Chapter 7

Cleaner Production and the Necessity of Promoting Recycling Industry in Vietnam

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Chapter 7: Cleaner Production and the Necessity of Promoting Recycling Industry in Vietnam

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I. Introduction

Vietnam's population is 86.16 million and distributed in 63 provinces and towns under direct control of the central government and/ or local governments. Being at the beginning of the industrialization and modernization period, the GDP growth rate of Vietnam in 2008 was 6.23%, the proportion of industry and construction in GDP (39.91%) is higher than that of agriculture (21.99%) and service (38.1%) (GSO, 2008). At present, the country is facing to an end of the Socio-economic 10-Year Strategy (2001–2010), which aimed to bring out the country from its under-developed status; to greatly improve people's physical, social and cultural living conditions; and to establish the foundation for Vietnam to become a modern industrialized country by 2020.

Rapid economic growth over the last years without taking appropriate attention to waste management has caused remarkable environmental degradation, especially on the problems of industrial and environmental pollution in urban cities. Vietnam now has 605,000 small and medium-sized private enterprises and around 1,800 major state-owned enterprises. Since 2006 and 2007, the country's industry has joint the ASEAN (Association of Southeast Asian Nations) Free Trade Area (AFTA) and the WTO (World Trade Organization), respectively. However, still 80% of Vietnamese enterprises are rated as having medium and low-level technology – this increased pressure on the environment**.** The amount of waste coming from industries, hospitals as well as households is facing the big challenges. The questions such as, "how to control it?", "how to minimise it?", and "how to recycle it?" are still the open-ended questions to environmental managers and policy makers. Vietnam is step by step trying to effectively manage it, and a number of environmental organizations as well as the environmental science and technology centres have proved the best efforts in protecting the natural environment.

II. Waste Management in Vietnam

II-1. Waste Generation

Vietnam's waste amounts to over 12 million tons each year, of which, majority is from urban cities (Table 1). In 2000, the average solid waste load per capita was 0.5-0.7 kg/person/day in large cities, this increased to 0.9-1.2 kg in 2008 (MONRE, 2008). In

addition, the solid waste was not separated at source, the industrial waste was mixed with domestic waste during collection, and transported to the landfills. A considerable proportion of domestic waste was disposed in canals, ponds, and lakes that caused water surface pollution and hampered the water flow movement. For toxic waste, the main measure to deal with it was to keep it in the factories' stocks, however this would bring about the risk of ground pollution within the factory's area in the long term. By the uncontrolled growth of industries and commercial institutions in the country, the problem is further compounded.

Table 1. Waste Generation in Vietnam in 2008

Category of waste	Sources	Total generation (1,000 t/yr)	% of total non-agricultural waste generation		
			Urban	Rural[1]	Total
Municipal waste	Residential Commercial	10,240	-	-	80
Industrial waste[2]	Industries	2,176	-	-	17
Hazardous healthcare	Hospitals	384	-	-	3
Total non-agricultural waste		12,800	51,56	48,44	100
Agricultural waste	Cultivation Livestock	64,560	0	100	100

Source: GSO, 2008 and MONRE, 2008.

Parallel with the industrialization of the country, the amount of industrial waste has been increasing. In 2008, more than 2.5 million tons of industrial waste was generated, of which 15% was hazardous waste (GSO, 2008). It was forecasted that by 2010, the industrial waste generation would be 3.2 million tons. In urban areas, industrial waste amounted approximately 22.5% of total municipal waste in Vietnam. The main sources are waste from light industries (occupied about 48% of total industrial waste), chemicals (24%), metallurgy (20%) and food processing (8%). In recent years, together with the development of information technology, the demand on electronic and telecommunication equipment in Vietnam is gradually creasing (Table 2), creating a stimulated market for development but also increasing electronic waste disposed to the environment. Electronic waste is considered hazardous waste. However, there has not been any specific study or full statistics on this waste in Vietnam.

[1] Rural industrial waste derives from craft villages
[2] Industrial waste excludes mining waste

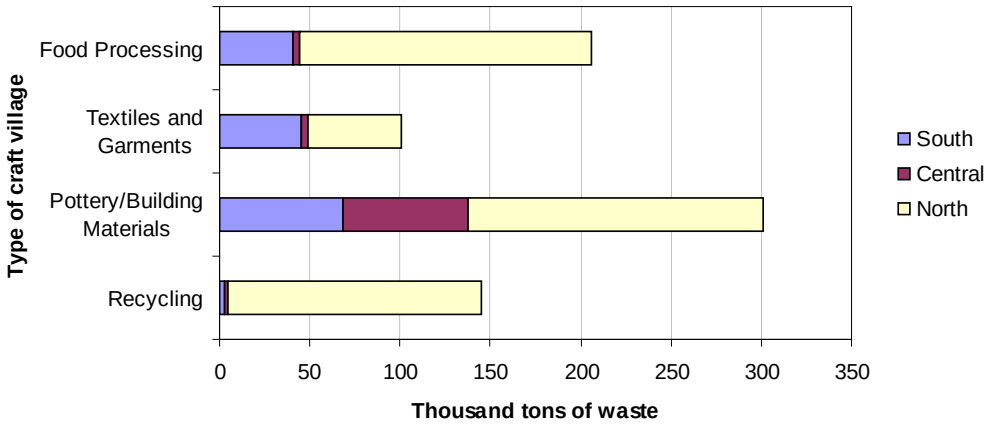
Table 2. Annual Growth Rate (%) of Electronic and Telecommunication Equipments

Product	2000	2005	2010
Home electronic appliances	12-15	12-15	10-13
Informatics and software equipment	15-20	20-25	25-30
Information and communication equipment	20-25	15-20	15-18
Industrial and specialized equipment	10-15	15-20	20-25

Source: UNS-HNU, 2006.

In rural areas, waste from agricultural production, forestry activities and traditional fisheries such as tree bark, leaves, paddy rice, seed husks, animal manure, etc. is used mainly as a source of fuel, fertilizer or is dumped. However, the amount of industrial waste generated from craft villages such as plastic, metal, persistent chemical residues is increasing rapidly, and is concentrated in the North. Waste problems have started appearing in populated areas (Figure 1).

Figure 1. Waste Generation from Craft Villages in Vietnam



Source: MONRE, 2005.

II-2. Waste Collection

According to Urban Environmental Companies (URENCOs), the average solid waste collection rate in cities reached 90% while it was only 40% in rural areas. A large portion (50-55%) of the municipal waste is organics such as kitchen waste. Usually, there are two systems of waste collection and disposal. In the first system, household collects their wastes in nylon bags and bins within their homes, and members of households along with workers of

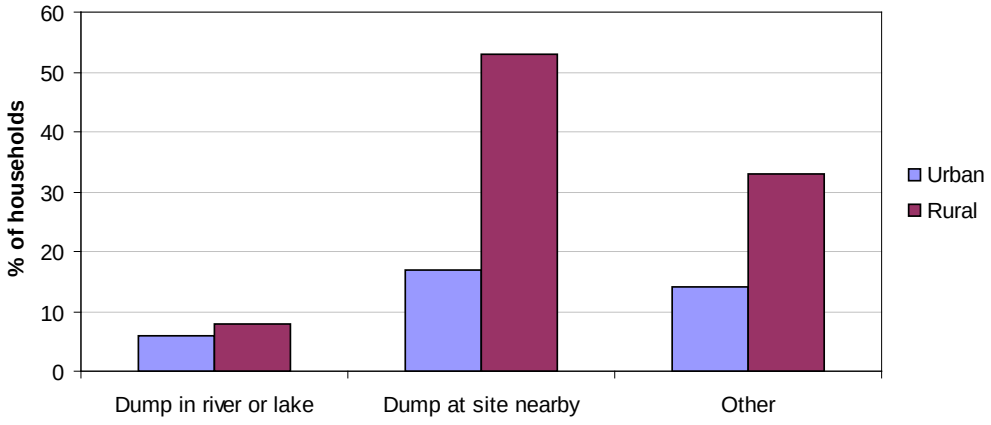
the local URENCO deposit them into the carts, and finally dispose by trucks to the dumping sites. The second approach is through communal storage in the living quarters. The Department of Transport and Urban Public Works (DTUPWs) and URENCO are the main authorities responsible for the administration of waste management in cities. In the case of electronic waste handling in Vietnam, a great number is collected by waste purchase units and recycled at craft villages and recycling units. For an industrial waste, it is classified at source under treatment method: reuse, recycle or discharge. Reusable and recycled wastes are sold to recycling units, non- recycled parts are collected, transported and treated by signing contract with local URENCO to landfill or store.

II-3. Treatment and Disposal

The treatment of solid waste is an urgent issue in Vietnam. Waste from traditional industrial areas is still collected and treated together with domestic waste and transported to dumping sites. There is only about 50-60% of the total toxic wastes that are being collected separately including hospital waste. The recyclable waste is mainly separated by the informal sectors. It is a limited, unorganized and unsystematic way of reusing and recycling solid waste. Waste recycling units are in small-scale with backward technology, which contributes much to the environmental pollution. In cities, a minimal amount of waste which is about 1.5-5% is made into bio-fertilizer and humus using hygienic technology (INEST, 2008).

Dumping is the most popular method of waste treatment in Vietnam. Currently, none of the dumping sites meets technical environmental requirements (sanitary landfill); and only 17 provinces treated waste by engineered landfills (GSO, 2008). In rural areas, self-disposal is common with no collection and disposal services, as shown in Figure 2. These dumping sites are seriously contaminating the soil, water and air environment.

Figure 2. Percentage of Self-disposal Waste by Households



Source: MONRE, 2005.

For hazardous waste, it is collected by licensed hazardous waste handling company, and stored on site and discharged with wastewater effluent. After classification, un-recyclable waste is treated by burning in incinerators or co-processing in industrial boilers, brick kilns, shaft cement kilns. Almost these treating units have small scale, use manual operation and with low or without control. The common technology of treating electronic waste is by burying or storing. Most of electronic waste in the North is collected by URENCO Hanoi, and then treated at Nam Son waste treating complex.

II-4. Waste Recycling

As mentioned, currently there is no large-scale systematic waste recycling facility in Vietnam. Recycling industry is only established in forms of craft village, small family business or private enterprises. These premises mainly operate for recycling paper, plastic, ferrous metals, aluminium, lead (Table 3) with backward technology and rudimentary equipment that are causing not only low economic benefit but also serious environmental pollution.

Table 3. Waste Recycling in Craft Villages

Materials	Quantity, Tons/year	Product, Tons/year	% being collected
Plastic	25.200	22.900	90.9
Paper	51.700	45.500	88.0
Metal	735.000	700.000	95.2
Total	811.900	768.400	94.6

Source: MONRE, 2005.

Recently, after receiving attention from the government, creating incentives for recycling is of priority in waste management. Waste exchanges and eco-industrial park is promoted in Bien Hoa 1 industrial zone. In the case of electronic industrial waste, the reuse part is relatively limited because the Vietnamese electronic sector has been focusing on using disassembly for spare parts. However, the recycling potential of this waste is high. About 80% of total electronic industrial waste can be recycled, according to MONRE's estimation.

Current polices for waste recycling management

In order to promote the environmental industry development harmonizing to economic growth, the basic institutional framework have set forth relatively. The detailed

regulations concerning to waste management and targets are to be striven for waste reuse/recycling/regeneration activities. The followings are some of great significances:

- Decision "No.152/1999/QD-TTg" by Prime Minister on approval of “solid waste management strategies in Urban and industrial zones of Vietnam towards 2020”;
- Amended Law on Environmental Protection (LEP) (became effective in July 2006) has spent section 1, 2, 3 of chapter III for solid and hazardous waste management;
- “*National Agenda 21”* provides further direction and could serve as a vehicle for improved cross-sector coordination; and
- Many other by-law documentations on environmental protection including collection of pollution fees, waste discharge, and waste management. The brief description of these documents is shown in Table 1 – Annex 1.

III. Cleaner Production Implementation in Vietnam

Cleaner Production (CP) has gained world acclaim for its proven ability to reduce industry's environmental burden while simultaneously improving industry's bottom line. The concept was pioneered by the 3M company and a few other large USA (The United State of America) - based processing industries. They realized in the mid 1970's that it could make far more sense- and money- to prevent waste and emissions in the first place, rather than to treat and control waste and emissions after these have been generated. Although it took until the mid 1980's before attempts were made to transfer the experience to small- to medium-sized enterprises, Cleaner Production practices and technologies for these enterprises developed and disseminated rapidly since then, particularly in Europe, North America, and more recently in Australia, New Zealand and South and East Asia as well.

Cleaner production was brought to Vietnam in 1998 by the Vietnam Cleaner Production Centre (VNCPC) of the Institute for Environmental Science and Technology (INEST), in the form of capacity buildings, and in-plant consultancy toward industry. From the beginning, VNCPC has been providing leadership and encouraging partnerships to promote the concept of CP on a national scale. Nowadays, cleaner production has become more popular and has attracted the interest and attention of almost enterprises as well as other related organizations in Vietnam. Outlined below are some of the policies and activities on cleaner production in Vietnam.

III-1. Policies and Legal Framework

CP activities in Vietnam have been based on relevant legislation and policies. Due to the broad content of regulations on environmental protection, this paper will focus on policies related to the prevention and control of environmental pollution in industrial production, and specifically on cleaner production.

III-1-1. Vietnam Agenda 21

The Government of Vietnam issued the "Strategic Orientation for Sustainable Development in Vietnam (Vietnam Agenda 21)" [3] on 17 August 2004, which gives orientations for the implementation of Agenda 21 in Vietnam.

The objective of the sustainable development in environmental terms is to utilize natural resources appropriately and effectively; prevent, stop, solve and control environmental pollution; protect the living environment; protect the national parks, natural preservation zones, bio-atmosphere preservation areas; preserve bio-diversity; overcome environmental degradation and improve the environment's quality.

In addition, the above mentioned overall objective gives eight main principles, of which principles four and five prescribe to "develop the environmentally friendly and clean production models", and to give priority to the "wide application of modern, clean and environment friendly technology. It then goes on with 18 priority areas.

CP is then linked to 7 of 18 priority areas as the followings:

a) Priority economic areas no 1, 2, 3

- Maintain rapid and stable economic growth rate based on continuous improvement in effectiveness, content of science and technology, thrifty utilization of natural resources and the environment.
- Shift production and technology modes as well as consumption patterns towards cleaner and environmentally friendly direction on basis of thrifty utilization of non renewable natural resources, minimization of the amount of toxic waste and substances with difficult dissolubility, maintain the society and individuals' lifestyle which is in harmony and close to nature.
- Implement the clean industrialization process. Formulate planning on industrial development with appropriate structures of industries, job categories, technologies and equipments that must comply with environmentally friendly principles as early as possible; actively prevent and deal with industrial pollution; and develop "green industries".

b) Priority natural resources and environment areas no 2, 3, 6, 7

- Protect water environment, sustainable utilize water resources.
- Appropriately and thriftily utilize mineral resources in a sustainable manner.
- Reduce air pollution in urban and industrial areas.

[3] Decision No. 153/2004/QD-TTg, on 17 August 2004, by Prime Minister

- Effectively manage solid and toxic wastes.

Priority economic areas, 3 in particular present a good basis for the promotion of cleaner production.

III-1-2. Strategy on Environmental Protection and Its Action Plan

National Strategy for Environmental Protection (NSEP) to 2010 and vision toward to 2020 was approved on 2 December 2003 (Decision 256/2003/QD-TTg).The NSEP states that "pollution prevention must be viewed as the key solution in combination with pollution control and treatment, remedy of degradation and improvement of the environmental quality", which includes "promoting the adoption of clean technology and cleaner production lines and the use of environmentally friendly and less pollution raw materials and fuels". The NSEP goes on by defining objectives and targets for 2010 and 2020, followed by 19 major activities and 36 specific programmes. The targets include a strong objective for implementing cleaner production that by 2010, all new establishments should apply cleaner technology or be equipped with waste minimization and treatment facilities to meet the environmental standards."

III-1-3. Law on Environmental Protection and Main Environmental Legislations

The Law on Environmental Protection (LEP) was issued on 27 December 1993, and became effective on 10 January 1994. The ammended LEP has adopted by the National Assembly [4] in the end of November 2005, and has come to enforce on 1 July 2006. The new LEP contains 15 chapters and 136 articles, of which the 12 following articles are related to cleaner production: 5; 6; 20; 23; 33; 43; 49; 108; 110; 116; 117; and 120.

The government encourages organization, and individual to utilize properly the environmental components, to apply advanced technology, cleaner technology, utilize waste, save materials, use renewable energy and bio- products in research, production and consumption.

Beside the LEP (2005), a number of other laws contain chapters related to environment. Their related clauses are summarized in Table 4.

[4] No. 52-2005-QH11; This Law was passed by Legislature XI of the National Assembly of the Socialist Republic of Vietnam at its 8th Session on 29 November 2005.

Table 4. Clauses related to Environmental Protection in Other Laws

Law	Clauses and/or description
Law on Science and Technology	Defines the tasks of Vietnam's science and technology as focusing on "proper use of natural resources and environmental protection"
Law on the Exploitation of Natural Minerals (1996) and Law on Petroleum (2003)	"the activities in this fields must apply appropriate technology, carry out measures in environmental protection, make availability of prevention measures on pollution and incidents " "be responsible for environmental remediation after exploitation"
Law on Water Resources (1998)	"the discharge of hazardous substances, untreated wastewater or wastewater that not meet the environmental standard to the water source is forbidden".
Law on Aquatic Product (2003)	"Methods, tools, measures of massive destroy in exploration, fishing are forbidden" "Application of Law on water resources on aquatic activities"
Law on encouragement of domestic (1999) and foreign investment (2000)	Encouragement and priority of investment on cleaner production, cleaner and environmental friendly technology conformance to all requirements of environmental impact assessment for investment projects

Some legislations related to industrial activities in Vietnam relevant to CP are shown in Table 2 in Annex 2.

III-1-4. Industrial Development Policy and Strategy

Ensuring a harmonization between socio-economic growth and environmental protection for sustainable development and an increased living quality is the key objective of the Government's socio-economic development plan 2006-2010[5], which sets out ambitious targets for improvement including:

1. 40% of urban areas have waste water treatment facilities;

[5] The five year socio-economic development plan 2006-2010 - Ministry of Planning and Investment Hanoi - March 2006.

2. Deal with 75% of establishments that cause serious environmental pollution;
3. 100% of newly-established manufacturing units adopt environmentally friendly technology;
4. 50% of production units and businesses have environmental protection tools; and
5. 3% of natural land is covered by forest.

The fifth principle of the Strategic Orientation for Sustainable Development in Vietnam states that: "Science and technology is the foundation and momentum for the country's industrialisation, modernisation, quick, strong and sustainable development. Priority should be given to wide application of modern, clean and environmentally friendly technology in production industries especially in the sectors and fields which have far reaching impact and capability to stimulate the development of many other sectors and production fields."

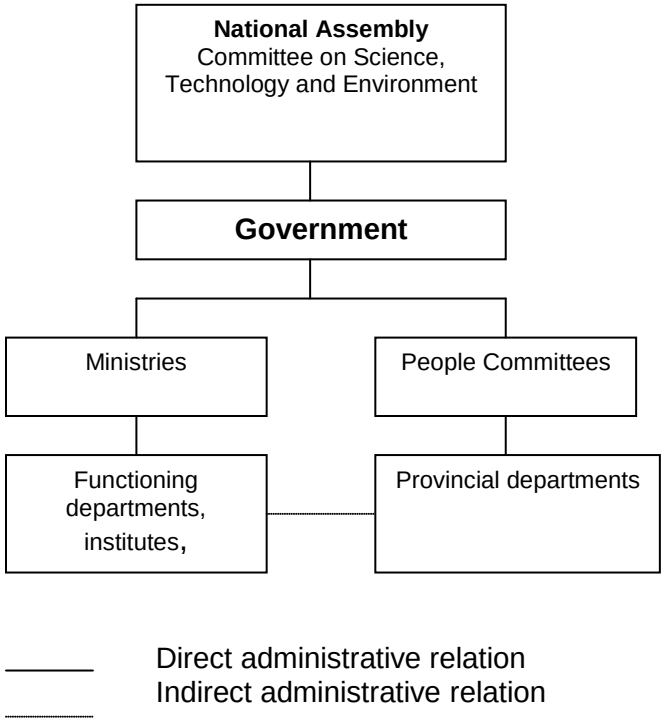
Based on the strategy of socio-economic development, the strategy for industrial development toward 2010 identified "industry is the key factor for economic growth of Vietnam with a speed 1.7 to 1.8 times higher than GDP growth" (i.e. 12-13% per year compared to 7-8% per year of GDP). In order to meet the target, technology innovation and upgrade are the decisive factors for development and improvement of competitiveness. The strategy also stated that the development must go with environmental protection. The national orientation on industrial development is defined as "selective industrial development toward modernization with priority given to export oriented sectors. Focuses should be placed on environmental friendly technology to ensure investment efficiency and the sustainability of the national industry".

III-2. Institutional Framework (The Actors)

III-2-1. Authorities (National and Local)

Figure 3 gives an overview of the Vietnam State's organization. At the top management level, the Committee on Science, Technology and Environment supports the National Assembly in the related fields.

Figure 3. Vietnam State's Organization



Ministries involved in CP:

1. Ministry of Natural Resources and Environment (MONRE): Its main responsibility is to develop environmental protection law.

    a. Vietnam Environmental Protection Administration (VEPA), supports MONRE to implement and enforce legislation although it also has a consulting role.

    b. Department of Natural Resources and Environment (DONRE): Provincial Up to date, 41 DONREs have set up a natural resource and environment division. These divisions will work on, but not limited to, environmental certificates, environmental impact assessment, environmental monitoring and environmental protection fees.

2. Ministry of Planning and Investment (MPI): It hosts ministry for Agenda 21, provides orientation for sustainable development and is in charge of the planning and investment.

a. The Department of Science, Education and Environment (DSEE) is supporting MPI in integrating annual and five year plans of other line ministries, universities and associations in order to propose appropriate policy measures and planning mechanisms, for the sector's specific plans. DSEE is the executive organization for Agenda 21.

b. The Institute of Development Strategy (IDS) is the administrative body of MPI that carries out researches to help develop and formulate socio-economic strategies; master plans; sectoral, local and regional development master plans; and national investment master plans.

3. Ministry of Industry and Trade (MOIT). It is responsible for state management of the industrial sector namely mechanical engineering, metallurgy, new energy, renewable energy, oil and gas, minerals mining, chemicals (including pharmaceutical industry), industrial explosion materials, consumer-goods industry, foodstuff industry and other processing industries throughout the country.

a. Science and Technology Department (STD) is the assistant body of the MOI in the management of science, technology, environment, standard, product quality, information technology and industrial ownership. The STD is the executive department of the Danish Project on Cleaner Production in Industry (2005-2010).

b. Institute for Industry Policy and Strategy (IPS) is the administrative body under MOI to carry out researches, studies in order to help development of strategies and policy for industry.

c. Industrial Safety Techniques and Environment Agency is an agency directly under the MOIT which fulfills the state management functions in terms of industrial safety technique and environmental protection in the industry and trade sector.

4. Ministry of Science and Technology (MOST). Its role is to manage activities of the state on science and technology, science and technology capacity building, product quality measurement standards, intellectual properties, atomic energy, radiation and nuclear safety.

a. The Department for Science and Technology (STD) is the assistant body of the MOST in the management of science, technology development of the following sectors.

b. The Department for technology Assessment and Inspection is the assistant body of MOST in unifying the management of evaluation, appraisal and examination of technology, technology transfer and provides consultancy in this field.

c. The National Institute for Science and Technology Policy and Strategy Studies (NISTPASS) is a research organization established in 1996 from the two former organisations: National Institute for Science and Technology Forecasting and

Strategy Studies (NISTFASS), and the Institute for Science Management (ISM) founded in 1978. In 2001, NISTPASS was awarded the Medal of Labour by the President of the Socialist Republic of Vietnam for its significant contributions to the science and technology development.

III-2-2. Universities and Research Institutes

1. Universities: Vietnam has 246 public and private universities and colleges[6], of which 42 offer training on environment (32 universities). So far, the following universities have introduced cleaner production as a 2-3 credit subjects[7]: University of Technology and University of Natural Sciences (from Vietnam National University of Technology Ho Chi Minh city), Ho Chi Minh city University of Technology, Van Lang University, Can Tho University, Hue University, Nha Trang University, Hai Phong University, Thai Nguyen University, Da Nang University, Hanoi University of Technology, University of Civil Engineering, Hanoi University of Science. The National Economics University is also integrating cleaner production into their existing topic on environmental economics.

2. Research institutes and centres: The following institutes and centres are mostly active in cleaner production:

   a. The Vietnam Cleaner Production Centre (VNCPC, www.vncpc.org) was founded in April 1998 at the Institute for Environmental Science and Technology, Hanoi University of Technology. It is a centre of excellence and advocacy in the field of CP. It is funded by the Swiss State Secretariat for Economic Affairs (seco) and is part of the UNIDO/UNEP (spell out) network of national cleaner production centres.

   b. The Vietnam Productivity Centre (VPC, www.vpc.org.vn) was established in 1997 under the Directorate for Standards and Quality (Ministry of Science & Technology). Its aim is to assist organizations and communities nationwide to improve their productivity and quality. VPC maintains a close and regular cooperative relationship with the Asian Productivity Organization (APO).

   c. The Energy Conservation Center of Ho Chi Minch City (ECC-HCMC) is working directly under the Department of Science and Technology of Ho Chi Minh City (DOST) since May 2002. Its aim is to gather dedicated scientists and technologists and managers from various industries in making policies, offering resolutions and training on efficient energy use and energy conservation for all of socio-economic components.

[6] MOET. <http://www.moet.gov.vn/?page=8.8&loai_bphan=261> (accessed 20 March 2009)
[7] Vietnam cleaner production Centre, Annual report 2006.

A list of international programmes and projects as well as a private sector and other organizations in the filed of CP are shown in the Table 3 and 4 of Annex 3, respectively.

III-3. Implementation

The main types of CP services to companies include rapid in-plant assessments or quick scans, and full CP in-plant assessments under the form of classical consultation services or combining with training.

1. Main types of CP services to companies:

Table 5. Annual Savings Achieved From CP Consultancy[8]

Sector	Elect., Mwh	Coal, ton	FO, ton	DO, ton	Gas, ton	Water, m^3	Chemicals, ton	Annual sav., USD	Invest., USD
Textile	6,991	1,747	6,510	0	0	1,014,223	496	2,011,205	506,149
Paper	44,338	24,541	1,901	0	0	2,906,570	1,228	3,297,851	766,246
Metal	911	490	111	21	41	150,203	77	503,414	307,481
Construction Materials	6,746	5,330	0	285	208	2,064,314	2.677	1,081,404	593,669
Food and beverage	727	383	163	30.2	0	80,143	60	797,434	173,840
Others	1,690	4,732	29	0	0.2	1,115,477	22	367,642	372,892
Total	61,403	37,223	8,714	336.2	249	7,330,930	4,560	8,058,950	2,720,277

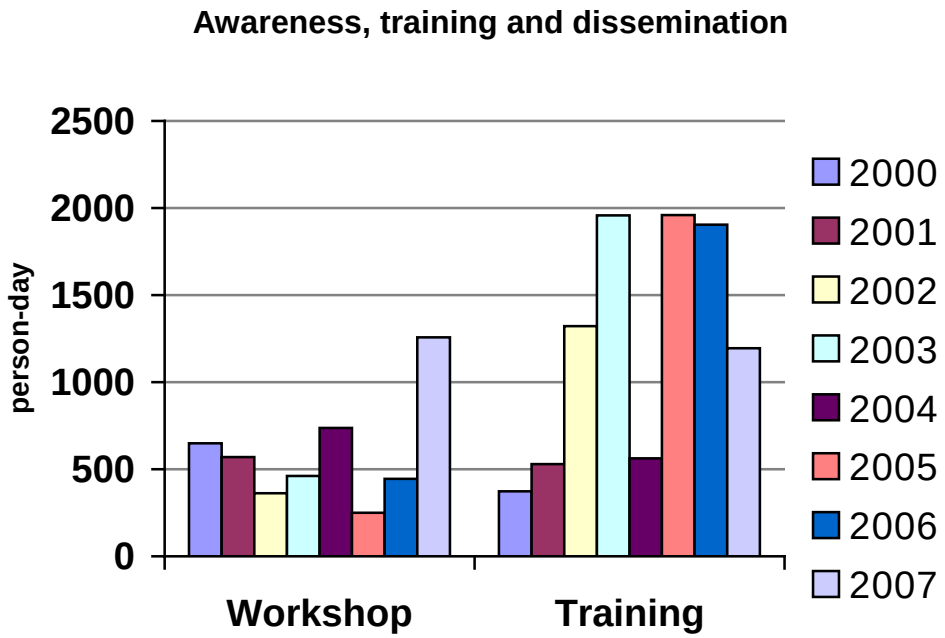
CP not only helps companies improve and protect the environment as well as saving non-renewable natural resources (through the reduction of water, chemical, and energy consumption) but also bring high economic efficiency with low investment costs to the company (annual saving is 8,058,950 USD while the investment is only 2,720,277 USD)..

-a. Quick scans, or rapid CP in-plant assessments, consist in a rapid review and evaluation of the CP improvement potential of a company. During a half-day or one-day company visit (depending on the company's size and process complexity), the consultant evaluates in which areas a company has the most potential for economic and environmental improvement through the application of CP and gives a rough estimation of how much these improvements could be done. The idea is to show the company the benefits it might get from the application of

[8] Annual report VNCPC 2007

CP, in the hope that the management will then be ready to invest in a full CP assessment.

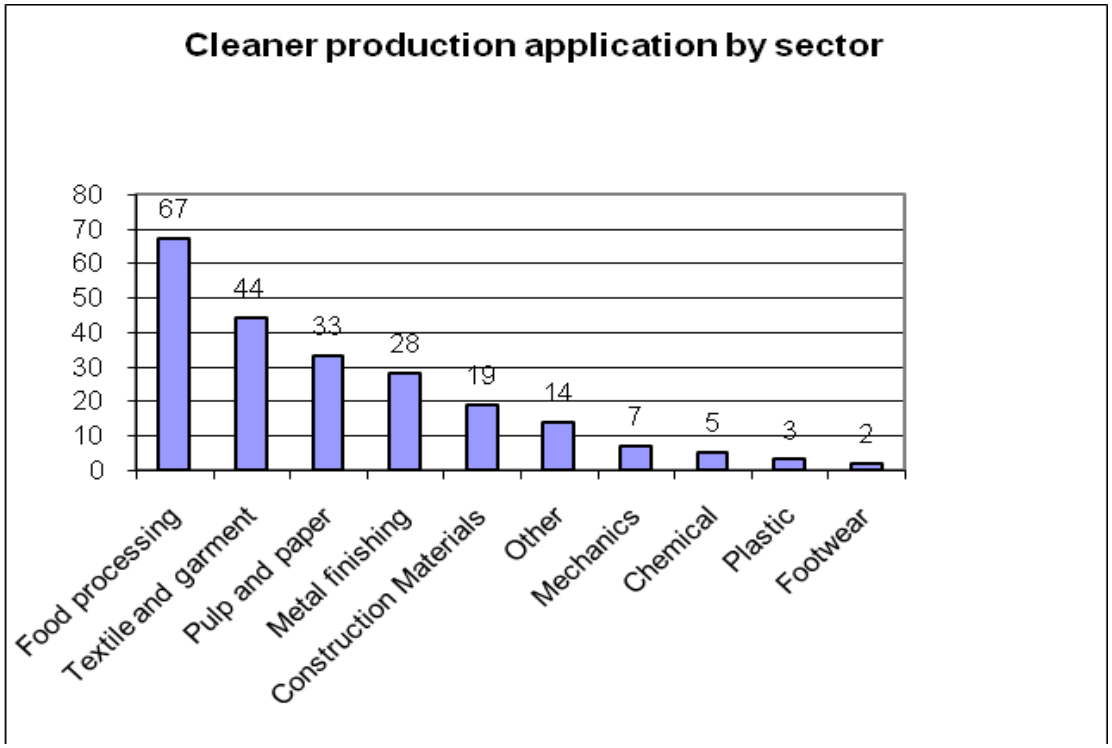
Figure 4. Awareness, Training and Dissemination Conducted by VNCPC[9]



b. Full CP assessments, covers duration of 6 to 12 months, depending on the size of the company and the resources devoted to the assessment. The objective is to analyze the situation of the company, develop ideas for potential improvements, determine their technical and financial feasibility as well as the environmental relevance, and develop an action plan for their implementation. The assessment can cover the whole company or focus on selected processes. While the company staff is carrying out the work under the responsibility of a CP team, the consultants visit the company on a regular basis to support the team and to ensure that the assessment is progressing according to plan. The ultimate objective is that the company will be able to apply CP on a continuous basis even after the consultants have achieved their support. This requires not only the acquisition of specific skills, but also significant changes of attitudes within the company staff and the management.

[9] VNCPC annual report, 2007

Figure 5. Cleaner Production Application by Sector[10]



2. Forms of CP services:

a. Consultation in classical consultation services, a consultant provides concrete advice for the implementation of one or several CP improvement measures (so-called CP options). The implementation is done either by the company or by the consultant/ consulting firm. One advantage of this solution is the possibility of quick implementation and thus achieved the desired results. The main disadvantage is that CP and its continuous improvement attitude are not integrated into the company's culture and the improvements tend to be short-lived, as the company management and workers promptly fall back in their previous habits and ways of working. Classical consultation usually does not lead to a sustained application of CP within the company.

b. Combining CP Assessment and Training: In order to provide a practical experience for trainees (mainly future CP consultants) as well as comprehensive

[10] VNCPC report

training to company's staff, trainings can be organized in combination with in-company assessment. The trainees follow the team to work in company for the first hand experience. The staffs of participating companies join in-class training with other future cleaner production promoters. In this case, CP assessments take in the form of a series of modules combining in-class training, in-company visits and consulting. This form works out especially well when the training is designed for a specific sector.

CP combined with related topics and environmental management tools

Despite its economic attractiveness in many respects, CP may not seem very attractive for a company manager when he evaluates the time he needs to put into it compared with the income he can get from spending time on other activities, e.g. sales. This hurdle, however, can often be overcome by combining CP programme with other services in a package that will better suit the needs and demand of the targeted client.

Table 6. Prioritize the Importance of CP and CP Related Services to the Business [11]

Order	Service	Consultancy,%	Training, %	Training and Consultancy, %	No Specification, %
1	Rapid CP Assessment	16	2	14	68
2	Full CP Assessment	21	8	14	57
3	Technology Gap Assessment	14	4	11	71
4	Energy Saving Advice	12	3	9	76
5	Financial Engineering	7	4	11	78
6	OHS	9	5	9	77
7	Design 4 Sustainability	9	4	12	75
8	Maintenance	4	5	16	75
9	Certification to a standard	7	2	5	86
10	CSR	15	2	7	76

[11] Surveying data by VNCPC, May 2006.

Companies were asked to indicate if they would prefer direct consultancy or training services or a combination of both. % is a % of the response rate for each service category. Responses have ranked other services relating to CP as low priorities in comparison with the CP services.

Cleaner production and energy efficiency:

One of the most obvious benefits through cleaner production application is energy saving. With the focus to specific thermal and/or electric use, the benefits can be quantified nearly immediately after the implementation. 20% of VNCPC's participating companies applied this programme even after benefiting from cleaner production assessment. Since the price of energy is increasing, the company has motivation in applying cleaner production. Similar idea can be applied to water efficiency, but this is not realized yet.

Cleaner production and hazardous waste management:

Using the same approach in cleaner production with focus to the usage of hazardous materials, cleaner production helps identify, reduce and thus manage the hazardous wastes. A programme is currently still going on in Nam Dinh province with 15 companies. The first batch composed of nine companies was completed with positive results. The curbing toxic chemicals as well as the amount used in the manufacturing process will result in the reduction of hazardous waste.

Cleaner production and occupational health and safety or social issues:

Similar to the hazardous waste management programme, cleaner production focuses to the working conditions and chemicals used in the companies. The application proved to be successful in 15 participating companies in Phu Tho province.

Cleaner production and end-of-pipe:

Obviously cleaner production helps reduce treatment cost. It is introduced now as a tool before designing end-of-pipe facility by VNCPC' CP trainees, particularly the ones in Ho Chi Minh city, where the environmental pressure and enforcement are highest. A typical example is CP application to reduce wastewater effluents (in both volume and effluent concentration) to reduce the size of the necessary wastewater treatment plant (WWTP), thereby significantly reducing the required investment. In certain cases, the reduction of the size of the WWTP also helps some companies with limited available space to avoid relocation. In other cases, the WWTP can even be avoided thanks to the application of CP.

CP and environmental regulation, relocation programmes, land use:

The DONRE HCMC has published a black book, which lists all polluters and a green book with good environmental performance companies. In order to be listed in the green

book, companies need to take actions to improve their environmental performance, and cleaner production can help.

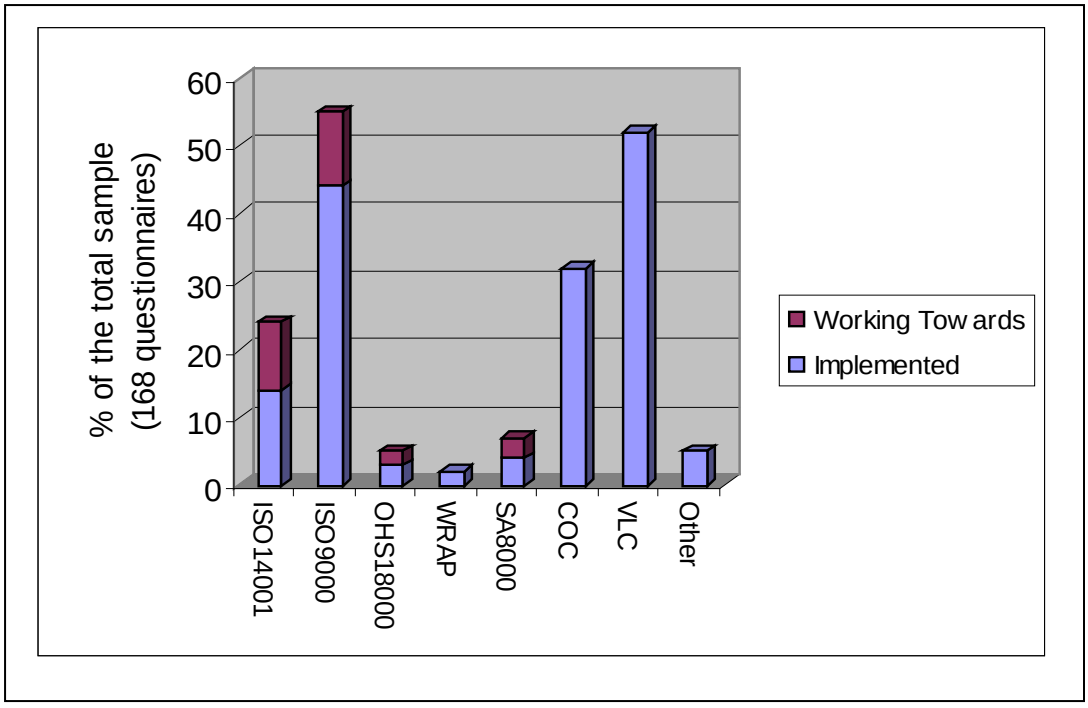
Following the decision 64/2003/QD-TTg on relocating the polluters and the current relocation programme of SMEs from resident areas to industrial parks, cleaner production can be a useful tool in designing phase/re-engineering or study on investment to avoid costs associated to relocation.

Although in practice this combination is not used enough yet, the DONRE of HCMC is considering to explicitly link the granting or extension of land use certificates to environmental performance and the application of CP by the concerned enterprises.

Environmental Accounting Management:

This tool has been introduced last year in Vietnam, mainly through training and case studies that serves training purpose. The number of application is still limited, but with promising market, particularly in export oriented, international and/or multinational companies, obviously cleaner production can be integrated in developing improvement options. Sai Gon Beer in Phu Yen applied environmental accounting management with support of a cleaner production expert.

Figure 6. Companies Working Toward to Standards [12]



[12] Surveying data by VNCPC, May 2006

Of 168 questionnaires analysed, only 52% of companies identified the Vietnam Labour Code as a standard they worked to. This indicates that there is a lack of awareness among industries about the basic labour law of Vietnam. As expected, ISO9000 is the second highest implemented standard. It is encouraging to see reasonable levels of awareness of ISO14001 in contrast to very low levels of OHS 18000 (ISO9000: Quality Management System certified by the International Standards Organisation demonstrates consistency of product quality; ISO14001: Environmental Management System certified by the International Standards Organisation demonstrates continual environmental improvement; and OHS 18000: Occupational Health and Safety (OHS) management system controls company's OHS risks and demonstrates its commitment to provide a safety working environment).

Environmental Management System:

Eighty-five (85) companies in Vietnam were ISO 14001 certified by December 2004. Application of CP provides continuous improvement actions, which is required for maintaining this certificate. Xuan Hoa Company (metal finishing in Vinh Phuc province) passed the surveillance audit despite some non-conformance thanks to the continuous application of CP. Ha Tien II Cement Company (Can Tho) can use the CP assessment as a base for its ISO 14001 application.

Incentives schemes:

With regards to the existing incentives, it appears that the only instruments currently enforce are user charges (e.g. on water and energy products) and fines which can be levied by Environmental Inspectorates in cases where environmental legislation has been violated. Environmental fines, if levied at all, typically do not have a tremendous financial impact on the enterprises fined, rather they are perceived as detrimental for the company image.

Multilateral Environmental Agreements/ International Conventions:

CP can also be integrated into projects related to the implementation of Multilateral Environmental Agreements like the Kyoto protocol (Kyoto protocol to the United Nations Framework Convention on Climate Change, and in particular the Cleaner Development Mechanism), the Basel Convention (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal), or the Stockholm Convention (Stockholm Convention on Persistent Organic Pollutants).

IV. Shortcomings in Waste Management System and the Necessity of Promoting Recycling Industry in Vietnam

IV-1. Shortcomings in Management System

The summary on waste management and cleaner production issues in Vietnam shows that the problem of non-separated waste is further compounded. Dumping is the most popular method of municipal waste and non-toxic industrial waste disposal. The recycling industry is only established in forms of craft village or private enterprises. These premises mainly operate in recycling paper, plastic, ferrous metals, aluminum, lead with backward technology and rudimentary equipment causing not only low economic benefit but also serious environmental pollution. Hazardous waste is collected by licensed hazardous waste handling company, treated by incinerators with small scale, manual operation and low control.

It is obviously that the amount of waste that needs to be treated in Vietnam can be reduced if the recycling industry of the country develops. As mentioned, with high recycling potential, recycling activities can strongly be produced locally and supplied to rural areas. However, there remain a large number of shortcomings identified, which include the following:

- There has not been a clear division of responsibilities between different waste management agencies.
- There is a lack of appropriate investment in facilities for collection, transportation and separation that meet technical and environmental requirements. Modern facilities for recycling collected waste and treating toxic waste are also limited. It is a fact that recycling activities have not been done in all sectors, only mainly implemented spontaneously in informal sectors with backward technology.
- Community awareness of environmental problems and health safety concerning waste is still low. There has not been a wide participation from the communities and private sector in waste collection and management. As mentioned, one the most important obstacles in developing of recycling industry is a custom of disposing and storing home electrical and electronic, which have been used.
- Regulations of waste management operators, industries and other line agencies, and authorities suffer many gaps in enforcement and insufficient supervision of waste management practices. For example, there is no detailed regulation on take-back systems that have been promulgated until now. In order to put the take-back regulation into the practice, it is essential for Government to put additional efforts on establishing more detailed legislation on this system.
- Regulations are not effectively enforced because resources and institutional capability to implement Vietnam's policy framework is still weak. The role of various governmental agencies and limited interagency coordination is still overlapped.
- There is no systematic monitoring of waste (including solid and hazardous waste) generation, collection and composition - (based on the decision No. 16/2007/QD-TTg by Prime Minister on Jan 29, 2007 ratified the plan on developing national natural resource and environmental network toward 2020). For instance, in the recent years, the import of waste as materials for domestic production has been allowed and regulated (according to article 43 - amended Environment Protection Law). This permission has facilitated the local recycling business to exploit recyclable materials from the wider regions. However, the low capacity for monitoring imported industrial

waste puts pressure on the environment of Vietnam due to the increase in illegal waste trade.

Besides those shortcomings and threats, it is seen that there are significant opportunities for the development of recycling industry. The demand on some recycling products is very high, especially in rural areas. Moreover, the industry is receiving the great focus of the government.

Figure 7. SWTO Analysis of Recycling Management in Viet Nam

Strengths	Weakness	Threat	Opportunities
- Can reduce the total amount of the waste for landfill - High recycling potential - Can be produced locally (supplied to rural areas)	- Lack of appropriate investment in facilities - Low community awareness - Lack of resources and institutional capability - No systematic monitoring	- Recycling activities mainly implemented spontaneously in informal sectors with backward technology - Waste import is permitted	- Receive great focus of the Government - Demand on some recycling products - Production price will be decreased

IV-2. Necessity of Promoting Recycling Industry in Vietnam

From 2015, as a member of ASEAN, Vietnam will have to eliminate all import duties for the Inclusion list of products traded within the region; and as a member of WTO, the country will complete the reduction of all committed import tariff lines to the final bound rates (which are the lowest rates). The deeper economic integration, therefore, will create more opportunities as well as challenges for Vietnam's economy and environment. For example, in the case of electronic waste, the trend of tariff reduction together with improved living standards in Vietnam will make more and more obsolete electronic appliances be scrapped into the environment. The amount of electronic wastes in the country will rapidly increase. It is also a toxic crisis if some substances contained in the waste (such as lead, beryllium, mercury, cadmium etc.) are not properly treated. Therefore, in order to gain the complete benefits of economic integration, it is essential to tackle the issues of waste recycling urgently.

Some correlative principles are contained in the enforced laws and regulations (Articles 5, 65, and 67 of the LEP, Decree 59/2007/ND-CP, Decree 174/2007/ND-CP). These principles could provide a management system to deal with the waste recycling in particular and solid waste problem in general. However, up to now, the current legal framework in Vietnam lacks clear guidelines on waste recycling management.

In Vietnam, waste recycling activities are mainly spontaneous. The waste-handling infrastructure executed by informal sector has developed. Purely business-driven e-waste recycling factories have established without any government intervention. Shortcomings in capacities, skills and technologies may put workers and the environment at considerable risk. Therefore, some of the recycling processes are extremely harmful and need to be transferred to formal industries. Moreover, zero-waste society is now an important issue all over the world. Waste management issues in Vietnam should focus on special attention to social awareness and public policies toward sustainable waste management. This requires a technology and legal support from the government and other stakeholders.

In the recent years, the Government of Vietnam has paid special attention in seeking for appropriate management and technical solutions for developing the recycling industry in the country. Currently, the "National strategy for waste reduction, reuse and recycling until 2020" is being prepared by MONRE (called 3R strategy) with specific targets until 2020 as follows:

a) The amount of solid wastes that requires land filling and incineration will be cut down to 50% of the total volume of collected wastes while 50% will be reused and recycled; 100% of solid wastes will be collected; 50% household waste and 100% industrial waste will be separated at source;

b) 75% of household organic waste shall be processed to composted fertilizer; 50% industrial waste shall be recycled, and 90% of the construction solid wastes will be reused/recycled;

c) The amount of non-environmental packages produced and distributed shall be decreased to 10% of 2005; and

d) 1% of industrial enterprises will use cleaner production technologies; 100% of exported products and 70% of domestically consumed products will be environmentally labelled; 50% of businesses will apply ISO 14000 environmental management system.

At present, the 3R decree and Extended Producer Responsibility (EPR) decision are also in preparation. In order to promote the development of recycling industry, the Vietnamese policies may need to focus on the following matters:

- Develop collection and material classification systems for recycling;
- [Consumption's stimulation and develop] (Promote the use of and improvement of recycled products);

- Support financial resources to develop waste recycling;
- Implementation of the national waste recycling management;
- Concretize regulations of support financial resources and land for recycling;
- Develop policies to establish recycling of individual wastes; and
- Promote international cooperation.

V. Conclusion

Parallel with rapid economic growth, industrial sectors in Vietnam have indicated to have a high rate growth in both quantity and diversification, satisfying increasing requirements of consumers. However, this also has resulted in the appearance of the new wastes, and growing environmental pollution. In the waste management system, a large number of shortcomings have existed because responsibilities between different concerned agencies have not been cleared and mechanism for the service is still heavily subsidized.

In this report, with the introduction of waste legislation in the form of regulations directives, a significant move towards sustainable waste management is becoming a legal requirement. Under increasing waste discharge quantity by high economic growth, the laws concerned about proper waste treatment should be enacted. In addition, the action to promote 3R should be soon conducted for reducing the final disposal waste quantity and restraining consumption of natural resource.

In order to protect the environment as well as save natural resources, the Government's emphasis is now being placed on increasing recycling and promoting more sustainable waste management practices, and better coordination between the public, private and independent sectors, and all concerned with the management of waste and reusable materials.

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Annex 1

Table 1. Main Legal Documents for Solid Waste Management in Vietnam

No.	Name of Document	Over view	Date issued
1.	Decision No. 152/1999/QĐ-TTg on strategy on solid waste management in urban and industrial zones	Gradually establish a synchronous system on solid waste management in urban and industrial zones to control the pollution and environmental protection for sustainable development in industrialization and modernization stage	10th July, 1999
2.	Decision No. 155/1999/QĐ-TTg on regulations on hazardous waste management	The regulations on hazardous waste management to prevent and minimize their generation and adverse impacts on the environmental quality and public health. Mapping out the responsibilities of institutions, privates involve to discharge, collect, transfer, store, treat… hazardous waste….	16th July, 1999
3.	Decision No.2575/1999/QĐ-BYT on regulations of medical waste management	Mapping out the responsibilities of all health services over country to manage medical waste.	27th August, 1999
4.	Decision No. 15/1999/-QĐ-TTg of the Prime Minister approving the "Strategy for solid waste management in rural areas and industrial estates in Vietnam towards 2020 ".	Gradually establish a comprehensive system on solid waste management in the urban and industrial areas to control the pollution, environmental protection towards to sustainable development in industrialization and modernization term of the country.	10th July, 1999
5.	Decision No 62/2001/ QĐ-BKHCNMT on technical documents of incinerators of medical waste	Stipulations on the basically technical requirements on incinerators of medical waste, was used as technical bases for assessing and approving the incinerators of medical waste	21st November, 2001
6.	Decision No 60/2002/QĐ-BKHCNMT regarding to promulgation on technical guideline of hazardous waste dumping	Technical guidelines provides the methodologies, Principles, and criteria to minimize and prevent the hazardous waste 's impacts on public health, environmental quality and integrated feasible approach for sanitary landfills for hazardous waste for every localities	7th August, 2002
7.	Decree No: 13/2003/NĐ – CP on list of hazardous goods, transportation of hazardous goods on road	Stipulations on list of general hazardous goods, the transportation by road. Especially for radioactive substances, transportation activities have to comply with Decree No 50/1998/NĐ-CP dated in 16th July 1998. Otherwise, for transportation of industrial explosive substances, Both this decree and Decree No 47/CP dated in August 12 th 1996	19th February, 2003
8.	Decision No. 64/2003/QD-TTg. Approving the plan for thoroughly handling establishments which cause	Establishes roles and responsibilities for identification and reporting the worst pollution sources, and modes or implementation to address these sources.	22nd April, 2003

No.	Name of Document	Over view	Date issued
	serious environmental pollution.		
9.	Decision No. 256/2003/QDD-TTg on approval of national environmental protection strategy until 2010 and vision toward 2020	Target to 2020: prevent basically the critical pollution, recovery the environmental declination and improve the environmental quality to ensure the sustainable development and public health. Target to 2010: Solve basically the environmental degradation in industrial zones, condensed community in big cities and rural zones, recover the pollutions on river branches, and explore properly the natural resources and preserve the biodiversity sustain…	2nd December, 2003
10.	Decision No. 153/2004/QĐ-TTg on the promulgation of sustainable development orientation in Vietnam (National agenda 21)	Sustainable development orientation in Vietnam is a framework strategy as legal bases for the ministerial, local, institutional agencies to act and ensure the close and reasonable coordination between economic, social development and environmental protection	17th August, 2004
11.	Decision No. 34/2005/QD-TTg for promulgating the Government's action program for implementation of the Politburo's Resolution No. 41/NQ-TW of November 15, 2004.	...maps out responsibilities and actions of the government and the people for implementation of Resolution #41 above.	22nd February, 2005
12.	Directive No.23/2005/ on promoting solid management in urban and industrial areas	Figure out the responsibility of authorities at level of ministerial, local and relevant to implement the solid waste management in urban and industrial areas	21st June, 2005
13.	Law on Environmental protection 2005	Stipulations on environmental protection activities as policies, measures and human resources for environmental protection, rights as duties of organizations, institutions, individuals… in environmental protection	29th November, 2005
14.	Official document No. 1160/TCHQ-GSQL on customs management for hazardous waste	Stipulations on the transference of hazardous waste to Vietnam's boundary (internal and territorial waters)	24th March, 2006
15.	Circular 12/2006/TT-BTNMT on promulgation of permissible imported waste as raw materials	Stipulation of List of permissible imported waste as raw materials is compliance to regulations at article 42 and 43 of environmental protection law and replacing decision No. 03/2004/QĐ-BTNMT dated 2nd April 2004 on environmental protection for imported waste	8th September, 2006
16.	Decree No. 59/2007/NĐ-CP on promulgating regulations for solid waste management	Stipulation of solid waste management activities, responsibilities of all organizations, agencies, individuals… involving the solid waste	9th April, 2007

No.	Name of Document	Over view	Date issued
17.	Decree No.81/2006/ND-CP Sanctioning of Administrative Violations in the Field of Environmental Protection.	… Prescribes violations of relevant regulations and applicable sanctions and remedial actions.	9th August, 2006
18.	Decree No. 174/2007/ND-CP on discharges of solid waste	Stipulations on environmental discharges from solid waste, fee management and payers…..	29th November, 2007
19.	Circular No. 08/2008/TT-BTC on amending and supplementing circular No 108/2003/TT-BTC on guideline of financial mechanism application in projects related to domestic waste treatment and urban waste funded by ODA	Detail guideline of financial mechanism application in projects related to domestic waste treatment and urban waste funded by ODA	29th January, 2008
20.	Circular No. 39/2008/TT-BTC on guideline implementing the decree No. 174/2007/ND-CP on solid discharge	Concretizing the Decree No. 174/ND-CP on implementing the solid waste discharge as the payers.	19th May, 2008

Annex 2

Table 2. Legislation Related to Industrial Activities in Vietnam Relevant to CP

Date	No	Type and content	Issued by
25 June 1998	36-CT/TW	Directive on strengthening the environmental protection in the period of industrialization and modernization	Politburo
1 July 1998	45/1998/ND-CP	Decree on technology transfers	Prime Minister (PM)
16 July 1999	155/1999/QD-TTg	Decision on the regulation on management of hazardous waste	PM
06 May 2002	1146/BKHCNMT-MTg	National CP Action Plan	Ministry of Science, Technology, and Environment
26 June 2002	82/2002/00-TTg	Decision on the setting up, organization and operation of Vietnam Environment Protection Fund	PM

Date	No	Type and content	Issued by
22 April 2003	64/2003/QD-TTg	Decision on approving the plan for thoroughly handling establishments which cause serious environmental pollution	PM
13 June 2003	67/2003/ND-CP	Decree on environmental protection charges for wastewater	PM
17 August 04	153/2004/QD-TTg	Decision: Strategic orientation for sustainable development of Vietnam (Agenda 21)	PM
15 Nov 2004	41-NQ/TU	Decree on environmental protection during the period of industrialization and modernization	Politburo
9 March 2005	01/2005/TT-BKH	Circular on implementation of the Strategic Orientation for Sustainable Development in Vietnam	Ministry of Planning and Investment
20 May 2005	68/2005/ND-CP	Decree on chemical safety	PM
21 June 2005	23/2005/CT-TTg	Directive on strengthening the solid waste management activities	PM
29 November 2005	No. 52-2005-QH11	LAW ON PROTECTION OF THE ENVIRONMENT	NATIONAL ASSEMBLY
2006		Preparation of a decree on the promotion of CP	Ministry of Industry and Trade

Annex 3

Table 3. List of international projects and programmes related to cleaner production

Existing Partners	Nature of work
UNIDO	CDM
DANIDA Development Cooperation in the Environment (DCE)	Cleaner Production in Industry
UNEP GERIAP	Encourage business energy efficiency to reduce associated GG emissions.
SECO (Hazardous waste management in Nam Dinh)	Waste minimisation
SEMLA (SIDA and MONRE)	Strengthening environmental management and land administration.

UNEP D4S	Development of a project proposal for D4S
VEPA / SDC	Raising the capacity of VEPA to handle and treat PCBs in Vietnam.
CIDA: VCEP	Strengthening provincial and national agencies in the field of Ind. Pollution management
CIDA Making Waste Work for the Economy with NISTPASS	Regional project to alleviate waste challenges
UNIDO / SIDA / DONRE Pollution Reduction in HCMC	Using case studies from previous research to develop policy and build capacities
UNDP GEF small grants programme	Supports demonstration of community level strategies and technologies
UNDP Formulation and Implementation of Agenda 21	Supports Government in formulation of Agenda 21
US-AEP (USAid) Asia Environmental Partnership	Regional Programmer o promote environmentally sustainable growth and improved quality of lie in six Asia Countries
ADB (HCMC DONRE)	HCMC Environmental Improvement. Revolving fund for CO
UNIDO Regional Energy Efficiency Programme	
UNIDO / GEF regional POPS programme	To promote BAT and BEAP for the management of POPS
SDC / UNIDO PCB Management Project	Capacity build Government to manage PCBs
UNIDO (VCCI/VBLI)	CSR
ADB & UNIDO Regional CP for Greater Mekong sub-region	Mekong River Pollution and TEST (Transfer of Environmentally Sustainable Technology) to industries lining the river.

Table 4. Private Sector and Other Organizations in the field of Cleaner Production

Organisation	Activity
The Vietnam Productivity Centre (VPC)	Main focus is management systems including EMS to improve productivity and quality.
Energy Conservation Centre HCMC	Training on energy efficiency and policy development, under DOST
Lefaso	Leather and Footwear business association have been involved in CSR
BLC (Tanneries Project) in partnership with Pentland, Adidas etc	Leather processing consultancy who are developing an environmental standard for tanneries.
Center for development and integration	Economic integration Governance and Privatization and Corporate Social Responsibility in Environment and Labor Aspects
Royal Melbourne Institute for Technology (RMIT)	Provide corporate consultancy support in the field of HR, Management change, Social issues.
Corporations.	Under the Ministry of Industry, 16 industrial sector corporations manage the state-owned companies of the following sectors:
Business Associations	There are over 80 business associations The associations exchange information between their members and support trade promotion.
Industrial Zones	Decree 64 requires the movement of polluting industries from urban areas to industrial zones