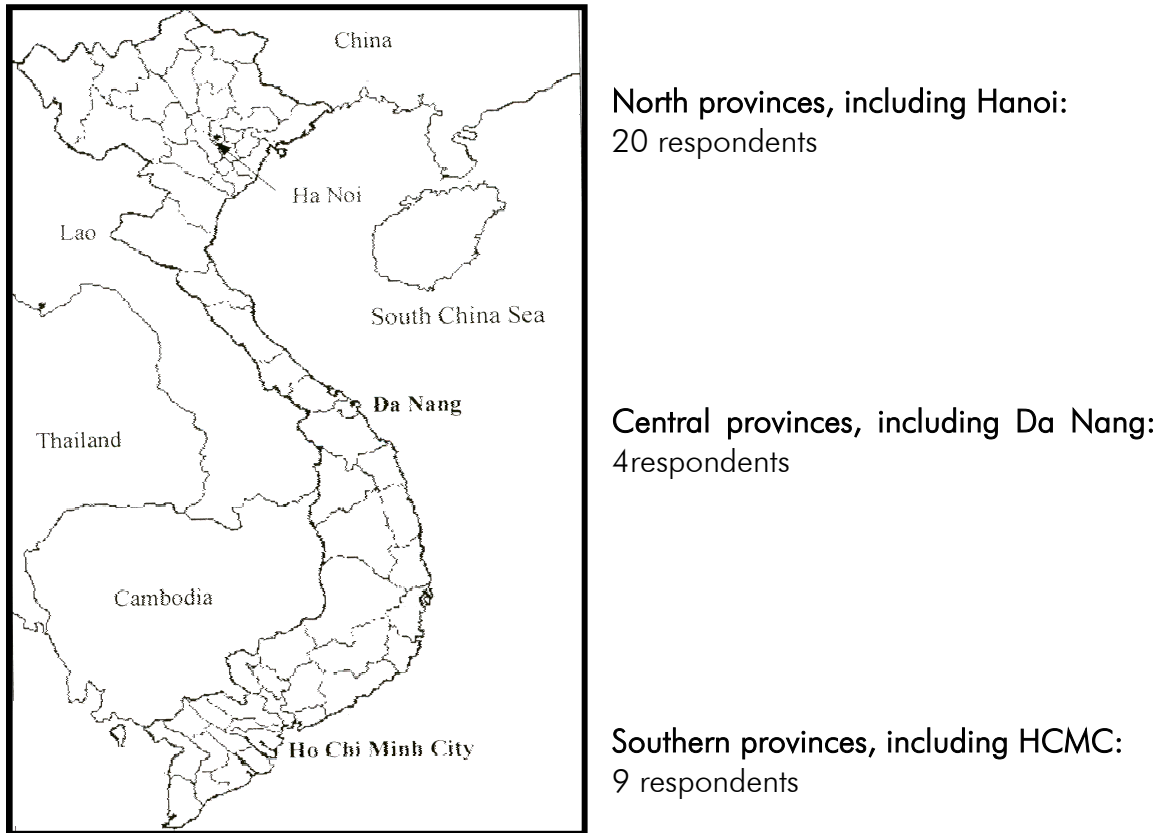
From my literature review and key informant interviews I determined that effective training was an integral component to the successful implementation of CP in companies. As a result, I decided to focus my attention on the trainers and consultants who work with companies. I designed a detailed questionnaire and administered it to 29 of the 45 available<sup>6</sup> consultants and trainers educated through the Vietnam Cleaner Production Centre (VNCPC), the leading institution for CP research and dissemination in the country. In addition, I administered the

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<sup>6</sup> As of the 2001 VNCPC annual report, 61 trainers and consultants had been certified through VNCPC. Of these 61 people 45 of them were available at the time of this research.

questionnaire to 4 other people involved in training and education of CP – 2 from academic and research institutions and 2 from governmental departments. In total 33 people responded to the questionnaire. The respondents were geographically dispersed and came from a wide variety of backgrounds, including academia and research institutions (11/33), industry (13/33) and government (9/33).

**Figure 1: Study Area and Location of Respondents**



Source: Nguyen et. al. (2000)

The questionnaires were translated into Vietnamese and faxed to respondents. Completed questionnaires were either picked up directly from respondents or faxed back, depending on their location within the country. Questionnaires were translated into English after respondents had the opportunity to fill them out. See Appendix 2 for a sample questionnaire.

### 3.0 BACKGROUND: WHAT IS CLEANER PRODUCTION?

#### 3.1 Ecological Modernization

CP is one element of an approach known as *ecological modernization*, which “focuses on prevention, on innovation and structural change towards ecologically sustainable development”<sup>7</sup>. Ecological modernization includes technological/material objectives such as waste reduction and elimination, resource recovery and reuse, and dematerialization, as well as resource conservation and cleaner production. It is also concerned with the “institutional and social dimensions of environmental transformation”<sup>8</sup>, or, more specifically, how market-based instruments and a shift away from top-down regulatory intervention may lead to more effective waste reduction measures. Research suggests that ecological modernization, or at the very least components of this concept such as CP, can be applied to industries in developing countries<sup>9</sup>.

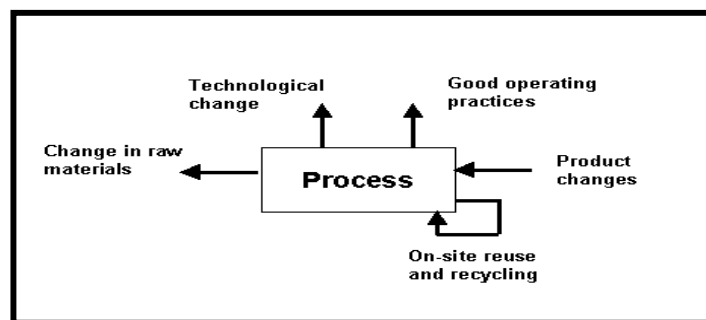
#### 3.2 How CP Works

Preventative options in CP generally fall into the following categories:

- ‘Good housekeeping’ or good operating practices;
- Material and raw material changes;
- Technological modifications;
- Product modifications; and
- On-site reuse and recycling<sup>10</sup>.

The diagram below illustrates these options in relation to the production process:

Figure 2: CP Implementation Options



Source: UNEP (2001)

<sup>7</sup> Sonnenfeld, David. (2000). Contradictions of Ecological Modernization: Pulp and Paper Manufacturing in South-East Asia. In *Ecological Modernization Around the World*, Ed. Arthur Mol and David Sonnenfeld, 235-255. London: Frank Cass.

<sup>8</sup> Sonnenfeld, David. (2000).

<sup>9</sup> Blackman, Allen. (2000). Informal Sector Pollution Control: What Policy Options Do We Have? *World Development*, 28 (12): 2067-2082.

<sup>10</sup> United Nations Environment Programme (UNEP). (2002). Understanding Cleaner Production. Available online: [http://www.unep.org/pc/cp/understanding\\_cp/home.htm](http://www.unep.org/pc/cp/understanding_cp/home.htm). Accessed 10/29/02.

**Good Operating Practices/Good Housekeeping:**

Good Housekeeping changes refer to procedural, administrative, or institutional measures that can be employed by a company to minimize wastes and emissions. These measures can be thought of as efficiency improvements and good management practices, and are able to be implemented in most areas of a company at a relatively low cost. One example of a good operating practice is improving handling and inventory practices to reduce the loss of input materials.

**Changes in Raw Materials:**

In this category CP can be achieved through the reduction or elimination of hazardous materials that enter the production process. Additionally, changing input materials (through material purification and material substitution) can help to eliminate the generation of hazardous waste within the production process.

**Technology Change:**

Technology change refers to modifications in the process and/or equipment to reduce waste and emissions. These changes can range from small, low-cost options to the replacement of processes involving large capital investments. One example of this is changing the process conditions, such as flow rates and/or temperature to save input materials and energy.

**Product Changes:**

In this category the manufacturer of the product can modify quality standards, product composition, and durability and/or substitute the entire product to reduce waste and emissions. The aim of these changes is to reduce the overall environmental impacts throughout the life cycle of the product, from raw material extraction to final disposal.

**On-site reuse and recycling:**

Recycling or reuse involves “the return of a waste material either to the originating process as a substitute for an input material, or to another process as an input material”<sup>11</sup>. In the seafood processing industry, for example, waste materials are sometimes used to create other products, such as fertilizer for agricultural fields or face creams. Other sectors can find creative uses for waste material as well.

The most effective way to implement CP is to generate CP options in as many different categories as possible. This will help to create solutions that vary in cost and implementation time. A diverse array of possible CP solutions will help create a more sustainable CP program.

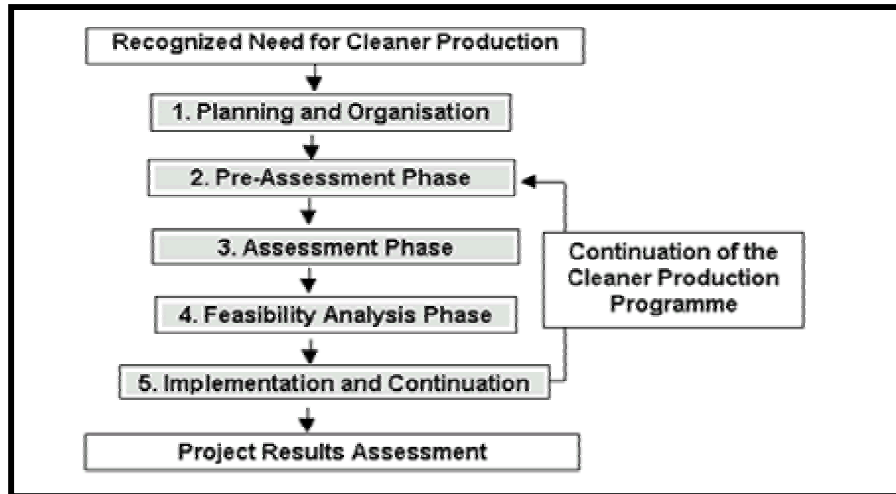
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<sup>11</sup> UNEP. (2002).

### 3.3 How CP is Implemented

The diagram below outlines the phases a company should go through in order to successfully implement CP:

Figure 3: CP Implementation Process



Source: UNEP (2001)

#### Planning and Organization:

The planning phase begins when people, usually management, begin to realize the need for some type of preventative action to occur in their company. Although only a few CP supporters are necessary to begin planning, experience from companies who have successfully implemented CP shows that both employees and management should be central to the planning process. Additionally, companies should have a good understanding of both the internal and external costs associated with their current waste system so as to be able to see the economic benefits associated with CP. Thus, the planning stage may need to include waste audits and implementation of better environmental accounting practices to be successful in the long run.

Organizing CP in companies is usually done through a project team. The project team initiates, co-ordinates and supervises the assessment activities and should include technical experts and people with authority to make decisions. Typically, in the pre-assessment phase, the project team will determine the site-specific barriers and create a list of goals.

#### Assessment Phase:

In the assessment phase the material balance is studied and appropriate options, which usually fall under the categories listed in the previous section, are proposed to reduce or prevent pollution. There are a number of avenues that the project team can draw from to brainstorm CP ideas, including literature searches, personal knowledge,

discussions with suppliers, examples in other companies, specialized data bases, and further research and development.

### **Feasibility Analysis:**

In order to determine whether the options generated will be successful, a feasibility analysis is conducted to gauge the technical and economic potential of each option. Additionally, the feasibility of each option should be tested for the environmental net benefits that could be derived from its implementation.

### **Implementation and Continuation:**

In the final stage, the feasible CP measures are implemented and the project team develops a strategy for the continuation of CP in their company. In order to develop a successful continuation program the first CP implementation measures should be monitored and evaluated on a continual basis. Once this is completed, the project team can repeat the process to ensure that CP creates a continuous cycle of environmental and economic improvements for the company<sup>12</sup>.

## **3.4 Proven Economic Benefits of CP**

In practice, CP has been explored in case studies in the United States and Europe since the 1980s, and has gradually moved from the introduction of new 'cleaning' technologies to an emphasis on "changing attitudes, responsible environmental management, creating conducive national policy environments, and evaluating technology options"<sup>13</sup>. In Vietnam, CP was introduced under the National Research Program on Environmental Protection, which took place from 1991 to 1995. This program was the first to be oriented towards CP in the country<sup>14</sup>.

In order to prove the economic benefits of CP, donor organizations often design and implement pilot projects that can later be used as case studies by companies interested in adopting CP. As a result, throughout the world numerous case studies exist to show that CP is an effective pollution prevention tool<sup>15</sup>. Although there are fewer Vietnamese case studies available for analysis, the examples that are available show the economic benefits that can accrue from CP implementation in a variety of company sizes, management structures and industrial sectors.

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<sup>12</sup> UNEP. (2002).

<sup>13</sup> UNEP. (2002).

<sup>14</sup> Nhan, Tran Van. (2000). Practice and Challenge for Cleaner Production in Vietnam. *International Conference on Industry and Environment in Vietnam*, 183–190.

<sup>15</sup> See the Australia Eco-efficiency and Cleaner Production homepages at: <http://www.ea.gov.au/industry/eecp/case-studies/index.html> for a good selection of international case studies. Accessed 02/07/03.

### 3.4.1 Case Study Examples in Vietnam

One example from the food-processing sector is Thien Huong Food Company, which, with a workforce of 1,200, is one of the largest food processing factories in HCMC. The company is state-owned but it has been selected for privatization, which has led to pressure on management to improve its economic performance. The factory was listed in HCMC's 'Black Book', a publication authored by Ho Chi Minh City's Environmental Committee (ENCO) which identifies the worst polluters in the city. It earned this distinction for the large amount of wastewater it expels into local waterways and its excessive air emissions, as well as its location within a residential neighbourhood<sup>16</sup>.



**Picture 1: Thien Huong Food Co.**  
Source: VNCPC (2002)

The table below summarizes the results of the CP demonstration project conducted in the company with the assistance of United Nations Industrial Development Organization's "Reduction of Industrial Pollution in HCMC" project.

**Table 1: Benefits of CP for Thien Huong Food Company**

<b>Investment</b>	840 Million Vietnamese Dong (MVND) (USD 62,000)
<b>Savings</b>	8960 MVND (USD 663,700)
<b>Pay back period</b>	<2 months
<b>Environmental savings</b>	68% reduction in wastewater volume. 30 – 35% reduction in organic pollution. Significant reduction in gaseous emissions.
<b>Management Changes</b>	Monitoring system to check the consumption of 27 key production inputs has been installed. A system to reward workers for improving resource efficiency has been established.
<b>Product quality improvements</b>	Improved shelf life of products. Decreased percentage of broken noodle from 9% to 3%, reducing product waste. 25% improvement in production capacity.

Source: VNCPC (2002)

<sup>16</sup> VNCPC. (2002). Cleaner Production Cases. Available online at: <http://www.un.org.vn/vncpc/cases/index.html>. Accessed 01/25/03.



Another example of a smaller scale project is the Thuan Thien Bleaching and Dyeing Company. Also in HCMC, the small family-run company employs only 20 semi-skilled labourers. But like the Thien Huong Food Company, its location in a residential neighbourhood and its negative environmental impacts, particularly gaseous emissions (black soot), has caused the company to be listed in the Black Book<sup>17</sup>.



**Picture 2: Thuan Thien Co.**  
Source: VNCP (2002)

Although the Thuan Thien Company has yet to see savings that exceed its investment, the CP options that were implemented, such as improving process control and changing input materials, will produce long-term savings for the company. The following table shows the benefits that the company derived from its CP program.

**Table 2: Benefits of CP for Thuan Thien Bleaching and Dyeing Company**

<b>Investment</b>	1400 MVND (USD 100,000)
<b>Savings</b>	1000 MVND (USD 75,000)
<b>Pay back period</b>	1.5 year
<b>Environmental savings</b>	34% reduction in wastewater volume. 30% reduction in organic pollution load. 70% reduction in gaseous emissions.
<b>Management Changes</b>	Systems for proper recording and reporting of inputs and outputs.
<b>Product quality improvements</b>	Improved finish of product. Reduced rejection/reprocessing of fabric. 30% increase in production capacity.

Source: VNCP (2002)

<sup>17</sup> VNCP. (2002).

