



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

Viet Nam Cleaner Production Centre

Annual Report 2000



Viet Nam Cleaner Production Centre

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FOREWORD

Cleaner Production, with its economic and environmental benefits, has successfully been applied in Vietnamese industries during the past two years.

The Viet Nam Cleaner Production Centre (VNCPC), has since its start in 1998, acted as a focal point for Cleaner Production. The Centre has planned and implemented Cleaner Production activities throughout the whole country, mainly in training, in-plant demonstration projects, information dissemination, and policy advice.

The achievements and experiences gained in Phase I, especially year 2000, establishing the infrastructure and gaining first-hand-experience in applying Cleaner Production in Vietnam, make the Viet Nam Cleaner Production Centre ready to support industries in applying Cleaner Production on their own.

The Viet Nam Cleaner Production Centre would like to convey our special thanks to all those who helped us to achieve the objectives and goals of 2000 and successfully complete the activity plan for Phase I: the donor, the executing organisation, ministries, the advisory board, the host institution, cooperating institutions, and individuals.

We are looking forward to further cooperation with all of you in the field of Cleaner Production and related areas.

Dr. Tran Van Nhan
Director of 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

Viet Nam Cleaner Production Centre has reached or surpassed all the main goals and objectives of Phase I (1998-2000). This fact is the direct result of the very good support from our partners and our host institute, and the result of the strong commitment and the work of all VNCPC staff members. It also proves the sound planning of the project and the reasonable and realistic targets defined in the beginning of Phase I.

Based on the achievements, VNCPC has developed very ambitious goals for Phase II. To achieve the new targets VNCPC will, during the next three years, face several difficult challenges:

- To cope with a fast increasing workload;
- To improve the quality of our services;
- To deal with more and more complicated cleaner technologies;
- To maintain and keep momentum in different Cleaner Production Demonstration Projects;
- To train new staff members and to support CP service providers with specific training;
- To develop and implement tools for CP technology transfer and technology change management;
- To develop a market for Cleaner Production in Viet Nam.

These are major challenges for one institution, but with the help and on-going support from all our partners, these hurdles can be overcome.

I would like to thank all involved Vietnamese ministries and partners, the national project director Professor Dinh Van Sam and his staff at INEST, and last but not least all my VNCPC colleagues for their support and their hard work and efforts to reach our common goals. I am looking forward to Phase II.

Dr. Heinz Leuenberger
Chief Technical Adviser, Viet Nam Cleaner Production Centre.

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1 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 adapting the internationally developed Cleaner Production approach to Vietnamese conditions;
- To assist policy-makers on the subject and to make recommendations on how to promote the concept of Cleaner Production in industries and through legislation;
- To promote the concept of Cleaner Production and to 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 Cleaner Production Centres.

2 ORGANISATION AND FACILITIES

The Viet Nam Cleaner Production Centre was established in 1998 within the framework of UNIDO/UNEP National Cleaner Production Centres Project. It is sponsored by the Swiss Government 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 11 members at managing levels of relevant ministries and organizations: MOET, MOI, MOSTE, MOF, MPI, VCCI, HUT, INEST, HCM National University, UNIDO and SDC/SECO. The Vice-Minister of Education and Training, Mr. Vu Ngoc Hai, is Chairman of the Board.

Organisational Structure

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

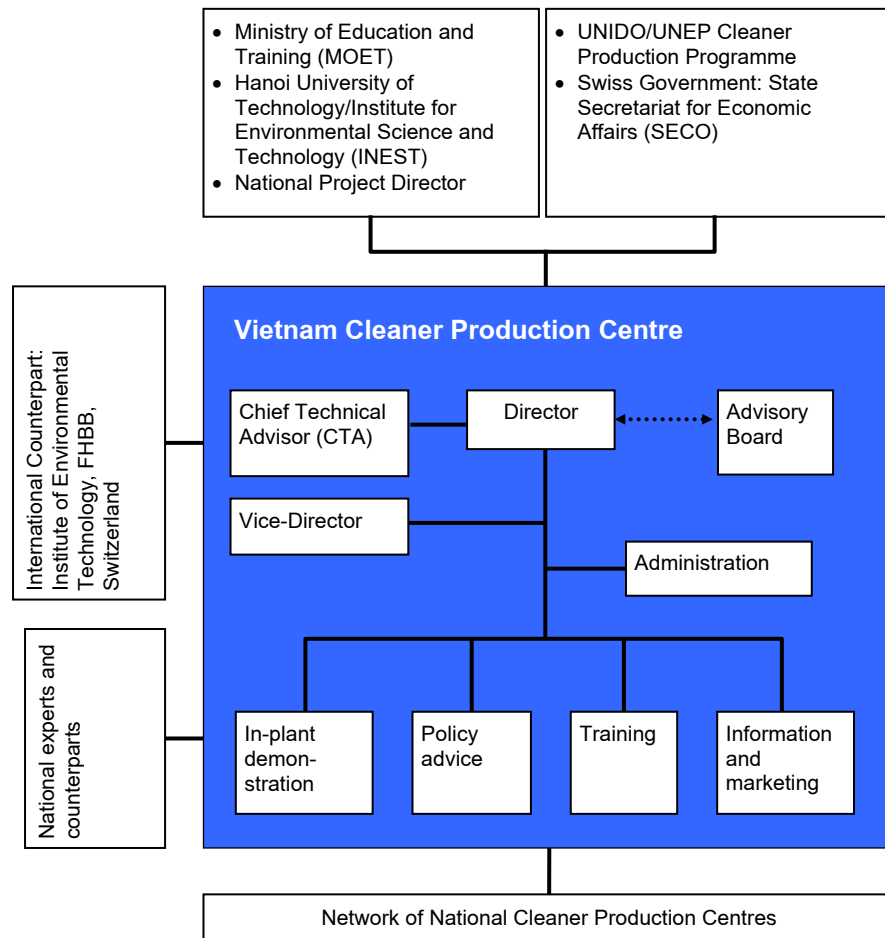


Figure 1. Organisational set-up of Vietnam Cleaner Production Centre.

Staff

The VNCPC team counts two foreigners and eight Vietnamese. Four staff members hold a Ph.D., three hold M.Sc., and two hold a B.Sc. Currently five of the eight Vietnamese staff members are qualified to facilitate Cleaner Production Assessments in industries.

During 2000 one staff member attended a ten-week training programme in cleaner production at AIT in Thailand. The management and staff of the Centre have received training through participation in seminars, international workshops and roundtables on cleaner production.

Staff at the Centre

Mr. Dinh Van Sam, Prof. Ph.D., National Project Dir.
 Mr. Tran Van Nhan, Ph.D., Director
 Mrs. Ngo Thi Nga, Ph.D., Vice Director
 Mrs. Tang Thi Hong Loan, M.Sc., CP Expert
 Mrs. Vu Tuong Anh, M.Sc., CP Expert
 Ms. Nguyen Le Hang, B.Sc., Secretary
 Mr. Pham Sinh Thanh, B.Sc., Support staff
 Mr. Pham The Hung, Driver
 Mr. Heinz Leuenberger Prof., Ph.D., CTA
 Mr. Bent Hummelose, M.Sc., UN Volunteer

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 to numerous national and international experts in the fields of environment and cleaner production.

Under the UNIDO/UNEP network, VNCPC is working closely together with the 18 other National Cleaner Production Centres worldwide. VNCPC is planning to establish a formal network of CP experts and institutions throughout Viet Nam in the years to come.

Facilities

Viet Nam Cleaner Production Centre and its host institution, INEST, have been equipped with portable and analytical equipment for quick and in-depth assessment for materials and energy in several different industrial sectors.

The library at the Centre counts now more than 600 titles (books and journals) related to environment, cleaner production and environmental management. Viet Nam Cleaner Production Centre has established a website at <http://www.un.org.vn/vncpc>.



3 ACTIVITIES 2000

3.1 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. Hence, one of the key activities of the centre is to build up, through training, a human resource base (national experts) on Cleaner Production.

Train-the-Trainer Programme

A seven-module training programme was conducted from May 1999 to August 2000 for 47 participants from industry, corporations and environmental authorities, consultancy organizations, universities and research institutes. These training activities were combined with in-plant demonstration activities, so that participants gained practical experience in Cleaner Production Assessments. The total duration of this training was 23 days of classroom training and more than 30 days of practical work in companies.

At the end of the seven-module training programme 39 participants earned a course certificate. About half of the participants have indicated that they would like to work as CP trainers and/or as CP consultants. A list of the certified participants is attached in annex.

Table 1. Overview of the seven-module training programme.

Module (Venue)						
1 (Hanoi)	2 (In-plant)	3 (Hanoi/ HCMC)	4 (Hanoi/ HCMC)	5 (HCMC)	6 (Hanoi/ HCMC)	7 (Hanoi)
Train the CP Trainers and Workshop 3-8 May 1999 6 days	CP pre-assessment July-Aug. 1999 2 days	CP Pre-Assessment 23-25/27-29 Sep. 1999 3 days	CP Assessment 1-3/6-8 Dec. 1999 3 days	Select CP Opportunities 14-17 Mar. 2000 4 days	CP In-plant Demo 18-20/22-24 May 2000 3 days	Implement CP-Measures 22-24 Aug 2000 2+1 days
<ul style="list-style-type: none"> ▪ Introduction to cleaner production ▪ CP-strategy and methodology ▪ UNEP/ UNIDO CP-program ▪ Material balance, energy balance ▪ How to start a CP-project ▪ Opportunities and constraints for CP in Vietnam ▪ Discussion 	<ul style="list-style-type: none"> ▪ Getting started in an in plant-demo unit ▪ Designate CP-audit team (2-3 people from unit together with our trainees) ▪ List process steps, flow sheet ▪ Walk through in the plant ▪ Identify and select wasteful process steps and discuss CP opportunities ▪ Collect data, measurements ▪ Develop rough material and energy balance 	<ul style="list-style-type: none"> ▪ Presentation of pre-assessment ▪ Discuss results and problems ▪ Introduction to energy audit ▪ Theory of project management ▪ Control figures, material and energy balance ▪ Work plan next steps: <ul style="list-style-type: none"> - improve material and energy balance - assign cost to waste streams ▪ Report: Pre-assessment 	<ul style="list-style-type: none"> ▪ Final presentation, material and energy balance, compare to bench-marking system ▪ Measure the efficiency of a boiler ▪ Heat loss balance ▪ Assign costs to waste stream ▪ Define baseline ▪ Introduction of opportunities for CP measures ▪ Selection solution for implementation ▪ Report: CP-assessment ▪ Next steps 	<ul style="list-style-type: none"> ▪ Presentation of implemented low cost measures ▪ Assess technical feasibility ▪ Assess financial feasibility ▪ Evaluate environmental aspects ▪ Report: CP-opportunities (selection) ▪ Performance test ▪ ISO 14000 ▪ BAT in Textile 	<ul style="list-style-type: none"> ▪ Follow-up of CP Assessment ▪ Presentation of selected CP measures ▪ Constraints for the implementation ▪ Action plan for implementation ▪ Monitoring of measures ▪ Follow-up ▪ Final report ▪ Introduction to Life Cycle Assessment (LCA) 	<ul style="list-style-type: none"> ▪ BAT in seafood processing ▪ BAT in pulp and paper industry ▪ Presentation of case studies ▪ Evaluation and lessons learned ▪ Develop project for funding ▪ Performance test ▪ Open seminar ▪ Introduction to the programme ▪ Results ▪ Certificates to trainers and companies ▪ Discussion and outlook
37 participants	263 participants	45 participants	45 participants	38 participants	36 participants	38 participants

Lecturers: Mr. S. P. Chandak, NCPIC India; Mr. P. K. Gupta, NCPIC India; Mr. Nguyen Cong Thanh, AIT Bangkok; Mr. Tran Van Binh, HUT; Mr. Nguyen Quy Trach, HUT; Mr. Thomas Bürki, FHBB Switzerland; Mr. Nguyen The Bao, HCM University of Technology; Mrs. