



Ministry of Education and Training
Hanoi University of Technology
Institute for Environmental Science and Technology

Viet Nam Cleaner Production Centre

Annual Report 2002



Viet Nam Cleaner Production Centre

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FOREWORD



A rapid growth of the industry has made a significant contribution to a stable development of the country economy in the past decade. On the other hand, this growth has brought equally unprecedented costs – air and water pollution, toxic waste and adverse social change, including a growing gap between rich and poor and a depletion of natural resources.

To a significant degree these costs highlight the inescapable fact that our current patterns of production and consumption are unsustainable. The potential to economically reduce energy and resource use, pollution, waste, and the cost of investment in the production of our goods and services is, quite simply, enormous. The copious examples of industries and companies that have greatly reduced – even eliminated – flows of waste and materials are signposts on the way forward. Furthermore, many of these examples demonstrate that it is often much cheaper and easier to reduce or prevent several negative impacts simultaneously than to reduce one or two individual impacts. In these examples lie the seeds of sustainability and the overriding truth that everything can be done better than it is.

This is the sense of cleaner production process and a core element of sustainable development.

On behalf of the Viet Nam Cleaner Production Centre, I would like to express our sincere thanks for the support of the donor - SECO, the executing organizations - UNIDO, ministries, advisory board, host institution, cooperating institutions, participating companies and individuals, who helped us to achieve the goals and objectives of 2002.

Special thank is conveyed to Prof. Heinz Leuenberger, Chief Technical Advisor of the centre for his great contributions from developing to executing and implementing our Business Plan.

We are looking forward to further cooperation with all of you in the future.

Prof. Dr. Tran Van Nhan
Director of Viet Nam Cleaner Production Centre.



The year 2002 started with a big event for our centre. In January we received the ISO 9001 and ISO 14001 Certificates. After an in-depth evaluation by SGS Vietnam, and correcting some minor complaints we have passed successfully both audits. In the meantime SGS already made the first official review for the Quality Management System. The Integrated Management System will be reviewed in March 2003.

In February our UN Volunteer, Bent Hummelose left our centre to start his new job with an environmental agency in Denmark. I would like to thank him for his hard work and valuable contributions to our centre and wish him and his family all the best in the future.

In June we organised together with National Environmental Agency (NEA), Vietnam Canada Environmental Programme (VCEP), Denmark Environmental Programme and United Nations Environmental Programme (UNEP) the first CP Roundtable in Vietnam, with around 150 participants from all over Vietnam. Many different stakeholders, including representatives from industry, discussed the newly formulated CP Action Plan for Viet Nam toward 2005. The event was a strong sign for the increasingly active CP "society" and improved interest in CP.

Twice in 2002 VNCPC organised training and study tour for Government and Industry representatives from Laos and our centre supported a four-module training course combined with 4 CP assessments also in Laos.

In Vietnam we very successfully conducted an in-depth CP Training in the textile sector. Eight textile companies with over 20 participants from different parts of Vietnam were trained during 14 days (4 modules) in Cleaner Production Methodology and they made use of their knowledge by doing practical CP assessments. The impressive results were presented together with VINATEX during a seminar in Hanoi in November.

The goals defined in the Business plan were once again reached and frequently surpassed thanks to the intense effort from all of the VNCPC Staff and all our partners.

In the future VNCPC will focus part of its work towards cleaner technology information, evaluation and promotion. The environmental situation in 20 years in Vietnam will heavily depend on the type of technology companies are installing in the coming years. If the future increased production will be produced with old, outdated and dirty technologies, the environmental situation will degrade even faster than currently projected and will consume all the progress made by cleaner production activities and the investments in end-of-pipe technologies at existing facilities. Independent, reliable and neutral technology information is a prerequisite for environmentally friendly industrial development.

I would like to thank all involved Vietnamese ministries and partners, the former National Project Director Professor Dinh Van Sam, the staff of INEST and VNCPC for all their work and contributions.

Prof. Dr. Heinz Leuenberger

Chief Technical Adviser, Viet Nam Cleaner Production Centre.

Cleaner Production

Cleaner Production (CP) is the continuous application of an integrated preventive environmental strategy applied to processes, products and services in order to increase eco-efficiency and reduce risks to humans and the environment.

For production processes: cleaner production includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes at the source.

For products: cleaner production includes the reduction of negative impacts along the life cycle of the product, from raw material extraction to its ultimate disposal.

For services: cleaner production is to incorporate environmental concerns into designing and delivering services.

Cleaner production requires changing attitudes, exercising responsible environmental management and evaluating technical options.

Definition by UNEP TIE

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1 POLICY

In connection with the implementation of an Integrated Management System following ISO 9001 and ISO 14001, the Viet Nam Cleaner Production Centre has established the following Policy for Quality and Environment

Policy for Quality and Environment

Viet Nam Cleaner Production Centre is a knowledge-based organisation delivering a wide range of high quality cleaner production solutions that gives added value to industry, consulting companies, research institutions, academia, and governmental organisations.

As a national focal point on Cleaner Production, we are committed to continual improvement and prevention of pollution. We will comply with legislation and are committed to the International Declaration on Cleaner Production.

We will continuously strive to improve the quality of our solutions and services and to improve the effectiveness of our Integrated Management System.

Based on our Policy we have formulated the following principles:

- All staff have an impact on the quality of our services and on our environmental performance, and are therefore responsible for the work they deliver to internal and external customers;
- All staff shall inform the management if they cannot fulfil customer requirements; and
- All staff shall seek and share experience to continuously improve our services.

2 VISION AND MISSION

The vision of Viet Nam Cleaner Production Centre is to play a catalytic and coordinating role in promoting Cleaner Production in Viet Nam.

The mission of Viet Nam Cleaner Production Centre is:

- To train the human resource base in enterprises, industry associations, consulting companies, research institutes, academic institutions, and governmental industrial and environmental management agencies in Cleaner Production methods;
- To demonstrate Cleaner Production Assessment in industries to show the advantages of the Cleaner Production approach, and at the same time adapt the internationally developed Cleaner Production approach to Vietnamese conditions;
- To assist policy-makers and make recommendations on how to promote the concept of Cleaner Production in industries and through legislation;
- To promote the concept of Cleaner Production and raise awareness among industries and governmental agencies;
- To assist universities in integrating Cleaner Production into their curricula;

- To co-operate with domestic and international organisations with the aim of supporting the implementation of preventive environmental protection; and
- To serve as a focal point of the UNEP/UNIDO Network of National CPC.

3 ORGANISATION AND FACILITIES

The Viet Nam Cleaner Production Centre was established in 1998 within the framework of UNIDO/UNEP National Cleaner Production Centres Project, sponsored by the Swiss Government through the State Secretariat for Economic Affairs (SECO) and located at the Institute for Environmental Science and Technology of the Hanoi University of Technology.

Advisory Board

The Centre has one Advisory Board consisting of 12 members at department managing levels of relevant ministries and organizations: MOET, MOI, MOF, MPI, NEA, HUT, INEST, HCM DOSTE, UNIDO and SECO/SDC. The Vice-Rector of Ha Noi University of Technology, Prof. Hoang Ba Chu, is Chairman of the Board. In 2002, the Advisory Board was re-established from Ministerial to Department level due to the phase II focuses on implementation in industries. The first meeting of new Board was organized in December.

Organisational Structure

The organisational structure of Viet Nam Cleaner Production is shown below.

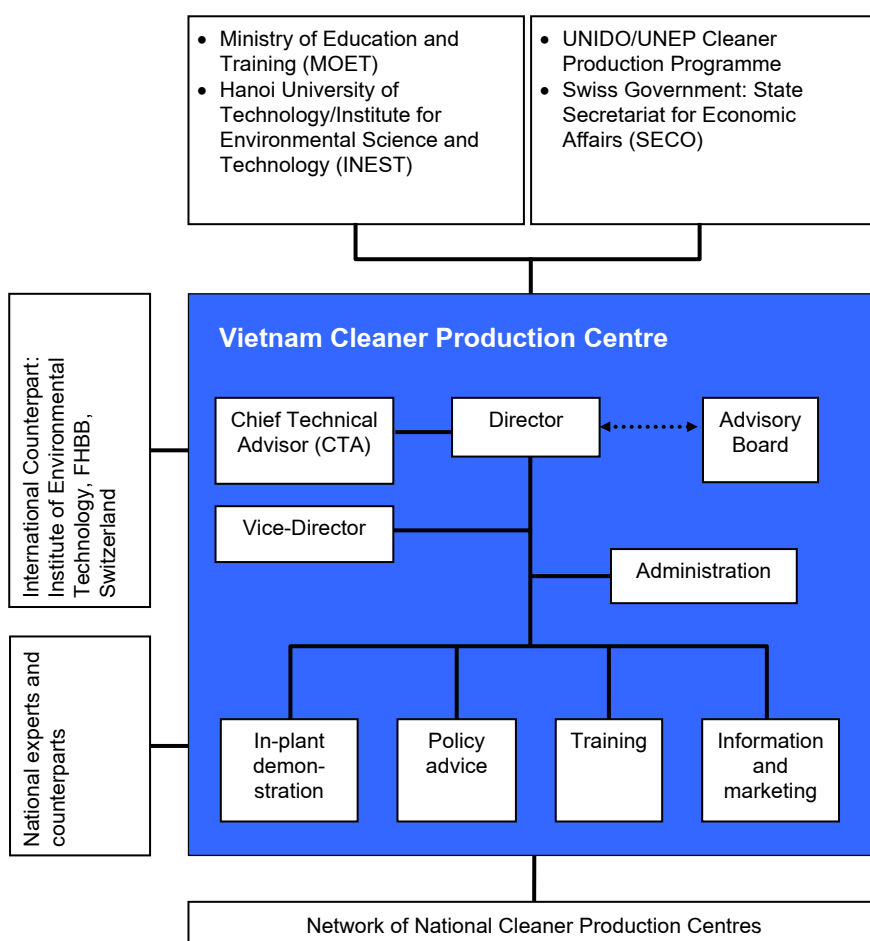


Figure 1. Organisational set-up of Vietnam Cleaner Production Centre.

Staff

At the end 2002, the VNCPC team counted 13 Vietnamese and one part-time foreigner (Chief Technical Advisor). Three staff members hold Ph.D's., four hold M.Sc.'s., and four hold a B.Eng's degree. Currently, six of the Vietnamese staff members are qualified to facilitate and to conduct Cleaner Production Assessments in industries.

During 2002 two staff members of VNCPC attended a three-week training programme in Cleaner Production and Energy Efficiency Integration in India. Another staff member attended a three-month training program in Cleaner Production Technology Training in Germany. The Deputy Director participated in a training program on Capacity Building for Cleaner Production Centres in Germany.

The management and staff of the Centre have received on-going training through participation in seminars, international workshops and roundtables on cleaner production.

Counterparts and Networks

The Viet Nam Cleaner Production Centre has established long-term cooperation with the Institute of Environmental Technology at FHBB in Switzerland. The Centre has contacts with numerous national and international experts in the fields of environment and cleaner production.

Within the UNIDO/UNEP network, the VNCPC is working closely with the 29 other National Cleaner Production Centres worldwide as well as with the participants at the Asia Pacific Roundtable for Cleaner Production. The VNCPC is building up a formal network of CP experts and institutions throughout Viet Nam in the coming years.

Facilities

The Viet Nam Cleaner Production Centre and its host institution, INEST, have been equipped with portable analytical equipment for both rapid and in-depth assessment of material and energy consumption in several different industrial sectors.

Staff at the Centre

Mr. Tran Van Nhan, Ph.D., Director
Mrs. Ngo Thi Nga, Ph.D., Vice Director
Mr. Do Trong Mui, M.Sc., CP Expert
Mrs. Vu Tuong Anh, M.Sc., CP Expert
Mrs. Tang Thi Hong Loan, M.Sc., CP Expert
Ms. Nguyen Thanh Tam, M.Sc., Junior CP expert
Ms. Nguyen Le Hang, B.Sc., Junior CP expert
Mr. Pham Sinh Thanh, B.Sc., Support staff
Mr. Bui Manh Cuong, B.Sc., Support staff
Mr. Dinh Quang Hung, B.Sc. Support staff
Ms. Vu Thanh Tu, B.Sc, Secretary
Ms. Tran Le My, B.A., Interpreter
Mr. Pham The Hung, Driver
Mr. Heinz Leuenberger Prof., Ph.D., CTA



The library at the Centre now counts around 500 titles (books and journals) related to environment, cleaner production and environmental management. Additionally, more than 1,000 books and reports are kept in an electronic library.

4 ACTIVITIES 2002

4.1 Overall

In 2002, the Centre achieved or surpassed the targets set in its business plan. The results of the surveillance audits for ISO 9001 and ISO 14001 proved the stability of the Management System to ensure the quality and environmental performance at the Centre.

With a total of 142 man-months (or around 12 man-years) available in 2002, the Viet Nam Cleaner Production Centre organized 15 training courses, 15 seminars, two study tours for 1221 person-days of training, 632 person-days of seminar, 12 cleaner production assessments and a number of other activities described in the following.

4.2 Training

The lack of well-trained and experienced Cleaner Production specialists is one of the main barriers to implementation of Cleaner Production in Vietnamese industry. Therefore one of the key activities of the centre is to build up, through training, a resource base of national experts on Cleaner Production.

In 2002, the centre did not only provide sectoral in-depth training as in its business plan, but also a very high number of tailor-made training session in cleaner production.

Table 1. Overview of training in 2002

Type of training	Planned man-days	Achieved man-days	Explanation
Sector specific training	210	466	Four-module training program "Cleaner production in Textile Industry" (400 man-day). More participants than expected. The 4 th module of "Cleaner Production and Environmental Management in Pulp and Paper industry" (66 man-day).
Special skill training	90	64	Financial Engineering (64 man-day)
Tailor-made training	50	634	- CP training for Bai Bang Paper Company (150 man-day) - CP in building materials under DANIDA request (40 man-day) - CP in Long An province under VCEP request (84 man-day) - 4 module CP training for Lao under DANIDA – Lao Ministry of Industry and Handicraft (360 man-day)
University lecture training	60	172	Two trainings including one from 2001

Intensive CP Training Programme

Since 2000, the intensive training activities have been organized focusing on a specific sector. In 2002, the Viet Nam Cleaner Production Centre completed training in the paper sector (continued from 2001) and organized a full program in the textile sector.

The training was organized in combination with in-plant demonstration activities so that participants gained practical experience in Cleaner Production Assessments. The total duration of this training was 14 days of classroom training and between 11 to 15 days of practical work in companies. At the end of the training, participants are able to carry out cleaner production assessment in industry and to work with a team in a company to develop opportunities to increase competitiveness for the company.

In 2002, four modules of intensive training programme called “Cleaner Production in Textile Industry” were conducted. Participants were from the textile industry, corporations and environmental authorities, consultancy organizations, universities and research institutes.

The last training module, module four, of the training program “Cleaner Production and Environmental Management in Pulp and Paper Industry” was organized in January 2002.

By the end of 2002, intensive long-term cleaner production training has been delivered to 86 certified participants throughout Viet Nam.

Table 2. Overview of the four-module incentive training programme

Module (Venue)			
1 (Hanoi)	2 (Nha Trang)	3 (HCMC)	4 (Hanoi)
Cleaner Production Methodology 21-25 January 2002 5 days & company practice	Cleaner Production Assessment 20-23 May 2002 4 days & company practice	Cleaner Production Assessment 15-18 July 2002 3 days & company practice	Completion of Cleaner Production Assessment 12-14 November 2002 3 days & 1 day dissemination
<ul style="list-style-type: none"> ▪ Introduction to cleaner production ▪ Textile processing ▪ Cleaner production Assessment Methodology ▪ Company visit ▪ Getting started ▪ Electricity efficiency in industry production 	<ul style="list-style-type: none"> ▪ Presentation of pre-assessment ▪ Discuss results and problems ▪ Case studies to illustrate methodologies ▪ Feasibility of CP options ▪ Environmental friendly dyeing stuff and chemical used in textile ▪ Implementation of good house-keeping and low-cost options ▪ Company visit 	<ul style="list-style-type: none"> ▪ Presentation of assessment ▪ Discuss results and problems ▪ Best available technology in textile-dyeing industry ▪ Feasibility study of CP options ▪ Company visit 	<ul style="list-style-type: none"> ▪ Presentation of assessment and status for implementation ▪ Textile-dyeing wastewater treatment in Viet Nam ▪ CP Investment proposal ▪ EMS, ISO 14001 and CP ▪ Certification
23 participants	24 participants	27 participants	27 participants

Special skill Training

These courses are organized mainly for our CP trainers and our staff to improve and to enlarge their own skills in conducting CP assessment.

In 2002, a course on Financial Engineering was organized. The second training was postponed due to significant increase of tailor-made training. Through this training, participants are able to make a bankable proposal for cleaner production investment.

Tailor-made Training

There was a great demand for tailor-made courses by different projects from VCEP, UNEP and DANIDA. Many training courses this year focused on sector.

Beside training as 2001, in 2002, the Viet Nam Cleaner Production Centre completed one full four-module training program in cleaner production methodology for Lao Ministry of Industry and Handicraft. Also in this year, we received the first training order on CP in Pulp and Paper from a company.

Curriculum Development at University Level

Following two awareness raising seminars for lecturers, in 2002, the Viet Nam Cleaner Production Centre organized two four-day training workshops for 43 lecturers of 13 Universities through-out the country. So far, Viet Nam already has 5 universities that have designed and included Cleaner Production into their Bachelor and Master Degree training programs. Courses in Cleaner Production are counted as 2-3 credits. These universities are, in the North: Ha Noi University of Technology, Civil Engineering University, Hai Phong Private University, in the South: University of Technology of Ho Chi Minh City, Van Lang University. Some other universities as Hue University, Da Nang

University and National Economic University have incorporated cleaner production into the curricula of economics and management courses.

Recently, feedback from participants revealed that some of the universities have changed their conventional teaching methods to the new interactive methods, that were introduced during training workshop. Besides, in many universities, projects have been developed to help students in practising cleaner production methodology in industries. Favourable conditions have been created for students to accomplish their master's thesis in cleaner production topics.

4.3 In-Plant Demonstration Programme

The objective of the in-plant demonstration programme is to show the benefits of Cleaner Production when implemented in Vietnamese industries. The in-plant demonstration programme has furthermore been used to provide hands-on training for the participants in our intensive training programme.

The textile industry was selected as a sector for Cleaner Production demonstration in 2002.

Besides cleaner production assessments, the Viet Nam Cleaner Production Centre also provides advice on cleaner technology implementation and financial engineering.

Cleaner Production Assessment

In 2002, the centre initiated **Cleaner Production Assessments** conducted in 8 textile companies, of which 5 were finished. The CP assessments in 6 pulp and paper companies were also finished in April 2002. Besides these completed assessments, the centre carried out 6 on-going, and follow-up programs in the demonstration companies.

In addition, cleaner production service providers trained by the centre delivered **Cleaner Production Assessments** to over numbers of companies in different industrial sectors.

The centre conducted, with its host institute, 10 screening audits (**Rapid Assessment**) for World Bank in the project Public Disclosure.

Also in 2002, the Viet Nam Cleaner Production Centre started a program called "Promoting Industrial **Energy Efficiency** through a cleaner production / environmental management system framework" in 7 companies. This program is expected to be completed in March 2003.

Table 3. Overview of CP assessment by sector carried out with assistance of Viet Nam Cleaner Production Centre since 1999

Sector	Number of companies	Products	Location	CP started in	Investment, USD	Annual benefits in demonstration year
Textile	8	Dyed fabric, threads	Nam Dinh, Ha Noi, Ho Chi Minh City	2002	73,950 USD	Savings of 477,000 USD; Reduction up to more than 30% in chemical & dye stuff use, 28% in fuel oil consumption, 17% in electricity consumption, 35% in water consumption, 4% in re-processing, 14% in low-quality products
	4	Dyed fabric, zippers, thread	Nam Dinh, Ha Noi, Ho Chi Minh City	1999	8,900 USD	Savings of 115,000 USD; Reductions up to 14% in air pollution, 14% in Green House Gas (GHG), 20% in chemical use, 14% electricity consumption and 14% in fuel oil consumption
Food and beverage	3	Breweries	Khanh Hoa	2002		On-going, benefits are not yet verified
	1	Sugar	Can Tho	2001		Savings of 88,000 USD
	1	Noodle	Ho Chi Minh City	2000	5,000 USD	Savings of 363,000 USD reduction up to 10% in GHG
	4	Agar-agar, beer, seafood	Hai Phong, Ninh Binh, Da nang and Ho Chi Minh City	1999	16,130 USD	Savings of 55,000 USD; Reductions up to 13% in air pollution, 78% in GHG, 34% in solid waste, 40% in chemical use, 78% in electricity consumption and 13% in coal consumption
Pulp and paper	6	Printing paper, tissues, carton	Phu Tho, Hoa Binh, Nghe An, Dong Nai, Khanh Hoa, Ho Chi Minh City	2001	346,000 USD	Savings of 500,000 USD; Reduction up to 42% wastewater, 70% COD
	3	Printing paper, tissues, carton	Phu Tho, Ho Chi Minh City	1999	74,000 USD	Savings of 344,000 USD; Reduction up to 35% in air pollution, 15% in GHG, 20% in fibre loss, 30% in wastewater, 24% in electricity consumption, 16% in fuel oil consumption and 20% in coal consumption
Metal	2	Wire and nets, steel pipes	Nam Dinh and Hai Phong	1999	36,500 USD	Savings of 357,000 USD; Reduction up to 15% in air pollution, 20% in solid waste, 5% in electricity consumption, 15% in coal consumption
Other	3	Footwear	Can Tho	2001		Savings of 33,000 USD; Reduction of 50% in fuel oil consumption, 19% in electricity consumption
		Pesticides	Can Tho	2001		Savings of 38,000 USD; Reduction of 0.1 in active ingredient
		Cement	Can Tho	2001		Savings of 249,000 USD; Reduction of 2% in clinker, 14% in gypsum, and 7.4% in electricity consumption

Sector	Number of companies	Products	Location	CP started in	Investment, USD	Annual benefits in demonstration year
Energy focus						
Textile, pulp and paper	7		Ha Noi, Phu Tho, Ho Chi Minh, Khanh Hoa	2002		Benefits are not verified

Thus, with the assessment completed in 2002, the centre saved for 12 companies 977,500 USD, contributed to the improvement of environmental performance by:

- Saving in energy: 116,720 GJ
- Saving in water: 2,335,805 m³
- Reduction of solid waste: 1,178 ton
- Reduction of COD: 120 ton (not completed data)
- Reduction of green house gas: 11,315 ton
- Reduction of SO₂: 95 ton

All these benefits are gained by reduction measures at source.

Cleaner Technology and Financial Engineering Advice

In 2002, 9 companies informed us about new installation of cleaner technologies based on cleaner production assessment and a financial engineering proposals. They are:

- Nam Dinh Textile Company: Cold Batch Pad Dyeing
- Nha Trang Garment Accessories Company (Textile): New boiler
- Thang Loi Textile Company: Automatic de-scaling for boiler (vibration)
- Nhat Tri Company Ltd. (Textile): Designing and installation of complete new production line (relocation)
- Trung Thu Textile Company: Low ratio Jet (1:3)
- Mai Lan Paper Company: Replacement of Hollander to Disk Refiner
- Rang Dong Paper Company: Replacement of Hollanders to Disk Refiners
- Dong Nai Paper Company: Replacement of Drum to Vertical Digester
- Ninh Binh Brewery: New Boiler

Except Nam Dinh Textile Company, where the new system are still under negotiation, installation in the other eight companies is finished and has proved beneficial in both economic and environmental terms.

In 2002, Viet Nam Cleaner Production Centre assists companies to prepare 5 loan proposals for cleaner production investment, and they are ready to submit to environmental funds in Ho Chi Minh City, in Ha Noi or to any other interested banks/funds.

4.4 Information Dissemination and Awareness Raising

The purpose of these activities is to create awareness of the Cleaner Production concept among industries, government agencies and universities. In 2002, the Centre increased its activities in the public media.

Public Media

The end of 2002, a 30-minute spot on introduction to cleaner production was shown on National Television VTV2 several times. The Voice of Viet Nam also aired a 20-minute news program about the application of cleaner production. Numerous articles were published in newspapers. The centre expects to have two other spots on television about sector-specific cleaner production application in the beginning of 2003.

In 2002, the Viet Nam Cleaner Production Centre was actively involved and presented at over 10 workshops and seminars, that were organized by other organizations.

The Indian manual "From Waste to Profits" for the textile industry was translated and distributed for relevant partners. A fact-sheet for cleaner production in the metal industry, which will be our target industry for cleaner production assessment in 2003, was published and distributed.

Awareness Raising Seminars

Table 4. Overview of Awareness Raising Seminars in 2002

Date	Location	Number of participants	Partners
11 January	Dong Nai	23	Dong Nai DPI
31 January	Phu Tho	25	Phu Tho DOSTE
29 March	Qui Nhon	27	Qui Nhon DOSTE
15 May	Khanh Hoa	21	Khanh Hoa DOSTE
13 July	Vung Tau	26	Vung Tau DOSTE
25 July	Binh Duong	32	Binh Duong DOSTE
5 August	Ha Noi	19	VCCI
7 August	Ho Chi Minh City	30	VCCI
15 August	Nghe An	34	Nghe An DOSTE
6 September	Ha Noi	25	Voice of Viet Nam
15 November	Ha Noi	80	VINATEX
18 December	Ho Chi Minh city	12	MPI

In 2002, 12 awareness-raising seminars were organised in different provinces. Seven seminars and one study tour were organized under the framework of the UNEP/MPI project, "Mechanisms and Strategies for Promoting Cleaner Production Investment in Developing Countries". Two seminars were organized under the framework of CDG to introduce Environmental Management Tools

Besides the target groups from industry, local authorities, and research institution, in 2002, the centre expand its target group to include journalists and economists.

Including the 796 participants from 1999-2001, a total of 1,150 participants took part in awareness raising cleaner production events conducted by the centre by the end of 2002.

4.5 Policy Advice

An effective policy framework for Cleaner Production is essential to promote this concept in industry. Such a framework must involve not only administrative measures as licensing and the enforcement of the laws and guidelines, but also economic instruments such as a duty and tax system for waste disposal and a realistic pricing system for raw materials and energy.

At the Government level, following the signing of the International Declaration on Cleaner Production in 1999 by the Minister of MOSTE and numerous cleaner production study tours for policy makers in 1999-2000, the Viet Nam Cleaner Production Centre is supporting the MOSTE/NEA in making cleaner production as main activity in the Environmental Strategy 2000-2010 and in drafting the National Cleaner Production Action Plan 2000-2005. The National Cleaner Production Action Plan was approved in May 2002. In June 2002, a National Cleaner Production Roundtable was organized with sponsorship from National Environment Agency, Viet Nam Cleaner Production Centre, Viet Nam Canada Environment Program, Program for Danish environmental assistance to Viet Nam, and the United Nations Environment Program. The one and a half day Roundtable was successfully organized in Ha Noi for over 150 participants from throughout the country. The participants were mainly CP consultants (service providers), and representatives of industries, governmental organizations, and environmental national and international projects.

At the local level, the centre supported Khanh Hoa province to establish a provincial cleaner production action plan.

4.6 Other activities

Beside the above-mentioned activities, the following activities were undertaken during 2002:

- The surveillance audit for ISO certificates by SGS was carried out successfully;
- A company survey, which is a preparation for cleaner production assessments, was carried out under the request of DANIDA project on "Industrial and Urban Development in Viet Tri City";
- Preparation for a cleaner production / environmental management component in the Executive Management Training Program of SIREN project (Support to Industry Restructuring & Enterprise Development) was carried out under the request of Ministry of Fishery-DANIDA;
- Preparation for GERIAP project (Greenhouse Gas Emission Reduction from Industry in Asia and Pacific) was carried out under the request of UNEP;
- Two proposals to EC, one in Textile (an eco-efficiency awareness and improvement programme with measures and activities delivered by ITC) and one in Food and Beverage (capacity building for transferring EU environmental best practices in the

Vietnamese Food and Beverage sector) were prepared. The project on textile was approved and will start in 2003;

- The centre is involved in a project formulation for hazardous waste management concepts in Nam Dinh province together with Colenco;
- Working in development of a pilot project in POP field;
- Maintaining contacts with a multinational company to develop a cleaner production program in the supply chain.

4.7 Cooperation

The Viet Nam Cleaner Production Centre has set-up, maintained cooperation with and provided services to:

- Viet Nam Industry Corporations (Viet Nam Textile and Garment Corporation, Pulp and Paper Corporation...) and enterprises;
- Ministry of Industry and Handicraft of Lao PDR under the framework of Danida;
- MPI-UNEP's Project: "Strategy and Mechanism for Promoting Cleaner Production Investment in Developing Countries";
- The Ministry of Fisheries' Project: "Seafood Quality Improvement Program" (SEAQIP);
- The Viet Tri DOSTE's Project "Industrial and Urban Development in Viet Tri City";
- The Ministry of Fisheries' Project "Support to Industry Restructuring & Enterprise Development" (SIREN);
- MOSTE's "Viet Nam Canada Environment Program" (VCEP);
- MOSTE/NEA-ADB's "Promotion of Cleaner Production Policies and Practices in Vietnam";
- MPI-UNDP's "Agenda 21" (Environmental Issues in Investment Planning);
- CDG's (Germany) on training for environmental management tools for SMEs;
- CP seminar providers in Viet Nam;
- DOSTEs

We are willing and interested to cooperate with all projects and institutions working in the environmental field to improve the environmental performance of Vietnamese industries.

5 ENVIRONMENTAL PERFORMANCE

In connection with the implementation of an Integrated Management System at VNCPC, the Centre has reviewed its own direct and indirect environmental impacts. Through CP assessment programmes, our clients have achieved positive environmental impact in savings of fuel and reduction of pollution loads. These achievements are accounted for in Chapter 4.3.

On the other hand, through our work and in connection with our training activities, we are causing negative environmental impacts because of:

- Travel by car and by air (resulting in the emissions of GHG gases and air pollution);

- Electricity consumption (resulting indirectly in emission of GHG gases and air pollutants);
- Paper consumption and waste paper generation; and
- Usage of printer and copy cartridges etc.

The Viet Nam Cleaner Production Centre monitor resource consumption and its discharge per two main groups called training and office. The training refers to all activities with training purpose, including seminars and workshops. The office includes all other activities.

5.1 Green House Gas Emission (by CO₂)

Travelling and consumption of electricity by Viet Nam Cleaner Production Centre caused CO₂ emission of 76.2 ton in 2002. The completion of energy savings of 116,720 GJ or 1080 ton CO₂ shows the positive impact on environment in Viet Nam.

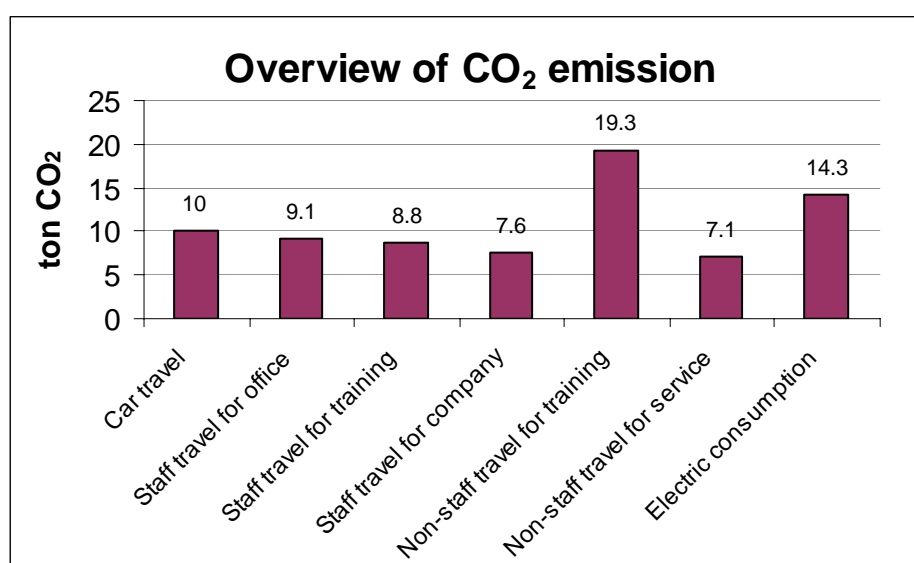


Figure 2. Distribution of CO₂ from activities in 2002

Travelling

The conversion from fuel consumption for the project car and from air travel to CO₂ emissions has been done using the guidelines and data from the GHG Protocol Initiative. In this way it is estimated that in 2002 the VNCPC caused CO₂ emission of about 62 tons.

This emission is result travelling by the staff and non-staff for office (including company visits and consultation services) and training activities.

The air travelling in 2002 for training caused 28.2 tons CO₂, of which 19.3 ton was caused by travelling of participants. Travelling for other activities of staff, excluding training, in 2002 caused 26.7 ton CO₂

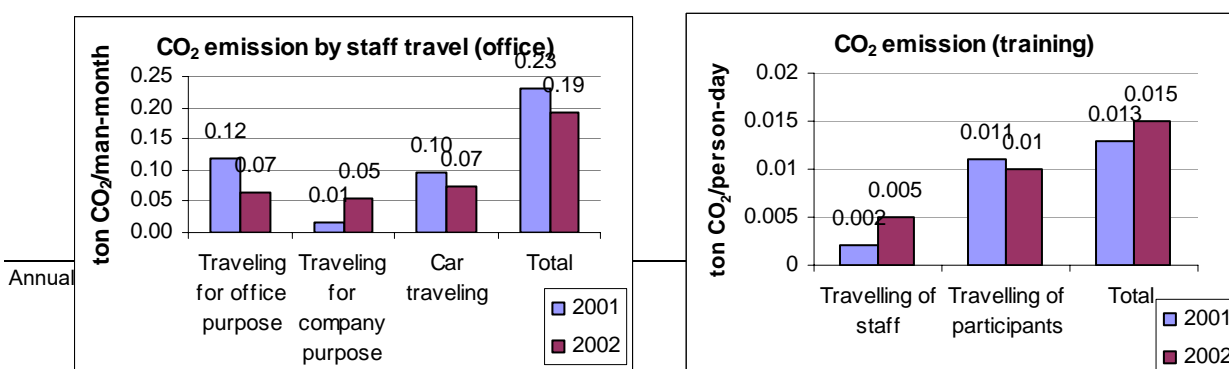


Figure 3. Comparison of CO₂ emission by travelling with 2001.

Electric consumption

In 2002, we have recorded data for 11 months. The data of last month was missing due to relocation of the office. The electricity consumption calculated for the year 2002 is 13,247 kWh, equivalent to 14,3 ton CO₂, and 95.7 kWh/man-month. This data is much more accurate than earlier figures and can be used as the base for reduction in 2003.

5.2 Paper consumption and its wastes

In 2002, the centre consumed 725 kg of paper, of which 21% is brown paper.

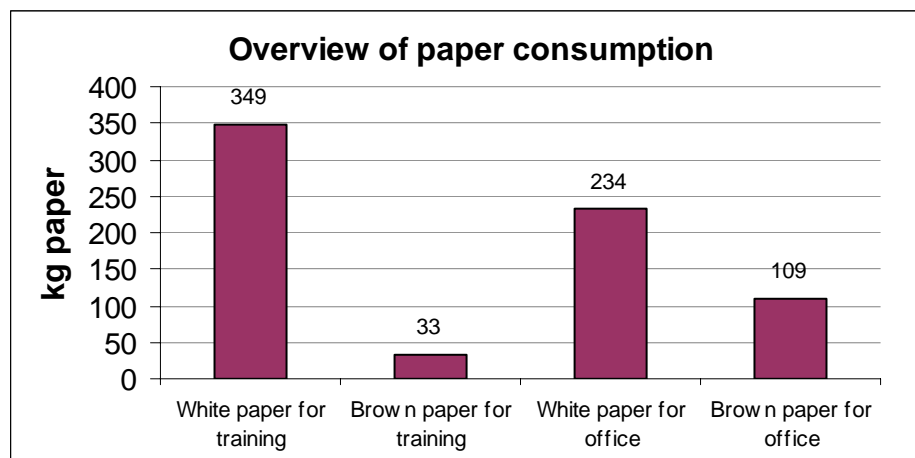


Figure 4. Distribution of paper consumption from activities in 2002

In 2002, the centre used 343 kg of paper for office purpose and 382 kg for training purpose. The benchmark of paper used for training (kg paper/person-day training) reduced by 18%, while that of office use (kg of paper/man-month) increased of 25% due to increased activities as described in previous chapter.

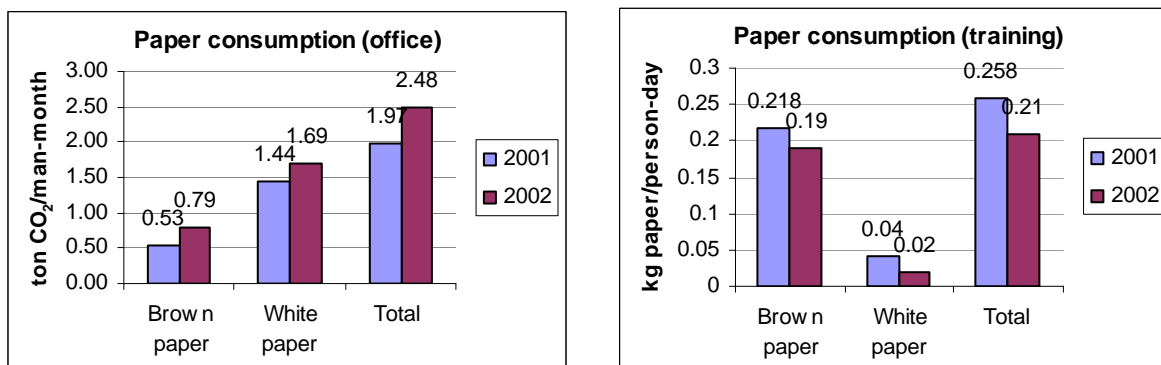


Figure 5. Comparison of paper consumption with 2001

All office wastepaper was recycled to be printed on both sides before discarding. This wastepaper counted for 9% of total paper consumption.

5.3 Other wastes

Besides the CO₂ emission and waste paper, the centre recorded of 37 kg cardboard, 78 bottles and cans, and 6 cartridges of printer and photocopy discarded in 2002.

6 OTHER CLEANER PRODUCTION ACTIVITIES IN VIET NAM

In addition to the activities directed by VNCPC, several other projects that focus on cleaner production or at least have a component on cleaner production have been started or designed in the country during 2002.

The Viet Nam Cleaner Production Centre tries to coordinate all these different activities to create as much synergy as possible. Cleaner Production will only have a significant impact on the industrial development of Viet Nam if it is possible to strengthen and mainstream the different inputs and to build up an efficient coordination.

Table 5. List of coordinated cleaner production projects in Viet Nam in 2002

Project	CP content	Donor	Counterpart	Location	Period
Environmental Management Thai Nguyen Province	Cleaner Technology and Industrial Pollution Project	Danida	DOSTE in Thai Nguyen	Thai Nguyen Province	2000-2002
Environmental Management in Viet Tri	Cleaner Production component	Danida	DOSTE in Viet Tri	Phu Tho Province	2002-2003
Environmental Pollution Prevention in HCMC	CP Assessments. Follow-up on earlier project	UNIDO/SIDA	DOSTE in HCMC	HCMC	2002-2003
Industrial Pollution Management. VCEP II	CP training and demonstration projects in 6 provinces	CIDA	NEA DOSTE in Hai Phong, Hanoi, Bac Ninh, Hai Duong, Da Nang, Long An	Viet Nam	2002-2005

Project	CP content	Donor	Counterpart	Location	Period
CP-EE	CP-EE training and demonstration	UNEP/GEF	Companies	Whole country	2002-2003
GERIAP	CP-EE training and reduction of GHG emission	Sweden/UNEP	Companies	Whole country	2002-2004
CP action plan for Khanh Hoa province	CP awareness and development of CP action plan	DOSTE Khanh Hoa	DOSTE	Khanh Hoa	2002

7 PROBLEMS ENCOUNTERED AND LESSONS LEARNED

- The decision to focus our in-depth training course in combination with CP assessments on only one industry sector proved to be very successful. Especially in the textile program we could achieve very impressive results and the participants could also gain much professional information from each other. Participants were very much interested in the presentation about Best Available Technologies.
- Dissemination workshops in cooperation with a state industry corporation are an excellent way to approach new clients.
- Using traditional awareness-raising seminars to promote VNCPC has become less effective. VNCPC must develop new marketing tools. Vietnam television made one short film about CP and twice broadcasted an interview with our director. The results are promising.
- Several service providers were conducting CP assessments for different clients; Cleaner Production is more and more attractive for the industry.
- Service providers are considering our centre as a competitor and not so much as a partner. The planned exchange of CP assessments could not be realized and we have no evidence about the quality of the assessments and the results achieved during the work. No service provider is willing to pay for VNCPC services; the quality of the work is still not the only criteria to get a job.
- International organizations are conducting more and more CP assessments. In some cases they are supporting the assessment and the technology implementation with a subsidy. Therefore it is difficult to enforce our financial strategy.
- According to the World-Bank, about 50 to 60% of the companies in 2025 are not yet in operation. It will be crucial which technology will be implemented in these new projects during the next decade. VNCPC must focus part on its activities on this problem. The introduction of a cleaner technology assessment at the permitting agency would help to prevent the installation of old, outdated and dirty production lines.
- VNCPC has to participate with national or international partners at biddings for the selection of consultants for specific “green field” projects. It has to represent the cleaner technology approach. Successful biddings would increase our image dramatically.
- To be more attractive to the Industry, VNCPC must develop new services in the field of technology change management, technology gap and needs assessment, re-engineering of production lines and simulation of production and logistic processes.

These themes appeal to industry as they are more timely and sophisticated and will help to strengthen our image of providing state-of-the-art technology. Only promoting good housekeeping measures will not be attractive enough and are not showing the full CP potential.

- To be able to offer industries a full and comprehensive package, VNCPC should have access to a CP fund. To establish such a fund will be an important step in the CP promotion in Vietnam.
- To build up a centre of excellence with a critical mass of well qualified experts and high quality services in cleaner production and technology needs more than 5 years.
- VNCPC needs to study other benchmark for its environmental performance, especially for office activities.

8 ANNEXES

8.1 List of Certificated participants in Cleaner Production

Table 6. List of participants certified in cleaner production

	Name	Contact details	Note
Since 2000			
1.	Trương Thanh Cần <i>as consultant</i>	Binh Giang Private Company for Industry and Environment - 31/8C Đông An, Tân Đông Hiệp, huyện Dĩ An, Bình Dương Tel/Fax: (650) 824-421; (650) 730-534; Mobile: 090-752-917	Service provider
2.	Trần Phước Cường	DOSTE Da Nang / Environmental Protection Centre - 15 Quang Trung, Đà Nẵng Tel: (511) 892-822; Fax: (511) 822-864	
3.	Vũ Nhật Dự	Nam Dinh Silk Textile Company - 4 Hà Huy Tập, Nam Định Tel: (350) 849-622; Fax: (350) 849-652	
4.	Nguyễn Duy Dũng <i>as trainer & consultant</i>	Viet Nam Textile Corporation VINATEX - 25 Bà Triệu, Hà Nội Tel: (4) 826-5902; Fax: (4) 826-2269; Mobile: 090-441-718	
5.	Lê Trần Nguyên Hân <i>as trainer & consultant</i>	DOSTE Da Nang - 15 Quang Trung, Đà Nẵng Tel: (511) 892-823; Fax: (511) 822-864; Mobile: 091-494-661	Service provider
6.	Lê Thị Hiền <i>as trainer</i>	Bai Bang Paper Company - Phong Châu, Phú Thọ Tel: (210) 829-755; Fax: (210) 829-177	
7.	Nguyễn Văn Hiện	Viet Tri Paper Company - Thanh Miếu, Việt Trì, Phú Thọ Tel/Fax: (210) 846-702; Mobile: 091-282-716	
8.	Đinh Thị Thanh Hoa <i>as trainer</i>	Viet Nam Chamber of Commerce and Industry - 9 Đào Duy Anh, Hà Nội Tel: (4) 574-2022/ext. 244; Fax: (4) 574-2030	
9.	Nguyễn Xuân Hồng <i>as trainer & consultant</i>	Viet Nam National Productivity Centre - Đường Hoàng Quốc Việt, Nghĩa Đô, Cầu Giấy, Hà Nội Tel: (4) 756-1925; Fax: (4) 756-1502; Mobile: 091-226-130	
10.	Nguyễn Thanh Hùng <i>as trainer & consultant</i>	Centre for Environmental Technology CEFINEA - 142 Tô Hiến Thành, quận 10, HCMC Tel: (8) 865-1132; Fax: (8) 865-5670	Service provider, integrated CP into curriculum
11.	Trần Lan Hương	Hai Long Company Limited - 109 Trường Chinh, Kiến An, Hải Phòng Tel: (31) 876-449; Fax: (31) 837-300	
12.	Nguyễn Thị Quỳnh Hương <i>as trainer</i>	Centre for Environmental Engineering of Towns and Industrial Areas (CEETIA) - 5 Giải Phóng, Hà Nội Tel: (4) 869-3714; Fax: (4) 869-3714	integrated CP into curriculum
13.	Nguyễn Thị Mai Hương <i>as consultant</i>	Environmental Protection Centre (EPC) - 56 Trương Quốc Dung, quận Phú Nhuận, HCMC Tel: (8) 844-7975; Fax: (8) 844-7976	
14.	Trần Hữu ích <i>as trainer</i>	Viet Nam Steel Corporation (VSC) - 91 Láng Hạ, Đống Đa, Hà Nội Tel: (4) 856-1807; Fax: (4) 856-1815	
15.	Phạm Duy Kháng <i>as consultant</i>	Hoang Van Thu Paper Mill - Quán Triều, Thái Nguyên Tel: (280) 844-655; Fax: (280) 844-548	Passed away
16.	Bùi Ngọc Khoa <i>as consultant</i>	Industrial Chemistry Institute - 2 Phạm Ngũ Lão, Hà Nội Tel: (4) 824-9231; Fax: (4) 824-8509	
17.	Nguyễn Ngọc Lân <i>as trainer & consultant</i>	Institute for Environmental Science and Technology (INEST) - 301, C10, ĐHBKHN, 1 Đại Cồ Việt, Hà Nội Tel: (4) 868-1686; Fax: (4) 869-3551	Service provider, integrated CP into curriculum
18.	Tôn Thất Lãng <i>as consultant</i>	Centre of Technology Environment - 236B/7B Lê Văn Sỹ, Tân Bình, HCMC Tel: (8) 990-7511; Fax: (8) 843-9143	Service provider, Integrated CP into curriculum

	Name	Contact details	Note
19.	Nguyễn Thị Tâm Lăng <i>as consultant</i>	Centre of Environmental Technology - 18A Cộng Hoà, Tân Bình, HCMC Tel: (8) 842-5760; Fax: (8) 842-5763	
20.	Đặng Thị Liên <i>as trainer</i>	DOSTE Ninh Bình - Đông Thành, Ninh Bình Tel: (30) 873-695; Fax: (30) 872-316	
21.	Hoàng Thị Liên <i>as trainer</i>	DOSTE Thai Nguyen - Đường Hùng Vương, Thái Nguyên City Tel: (280) 856-335; Fax: (280) 857-943	
22.	Hoàng Thị Lĩnh <i>as trainer & consultant</i>	Textile Faculty of Ha Noi University of Technology - 217, C5, ĐHBKHN, 1 Đại Cồ Việt, Hà Nội Tel: (4) 869-2401; Fax: (4) 869-4731	Integrated CP into curriculum
23.	Nguyễn Thị Thuý Loan <i>as consultant</i>	Environmental Protection Centre, DOSTE Da Nang - 15 Quang Trung, Đà Nẵng Tel: (511) 892-822; Fax: (511) 822-864	
24.	Phạm Quang Mạnh <i>as trainer</i>	Industrial Environmental Centre at the Research Institute for Mining and Metallurgy - 30B Đoàn Thị Điểm, Hà Nội Tel: (4) 845-7515; Fax: (4) 845-6983	
25.	Lê Hoài Nam <i>as trainer</i>	National Environment Agency - 67 Nguyễn Du, Hà Nội Tel: (4) 822-4423; Fax: (4) 822-3189	
26.	Đặng Xuân Năm <i>as consultant</i>	Ninh Bình Brewery - Ninh Bình Province Tel: (30) 871-044	
27.	Đào Ngọc Ngà <i>as consultant</i>	Centre for Assistance to Enterprises - 62 Giảng Võ, Hà Nội Tel: (4) 823-6368; Fax: (4) 823-6382	
28.	Phạm Quang Phúc	DOSTE Hai Phong - 1 Phạm Ngũ Lão, Hải Phòng Tel: (31) 846-475; Fax: (31) 840-691	
29.	Nguyễn Phước Vĩnh Phúc	Nam O Export Special Marine Products Factory - Quốc lộ 1A, Nam Ô, Liên Chiểu, Đà Nẵng Tel/Fax: (511) 842-670	
30.	Trần Thành Phương	Vinh Hue Paper Company - 66/5 quốc lộ 1, phường Linh Xuân, quận Thủ Đức, HCMC Tel: (8) 896-0006; Fax: (8) 896-2092	
31.	Tăng Bá Quang <i>as trainer & consultant</i>	Institute of Chemical Engineering - 1 Mạc Đĩnh Chi, quận 1, HCMC Tel: (8) 829-3190; Fax: (8) 829-3889; Mobile: 091-906-033	Service provider
32.	Vũ Trọng Quốc <i>as consultant</i>	Industrial Foreign Investment Service Company (INFISCO) - D7A Thành Công, Ba Đình, Hà Nội Tel: (4) 834-3961; Fax: (4) 835-6134	
33.	Nguyễn Xuân Sinh <i>as consultant</i>	Centre for Environmental Technology and Industrial Chemistry (CECO) - 21A Cát Linh, Hà Nội Tel: (4) 823-5335; Fax: (4) 823-2325	
34.	Phạm Thị Thân	Sai Gon Textile Company - 40 Luỹ Bán Bích, Phường 20, Quận Tân Bình, HCMC Tel: (8) 856-0362; Fax: (8) 858-0222	
35.	Nguyễn Hồng Thanh	DOSTE Phu Tho - Gia Cẩm, Việt Trì, Phú Thọ Tel: (210) 848-854; Fax: (210) 847-333	
36.	Phạm Văn Trí	Nam Dinh Galvanic Company - 67 đường Nguyễn Văn Trỗi, Nam Định city Tel: (350) 848-290; Fax: (350) 843-765	
37.	Nguyễn Thị Truyền <i>as consultant</i>	Institute for Environment and Resources (IER) - 142 Tô Hiến Thành, quận 10, HCMC Tel: (8) 865-1132; Fax: (8) 865-5670	Service provider, integrated CP into curriculum
38.	Nguyễn Văn Viện	Nhat Tri Manufacturing Unit - 7/7 - 7/8 Lạc Long Quân, Phường 5, Quận 11, HCMC Tel/Fax: (8) 860-0868	
39.	Lê Thị Yến	Mai Lan Paper Company - 129 Âu Cơ - Phường 13 - Quận Tân Bình, HCMC Tel: (8) 849-0754; Fax: (8) 842-5594	

	Name	Contact details	Note
Since 2001			
40.	Dương Thị Bích Hảo <i>as consultant</i>	Training Institute in Pulp and Paper Technology Xã Phong Châu, huyện Phù Ninh, thành phố Việt Trì, tỉnh Phú Thọ	
41.	Lê Văn Hiền <i>as trainer & consultant</i>	Researching Department of Chemical and Environmental Technology Số 100, đường Hoàng Hà, Quận Tân Bình, thành phố Hồ Chí Minh Tel/Fax: (8) 848-5480; Mobile: 0913-307-058	
42.	Bùi ánh Hoà <i>as consultant and trainer</i>	Faculty for Pulp and Paper Technology, Ha Noi University of Technology 1 Dai Co Viet Road, Ha Noi Tel: (4) 869 – 2300; Fax: (4) 868-1019	
43.	Trịnh Văn Hoàn <i>as consultant</i>	Union for Science of Electronic Engineering (SEEN) 46 Nguyễn Văn Ngọc, Ba Đình, Hà Nội Tel: (4) 766-0467; Fax: (4) 766-0468; Email: hoanseen@hn.vnn.vn	
44.	Nguyễn Thị Hồng	Song Lam – Nghe An Paper Company Hưng Phú, Hưng Nguyên, Nghệ An Tel: (38) 820-128; Fax: (38) 820-158	
45.	Đỗ Thế Hưng <i>as consultant</i>	Center for Chemical Technology under National Center for Natural Science and Technology	
46.	Huỳnh Nguyễn Anh Kiệt <i>as consultant</i>	Khanh Hoa DOSTE 1 Trần Phú, Nha Trang Tel: (58) 829-849; Fax: (58) 824-676	
47.	Vũ Minh Kỳ <i>as consultant</i>	Dong Nai Paper Company 55 Khu phố 2, Biên Hoà, Đồng Nai (khu công nghiệp biên hoà I, tỉnh Đồng Nai) Tel: (61) 836-201; Fax: (61) 836-231	
48.	Thái Thị Liễu	Song Lam – Nghe An Paper Company Hưng Phú, Hưng Nguyên, Nghệ An Tel: (38) 820-128; Fax: (38) 820-158	
49.	Trương Thị Phương	Hoa Binh Paper Company Xã Dân Hạ, huyện Kỳ Sơn, tỉnh Hoà Bình Tel: (18) 842-195; Fax: (18) 842-536	
50.	Trần Nam Thắng <i>as consultant</i>	Center for Environmental Protection and Chemical Safety; Institute for Industrial Chemistry Số 2 Phạm Ngũ Lão, Hà Nội Tel: (4) 824-9231; Fax: (4) 824-8509	
51.	Nguyễn Kim Thanh <i>as consultant and trainer</i>	CENTEMA Số 45 Nguyễn Khắc Nhu, quận 1, thành phố Hồ Chí Minh Tel: (8) 836-5317; Fax: (8) 898-1505	
52.	Trần Hoàng Ngọc Thảo	Industrial Department, supervisor of pulp workshop, Rang Dong Paper company Tỉnh Diên Phước, Diên Khánh, Khánh Hoà	
53.	Đỗ Đức Thiện	Muc Son Joint-stock paper company Thành phố Thanh Hoá Tel: (37) 834-074; Fax: (37) 834-099	
54.	Nguyễn Quang Thúc	Lua Viet Paper Company Huyện Hà Hoà, thành phố Việt Trì, tỉnh Phú Thọ Tel: (210) 883-117; Fax: (210) 883-120	
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56.	Nguyễn Ngọc Tiến	Lam Sơn Paper Company Thành phố Thanh Hoá Tel: (37) 839-059	

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57.	Lê Thị Hồng Trân <i>as trainer & consultant</i>	Department of Environmental Management and Technology, Ho Chi Minh University of Technology 273 đường Cách mạng tháng 8, phường 7, quận Tân Bình, HCMC Tel/Fax: (8) 863-9682; Email: lethihongtran@hotmail.com	
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59.	Dương Đắc Tuấn <i>as consultant</i>	Centre for Environmental Protection and Chemical Safety; Institute for Industrial Chemistry 264 Đội Cấn, quận Ba Đình, Hà Nội Tel: (4) 833-2591; Fax: (4) 833-3039	
60.	Nguyễn Thị ánh Tuyết <i>as consultant</i>	Department of Environmental Management and Technology; Ha Noi National University 334 Nguyễn Trãi, quận Thanh Xuân, Hà Nội Tel/fax: (4) 858-4995; Email: nanhtuyet@hotmail.com	
61.	Nguyễn Quốc Việt <i>as consultant</i>	Vien Dong Joint-Stock Paper Company 129 Âu Cơ, phường 13, quận Tân Bình, thành phố Hồ Chí Minh	
<i>Since 2002</i>			
62.	Nguyễn Thị Mỹ Anh <i>as consultant</i>	Environmental Technology Centre (ENTEC) 439A9 Phan Văn Trị, phường 5, quận Gò Vấp, thành phố Hồ Chí Minh Tel: (8) 985-0540; Fax: (8) 985-0541; Email: entec@hcm.vnn.vn	
63.	Phan Kim Dũng	Thang Loi Textile – Garment Company Số 2 đường Trường Chinh, phường 15, quận Tân Bình, thành phố Hồ Chí Minh Tel: (8) 815-3044; Fax: (8) 815-3076; Email: detthangloi@hcm.vnn.vn	
64.	Nguyễn Văn Dũng	Nha Trang Garment Accessories Joint-Stock Company Số 2 Nguyễn Thiện Thuật, Nha Trang Tel: (58) 822-105; Fax: (58) 821-911; Email: isecompany@dng.vnn.vn	
65.	Nguyễn Trường Duy <i>as trainer and consultant</i>	Institute of Chemical Technology Số 1 Mạc Đĩnh Chi, quận 1, thành phố Hồ Chí Minh Tel: (8) 825-6394; Fax: (8) 829-3889; Email: dungkha@hcm.vnn.vn	
66.	Nguyễn Hoàng Hải <i>as consultant</i>	Trung Thu Textile Company Thôn Văn, Thanh Liệt, Thanh Trì, Hà Nội Tel: 0903-455-154; Fax: (4) 688-0922	
67.	Cao Hữu Hiếu <i>as trainer and consultant</i>	Viet nam Textile and Garment Corporation 25 Bà Triệu, quận Hoàn Kiếm, Hà nội Tel: (4) 934-9607; Fax: (4) 826-2269; Email: hieu_ktdt@yahoo.com	
68.	Nguyễn Quang Hồng	Centre for Environmental Economics and Regional Development (CEERD) 207 Đường Giải phóng, Hai Bà Trưng, Hà Nội Tel: (4) 869-7382; Fax: (4) 869-8231; Email: hongmt@yahoo.com	
69.	Nguyễn Thu Lan	Mua Dong Textile Company 47 Nguyễn Tuân, Thanh Xuân, Hà Nội Tel: (4) 583-857; Fax: (4) 858-2061; Email: muadong@fpt.vn	
70.	Nguyễn Thị Lê Liên <i>as trainer</i>	Department of Environment, HCM University of Technology 268 Lý Thường Kiệt, Phường 14, quận 10, thành phố Hồ Chí Minh Tel: (8) 863-9682; Fax: (8) 863-9682; Email: phuongtan@saigonnet.vn	
71.	Huỳnh Tấn Lộc	Nha Trang Garment Accessories Joint-Stock Company Số 2 Nguyễn Thiện Thuật, Nha Trang Tel: (58) 822-105; Fax: (58) 821-911;	

	Name	Contact details	Note
72.	Vũ Duy Luân <i>as consultant</i>	Nam Dinh Textile Company 43 Tô Hiệu, thành phố Nam Định Tel: (350) 849-422; Fax: (350) 835-704	
73.	Nguyễn Trần Luật	Agtex (Textile Company 28) Số 3 Nguyễn Oanh, phường 10, quận Gò Vấp, thành phố Hồ Chí Minh Tel: (8) 943-831; Fax: (8) 944-380	
74.	Nguyễn Văn Mai <i>as consultant</i>	Ha Noi University of Technology – Textile Faculty C5 – 217 Đại học bách khoa Hà Nội 1 Đại Cồ Việt – Hà nội, Việt nam Tel: (4) 869-2401	
75.	Nguyễn Thanh Ngân <i>as consultant</i>	Textile Research Institute (TRI) 478 Minh Khai, Hai Bà Trưng, Hà Nội Tel: (4) 862-4025; Fax: (4) 862-2867; Email: viendetmay@hn.vnn.vn	
76.	Nguyễn Hồng Nguyên <i>as consultant</i>	Bình Dương DOSTE Khu Phú Lợi, thị xã Thủ Dầu Một, tỉnh Bình Dương Tel: (650) 823-398; Fax: (650) 824-421	
77.	Đặng Bích Phương <i>as trainer</i>	Ha Noi Textile and Garment Company Số 1 Mai Động, Hai Bà Trưng, Hà nội Tel: (4) 862-1223; Fax: (4) 862-3334	
78.	Nguyễn Thị Thảo <i>as consultant</i>	Institute of Chemical Technology Số 1 Mạc Đĩnh Chi, quận 1, thành phố Hồ Chí Minh Tel: (8) 822-8041; Fax: (8) 822-8041; Email: envidep@hcm.netnam.vn	
79.	Nguyễn Đặng Anh Thi <i>as trainer and consultant</i>	Environmental Technology Centre (ENTEC) 439A9 Phan Văn Trị, phường 5, quận Gò Vấp, thành phố Hồ Chí Minh Tel: (8) 985-0540; Fax: (8) 985-0541; Email: entec@hcm.vnn.vn	
80.	Lê Vinh Liên Trang <i>as consultant</i>	Khanh Hoa Standard Measurement and Quality Branch 11 Hùng Vương, Nha Trang Tel: (58) 822-555; Fax: (58) 811-056	
81.	Nguyễn Thị Hiền Trang	Bao Thach Manufacturing Co., Ltd. 14/10 ấp Đông, xã Thới Tam Thôn, huyện Hóc Môn, thành phố Hồ Chí Minh Tel: (8) 891-0214; Fax: (8) 891-6136; Email: baothach@hcm.vnn.vn	
82.	Du Kiến Trung	Viet Thang Textile Garment Company Linh Trung, Thủ Đức, thành phố Hồ Chí Minh Tel: (8) 896-9337; Fax: (8) 896-9319	
83.	Bùi Quang Tùng <i>as consultant</i>	Phu Tho DOSTE Đường Kim Đồng, phường Gia Cẩm, Việt Trì, tỉnh Phú Thọ Tel: (210) 846-343; Fax: (210) 847-333	
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List of Abbreviations

BAT	Best Available Technique
BEAT	Best Economical Attractive Technology
CDM	Clean Development Mechanism
COLENCO	A Swiss Consulting Company in Viet Nam
CP	Cleaner Production
DOI	Department of Industry
DOSTE	Department of Science, Technology and Environment
DPI	Department of Planning and Investment
EMS	Environmental Management System
FHBB	Fachhochschule bei der Basel
HUT	Hanoi University of Technology
INEST	Institute for Environmental Science and Technology
LCA	Life Cycle Assessment
MOET	Ministry of Education and Training
MOF	Ministry of Finance
MOI	Ministry of Industry
MOSTE	Ministry of Science, Technology and Environment
MPI	Ministry of Planning and Investment
NEA	National Environmental Agency
SDC	Swiss Agency for Development and Cooperation
SECO	State Secretariat for Economic Affairs
UNEP	United Nations Environment Program
UNIDO	United Nations Industrial Development Organization
VCCI	Viet Nam Chamber of Commercial and Industry
VINATEX	Viet Nam National Textile and Garment Corporation
VIZA	Viet Nam Industrial Zone Authorization
VNCPC	Viet Nam Cleaner Production Centre