## 4.0 THE INDUSTRIAL SECTOR IN VIETNAM

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In this section of the report I will examine the industrial sector in depth, focusing on industry characteristics; the current economic trends and the resulting changes to the sector; and finally, the specific environmental problems most generally associated with industrial pollution in Vietnam.

### 4.1 Company Characteristics

#### 4.1.1 Management Structure

The industrial sector in Vietnam comprises a number of different management styles that differ by ownership type. Historically, the planned economy was the centrepiece of the Vietnamese government and, as a result, the Government controlled much of the industrial sector. From the early 1960s to the mid-1980s the Vietnamese government focused primarily on heavy industry, including iron and steel, chemicals and fertilizers, cement, coal, vehicle manufacture, machinery production, as well as 'light industries' such as foodstuffs and textiles. Typically, resource inputs, such as water, were considered 'free' goods. This resulted in "inefficient use of resources and ineffective production methods"<sup>18</sup>. Additionally, the state did not regularly reinvest in its production lines, which has left industry in Vietnam with old and often obsolete manufacturing technologies<sup>19</sup>.

In 1986 the *Doi Moi* reform package was formally adopted at the Sixth Congress of the Communist Party of Vietnam. Its aim was to "end the period of economic stagnation that had existed in Vietnam, and introduce a new era of rapid growth"<sup>20</sup>. The reform process comprised two major components:

1. Macro-economic stabilization, market reforms and a gradual shift from central planning; and,
2. A gradual opening of the Vietnamese economy to the rest of the world via a more "open door policy" towards international trade<sup>21</sup>.

One of the major results of *Doi Moi* reform has been the transformation of the institutional framework underlying economic activity in Vietnam. The *Doi Moi* reform package has gradually introduced institutional, legal and regulatory shifts towards a market-based economy. In the early nineties the Vietnamese government began to institute a number of reforms to key areas including trade, the private sector, banking,

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<sup>18</sup> Sikor, Thomas O. and Dara O'Rourke. (1996). A Tiger in Search of a New Path: The Economic and Environmental Dynamics of Reform in Vietnam. *Asian Survey*. Vol. 36, No. 6: 601-617.

<sup>19</sup> Sikor, Thomas O. and Dara O'Rourke. (1996).

<sup>20</sup> Do et. al. (2002). The Doi Moi Process and Human Development. *Vietnam's Socio-Economic Development*, No. 29, Spring 2002.

<sup>21</sup> United Nations Development Programme (UNDP). (2002). Vietnam and UNDP: Past, Present and Future. Available from Vietnam Development Information Center, Hanoi, Vietnam.

public expenditure management, public administration, law, and banking<sup>22</sup>. This included reforms in state enterprises, the 1993 Land Law, and tax reforms, which enabled assets to be transferred from the public to the private sector<sup>23</sup>. The *Doi Moi* reforms also liberalized international trade and investment by way of the Foreign Investment Law (1987) and included additional measures to improve the climate for enterprises in Vietnam<sup>24</sup>.

As a result of *Doi Moi*, more privately owned firms have emerged as well as ‘joint-ventures’ with Vietnamese and foreign interests. Between 1996 and 2000, the private sector, including joint ventures (JVs), created more than three times as many jobs as state-owned enterprises (SOEs)<sup>25</sup>. The table below shows the breakdown of gross domestic product (GDP) and employment by enterprise type:

**Table 3: 2000 GDP and Employment by Enterprise Type (%)**

	<b>GDP</b>	<b>Employment</b>
<u>Public Sector</u>	40.6	8.8
<b>-State Owned Enterprises</b>	<b>31.6</b>	<b>5.2</b>
-State Administration	9	3.6
Collectives	8.5	.6
<u>Domestic Private Sector</u>	40.2	90.0
-Households & Farmers	32.6	87.9
Non-Agricultural HH		8.4
<b>-Private Companies</b>	<b>7.6</b>	<b>2.1</b>
<b>Foreign-Invested Companies (JVs)</b>	<b>10.7</b>	<b>.6</b>
<b>Total</b>	100.0	100.0

Source: Steer and Taussig (2002)

However, the growth of private firms has not been consistent throughout the country. As table 4 illustrates, there is a significant variation in the amount of private companies by region.

<sup>22</sup> World Bank. (2002). *Vietnam Economic Monitor*. The World Bank in Vietnam. Spring Edition.

<sup>23</sup> Sikor, Thomas O. and Dara O'Rourke. (1996).

<sup>24</sup> World Bank. (2002).

<sup>25</sup> World Bank. (2002).

Table 4: Private Companies by Region (2000)

Provinces	Firms	Share
Red River Delta	5,732	18.1%
-Hanoi	3,666	11.6%
North East	1,114	3.5%
North West	146	0.5%
<b>The North</b>	<b>6,992</b>	<b>22.1%</b>
North Central Coast	1,336	4.2%
South Central Coast	2,383	7.5%
<b>The Center</b>	<b>3,719</b>	<b>11.8%</b>
Central Highlands	1,248	4.0%
Northeast South	12,296	38.9%
-Ho Chi Minh City	9,089	28.8%
Mekong River Delta	7,338	23.2%
<b>The South</b>	<b>20,882</b>	<b>66.1%</b>
<b>Total</b>	<b>31,593</b>	<b>100.0%</b>

Source: Steer and Taussig (2002)

#### 4.1.2 Size of Firms

Another characteristic of industry is the diverse sizes of firms, including small (under 50 workers), medium (50 to 200 workers) and large scale (over 200 workers). In Ho Chi Minh City, the largest city in Vietnam, small and medium enterprises (SMEs) make up the majority of businesses. In 1997 small-scale enterprises accounted for 95 per cent of the total number of industries in the city<sup>26</sup>. Most of these enterprises are located in residential neighbourhoods and are said to contribute to urban pollution and nuisance for residents.

Both in Vietnam and globally, small and medium enterprises (SMEs) have traditionally faced a number of constraints in terms of their ability to deal effectively with their negative environmental impacts. Specifically, lack of capital is considered to be one of the major problems for these companies<sup>27</sup>. The lack of capital means that most SMEs are “operating at low, and often obsolete levels of technology” and insufficient funds can severely limit their ability to implement pollution control equipment when required to do so<sup>28</sup>.

Combined with this is the intense competitive nature of SMEs. Typically, they have low barriers to entry, which in turn makes their enterprises highly competitive. As a result, they are under intense pressure to produce at the lowest possible price, regardless of the environmental impact<sup>29</sup>. These factors have caused considerable debate about

<sup>26</sup> Frijns, Jos. (2000).

<sup>27</sup> Frijns, Jos. (2000).

<sup>28</sup> Pallen, Dean. (2001). Reinventing the City: The Role of Small Scale Enterprise. *Canadian International Development Agency, Asia Branch*.

<sup>29</sup> Blackman, Allen. (2000). Informal Sector Pollution Control: What Policy Options Do We Have? *World Development* 28(12): 2067-2082.

the aggregate level of pollution from small and medium-sized factories, and it can be argued that they are in fact more pollution-intensive than larger firms<sup>30</sup>.

Technological barriers also hinder CP efforts in SMEs. Often these industries lack access to even the most basic sanitation services such as sewers and waste disposal<sup>31</sup>. Additionally, people who may have little awareness of the health and environmental impacts of pollution often operate SMEs. Therefore, efforts to minimize waste, even through simple 'good housekeeping' techniques, may be ineffectual<sup>32</sup>.

Finally, there is generally a lack of internally driven information<sup>33</sup> in Vietnamese industries, but particularly in SMEs, which makes implementing CP more difficult. It is difficult to show SMEs the costs savings they could accrue when they have no quantifiable data to substantiate this claim.

## 4.2 Current Trends

The introduction of *Doi Moi* in Vietnam changed the structure of the economy by promoting a more market-oriented approach to future development. Along with this change was the active integration of Vietnam into the world economy. Prior to 1993, when many major international donors resumed their assistance programs, only the United Nations, Sweden and Finland were present in the country<sup>34</sup>. In 1993 the Vietnamese Government, with the assistance of the United Nations Development Program, organized the first International Donor Conference, which mobilized 1.8 billion USD for financial assistance to the country. Additionally, the Government officially requested the technical assistance of foreign donor organizations in capacity building and aid coordination in the country<sup>35</sup>. A burgeoning international interest has emerged in Vietnam since this time, due in large part to its strategic position in Asia and its untapped (human and natural) resources. Today Vietnam is host to international organizations and investment projects from around the world, whose mandates usually include increasing trade relations between the host country and Vietnam.

As a result of this shift in focus, Vietnamese industry is highly sensitive to its export performance, since 44 per cent of GDP is derived from it<sup>36</sup>. This trend can be witnessed in the seafood-processing sector, one of Vietnam's top export earners with

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<sup>30</sup> Scott, Andrew. (2000). Small Scale Enterprise and the Environment in Developing Countries. In *Small and Medium Scaled Enterprises and The Environment*, Ed. Ruth Hillary, 276-288. Greenley Publishing Ltd.

<sup>31</sup> Pallen, Dean. (2001).

<sup>32</sup> Blackman, Allen. (2000).

<sup>33</sup> Internally-derived information refers to "details concerning volumes and characteristics of wastes generated, the points in production where waste is generated, the means of waste disposal currently employed, and the cost of waste generation in terms of treatment, disposal and value of feedstock wasted" (Palladino: 2001).

<sup>34</sup> UNDP. (2002).

<sup>35</sup> UNDP. (2002).

<sup>36</sup> World Bank. (2002). Vietnam's Pillars of Development. Available online at: [http://www.worldbank.org.vn/vn\\_pillars/create/create001.htm](http://www.worldbank.org.vn/vn_pillars/create/create001.htm). Accessed 10/23/02.

USD 1.77 billion in sales in 2001<sup>37</sup>. Because the main markets for seafood are foreign, the seafood-processing sector is highly sensitive to external firm dynamics, such as quality standards. Two of the most influential types of standards are the Hazard Analysis and Critical Control Point System for the United States market and the European Union Code for the European markets<sup>38</sup>. Meeting these quality standards are required for Vietnamese seafood-processing companies to export to either of these regions. In 2001, the United States and the European Union purchased 34 per cent of Vietnam's total seafood export, and as a result have a significant influence over the production requirements for seafood processing in the country<sup>39</sup>.

Vietnam's aim to enter into the World Trade Organization (WTO) also marks a significant economic shift for the country. The economic benefits of this accession are already being witnessed in Vietnam, despite the fact that actual membership in WTO is still a few years away. Nike, for example, has already announced plans to increase its production by up to 25 per cent a year<sup>40</sup>. However, as noted above, increased economic improvement will most likely cause increased detriment to the natural environment.

### 4.3 Environmental Concerns

The economic results of the *Doi Moi* reforms are, on the whole, impressive. It is reported that the economy of Vietnam has grown at an annual average rate of 7.6 per cent over the last decade. GDP has grown at a 2.5 times higher rate in 2000 than was reported in 1985<sup>41</sup>. However, this growth is not without problems, particularly for the natural environment. The growth in industrial activities in the country has required more extraction of natural resources, increases in energy consumption, and higher dependence on transportation and other infrastructure, which have all resulted in more wastes and pollution<sup>42</sup>. The negative environmental effects of industry in Vietnam can typically be broken down into a number of categories, including:

1. Water-related environmental impacts
2. Air pollution-related environmental impacts
3. Solid Waste related environmental impacts
4. Workplace health and safety problems

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<sup>37</sup> Lindahl, Jakob. (2002). Vietnam's Seafood Processing Industry Divided Between Global and the Regional Market. Draft Paper. Available online: [http://www.geogr.ku.dk/courses/p\\_hd/glob-loc/papers/lindahl.pdf](http://www.geogr.ku.dk/courses/p_hd/glob-loc/papers/lindahl.pdf). Accessed 11/23/02.

<sup>38</sup> Hazard Analysis and Critical Control Point is a preventative system focusing on 'hazard control' by anticipating and preventing problems, rather than relying on inspection of the final product.

<sup>39</sup> Lindahl, Jakob. (2002).

<sup>40</sup> United States/Vietnam Trade Council. (2002). Mostly Good News for WTO Campaign. Available online: <http://www.usvtc.org/News/MAY%2002/VIR%20Mostly%20Good%20news%20on%20WTO.htm>. Accessed 9/7/02.

<sup>41</sup> "Doi Moi Lays the Foundation for Industrial Growth". (2001). Vietnam News. Available Online: <http://vietnamnews.vnagency.com.vn/2001-04-19/Stories/04.htm>. Accessed 8/8/02.

<sup>42</sup> Sikor, Thomas O. and Dara O'Rourke. (1996).

### 4.3.1 Water-Related Environmental Impacts

Water-related environmental impacts can occur in a number of sectors including food processing, textile dyeing and printing, and electroplating. In Vietnam, seafood-processing companies are a good example of this type of environmental impact since they contribute a high proportion of the overall effluent discharge in waterways. Curbing this problem is difficult since installation of wastewater treatments plants are necessary, but expensive propositions. The effluent streams created from fish processing, which include high loads of organic matter, are often discharged directly into local rivers and costal areas without any pre-treatment, as illustrated in these pictures.



**Picture 3: Effluent pipe from a seafood-processing factory near HCMC (left)**

**Picture 4: Water body directly behind the same processing factory (above)**

This can result in negative environmental impacts, as witnessed in Khanh Hoa province where untreated effluent from seafood-processing factories “had an adverse impact on neighbouring shrimp farms”<sup>43</sup>. In addition, because wastewater often contains oils, and since oil floats on water, often the wastewater from nearby factories can degrade surrounding coastlines. Data collected from DOSTE- Ho Chi Minh City<sup>44</sup> and the Institute for Environment and Resources – The National University of Ho Chi Minh City (CEFINEA) indicates that seafood processing is one of the sectors causing the most environmental damage to the Saigon-Dong Nai river catchment area<sup>45</sup>.

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<sup>43</sup> Nguyen Phuoc Dan, C. Visvanathan and Nguyen Cong Thanh. (2000). Environmental Management Strategy for Seafood Processing Industry in Vietnam. *International Conference on Industry and Environment in Vietnam*, 191 – 204.

<sup>44</sup> DOSTE is the Department of Science, Technology and the Environment and is the provincial management agency for environmental protection in Vietnam.

<sup>45</sup> Nguyen Phuoc Dan, C. Visvanathan and Nguyen Cong Thanh. (2000).

### 4.3.2 Air Pollution-Related Environmental Impacts

Factories built before the 1970s often possess old and obsolete technologies. Besides being inefficient in the use of resources, these production technologies are mostly unequipped with filters for treating toxic waste gases or other pollutants caused by the production process. Additionally, older factories are most often located within urban areas, as opposed to new industrial zones outside the city centre. The result is that industry is a significant contributor to degraded air quality in Vietnam generally, and in the large industrial cities particularly<sup>46</sup>.



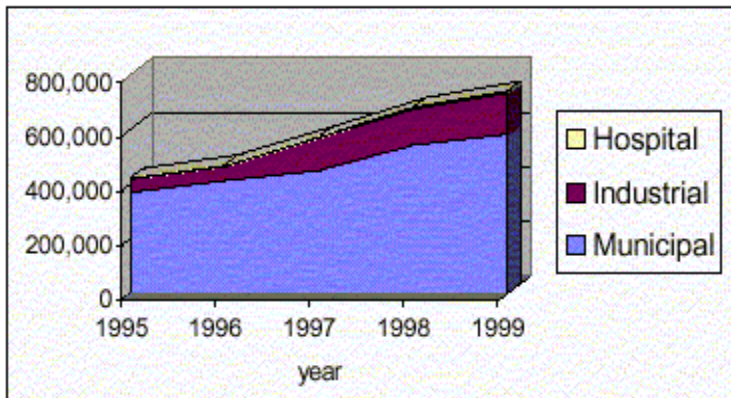
Picture 5: Factory pollution in Vietnam  
Source: UNEP (2002)

Some of the most polluting sectors include: cement and construction materials production, metallurgy, chemical, paper-mills, food processing (sugar, alcohol, beer), textile, dyeing, rubber, plastics and cosmetics<sup>47</sup>.

### 4.3.3 Solid Waste Related Environmental Impacts

As industrial production increases in Vietnam, so too does the quantity of solid waste. In 1995 industrial solid waste in Hanoi accounted for 11 per cent (47,374 tonnes) of all solid waste generated in the city. By 1999 that percentage had increased to 20 per cent (151,170 tonnes)<sup>48</sup>. The following graph illustrates this increase in relation to hospital and municipal waste.

Figure 4: Solid Waste Generation Rates in Hanoi, 1995 - 1999 (Tonnes)



Source: Palladino (2001)

<sup>46</sup> UNEP. (2002). State of the Environment Vietnam. Available online at: [http://www.rrcap.unep.org/reports/soe/vietnam/Issues/pressure/air\\_pressure.htm](http://www.rrcap.unep.org/reports/soe/vietnam/Issues/pressure/air_pressure.htm). Accessed 01/24/03.

<sup>47</sup> UNEP. (2002).

<sup>48</sup> Palladino, Angela. (2001). Industrial Waste Management in Hanoi, Vietnam: A Case Study of Thuong Dinh Industrial Zone. *Master's Thesis, University of Toronto*.



Although there are environmental laws stipulating industry to invest in waste treatment systems, very few companies do since penalties for non-compliance are minimal. As a result only 20 percent of existing firms have implemented technological changes to minimize waste production<sup>49</sup>.

#### 4.3.4 Workplace Health and Safety Problems

In combination with the environmental concerns noted above, worker health and safety should also be considered when examining the overall impact of industry. Degraded air quality, contaminated water and poor waste disposal practices adversely affect the entire community surrounding industrial enterprises. However, workers who come in direct contact with contaminants are arguably more at risk from a health and safety standpoint.

One of the most notable examples of this is the adverse health and occupational impacts from waste picking. Waste pickers, or people who earn their income from removing income-generating waste (mainly recyclables) from the waste stream are common in developing countries. Waste pickers at a landfill in Hanoi reported coming in contact with “blood, fecal matter, broken glass, needles, sharp metal objects, air particulates, chemical fumes, run-off, mice/rats, flies, mosquitoes, stray animals and animal carcasses”<sup>50</sup>. All pickers reported adverse health effects from working on the landfill, ranging from sore extremities and skin rashes to being buried beneath garbage by trucks unloading waste<sup>51</sup>. Industrial waste is common in municipal landfills, since many firms do not sort their own waste. As a result, waste pickers are directly affected by waste products from the industrial sector<sup>52</sup>.



**Picture 6: Waste pickers at a dumpsite in Vietnam**  
Source: Waste-Econ (2003)

Generally, there is an absence of occupational health and safety standards in developing countries, but particularly in smaller companies and home based enterprises<sup>53</sup>. Home-based enterprises are gaining popularity in developing countries since their operating costs are lower and companies can more easily circumvent environmental and safety standards. The table on the next page highlights a few of the industrial processes where workers come into contact with hazardous residues.

<sup>49</sup> Palladino, Angela. (2001).

<sup>50</sup> Nguyen, Huyen. (2000). Health and Social Needs of Waste Pickers in Vietnam. Waste-Econ Publication. Available online at: <http://ots.utoronto.ca/users/WasteEcon/publications.htm>. Accessed 03/24/03.

<sup>51</sup> Nguyen, Huyen. (2000).

<sup>52</sup> Malaviya, Nupur. (2002). On the Road to a More Ecological Industrial System: The Role of Waste Exchanges in Ho Chi Minh City. *Current Issues Report, University of Toronto, Department of Geography and Planning*. Toronto, Ontario

<sup>53</sup> Pallen, Dean. (2001).

Table 5: Pollutants and Hazardous Residues from Industries in Developing Countries

<b>Industry Process</b>	<b>Hazardous Residues</b>
Bricks	Chromium, fluoride, sulphur, dioxide
Textile dyeing and finishing	Cyanide, dyes, oils, resins, sodium hypochlorite, caustic soda, sodium carbonate
Canning	Alkalis, bleach, solvents, wax
Glass and ceramics	Arsenic, barium, manganese, selenium
Dry cleaning	Solvents, bleach
Dye formulations	Tin, zinc
Metal Mechanics and metal finishing	Caustic soda, sulphuric acid, iron oxide, zinc, solvents
Metal plating	Polyphosphates, cyanide, caustic soda, chromium, zinc, carbonates, detergents
Automotive services and machine shops	Burnt oil, oil adsorbents, solvents
Pickling	Acid, metal, salts
Battery recovery	Lead, cadmium, chromium, copper, nickel, acids, mercury, methanol
Paper recycling	Methanol, mercury, titanium, zinc, wax pesticide formulations, zinc, copper, fluoride, organic phosphorus, phenol

Source: Pallen (2001)

## 5.0 OBSTACLES TO SUCCESSFUL CP IMPLEMENTATION IN INDUSTRY

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Despite the 'common sense' approach of CP and the economic benefits associated with its implementation, CP remains a hard sell to industry, particularly in developing countries. There are a number of reasons for this response. In Southeast Asia generally, researchers have found that companies have been slow to implement cleaner production technologies and practices due to:

- End-of-pipe solutions being viewed as cheaper in the short term, more widely known and less disruptive to adopt;
- A lack of necessary expertise to implement cleaner technologies;
- A reluctance by companies to invest in long-term returns; and,
- Less stringent environmental regulations, which are rarely enforced<sup>54</sup>.

In Vietnam specifically, company representatives, government officials and academics discussed obstacles to CP implementation at the Cleaner Production Roundtable<sup>55</sup>. The participants identified the following factors as the most significant obstacles to successful uptake of CP concepts in industry:

- Poor enforcement of environmental regulations;
- Limited CP information available for engineers, and as a result, lack of technical know-how to implement new ideas in industrial settings;
- Few trained technical experts;
- Lack of awareness of CP concepts generally among company officials; and,
- Lack of capital to finance new CP projects and to acquire new technologies<sup>56</sup>.

### 5.1 CP Obstacles: Examining Root Causes

If eliminating these obstacles were simply a matter of training more experts or raising awareness, CP training programs could easily be developed to meet these goals. However, the literature search and key informant interviews suggest that many of the obstacles associated with successful CP implementation in Vietnam are in fact part of systemic problems of incorporating pollution prevention concepts into industry. Specifically, I have identified a number of 'root causes' that produce, both directly and indirectly, the obstacles noted above. In the following sections I will outline the root causes that led to obstacles for CP adoption and make specific recommendations for the Government of Vietnam, VNCPC and national and international CP programs to take to combat these problems.

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<sup>54</sup> Sinclair, Darren and Neil Gunningham. (2000). Promoting Cleaner Production in South East Asia: A Case Study of the Philippine DTI/BOI Environmental Unit. *Asia Pacific Journal of Environmental Law*, Vol. 5, Issue 3.

<sup>55</sup> The CP Roundtable was held in Hanoi, Vietnam: June 20<sup>th</sup>, 2002.

## 5.2 Root Cause Number One: The Policy Environment in Vietnam

One of the main obstacles to CP implementation in Vietnamese industry is said to be the poor enforcement of environmental regulations. This is often attributed to a lack of funds as well as to a lack of trained personnel in environmental agencies to carry out policy objectives. While this is true, the lack of effective regulations appears to also stem from the policy environment in Vietnam. While environmental support dates back to the 1980s with the introduction of the *National Conservation Strategy* (1984), environmental sustainability was not introduced in any concrete manner until the release of the *National Plan for Environment and Sustainable Development* in the early 1990s<sup>57</sup>. The national plan enabled a number of policy and legal instruments to be put into effect, including the *Law on Environmental Protection* (1993), with subsequent air, soil and water standards enacted in 1995, and the *Directive 36/CT-TW* concerned with "strengthening environmental protection in the period of industrialization and modernization of the country" (1998)<sup>58</sup>.

These early directives aided the Government in developing the *National Strategy for Environmental Protection* (2001 – 2010), which "considers pollution prevention to be a guiding principle to be combined with pollution treatment, environmental quality improvement and natural resource conservation"<sup>59</sup>. In response to the guiding principle of pollution prevention, the Ministry of Science, Technology and Environment (MOSTE) and the National Environment Agency drafted the *National Action Plan of Cleaner Production* (2001 – 2005).

However, despite the multitude of national environmental plans that have been drafted in the past few years, many of the recommendations of these plans have not been implemented and numerous environmental regulations have effectively been ignored. The Vietnam Capacity 21 Project conducted an analysis of the national environmental plans in Vietnam, and summarized that:

Up to now, environmental planning in Vietnam has been considered as planning by and for MOSTE, not planning for development of all sectors. On the whole 'environmental' strategies are not taken seriously by the key resource development sectors and by economic planners. This is not necessarily because there is a reluctance to implement them, but because, having not been involved in formulation, they are unclear as to how to do so<sup>60</sup>.

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<sup>57</sup> Hoang, Kim Chi. (2001). Promotion of Cleaner Production in Vietnam: Systemic Evaluation of Experience from the VNCP's Cleaner Production Demonstration Projects. *Master's Thesis, The International Institute for Industrial Environmental Economics*. Lund, Sweden.

<sup>58</sup> Government of Vietnam. (2000). *National Strategy for Environmental Protection*. Available from NISTPASS- Hanoi, Vietnam.

<sup>59</sup> MOSTE/NEA. (2001).

<sup>60</sup> Ministry of Planning and Investment (MPI)/United Nations Development Programme (UNDP). (1997). *An Analysis of National Environmental Plans in Vietnam. Vietnam Capacity 21 Project*.

### 5.2.1 Conclusions

Overall, the current policy environment is not conducive to either enforcing environmental regulations or to effectively promoting pollution prevention tools. There is a significant lack of cooperation and understanding between government sectors as to how commitment to social equity and environmental improvement should be managed alongside the government's development strategy of "increased exploitation of natural resources and the rapid expansion of resource processing industries"<sup>61</sup>. This dichotomy of objectives at the state level inevitably leads to confusion at the industry level, when conflicting mandates are passed down by government agencies.

### 5.2.2 Recommendations

There is a lack of knowledge at various levels of government as to the role pollution prevention generally, and CP specifically, can play in promoting economic benefits for industry<sup>62</sup>. In order to lessen the impact of regulatory obstacles in the uptake of CP, future environmental plans and economic development initiatives should be developed in a coordinated effort. In order for this to happen, I recommend a three-fold approach. First,

**The Vietnam Cleaner Production Centre, in conjunction with the Ministry of Science, Technology and Environment and the Ministry of Education and Training, should develop general environmental education courses for government officials in the Ministries of Planning and Investment, Finance, Industry, Trade, Transport, Health, and Agriculture and Rural Development.**

The goal of these general education courses should be to educate ministry officials, particularly those not traditionally associated with the environment, about the immediate need for environmental improvements in the industrial sector and the effectiveness of CP, as well as other pollution prevention tools, in meeting these needs. As one questionnaire respondent noted "everyone should be aware of the process of CP" and government should take an active role in its promotion<sup>63</sup>. These general education seminars should also stress the benefits of creating links between ministries and how better cooperation and communication can improve the overall effectiveness of both economic and environmental plans. Second,

<sup>61</sup> O'Rourke, Dara. (1995). Economics, Environment and Equity: Policy Integration During Development in Vietnam. *Berkeley Planning Journal*. Vol. 10: 15-35.

<sup>62</sup> CP Roundtable. Hanoi, Vietnam: June 20<sup>th</sup>, 2002.

<sup>63</sup> Respondent's comment to question 26.

**The Vietnam Cleaner Production Centre, in conjunction with the Ministry of Science, Technology and Environment and the Ministry of Education and Training, should develop targeted Cleaner Production training for all government officials involved in industrial development and economic planning.**

These training courses should be promoted by the Prime Minister's office to ensure active participation by officials. Training courses should provide a more detailed understanding to participants regarding the usefulness and necessity of incorporating CP concepts into industrial development and economic plans. Specifically designed training should be aimed directly at officials in the Ministries of:

1. Industry;
2. Finance;
3. Planning and Investment; and,
4. Trade.

Specific details regarding the content of these training programs are beyond the scope of this report. However, all directed training should positively communicate the opportunities that could be realized by Ministries through the incorporation of CP into industrial development and economic planning initiatives. Opportunities such as increased efficiency, economic profits and international competitiveness should be described in detail within these seminars. Case studies should be used to show how CP has achieved these outcomes in other countries. This level of directed training should also strongly promote the advantages of intra- and inter- governmental cooperation and communication. Third,

**The Vietnam Cleaner Production Centre, with the support of the Prime Minister's office, should organize a roundtable with officials from all ministries to discuss mechanisms for expanding Cleaner Production within industry and fostering partnerships between ministries to accomplish this goal.**

Each ministry, in collaboration with their relevant provincial departments, should develop a list of recommendations on how their ministry could contribute to improved environmental performance generally, and CP in particular. These recommendations should be presented to all other ministries in a roundtable sponsored by the Government of Vietnam and the Vietnam Cleaner Production Centre. Specific cooperation plans, outlining the roles each ministry should play in fostering CP support in industry, should be an outcome of this roundtable.

### 5.3 Root Cause Number Two: Dependence on Outside Assistance

A number of the obstacles noted at the CP Roundtable in Hanoi dealt with lack of training and limited information, both at the management and technical levels. These problems are significant obstacles to successful CP implementation, but may have less to do with the amount of training available than the manner in which it is delivered. Therefore, I argue that dependence on outside assistance is a root cause for some of the problems associated with awareness and effective implementation of CP concepts.

Since CP is a relatively new concept in Vietnam almost all of its demonstration projects and training programs have been developed and financed by international organizations (see Appendix 3). The amount of international involvement in Vietnam is typical of CP demonstration projects and dissemination programs in developing countries, which are primarily carried out with the support of external consultants and CP experts. Furthermore, it is characteristic that a considerable part of the program costs are met by outside, or international, funds<sup>64</sup>. However, a major question arises from this trend, namely what happens when foreign financial support leaves? This is a serious issue, since many companies will not implement CP projects unless they are funded by an international organization<sup>65</sup>. This makes economic sense for companies, since demonstration projects often provide free training, and in some cases, help finance the purchase of new technology<sup>66</sup>.

The inevitable outcome of this is 'donor-dependence', whereby firms do not take an active role in changing their management and operational behaviours. They accept the technology and training provided, but are less likely to make changes that would create a climate for sustainable CP implementation within their companies. This attitudinal obstacle was noted in a research study conducted on the experience of six of the thirteen companies in Vietnam who had received in-plant training from VNCP. Specifically, the researcher found that:

1. The CP assessment methodology and its implementation did not lead to long-term improvement within the studied companies;
2. There remains a lack of priority for conducting CP assessments with little encouragement or incentives for promoting and implementing ideas; and,
3. The CP assessment methodology and its implementation did not appear to raise the consciousness for environmental compliance within the companies<sup>67</sup>.

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<sup>64</sup> Zwetsloot, G.I.J.M. and A. Geyer. (1996). The Essential Elements for Successful Cleaner Production Programmes. *Journal of Cleaner Production*. Vol. 4 No. 1: 29 – 39.

<sup>65</sup> Patterson, John. (2002). Chief Advisor and Project Manager, Vietnam – Canada Environment Project (VCEP). Personal Interview.

<sup>66</sup> One example in Vietnam is the SEAQUIP project funded by the Danish Development Organization (DANIDA), which subsidizes up to 50 per cent of the cost of new technology for its demonstration companies.

<sup>67</sup> Hoang, Kim Chi. (2001).

### 5.3.1 Conclusions

Donor support in Vietnam appears to be a catch-22: without it CP would not exist, but with it companies inevitably take a passive role in environmental management. A fine line exists between working *with* companies and giving them the information they need to become environmentally self-sufficient versus working *for* them, creating solutions that unavoidably repress innovation and creativity at the firm level. Currently there are efforts under way to establish a CP Network and it is argued that this is necessary to the continued development of CP in Vietnam<sup>68</sup>. However, it appears that few donor-funded projects are tackling the sustainability of CP in Vietnam. The Vietnam-Canada Environment Project (VCEP) is working to strengthen some provincial environmental agencies (DOSTEs) throughout the country and VNCPC is planning to strengthen the demand for CP consultant services, however the majority of projects are still highly dependent on the financial support provided from donor organizations.

### 5.3.2 Recommendations

**All international donor agencies working to promote Cleaner Production should ensure that their programs contain a significant sustainability component.**

Donor agencies should take a hard look at their project outcomes to determine if they are in fact achieving sustainable results and adequately addressing long-term environmental management needs in Vietnam. Projects that give away technology and/or training should ensure that they are not creating a cycle of dependence and stifling future environmental progress. One way to do this is to incorporate a sustainability component into each and every CP project.

Sustainability components within projects could focus on CP marketing via media and television and other forms of press at the same time as introducing demonstration projects. Regularly scheduled conferences could also be established and funded by donor agencies to promote the benefits of CP by showcasing successful CP implementation case studies<sup>69</sup>. Another way to build sustainability into programs is to link up with industry organizations. CP concepts could be taught to people who already have the necessary technical knowledge and ideas would be passed on to a wider audience through the support of industry partnerships<sup>70</sup>.

Another way to promote sustainability is to focus efforts on the content of university programs, particularly in the engineering and other technical based fields. Hanoi and Van Lang Universities offer CP as an independent subject and other universities across

<sup>68</sup> Nguyen Ngoc, Sinh. (2002). National Environmental Agency. Speech Presented at the CP Roundtable, June 20 – 21, Hanoi, Vietnam.

<sup>69</sup> Respondent's comment to question 26.

<sup>70</sup> Leuenberger, Heinz. (2002). Chief Technical Advisor, Vietnam Cleaner Production Centre. Personal Interview.



Vietnam are trying to implement, at the very least, a component of CP into existing programs. However, further development of these programs needs to occur as most courses currently lack a practical link with industry, resulting in students who are not always able to effectively implement in industry what they have learned in the classroom<sup>71</sup>.

International donors should focus some component of their CP projects on skills development in education, with a practicum component in industry. Skills development would increase the overall number of trained experts, while at the same time developing a local knowledge base, who could continue CP efforts after donor financing leaves the country. VNCPC has also reported that there is a lack of background material, good teaching materials, and teachers who have in-depth CP knowledge<sup>72</sup>. International donors should work with VNCPC to develop teaching materials from demonstration projects they have conducted in industry. Teaching materials could include textbooks, case study reports and video modules. International donors should also finance CP education for Vietnamese professors from non-environmental fields such as economics, engineering and businesses management. This would improve the understanding of CP outside of the environmental discipline.

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<sup>71</sup> Leuenberger, Heinz. (2002). Personal Interview.

<sup>72</sup> Ngo et. al. (2002). Integration of CP into University Curricula. Available from the Vietnam Cleaner Production Centre, Hanoi, Vietnam.

## 5.4 Root Cause Number Three: Traditional Corporate Culture

Company officials have been faulted for lacking the necessary knowledge concerning CP and the economic benefits they could yield from its implementation. However, it may be that many company officials are unaware of CP, and its profit maximizing potential, because of the corporate culture of businesses in Vietnam.

Little has been written about corporate culture in Vietnam, and as a result, few researchers have studied the effect of corporate culture's influence in the adoption of pollution prevention tools at the firm level. In general, Vietnamese corporate culture can be defined as static, due to the former system of control over industry in the country. Until very recently, the Vietnamese government made almost all decisions concerning large-scale industrial activities.

Product mixes and quantities of outputs, as well as the specifics of technological and resource inputs into production were determined by the Ministry of Industry. Capital allocations were proposed by the Ministries of Industry and approved by the Ministry of Finance<sup>73</sup>.

The *Company Law* was passed in 1990 to initiate the privatization of firms. However, in 2000 the state sector still accounted for the largest percentage of GDP at approximately 32 per cent<sup>74</sup>.

This type of management structure suppresses long-term environmental planning initiatives. Management is typically extremely bureaucratic, and because profits accrued are directed back to the state, they are less responsive to incentives found in pollution prevention methods. Compounded with these attitudinal barriers is the historical insignificance of environmental considerations within state-owned enterprises. "Resource inputs were priced through planning decisions or considered "free" goods, resulting in a general atmosphere of inefficient use of resources and ineffective production methods<sup>75</sup>. In a 1999 study conducted of private firms in Vietnam, it was found that 50 per cent came from management positions in state-owned enterprises<sup>76</sup>. Thus, the corporate culture within private firms may share some of the same characteristics as those of state-owned enterprises, since managers come from the state system, and will most likely transfer their style of administration to their new companies<sup>77</sup>.

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<sup>73</sup> Sikor, Thomas O. and Dara O'Rourke. (1996). A Tiger in Search of a New Path: The Economic and Environmental Dynamics of Reform in Vietnam. *Asian Survey*. Vol. 36, No. 6: 601-617.

<sup>74</sup> Taussig, Markus and Liesbet Steer. (2002). A Little Engine that Could...: Domestic Private Companies and Vietnam's Pressing Need for Wage Employment. *World Bank Policy Research Working Paper 2873*.

<sup>75</sup> Sikor, Thomas O. and Dara O'Rourke. (1996).

<sup>76</sup> Mekong Project Development Facility (MPDF). (1999). *Vietnam's Undersized Engine: A Survey of 95 Larger Private Manufacturers*. Available online: <http://www.mpdf.org/tfind/find699a.htm>. Accessed 10/15/02.

<sup>77</sup> Mekong Project Development Facility (MPDF). (1999).

In contrast, for SMEs research suggests that corporate culture may actually facilitate the uptake of pollution prevention concepts. The culture of improvisation, innovation and imitation are in large part how SMEs survive in a competitive economic climate. This type of embedded corporate culture could arguably support the development of ideas, technologies and products that support pollution prevention concepts such as CP<sup>78</sup>.

### 5.4.1 Conclusions

Due to the overall significant of state-owned enterprises, both in their continued contribution to GDP and to the extension of their management control in private firms, a static type of management style continues to be dominant in Vietnam. The result is that a majority of the industrial sector is resistant to change, undervalues the environment, and has little incentive to alter practices based purely on profit motivation. In fact, the traditional corporate culture dictates that funds are best spent in the short-term, often on added production lines rather than on environmental improvements that often require capital investments and may see financial gains only in a relatively long time horizon<sup>79</sup>.

### 5.4.2 Recommendations

**The Vietnam Cleaner Production Centre, in conjunction with other donor-funded Cleaner Production projects, should develop training programs, targeting company management in private firms, to specifically address the issues related to traditional state-run management styles.**

Tackling corporate culture through training and education means taking a 'bottom line' approach. Training programs should explicitly express why CP should be implemented and how it would add more benefits to the company than other profit generating activities, such as added production lines.

An effective way to reach a large number of top management would be to promote CP training programs through industry associations or to incorporate CP training into already established organizations, such as the Vietnam Chamber of Commerce and Industry. The Vietnam Chamber of Commerce and Industry, for example, has local branches and representatives in 8 locations throughout Vietnam<sup>80</sup> and already provides extensive training services to businesses<sup>81</sup>. The Vietnam Cleaner Production Centre and other donor-funded projects should explore possible links with already existing industry and training organizations to reach as many company managers as possible.

<sup>78</sup> Pallen, Dean. (2001).

<sup>79</sup> Patterson, John. (2002). Personal Interview.

<sup>80</sup> Including: Ho Chi Minh City, Da Nang, Hai Phong, Can Tho, Vung Tau, Vinh, Khanh Hoa and Thanh Hoa.

<sup>81</sup> Vietnam Chamber of Commerce and Industry. (2003). Training Activities. Available online at: <http://www.vcci-hcm.com.vn/VCCI/MainActivities/Training.asp>. Accessed 03/25/03.

In order to change poor environmental behaviour in state-owned enterprises, I recommend:

**The Ministry of Industry should mandate all managers in state-owned enterprises to actively incorporate Cleaner Production initiatives into the production process.**

Given the static nature of management in state-owned enterprises, training and education courses alone may not be enough to persuade management to change their environmental behaviour. Therefore, the Ministry of Industry should mandate all managers running state-owned companies to implement CP<sup>82</sup>. While this is currently not politically realistic, if recommendations made previously in this report are acted upon (specific and directed training aimed at government officials) the Ministry of Industry may take a more active role in promoting positive environmental behaviour within its own industries.

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<sup>82</sup> Patterson, John. (2002). Personal Interview.

## 5.5 Root Cause Number Four: Weak Internal Information System

Lack of capital to finance CP projects is one of the most commonly stated obstacles to successful CP adoption in Vietnam. However, lack of capital is actually a symptom of a larger problem, namely the weak internal information systems within companies.

Many companies do not account for the volume of waste generated or the points in their production process where waste is produced. This was one of the major obstacles to sustaining CP noted by Hoang (2002), in her assessment of VNCP's demonstration companies. She found that generally companies had a weak awareness of the relationship between trade and the environment and are often unable to account for all their inputs and outputs in the production process<sup>83</sup>. Consequently, the true costs of inefficient material and production patterns are not clearly understood, and as a result, firms do not recognize the potential savings that could be accrued from CP implementation<sup>84</sup>.

CP proponents and opponents alike argued that most companies do not have the financial capacity to implement new technologies or the time to allow employees to develop CP ideas<sup>85</sup>. They also state that there is an overall lack of funds to support CP initiatives, and as a result, foreign donor technology and training 'giveaways' are necessary. However, it is a popular misconception that there is a lack of financial capital available for CP projects. In fact, in both Hanoi and HCMC environmental funds, which offer low interest loans, are available for companies to borrow from. Yet, as of May 2002 only two companies in Hanoi had utilized the fund,<sup>86</sup> and overall the funds have met with little success<sup>87</sup>.

The root cause for why financial capacity is weak, despite the availability of low interest loans, is the limited accounting procedures in place within companies. Poor recordkeeping and a lack of collateral make it difficult for companies to conform to the loan structure set out in the environmental funds. As a result, most companies find it too difficult to go through the process associated with acquiring a loan, choosing instead to use their own capital or waiting for a financed demonstration project, if they do implement CP.

### 5.5.1 Conclusions

Financing of CP in Vietnam is hampered by two major problems. While there are funds available to finance new projects, the money is not utilized because:

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<sup>83</sup> Hoang, Kim Chi. (2002).

<sup>84</sup> Palladino, Angela. (2001).

<sup>85</sup> CP Roundtable Hanoi, Vietnam: June 20<sup>th</sup>, 2002

<sup>86</sup> Dr. Ngo Thi Nga. Deputy Director, Vietnam Cleaner Production Centre (2002). Personal Interview.

<sup>87</sup> McCallum, Mary Ellen. (2001). Notes from a telephone conversation with Virginia Maclaren, 11/20/01.

1. Companies are often not aware of the potential financial benefits from the implementation of CP due to weak internal information systems, and;
2. The accounting procedures in place in many companies are not adequately developed for the formal banking system. As a result, many companies cannot acquire a loan for implementing CP.

### 5.5.2 Recommendations

**The Vietnam Cleaner Production Centre, in conjunction with other donor-funded Cleaner Production projects, should develop training programs that teach general management and accounting systems to companies prior to the introduction of Cleaner Production concepts.**

Despite the current popularity of CP, most firms in Vietnam do not have the internal capacity to effectively implement and sustain CP on their own. While the Vietnamese government and international donors may be more enthusiastic about seeing impressive results from CP demonstration projects, a more pressing objective of environment programs should be increasing structural and management capacity within firms.

Therefore, I argue that primary training programs, focusing on incorporating general management systems into companies, should precede CP training programs. CP should then be introduced in subsequent training seminars after companies have established effective accounting and recording systems. While this may slow environmental progress in the short-run, it will help build a foundation for long-term sustainable environmental management in the industrial sector.

## 6.0 EVALUATING EXISTING TRAINING AND EDUCATION PROGRAMS

In this section of the report I will outline the existing training and education programs in Vietnam and explore some of the strengths and weaknesses of these programs, as defined by respondents of the questionnaire. These strengths and weaknesses will be used to make recommendations for improving future CP programs.

### 6.1 Existing Training and Education Programs

Questionnaire respondents were asked to list the details of previous CP courses they had taken. This question was posed to determine the types of courses that have been offered in Vietnam, the agency responsible for their delivery and how long each course was in duration.

Overall there were a large variety of responses in all categories. In terms of the sponsoring agency, most (52/70 responses) listed VNCPC, United Nations Industrial Development Organization (UNIDO) and or United Nations Environment Program (UNEP) as the administering agent. However, it was difficult to determine from respondents the exact titles of courses, since different titles were often used for the same course. Generally, training programs were part of the VNCPC module series and can be categorized within the following programs described in the table below.

**Table 6: VNCPC Training Activities (2001)**

<b>Type of Training Activity</b>	<b>Description</b>
Intensive CP training program	A four-module training program (first designed for the pulp and paper sector), which consisted of 14 days of classroom training and 11 days of practical work in companies.  Intensive long-term (1 year) CP training delivered to 61 participants throughout Vietnam.
Special skills training	Organized mainly for VNCPC's trainers and staff to improve and increase their own skills in conducting CP assessments.
Tailor made training	Specific training packages developed for clients such as VCEP, UNEP and DANIDA.
Curriculum development at university level	Two-day seminars held in Hanoi and Ho Chi Minh City in order to determine the interest and define ways to integrate CP into food processing and chemical and environmental engineering curricula.

Source: VNCPC (2001)

Additionally, some respondents noted that they had taken part in the UNEP CP 1-4 training project. This project was designed by UNEP to help the National Cleaner Production Centres worldwide increase investments in CP. The project is called "Strategies and Mechanisms to Promote CP Investments" and it was launched in 1999. The project demonstrates, through five pilot projects (in Guatemala,

Nicaragua, Tanzania, Vietnam and Zimbabwe), how to “initiate and facilitate the financing of CP investments by developing financing instruments for them, and by persuading public and private financial institutions and the industrial community to adopt these instruments”<sup>88</sup>. Within the project, four training courses have been developed:

1. CP1 – Introduction to Cleaner Production concepts and practices;
2. CP2 – Introduction to capital budgeting;
3. CP3 – Profiting from Cleaner Production; and,
4. CP4 – Funding Cleaner Production projects.

The remaining courses listed by respondents were either international (from Thailand, France) or national (from Government agencies such as the Ministry of Planning and Investment or the National Environmental Agency). This is not an exhaustive list of all training courses that have been offered in Vietnam, since respondents may not have been a part of all courses offered. In addition to the CP training outlined above a number of international donor organizations have been active in CP training and promotion (see Appendix 3).

The duration of courses was varied as well, with courses as short as two days and as long as a year and a half. It is not possible to catalogue responses since respondents did not always list the length of the program, but rather stated the year in which they participated. What is evident is that there is little consistency between courses, with some teaching CP concepts in one day, while others take a week to accomplish the same goal. Additionally, respondents appeared to be unclear about what constituted ‘certified’ in Cleaner Production. According to VNCPC, participants were certified to train and act as CP consultants if they had attended their yearlong course. However, despite the fact that I had obtained my respondent list from participants in this course, many failed to list it as one of the courses they had taken and their ‘date certified in CP’ did not always correspond to the date of the VNCPC course. This is a concern because it appears that ‘certification’ in CP means different things to different respondents and there is no clear consensus among respondents as to what constitutes certification, and hence expertise in, CP implementation.

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<sup>88</sup> UNEP DTIE. (2002). *Changing Production Patterns: Learning from the Experience of National Cleaner Production Centres*. United Nations Publication.



## 6.2 Strengths and Weaknesses of Current Training

To gain a more thorough understanding of the effectiveness of the current training courses I asked respondents to list what they felt were the top three strengths and weakness of the current training and education of CP in Vietnam. Many respondents listed the strengths and weaknesses of CP in general, however, for those that did focus on training specifically there were a few common responses<sup>89</sup>.

In terms of the current strengths of CP training in Vietnam, respondents' answers showed that training courses in Vietnam are most successful at:

1. Raising CP awareness amongst company representatives (11/46);
2. Providing links between theory and practice (10/46);
3. Generating enthusiasm amongst participants (5/46);
4. Proving that CP is an effective tool for managing environmental problems (5/46);
5. Providing free training, and thus motivate larger attendance (4/46);
6. Effectively training both top management and workers (4/46);
7. Providing training that is brief and concise (3/46);
8. Offering courses that draw company representatives, government officials and environmental centre representatives together to discuss CP (2/46);
9. Training CP consulting teams for companies (1/46); and,
10. Providing easy to understand material for participants (1/46).

Respondents also cited a number of weaknesses with the current training system, namely that:

1. Too few company representatives receive training (6/28);
2. There is a lack of in-depth training (4/28);
3. There is a lack of sector specific training (4/28);
4. Too much focus is placed on theoretical training and training lacks practical application exercises (4/28);
5. Training courses are too short and do not provide enough detail (3/28);
6. No training network exists to link up companies and consultants (2/28);
7. Sometimes the material in the training programs is unsuitable for the Vietnamese context (2/28);
8. It is hard to arrange suitable times to attend courses, since CP trainers often have other jobs in companies (1/28);
9. There is a lack of guidance from training organization after courses end (1/28); and,
10. The geographic location of training centres makes it difficult for rural participants to attend courses (1/28).

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<sup>89</sup> Note that response rates for strengths and weaknesses varied.

### 6.2.1 Conclusions

There are a wide variety of CP courses currently offered in Vietnam. VNCPC along with both national and international CP projects have been quite successful in providing a diverse array of training targeting a number of different audiences. However, there appears to be a lack of consensus in terms of determining how long specific training courses should be to cover all the necessary material and what constitutes a 'certified' CP trainer, at least among the respondents of the questionnaire. Overall, coordinating CP training courses across the country is difficult. The geographic barrier of north and south and the lack of cooperation on the part of competing institutions make it difficult for VNCPC to maintain effective communications across the country<sup>90</sup>.

It is clear that many respondents find training programs in Vietnam to be an effective means to disseminate CP information and to increase the environmental awareness of company representatives. A number of respondents found that the link between theory and practice was a significant strength of the current programming. However, it was also noted that too few companies in Vietnam actually receive training and that the training that is received is sometimes superficial and too short in duration, focusing too much on the theory of CP, rather than on the details of how to implement it.

### 6.2.2 Recommendations

**The Vietnam Cleaner Production Centre should actively pursue establishing a Cleaner Production Network to link all Cleaner Production training efforts throughout the country.**

A CP Network is critical to managing all the training efforts throughout the country. Currently there is no system to track all training courses, and as a result, there is an overlap in service provision. A centrally managed database could not only eliminate overlapping service provision, but it could also highlight areas of the country that have not been targeted or sectors that have been overlooked by past training initiatives.

The CP Network could be managed in Hanoi, but supported locally by selecting partner organizations in Ho Chi Minh City, Da Nang and other major industrial centres that could work in tandem with VNCPC to promote the network. Another option is to create a CP magazine, which would be updated on a regular basis, and distribute to industry and other stakeholders<sup>91</sup>. This magazine could be distributed through industry organizations, the Vietnam Chamber of Commerce and Industry as well as VNCPC. The most effective way to maintain a network would be to develop a website, however, respondents state that they rarely use the internet/email to share information. However, this may change in the coming years.

<sup>90</sup> Leuenberger, Heinz. (2002). Personal Interview.

<sup>91</sup> CP Roundtable Hanoi, Vietnam: June 20<sup>th</sup>, 2002.

A significant weakness of current training and education efforts is that there are no national guidelines regarding CP training and any organization can develop a CP training program. This lack of coordination can lead to poor quality in CP service delivery because of varying standards<sup>92</sup>. Thus, there is a distinct need for coordination in terms of the length and content of training programs. I therefore recommend:

**The Vietnam Cleaner Production Centre should establish guidelines for all future CP training projects, in terms of the length and content of their programs.**

Various lengths of training programs should be used for different objectives. Two-day programs should only be used for dissemination purposes. These types of short training seminars are not long enough to effectively teach CP assessment and/or implementation skills.

On-site training programs, which are held in a factory for company employees, should last at a minimum 6 weeks. Within these courses participants need to be taught CP assessment, implementation and follow-up procedures.

CP training for university professors should be a minimum of 6 weeks. These training programs should not only address the technical aspects of CP, such as assessment and implementation procedures, but should also discuss need for behavioural changes within environmental management. Specifically, participants in these training courses should understand the importance of shifting from an 'end-of-pipe/waste is a cost' environment management strategy to a 'pollution prevention/waste is a resource' mentality. Pollution prevention tools such as environmental management systems, industrial ecology and CP should be addressed in detail. These training programs should also strongly encourage teachers from various disciplines to exchange ideas about how to develop effective cross-discipline programs in their universities.

Train the trainer programs and practical training for university students should be a minimum of 3 months in duration. Ideally, 2 months should be spent on the factory floor learning and critiquing the CP assessment and implementation process. An additional classroom component should be part of this training, whereby a number of students come together to discuss their fieldwork experiences and make recommendations for strengthening CP initiatives in their factories.

Given that VNCPC is the leading institution for CP training and education in the country, they should develop and distribute training guidelines, as generally outlined above, to all CP training projects operating in Vietnam.

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<sup>92</sup> Leuenberger, Heinz. (2002). Personal Interview.

## 7.0 EXPERIENCE OF CP TRAINERS AND CONSULTANTS

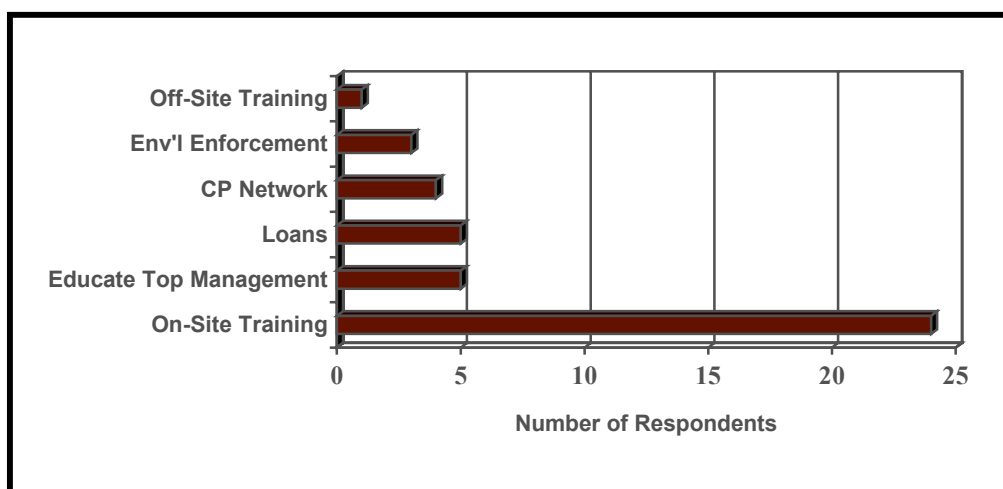
The knowledge of the Vietnamese trainers and consultants who have worked directly with companies is incredibly valuable in determining appropriate training methods. Thus, in this section I will highlight the responses of questionnaire respondents concerning a number of important training questions, including preferred training methods, best size and management structure to implement CP in, success factors for implementation and the benefits of CP for companies<sup>93</sup>.

Questionnaire respondents have worked with 33 CP implementation projects in 13 different industrial sectors, including pulp and paper, food processing, textiles, seafood processing, packaging, metal finishing, beverage, chemical, fertilizer, cement/tile, roofing, mechanics and plastics. Respondents also represent a number of different organization types, including industry (13/33), government (9/33) and academic/research organizations (11/33)<sup>94</sup>.

### 7.1 Preferred Training Method

In designing the survey, I used knowledge gained from key informant interviews as well as relevant international literature. Two important questions were raised in these interviews and in the literature, namely, 1) what is the most important CP initiative that donor agencies can invest in? and, 2) what are the most effective methods of encouraging CP implementation in companies? Respondents were first asked to rank a number of different forms of outside assistance, which were identified in my preliminary research. This question was asked to allow respondents to express the best investment opportunities for foreign donors interested in CP promotion in Vietnam. Figure 5 shows the most popular answers given by respondents.

Figure 5: Important CP Investments for Donors

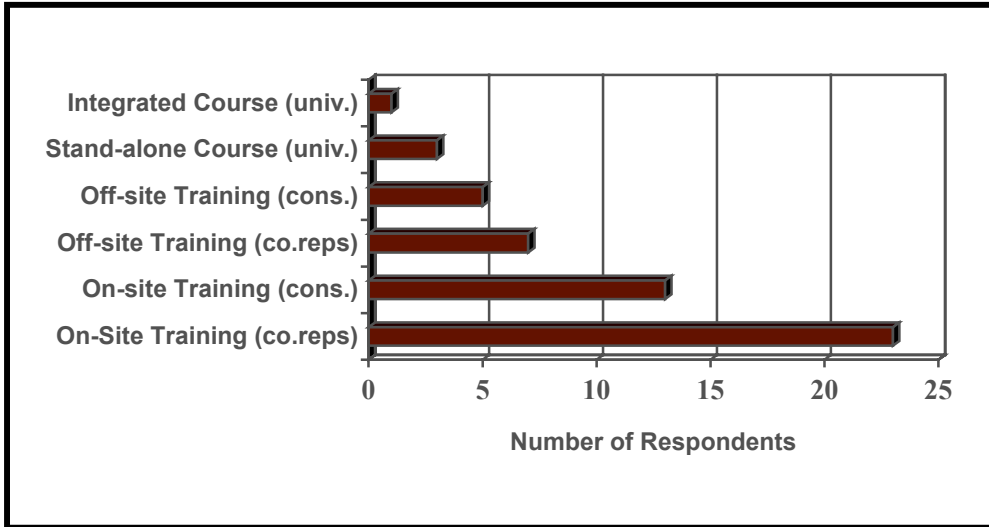


<sup>93</sup> Note that response rates for some questions vary.

<sup>94</sup> Results were cross-tabulated with type of organization and location within the country. Variations are noted.

Respondents were then asked to rank their preferred types of training and education courses for encouraging CP practices in companies. Figure 6 highlights the respondents' choices for most important types of training.

Figure 6: Most Effective Methods for Training



It is interesting to note that in both questions, an equal number of respondents identified on-site training and education courses and in-plant demonstration programs as the most important component to successful CP implementation. It is clear that respondents feel this is the most effective way to successfully promote CP. However, due to the nature of the role of CP trainers and consultants, in terms of implementing CP in companies, there may be some bias in these responses. Specifically, respondents most likely favoured on-site training of company representatives due to the fact that this is how they earn money as consultants.

## 7.2 Firm Size and Management Type

Another question that arose from the literature review and key informant interviews was the management structure and size of companies in Vietnam, and how these factors would influence CP implementation. Both of these firm characteristics are important in designing appropriate CP training programs. Some researchers argue that small-scale companies need special and directed training approaches<sup>95</sup> and that direct economic incentives and command and control instruments will generally not be effective<sup>96</sup>. Additionally, there is concern, as stated in previous sections, that state-owned companies will not be as effective at implementing CP do to the management style of these firms. Figures 7 and 8 summarize the most common answers given.

<sup>95</sup> Pallen, Dean. (2001).

<sup>96</sup> Blackman, Allen. (2000).

Figure 7: Size of Firm and Effectiveness at CP Implementation

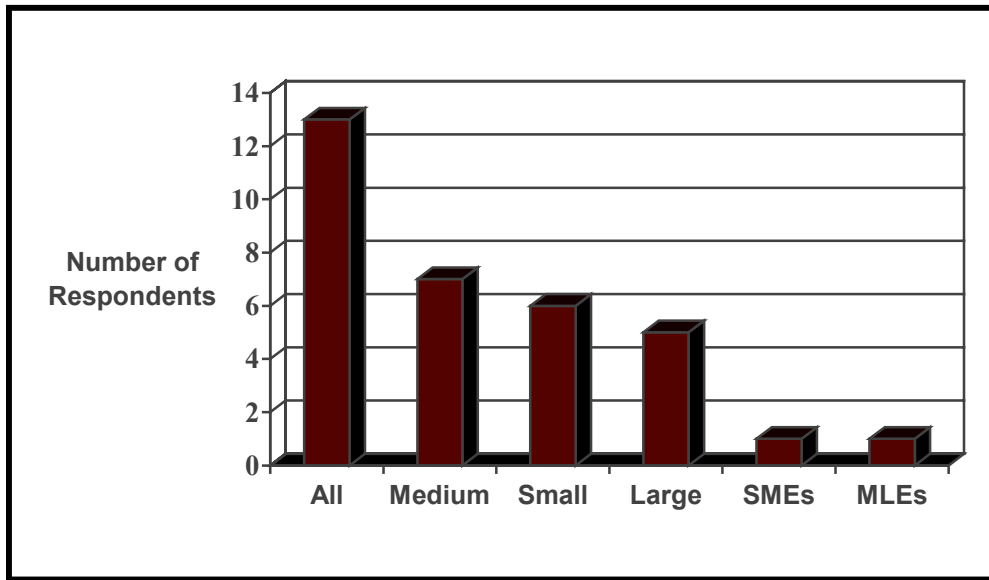
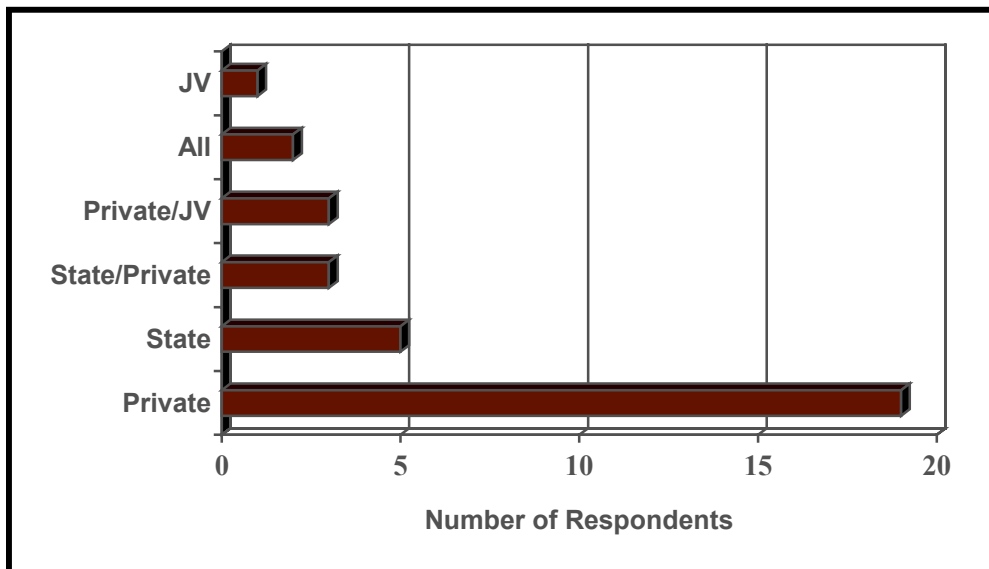


Figure 8: Management Style and Effectiveness at CP Implementation



In terms of the most optimal size of company for the implementation of CP, respondents surprisingly answered that all sizes of companies could effectively implement it. Common reasons<sup>97</sup> for this belief were that it is not actually the size of a company that determines whether CP will be a success, but rather the awareness of, and commitment to, CP by top management (3/9); the awareness of employees (2/9); and the knowledge of the consultants and trainers working with the company (1/9).

<sup>97</sup> Note that not all respondents answered this question.

Additionally, a few respondents noted that all companies have the potential to gain economic and environmental benefits from CP implementation (3/9), and thus size is less of a concern in terms of preventing companies from experiencing benefits.

Overall respondents agreed that private companies were most effective at implementing CP. Specifically, respondents noted a few key advantages in terms of a private firm's ability to successfully adopt CP, namely that:

1. The economic benefits assist the management/owners rather than state (8/24);
2. Management decision-making is easier in private firms (7/24);
3. It is easier to obtain commitment of top management in private firms (2/24);
4. Awareness of CP benefits are higher in private firms (2/24);
5. Financial capacity is greater in private firms than in state-owned enterprises (2/24);
6. There are economic benefits for employees in private firms (1/24);
7. Cooperation between management and employees is higher than in state-owned enterprises or joint-ventures (1/24); and,
8. Private firms have a better management than state-owned enterprises (1/24).

Two of the most commonly cited advantages for private firms are the direct benefits, in terms of profit motivation, and the fact that private firms have more control over their production process and often have less 'red tape' than their state counterparts. Therefore, the economic advantages of CP will be more readily accepted in private firms since the company is in direct control of profits, rather than funneling them back to the government, and thus has more of a motivation to save money and increase efficiency. Additionally, respondents argue that CP will be easier to implement in private firms because the organizational structure is simpler and top management has control over changes in production.

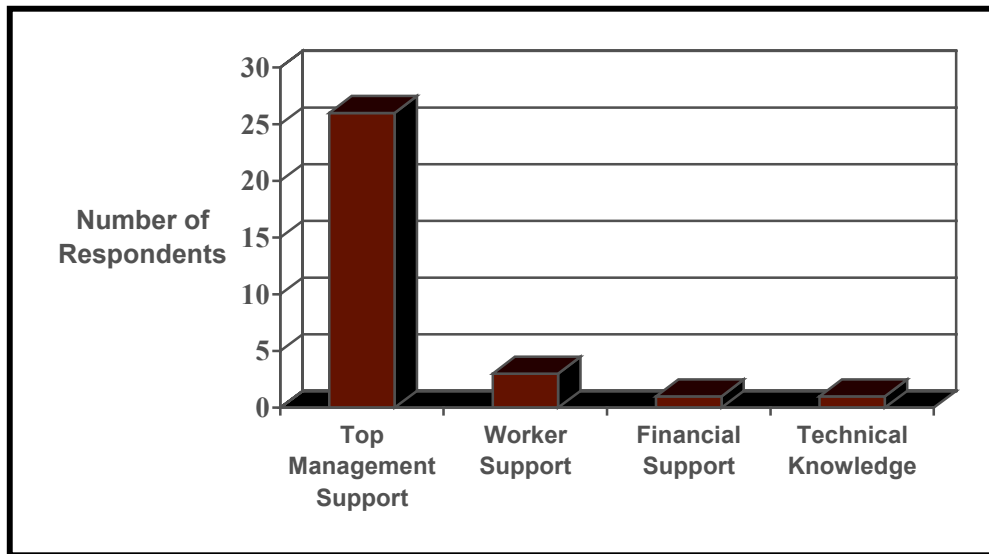
### 7.3 Success Factors

When asked what was the most important factor for CP success in the companies they have worked with, respondents overwhelmingly stated that the support of top management was the most essential component to a successful CP project. The key informant interviews also noted that top management support is an important success factor. When CP projects get the top management of the company 'on board' the staff will follow their lead. However, staff may not always be educated about the program or its benefits and this can lead to failure of projects in the long run<sup>98</sup>. The results are summarized in figure 9.

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<sup>98</sup> Hoang, Kim Chi. (2002). Personal Conversation.

Figure 9: Important Factors for CP Success in Companies



## 7.4 Benefits to Companies

The literature search and key informant interviews repeatedly stated that economic benefits were the most important factor for motivating companies to adopt CP. Key informants mentioned that when promoting economic benefits in training seminars, trainers should specifically state how much a company could save with the implementation of CP.

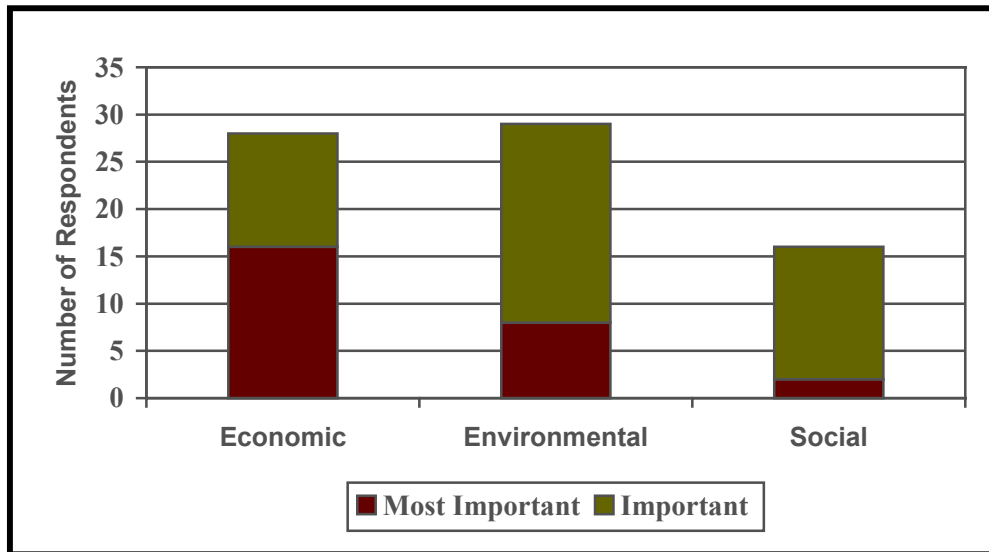
However, there is also research to suggest that community driven regulations that make companies aware of their social and environmental impacts, by way of public pressure, are an effective tool in some developing countries, including Vietnam<sup>99</sup>. Specifically, the public will complain to local authorities about the pollution from neighboring factories and this public pressure will sometimes force local authorities to take action against the polluting firm. Therefore, this research suggests that social and environmental factors may also be important in motivating CP implementation.

When asked about the type of benefit that was most desired by the companies they have implemented CP in, not surprisingly, respondents ranked economic benefits the highest. While some respondents ranked environmental and social benefits as 'most important' (8 and 2 respectively), overwhelmingly, economic benefits were determined to be the most important factor in persuading companies to adopt CP. The results are shown in figure 10.

<sup>99</sup> O'Rourke, Dara. (2002). Community-Driven Regulation: Toward an Improved Model of Environmental Regulation in Vietnam. Ed. Peter Evans. *Liveable Cities? Urban Struggles for Livelihood and Sustainability*. University of California Press: Los Angeles, California.



Figure 10: Benefits Motivating Companies to Adopt CP



However, when motivating benefits were cross-tabulated with the organization from which the respondent was from it was found that respondents from industry actually ranked environmental benefits as most important. This may suggest that prior environmental training has altered their viewpoint regarding the importance of the natural environment, or that these particular respondents were the most 'environmentally advanced' in their companies. Since these findings are not statistically significant, I would recommend further study of this topic.

### 7.5. Conclusions from Findings

It is important to note that the small sample size does not allow for these results to be statistically significant and the vested interest of promoting CP in companies may lead to the possibility of bias in some answers provided by respondents. However, the respondent's opinions do indicate some interesting preliminary findings. Specifically, all respondents have indicated that on-site training and education seminars using practical in-plant demonstrations are the most effective teaching tool for company representatives and the most effective use of donor financing. Questionnaire results also show that while management structure does matter in terms of CP implementation, the size of the company is less of a factor. Respondents repeatedly stated that the most important factor for CP success was the commitment of top management, rather than the size of companies. Finally, the most effective way to motivate the adoption of CP in companies, according to respondents, is to show company representatives the economic benefits that will accrue with the implementation of CP.

In terms of training, these findings suggest that:

1. Training programs should continue to be offered in factories, with practical hands-on training for company officials. This type of training appears to be the most effective at promoting CP implementation and thus should be a component in future CP projects.
2. State-owned enterprises require special and directed training programs since they appear to be more resistant to implementing CP.
3. SMEs should be included in CP training initiatives. Questionnaire results show that all size firms can reap benefits from CP, thus special efforts should be made to prove that environmental improvements can be accomplished alongside economic growth in these companies.
4. Training programs should target top management, ensuring that they understand how proactive environmental measures can create positive economic returns for their company. Some respondents also noted that top management training should also highlight the role employees can play in CP implementation and how motivating and rewarding employees can lead to increased CP ideas and economic savings for the company.
5. Training programs need to state specifically how much a company can save from implementing CP. They should also state, through industry-specific examples, possible options and payback periods for CP technologies<sup>100</sup>.

### 7.5.1 Recommendations

**The Vietnam Cleaner Production Centre should commission a comprehensive study to evaluate the content of all Cleaner Production training programs in Vietnam.**

The findings from the survey highlight the need for a variety of programs with varying content. However, it is not clear whether the various CP training programs offered throughout the country are currently meeting all of these training needs. Prior to the establishment of a CP Network, VNCPC should determine the gaps in service delivery by commissioning an independent study of all CP training programs offered in established CP centres as well as in government departments, international aid programs and industry organizations. This independent study should determine geographic areas in which more training is needed, specific industrial sectors that have not received adequate CP investment and whether current training programs are addressing the findings noted above.

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<sup>100</sup> Hoang, Kim Chi. (2002). Personal Conversation.

## 8.0 BEST PRACTICES

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In this section of the report I will explore best practices from other CP projects. This information will be useful for two reasons:

1. It will help put the questionnaire findings from Vietnamese trainers and consultants into a broader international context; and,
2. It will highlight possible gaps in the current CP training and education services offered in Vietnam.

In the first part of this section I will highlight best practices from other National Cleaner Production Centres globally. In the second half of this section I will examine some of the essential success factors for CP projects as determined by international CP experts.

### 8.1 Experiences from National Cleaner Production Centres

The National Cleaner Production Centre (NCPC) is a joint initiative by United Nations Industrial Development Organization and the Division of Technology, Industry and Economics of the United Nations Environment Program. The aim of the NCPC initiative is to “build local capacity to implement CP in developing countries and economies in transition”<sup>101</sup>. Currently there are 21 NCPCs globally. While there is no definitive plan for successful CP implementation that would work in all countries and in all economies, the years of experience from NCPCs can serve as a useful example for Vietnam.

Specifically, NCPCs have experience in dealing with the following issues that VNCPC may find useful in helping to further their own CP program:

1. Moving from a national centre to national network;
2. Awareness raising;
3. Training to increase local experience and capacity;
4. Assisting in obtaining investments; and,
5. Disseminating information.

Three countries have moved from one NCPC to a national network. In India, their NCPC has helped establish 4 domestically funded regional centres in various states. A similar shift has occurred in Hungary, where 3 regional CP Centres have been created and work directly with the NCPC. In addition 5 municipalities have designated CP representatives. A different move has taken place in China whereby the NCPC developed into 15 CP Centres, which serve separate industrial sectors (e.g. aviation, chemical, metallurgical, petrochemical) as well as provincial governmental

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<sup>101</sup> UNEP DTIE. (2002).

bodies and municipalities. This shift has helped propel China's National CP Network, which at present has 87 member units.

One of the most effective ways the NCPCs have raised awareness of CP is by 'piggybacking' the CP message onto events organized by other organizations. For example, in Mexico the NCPC is now doing more presentations at industrial meetings – especially at the municipal and regional levels – as they find they have a wider audience to draw from. India uses the same technique by presenting at industry meetings as well as other non-technical events. They find that by employing this method they can save money and educate more people.

The directors of NCPCs realize that in order for CP to be sustainable, training must be focused on building a national base of CP experts. In Hungary, for example, the NCPC has focused on incorporating CP concepts into the university curriculum. They estimate that their university courses produce 750 graduate economists a year who have training in preventative environmental approaches. India's NCPC noted that training has to be adapted to the local environment and that each NCPC should develop its own training manuals. Additionally, experience from China and El Salvador has found that specific training packages should be developed to suit the needs of specific target audiences, such as factory staff, top management, CP auditors, etc.

Most NCPCs have had little direct experience in helping companies to obtain investment finance since they are just beginning to build capacity in this area. However, both the Zimbabwe and Slovakia NCPCs, who have experience in this field, suggest having a cost accountant be part of the CP team in companies and develop formal arrangements with banks to help in acquiring loans for companies.

The ultimate goal for NCPCs should be to create an internal demand for CP. This process begins with active dissemination of information. In China, the CP Centre publishes numerous manuals, guidelines and training material for different industrial sectors. Additionally, it produces its own bi-monthly CP newsletter. It is important to realize that different stakeholders require different information and to tailor material to meet these audiences. NCPCs experience has also proven that Centres should develop a feedback system to continuously monitor user needs<sup>102</sup>.

### **8.1.1 Conclusions**

A number of best practices have emerged from the evaluation of NCPCs around the world. Specifically,

- How to create a national network;
- How to raise awareness with limited funds;

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<sup>102</sup> UNEP DTIE. (2002).

- The most effective ways to establish a local knowledge base;
- Some techniques for acquiring investment capital for companies; and,
- Proven methods for successful information dissemination.

Because VNCPC has only been in operation for approximately 5 years it is difficult to gauge whether it has actual gaps in service delivery or whether current training and education will expand to the point that it is at in other countries. Discussions with VNCPC representatives suggest that the Centre has plans to expand the scope of its project in subsequent phases to meet and/or exceed international examples<sup>103</sup>.

## 8.2 Best Practices from Around the World

CP was first introduced within a research project in a Swedish and a Dutch company in 1987<sup>104</sup>. Since that time numerous large scale experiments have taken place, both in Europe and outside, including, but not limited to: 'Eco-Profit' – Austria; 'PREPARE' – Europe; 'DESIRE' – India; and, UNEP CP Program – China.

To capitalize on the knowledge acquired from past CP projects a research team from the Netherlands asked participants, during the first European Roundtable on Cleaner Production (1994), to identify the essential factors for successful CP programs. Twenty respondents from 13 different countries described 18 different CP programs. The respondents identified success factors that fell into 5 broad categories detailed in the following table:

Table 7: Categories of Essential Success Factors for CP Programs

Categories	Subcategories
Cooperation, training and communication	Cooperation with authorities and/or other companies Training and transfer of know-how Good internal communication and information management
Assessing tangible benefits	Improving company status Gaining economic benefits Gaining technological advances
Leadership and management commitment	Commitment of top management Commitment of middle management
Commitment and motivation of employees	Participation, motivation or enrolment of all employees Highly experienced, educated and motivated program teams
Factors ensuring good program management	Adequate program organization and program design Receiving financial support

Source: Zwetsloot and Geyer (1996)

<sup>103</sup> Dr. Ngo Thi Nga and Dr. Heinz Leuenberger. Personal Interviews.

<sup>104</sup> Baas, Leo W. (1995). Cleaner Production: Beyond Projects. *Journal of Cleaner Production*. Vol. 3, No. 12: 55-59.

### **8.2.1 Conclusions**

One of the most effective ways to overcome obstacles to positive environmental performance in industry is through the use of proper training and education. International experience has shown that there are a number of important success factors to effectively implementing CP in companies. Specific focus in the international CP programs has been given to cooperation and communication with authorities and other companies; the importance of assessing tangible benefits, besides the environmental benefits that come with CP implementation; the importance of leadership and management commitment in promoting and sustaining environmental programs in companies; the commitment of employees to the process, through motivational and participatory activities; and finally, ensuring that programs are well organized and have the financial support to be carried out completely.

Questionnaire findings show that many of the CP training programs in Vietnam have already incorporated some of the essential success factors listed in this section. Respondents stated that training programs were effective at creating enthusiasm, raising general awareness and illustrating the practical application of CP. However, as the experience from international CP programs show, successful CP programs require considerable development in terms of cooperation and communication, accessing tangible benefits, gaining the commitment of all levels within the company, and providing well organized and managed programs that are integrated into the corporate structure.

### **8.2.2 Recommendations**

**The Vietnam Cleaner Production Centre, in conjunction with other donor-funded Cleaner Production projects, should design training programs that create industry-community partnerships to implement Cleaner Production initiatives.**

Community pressure has proven to be an effective way to persuade industry around the world to improve their environmental performance. In Vietnam, research conducted by Dara O'Rourke (1999), and followed up by Phung and Mol (2001), illustrate cases in which communities acted as powerful political actors and proved to be catalysts for the environmental improvement of industries.

CP training programs for industry would benefit from incorporating community members in the implementation process. In Europe, the Eco-Profit program considers cooperation and communication to be an essential part of their training program. The project has been successful by moving beyond 'company borders' and involving companies, consultants, authorities and the community in the problem-solving

process<sup>105</sup>. Community members are a valuable addition to the implementation process because they have an acute understanding of the local circumstances and would be well equipped to offer program planners detailed information about the affects of industrial processes on community health and in some cases, agricultural output.

In order for community members to be effective in the CP implementation process general environmental educational programs should be developed for communities by donor organizations and/or the Government to enable people to acquire the necessary knowledge to anticipate, and subsequently address, environmental problems in their communities<sup>106</sup>.

**The Vietnam Cleaner Production Centre should develop a series of promotional materials illustrating the benefits of Cleaner Production and distribute them widely to industry and other media sources.**

Assessing tangible benefits has long been cited, both in Vietnam and internationally, as the key to effective promotion of CP<sup>107</sup>. In Southeast Asia, tangible benefits are especially important, given the competitive nature of companies and the historically weak regulatory compliance.

Promotional material, such as leaflets, newsletters or video footage, should be targeted to various audiences with appropriate material for each situation. For example, the economic benefits of CP should be incorporated into promotional material targeted to industry whereas the health benefits of CP should be targeted to workers in factories, surrounding communities and public health authorities. The aim of these promotional materials should be to increase general environmental education and promote the multiple benefits of CP to as wide an audience as possible.

**The Vietnam Cleaner Production Centre, in conjunction with other donor-funded Cleaner Production projects, should create a series of training programs, each of which target specific levels within companies with relevant Cleaner Production information.**

Experience from the ASEAN Environment Improvement Project 1993 - 1996, a training program for Southeast Asian business managers, proved that top management "must be trained to see the benefits of pollution prevention and to know

<sup>105</sup> Sage, Jan. (2000). Continuous Learning and Improvement in a Regional Cleaner Production Network. *Journal of Cleaner Production*. 8: 381 – 389.

<sup>106</sup> Carnegie, Kashonia L. et al. (2000).

<sup>107</sup> Patterson, John. (2002). Personal Interview.

their own roles in implementation”<sup>108</sup>. The ‘MIRT’ project carried out in Denmark during the same time period focused on employee participation and how to develop a more active role for employees in the environmental activities of their companies. The study found that employees were able to improve their company’s environmental activities and had a comprehensive understanding of environmental problems and solutions<sup>109</sup>. Thus, international experience shows that effective CP implementation requires the support and participation from all levels in a company.

Training programmes in Vietnam should be directed at a number of different levels within companies. Specifically, training should target:

1. Top management
2. General employees
3. Engineers and other direct implementation staff

Training for top management should address corporate culture and how proactive environmental measures will create economic returns for the company, both in the short and long term time horizon. Training should also include the important role top managers play in motivating and rewarding their employees and how employees can be used to generate CP ideas and save money for the company.

Training for general employees should empower them regarding the important role they can play in environmental management and improving their own work conditions. Often employees are the best source for CP solutions, since they work on the factory floor. Training should include practical steps employees could take in determining potential CP solutions.

Technical training regarding how to implement CP should be given to engineers and other CP implementation staff. Technical training could take the form of training seminars held at other companies and/or specific training seminars within engineers’ own factories.

All of the above mentioned training programs should stress the interconnectedness of each group in the CP implementation process. Training programs should also emphasize that CP is a continuous process, meaning that companies can continue to generate new ideas and improve their own production process indefinitely.

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<sup>108</sup> Hamner, Burton. (1999). Cleaner Production Training in Asia: Experience from the ASEAN Environmental Improvement Project. *Journal of Cleaner Production*, 7: 75-81.

<sup>109</sup> Remmen, Arne and Borge Lorentzen. Employee Participation and Cleaner Technology: Learning Processes in Environmental Teams. *Journal of Cleaner Production*. 8: 365 - 373.



The Vietnam Cleaner Production Centre, in conjunction with other donor-funded Cleaner Production projects, should ensure that training programs are relevant to the corporate structures of participating companies and have adequate follow-up to assess the strengths and weaknesses of their program design.

Ensuring good program management is an essential component to successful CP training and implementation. Experience from international CP projects shows that programs that are more integrated into the corporate structure produce better results in companies<sup>110</sup>. Therefore, all previously recommended training programs should ensure that the material within the program, and the manner in which it is delivered, matches the needs of the recipients of the information. This means that program planners and trainers must know their audience and adjust their teaching method accordingly.

All CP training programs outlined in previous sections must also incorporate follow-up procedures into their program design. This information should be distributed to all national and international organizations involved in CP training and education through the CP Network to ensure future program planners will be able to design effective courses and learn from the strengths and weaknesses of past programming.

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<sup>110</sup> Hamner, Burton. (1999).

## **9.0 CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS**

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Training and education is one of the most effective ways to stimulate positive environmental behaviour in industry. In order to develop effective and sustainable training programs, program planners require a thorough knowledge of existing implementation obstacles, current programs offered, successful projects in practice and the gaps between the current delivery of services and actual needs of industry.

This report has highlighted the obstacles to successful CP implementation and identified the root causes associated with them; examined some of the current CP programs offered in Vietnam and evaluated their strengths and weaknesses; queried CP trainers and consultants about their experiences with CP implementation in Vietnamese industry; and, scrutinized international CP projects, both in association with the NCPCs as well as independent projects, and established some of the areas of CP training and education that could be strengthened in Vietnam.

### **9.1 Summary of Recommendations**

The summary of recommendations is divided into three sections.

- Section one outlines steps that should be taken by VNCPC, various government ministries and donor organizations to combat the systemic problems of incorporating pollution prevention concepts into industry.
- Section two outlines the recommendations made to VNCPC specifically, given that it is the leading institution for CP advancement in the country.
- Section three summarizes the recommendations made to all CP projects operating in the country, including VNCPC.

It is recommended that VNCPC take the lead in organizing training projects to ensure adequate coverage, in terms of content of programs, industrial sectors and geographic distribution.

### 9.1.1 Recommendations for Overcoming Root Causes

The Vietnam Cleaner Production Centre, in conjunction with the Ministry of Science, Technology and Environment and the Ministry of Education and Training, should:

1. **Develop general environmental education courses for government officials in the Ministries of Planning and Investment, Finance, Industry, Trade, Transport, Health, and Agriculture and Rural Development.**
2. **Develop targeted Cleaner Production training for all government officials involved in industrial development and economic planning.**

The Vietnam Cleaner Production Centre, with the support of the Prime Minister's office, should:

3. **Organize a roundtable with officials from all ministries to discuss mechanisms for expanding Cleaner Production within industry and fostering partnerships between ministries to accomplish this goal.**

The Ministry of Industry should:

4. **Mandate all managers in state-owned enterprises to actively incorporate Cleaner Production initiatives into the production process.**

All international donor agencies working to promote Cleaner Production should:

5. **Ensure that their programs contain a significant sustainability component.**

The Vietnam Cleaner Production Centre, in conjunction with other donor-funded Cleaner Production projects, should:

6. **Develop training programs, targeting company management in private firms, to specifically address the issues related to traditional state-run management styles.**
7. **Develop training programs that teach general management and accounting systems to companies prior to the introduction of Cleaner Production concepts.**

### 9.1.2 Recommendations for the Vietnam Cleaner Production Centre

1. Commission a comprehensive study to evaluate the content of all Cleaner Production training programs in Vietnam.
2. Actively pursue establishing a Cleaner Production Network to link all Cleaner Production training efforts throughout the country.
3. Establish guidelines for all future Cleaner Production projects, in terms of the length and content of their programs.
4. Develop a series of promotional advertisements illustrating the benefits of Cleaner Production and distribute widely to industry and other media sources.

### 9.1.3 Recommendations for The Vietnam Cleaner Production Centre and Other Donor-Funded Cleaner Production Projects

1. Design training programs to move beyond 'company borders' and create industry-community partnerships to implement Cleaner Production initiatives.
2. Create a series of training programs, each of which target specific levels within companies with relevant Cleaner Production information.
3. Ensure that training programs are relevant to the corporate structures of participating companies and have adequate follow-up to assess the strengths and weaknesses of their program design.

## 10.0 REFERENCES

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- Afsah, Shakeb et al. (1996). Controlling Industrial Pollution: A New Paradigm. *World Bank: Policy Research Working Paper #1672*.
- Afsah, Shakeb and Jeffrey R. Vincent. (1997). Putting Pressure on Polluters: Indonesia's PROPER Program. *Harvard Institute for International Development*.
- Asia-Pacific Centre for Environmental Law. (1998). Vietnam: Implementing Regulations. Available online at: <http://sunsite.nus.edu.sg/apcel/dbase/vietnam/regs.html>. Accessed 03/24/03.
- Baas, Leo W. (1995). Cleaner Production: Beyond Projects. *Journal of Cleaner Production*. Vol. 3, No. 12: 55-59.
- Bartone, Carl and Livia Benavides. (1997). Local Management of Hazardous Wastes From Small-Scale and Cottage Industries. *Waste Management and Research* 15: 3-21.
- Blackman, Allen. (2000). Informal Sector Pollution Control: What Policy Options Do We Have? *World Development*, 28 (12): 2067-2082.
- Blackman, Allen and Geoffrey J. Bannister. (1996). Community Pressure and Clean Technologies in the Informal Sector: An Econometric Analysis of the Adoption of Propane by Traditional Brickmakers in Cd. Juarez, Mexico. *Resources for the Future: Discussion Paper* 97-16.
- Carnegie, Kashonia L. et al. (2000). Stepping Upstream 'Naturally' for Cleaner Production Through Community Environmental Learning. *Journal of Cleaner Production*. 8: 391 – 396.
- Chandak, S.P. (1994). DESIRE: Demonstration in Small Industries for Reducing Waste. *UNEP Industry and Environment*, Vol. 41: 41-45.
- Dasgupta, Nandini. (2000). Environmental Enforcement and Small Industries in India: Reworking the Problem in the Poverty Context. *World Development*, 28 (5): 945-967.
- Dasgupta, Susmita et al. (1998). Small Plants, Pollution and Poverty: New Evidence from Brazil and Mexico. *DECRCG Infrastructure/Environmental Group*.
- Dieu, T.T.M and N.T. Viet. (2000). Status of Industrial Development in the South Key Economic Regions of Vietnam and Environmental Implications. *International Conference on Industry and Environment in Vietnam*, 132 – 144.

- Do et. Al. (2002). The Doi Moi Process and Human Development. *Vietnam's Socio-Economic Development*, No. 29, Spring 2002.
- "Doi Moi Lays the Foundation for Industrial Growth". (2001). Vietnam News. Available Online: <http://vietnamnews.vnagency.com.vn/2001-04-19/Stories/04.htm>. Accessed 8/8/02.
- DOSTE- HCMC. (1999). Cleaner Production Case Studies: Food Processing, Pulp and Paper and Textile Processing Sectors. *Reduction of Industrial Pollution in HCMC Project TF/VIE/97/001*. Available from UNIDO office, Hanoi, Vietnam.
- Energy Conservation Research and Development Center (ENERTEAM). (2001). Information as an Economic Instrument: Lessons from Ho Chi Minh City DOSTE's Black and Green Books. *Project VIE/97/007: Environment Issues in Investment Planning*.
- Environment Australia. (2002). Eco-Efficiency and Cleaner Production Case Studies. Available online: <http://www.ea.gov.au/industry/eecp/case-studies/index.html>. Accessed 02/07/02.
- Food and Agriculture Organization (FAO). (2002). HACCP in the Seafood Industry. Available online: [http://www.fao.org/DOCREP/\\_003/X0465E07.htm](http://www.fao.org/DOCREP/_003/X0465E07.htm). Accessed 11/27/02.
- Frijns, Jos. (2000). Pollution Control of Small-Scale Industry in Ho Chi Minh City: To Relocate or to Renovate? *International Conference on Industry and Environment in Vietnam*, 80 – 96.
- Frijns, Jos and Bas Van Vliet. (1999). Small-Scale Industry and Cleaner Production Strategies. *World Development*, 27 (6): 967-983.
- Government of Vietnam. (2000). National Strategy for Environmental Protection. Available from NISTPASS- Hanoi, Vietnam.
- Hamner, Burton. (1999). Cleaner Production Training in Asia: Experience from the ASEAN Environmental Improvement Project. *Journal of Cleaner Production*, 7: 75-81.
- Hettige, Hemamala et al. (1996). Determinants of Pollution Abatement in Developing Countries: Evidence from South and Southeast Asia. *World Development* 24(12): 1891-1904.

- Hoang, Kim Chi. (2001). Promotion of Cleaner Production in Vietnam: Systemic Evaluation of Experience from the VNCPC's Cleaner Production Demonstration Projects. *Master's Thesis, The International Institute for Industrial Environmental Economics*. Lund, Sweden.
- Hollod, G and W. Beck. (1995). Implementing Waste Minimization Programs in Industry, In H. Freeman. *Hazardous Waste Minimization*. McGraw-Hill, Inc.; Toronto, Canada.
- Kalavapudi, M. (1994). Pollution Prevention Incentives, Barriers, Regulations, and State Programs, In H. Freeman. *Industrial Pollution Prevention Handbook*. McGraw-Hill, Inc.; Toronto, Canada.
- Kirkland, Lisa-Henri and Dixon Thompson. (1999). Challenges in Designing, Implementing and Operating an Environmental Management System. *Business Strategy and the Environment*, Vol. 8: 128-143.
- Labatt, Sonia and Virginia Maclaren. (1999). Looking Beyond the Fence: Industry, Its Publics and the Environment. Available from David Powell, *Institute for Environmental Studies*, University of Toronto.
- Le Thi Thanh, Huyen, (2002). Quality Assurance and Environmental Expert, SEAQUIP. Personal Interview.
- Leuenberger, Heinz. (2000). Cleaner Production as a Powerful Tool in the Environmental Management of Industrial Parks. *International Conference on Industry and Environment in Vietnam*, 171 – 182.
- Leuenberger, Heinz. (2002). Chief Technical Advisor, Vietnam Cleaner Production Centre. Personal Interview.
- Lindahl, Jakob. (2002). Vietnam's Seafood Processing Industry Divided Between Global and the Regional Market. Draft Paper. Available online: <http://www.geogr.ku.dk/courses/p hd/glob-loc/papers/lindahl.pdf>. Accessed 11/23/02.
- Malaviya, Nupur. (2002). On the Road to a More Ecological Industrial System: The Role of Waste Exchanges in Ho Chi Minh City. *Current Issues Report, University of Toronto, Department of Geography and Planning*. Toronto, Ontario
- McCallum, Mary Ellen. (2001). Notes from a Telephone Conversation between Virginia Maclaren and Mary Ellen McCallum, 11/20/01.

- Magno, Brilhante Ogenis. (2000). Environmental Management System (EMS) and Pollution Prevention in Small and Medium Enterprises (SMEs): International Valuable Experiences for Vietnam. *International Conference on Industry and Environment in Vietnam*, 49 – 58.
- Mead, Donald and Carl Liedholm. (1998). The Dynamics of Micro and Small Enterprises in Developing Countries. *World Development* 26(1): 61-74.
- Mekong Project Development Facility (MPDF). (1999). *Vietnam's Undersized Engine: A Survey of 95 Larger Private Manufacturers*. Available online: <http://www.mpdf.org/tfind/find699a.htm>. Accessed 10/15/02.
- Ministry of Planning and Investment (MPI)/United Nations Development Programme (UNDP). (1997). An Analysis of National Environmental Plans in Vietnam. *Vietnam Capacity 21 Project*.
- Ministry of Science Technology and Environment (MOSTE) / National Environmental Agency (NEA). (2000). National Action Plan of Cleaner Production 2001 – 2005 (draft). Available from the Vietnam Cleaner Production Centre (VNCPC).
- Ngo et. al. (2002). Integration of CP into University Curricula. Available from the Vietnam Cleaner Production Centre, Hanoi, Vietnam.
- Ngo Thi Nga. (2002). Deputy Director, Vietnam Cleaner Production Centre. Personal Interview .
- Nguyen, Huyen. (2000). Health and Social Needs of Waste Pickers in Vietnam. Waste-Econ Publication. Available online at: <http://ots.utoronto.ca/users/WasteEcon/publications.htm>. Accessed 03/24/03.
- Nguyen Ngoc, Sinh. (2002). National Environmental Agency. Speech Presented at the CP Roundtable, June 20 – 21, Hanoi, Vietnam.
- Nguyen Phuoc Dan, C. Visvanathan and Nguyen Cong Thanh. (2000). Environmental Management Strategy for Seafood Processing Industry in Vietnam. *International Conference on Industry and Environment in Vietnam*, 191 – 204.
- Nhan, Tran Van. (2000). Practice and Challenge for Cleaner Production in Vietnam. *International Conference on Industry and Environment in Vietnam*, 183 –190.
- Nhue, Tran Hieu. (2000). The Establishment of the Environmental Management System in the Industrial Zones in Vietnam. *International Conference on Industry and Environment in Vietnam*, 177 – 126.



- O'Rourke, Dara. (1995). Economics, Environment and Equity: Policy Integration During Development in Vietnam. *Berkeley Planning Journal*. Vol. 10: 15-35.
- O'Rourke, Dara. (2002). Community-Driven Regulation: Toward an Improved Model of Environmental Regulation in Vietnam. Ed. Peter Evans. *Liveable Cities? Urban Struggles for Livelihood and Sustainability*. University of California Press: Los Angeles, California.
- Palladino, Angela. (2001). Industrial Waste Management in Hanoi, Vietnam: A Case Study of Thuong Dinh Industrial Zone. *M.A. Thesis. University of Toronto, Department of Geography: Toronto, Ontario*.
- Pallen, Dean. (2001). Reinventing the City: The Role of Small Scale Enterprise. *Canadian International Development Agency, Asia Branch*.
- Patterson, John. (2002). Chief Advisor and Project Manager, Vietnam – Canada Environment Project (VCEP). Personal Interview.
- Phung Thuy Phuong and Arthur P.J. Mol. (2001). Communities as Informal Regulators: Local Protests Against Industrial Pollution in Vietnam. *Greening of Industry Network Conference. Bangkok, 2001*.
- Remmen, Arne and Borge Lorentzen. Employee Participation and Cleaner Technology: Learning Processes in Environmental Teams. *Journal of Cleaner Production*. 8: 365 - 373.
- Sage, Jan. (2000). Continuous Learning and Improvement in a Regional Cleaner Production Network. *Journal of Cleaner Production*. 8: 381 – 389.
- Scott, Andrew. (2000). Small Scale Enterprise and the Environment in Developing Countries. In *Small and Medium Sized Enterprises and The Environment*, Ed. Ruth Hillary, 276-288. Greenley Publishing Ltd.
- Shaw, Laurinda, et al. (1999). Improving the Design and Implementation of Environmental Training Programmes. *Eco-Management and Auditing*. 6: 140 – 147.
- Sikor, Thomas O. and Dara O'Rourke. (1996). A Tiger in Search of a New Path: The Economic and Environmental Dynamics of Reform in Vietnam. *Asian Survey*. Vol. 36, No. 6: 601-617.
- Sinclair, Darren and Neil Gunningham. (2000). Promoting Cleaner Production in South East Asia: A Case Study of the Philippine DTI/BOI Environmental Unit. *Asia Pacific Journal of Environmental Law*, Vol. 5, Issue 3.

- Sonnenfeld, David. (2000). Contradictions of Ecological Modernization: Pulp and Paper Manufacturing in South-east Asia. In *Ecological Modernization Around the World*, Ed. Arthur Mol and David Sonnenfeld, 235-255. London: Frank Cass.
- Taussig, Markus and Liesbet Steer. (2002). A Little Engine That Could...: Domestic Private Companies and Vietnam's Pressing Need for Wage Employment. *World Bank Policy Research Working Paper 2873*.
- Tran Thi Thanh Phuong. (1996). Environmental Management and Policy-Making in Vietnam. *Seminar on Environment and Development in Vietnam*. Available online at: [http://coombs.anu.edu.au/~vern/env\\_dev/papers/pap03.html](http://coombs.anu.edu.au/~vern/env_dev/papers/pap03.html). Accessed 03/24/03.
- United Nations Development Programme. (2002). Vietnam and UNDP: Past, Present and Future. Available from *Vietnam Development Information Center*, Hanoi, Vietnam.
- United Nations Environment Programme – Division of Technology, Industry and Economics (UNEP-DTIE). (2002). *Changing Production Patterns: Learning from the Experience of National Cleaner Production Centres*. United Nations Publication.
- United Nations Environment Programme (UNEP). (2002). State of the Environment Vietnam. Available online at: [http://www.rrcap.unep.org/reports/soe/vietnam/Issues/pressure/air\\_pressure.htm](http://www.rrcap.unep.org/reports/soe/vietnam/Issues/pressure/air_pressure.htm). Accessed 01/24/03.
- United Nations Environment Programme (UNEP). (2002). Understanding Cleaner Production. Available online: [http://www.uneptie.org/pc//cp/understanding\\_cp/home.htm](http://www.uneptie.org/pc//cp/understanding_cp/home.htm). Accessed 10/29/02.
- Vietnam Chamber of Commerce and Industry. (2003). Training Activities. Available online at: <http://www.vcci-hcm.com.vn/VCCI/MainActivities/Training.asp>. Accessed 03/25/03.
- Vietnam Cleaner Production Centre. (2001). Vietnam Cleaner Production Centre's Annual Report 2001. Available online: <http://www.un.org.vn/vncpc>. Accessed 10/29/02.
- Wheeler, David and Tom Tietenberg. (1998). Empowering the Community: Information Strategies for Pollution Control. Online, available: [http://www.worldbank.org/nipr/work\\_paper/ecoenv/confpap.pdf](http://www.worldbank.org/nipr/work_paper/ecoenv/confpap.pdf). Accessed 10/10/01.
- Wilson, David C. (1996). Stick or Carrot?: The Use of Policy Measures to Move Waste Management Up the Hierarchy. *Waste Management and Research* 14: 385-398.

World Bank. (1999). Pollution Prevention and Abatement Handbook: Toward Cleaner Production. *The World Bank Group*. Washington D.C.

World Bank. (2002). *Vietnam Economic Monitor: The World Bank in Vietnam*, Spring 2002

World Bank. (2002). Vietnam's Pillars of Development. Available online at: [http://www.worldbank.org.vn/vn\\_pillars/create/create001.htm](http://www.worldbank.org.vn/vn_pillars/create/create001.htm). Accessed 10/23/02.

Zwetsloot, G.I.J.M. and A. Geyer. (1996). The Essential Elements for Successful Cleaner Production Programmes. *Journal of Cleaner Production*. Vol. 4 No. 1: 29 – 39.

## **11.0 APPENDICES**

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## Appendix 1: Key Informant Communications

May 30, 2002

United Nations Industrial Development Organization (UNIDO)

Interviewee: Tran Tuyet Van, Programme Assistant

May 30, 2002

Vietnam Cleaner Production Centre (VNCPC)

Interviewee: Ngo Thi Nga, Deputy Director

June 7, 2002

National Environment Agency (NEA)

Interviewee: Chi Kim Hoang, Environmental Advisor

June 10, 2002 and August 12, 2002

Vietnam-Canada Environment Project (VCEP)

Interviewee: John Patterson, Chief Advisor and Project Manager

June 17, 2002

Ministry of Fisheries, Seaquip Program (DANIDA)

Interviewee: Le Thi Thanh Huyen, Quality Assurance and Environmental Expert

June 17, 2002

Vietnam Cleaner Production Centre (VNCPC)

Interviewee: Dr. Heinz Leuenberger, Professor and Chief Technical Advisor

June 17, 2002 and August 9, 2002

National Institute for Science and Technology Policy and Strategy Studies (NISTPASS)

Interviewee: Dr. Nguyen Danh Son, Chief- Department of Sustainable Development, Vietnamese Director- Waste-Econ Project

June 21, 2002

Cleaner Production Roundtable Discussion

Department of Science, Technology and Environment (DOSTE) - HCMC

Speaker: Mr. Vu Ba Minh

June 21, 2002

Cleaner Production Roundtable Discussion

National Economics University

Speaker: Dr. Chinh, Professor and Lecturer

July 9, 2002

Department of Science, Technology and Environment (DOSTE) – HCMC

Interviewee: Tran Nguyen Hien, Deputy Head of Environmental Management Division

July 19, 2002

Environmental Protection Center (EPC)

Interviewee: Nguyen Thi Mai Huong, Research Assistant

July 23, 2002

Swiss Federal Institute of Technology – Lausanne

Interviewee: Catherine Brassaud, Project Manager – Asia

August 2, 2002

United Nations Development Programme (UNDP)

Nguyen Ngoc Ly – Senior Sustainable Development Advisor

August 9, 2002

United Nations Industrial Development Organization (UNIDO)

Interviewee: Helene La Cour, Program Officer

August 13, 2002

Ministry of Industry, Institute for Industry Policy and Strategy

Interviewee: Le Minh Duc, External Relation Department

August 13, 2002

Ministry of Planning and Investment, Department of Science Education and Environment

Interviewee: Dr. Le Minh Duc, Deputy Director

August 29, 2002

Institute for Environment and Resources – The National University of HCMC (CEFINEA)

Interviewee: Dr. Nguyen Phuoc Dan, Researcher and CP Expert

August 29, 2002

Institute for Environment and Resources – The National University of HCMC (CEFINEA)

Interviewee: Nguyen Thi Truyen, Researcher

## Appendix 2: Questionnaire

### Cleaner Production (CP) in Vietnam: Consultants, Trainers and Experts Experience with CP

#### Part 1: Background Information about Interviewee

1. Name:
2. Title:
3. Organization:
4. Type of involvement in CP (please check all that apply)
  - Trainer
  - Consultant
  - Service Provider
  - Teacher/Instructor
  - Other (please explain) \_\_\_\_\_
5. Educational background (please check all that apply)
  - Bachelor's degree
  - Master's degree
  - PhD degree
  - Other (please explain) \_\_\_\_\_
6. Did you receive CP training in your university courses?
  - Yes
  - No
- 6.b) If yes, was practical training at a company a component of the course?
  - Yes
  - No
7. Since what date have you been certified in CP?  
\_\_\_\_\_

8. Can you please list the names of the courses you are certified in, the name of the sponsoring agency who delivered the course, and the length of time of each course:

	Name of Course	Sponsoring Agency	Length of Course
1			
2			
3			
4			
5			

#### Part 2: Current state of CP training and education in Vietnam

9. In your view, what are the top three strengths and weaknesses in the training and education of CP for companies in Vietnam?
  - Strengths:
    - 1.
    - 2.
    - 3.
  - Weaknesses:
    - 1.
    - 2.
    - 3.

10. Outside assistance has been identified as critical to successful implementation of CP into companies in Vietnam. From your experience, can you please rank each of the following options in terms of how important you think each is to successful CP implementation, using the following scale:

- 1= Most important
- 2= Important
- 3= Somewhat important
- 4= Not important

- \_\_\_\_\_ Financial assistance (in the form of supplying new technology directly)
- \_\_\_\_\_ Financial assistance (in the form of loans for companies to purchase new technology)
- \_\_\_\_\_ On-site training and education for company representatives (such as demonstration projects)
- \_\_\_\_\_ Off-site training and education for company representatives (training courses outside of the company at universities, DoSTEs, or other organizations)
- \_\_\_\_\_ More stringent environmental laws
- \_\_\_\_\_ Overall awareness building and dissemination of CP success projects through media, internet, brochures, etc.
- \_\_\_\_\_ Creation of a National CP Network to facilitate experience exchanges between participating companies and CP organizations
- \_\_\_\_\_ Educational programs to raise awareness of CP for top management in a company
- \_\_\_\_\_ Other (please explain) \_\_\_\_\_

11. From your experience, can you please rank the following types of training and education courses according to their effectiveness at encouraging CP practices in companies, using the following scale:

- 1= Most important
- 2= Important
- 3= Somewhat important
- 4= Not important

- \_\_\_\_\_ Short training and awareness building courses (held at DoSTEs, VNCPC, and other organizations) for company representatives
- \_\_\_\_\_ In-plant demonstration projects for company representatives
- \_\_\_\_\_ Training of CP consultants through training courses at DoSTEs, VNCPC, and/or other agencies
- \_\_\_\_\_ Training of CP consultants through in-plant demonstration projects
- \_\_\_\_\_ The current university courses offered in CP (integrated)
- \_\_\_\_\_ The current university courses offered in CP (stand alone)
- \_\_\_\_\_ Other (please explain) \_\_\_\_\_

12. From your experience, what size of company can implement CP practices most effectively?

- Small scale (less than 50 employees)
- Medium scale (less than 100, but more than 50 employees)
- Large Scale (over 100 employees)

12.b) Why?



13. From your experience, who is most willing to implement CP practices into their company?
- State owned companies
  - Private companies
  - Joint-Venture companies
  - Other (please explain) \_\_\_\_\_

13.b) Why?

14. In your experience, which of the following factors is the most important for CP success in companies? (please check only one)
- Financial support for CP
  - Support of CP by top management
  - Support of CP by workers
  - Technical know-how to implement CP
  - Training and education within the company to raise CP awareness
  - Governmental support for CP
  - Other (please explain) \_\_\_\_\_

**Part 3: Experience with Companies**

15. How many CP implementation projects have you worked with? \_\_\_\_\_

16. Can you please list the industry sector (textile, paper, etc) of the projects you worked with, the size of the company (small, medium, large), and their management structure (state owned, joint-venture, private):

	Industry Sector	Size of Company	Management Structure
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

17. How did you become involved in these projects?
- Private consultant hired by the company
  - Part of a team from DoSTE, VNCPC, or another organization
  - Other (please explain) \_\_\_\_\_

18. How important were each of the following types of benefits in persuading companies to implement CP?

- 1= Most important
- 2= Important
- 3= Somewhat important
- 4= Not important

\_\_\_\_\_ Economic benefits  
 \_\_\_\_\_ Environmental benefits  
 \_\_\_\_\_ Social benefits  
 \_\_\_\_\_ Other (please explain) \_\_\_\_\_

19. Did any of the companies you worked with experience failure in terms of their ability to implement all the CP measures you (or your team) suggested?

- Yes
- No

19. b) If yes, why?

20. Are the companies you worked with continuing to increase the number of CP measures since the initial consultation?

- Yes
- No

20.b) If no, why not?

**Part 4: Dissemination of CP**

21. Do you share the experiences you gained from consulting and/or training of CP?

- Yes
- No

21.b) If yes, with whom of the following do you share information? (please check all that apply)

- Your employer
  - DoSTE
  - VNCPC
  - Other companies
  - Other (please explain)
- 

21.c) How do you share the information? (please check all that apply)

- Word of mouth/verbal communication
  - Reports/prepared documents
  - Email correspondence
  - Other (please explain)
- 

22. How important do you think sharing and dissemination of information is to sustaining CP in Vietnam?

- Very important
- Important
- Somewhat important
- Not important

23. Any other comments?

**Thank you very much for your time.**

## Appendix 3: Recent CP Projects in Vietnam

Project	CP Content	Donor	Counterpart	Location	Time Frame
Environmental Strategy for 2001 – 2010	Development of the environmental strategy for 2001 – 2010	Government of Vietnam	NEA	Vietnam	2000 – 2001
CP Action Plan	Development of national strategy for CP for 2001 – 2005	ADB (Asian Development Bank)	NEA	Vietnam	2000 – 2001
Environmental Management Thai Nguyen Province	Cleaner Technology and Industrial Pollution Project	DANIDA (Denmark)	DOSTE in Thai Nguyen	Thai Nguyen Province	2000 – 2002
Environmental Management in Viet Tri	CP component	DANIDA (Denmark)	DOSTE in Viet Tri	Phu Tho Province	2001 - 2003
Environmental Pollution Prevention in HCMC	CP assessments Follow-up on earlier project	(UNIDO/SIDA) (Sweden)	DOSTE in HCMC	HCMC	2001 – 2003
Industrial Pollution Management VCEP II	CP training and demonstration projects in 4 provinces	CIDA (Canada)	NEA DOSTE in Hai Phong, Hanoi, DaNang, and Binh Duong	Vietnam	2001 – 2005
Agenda 21	4 CP assessments in Hanoi	UNDP and SDC (Switzerland)	MPI	Hanoi	2000 - 2001
CP Investment	7-8 bankable CP projects	UNDP, Norway	MPI	Vietnam	2000 - 2001
Wastewater Treatment Technology Transfer and CP Demonstration AAACP-Australia	Waste minimization audit at three candy/brewery companies	AUSAID (Australia)	Institute of Brewery Research	Vietnam	1998 - 2000

Source: VNCPC: (2001)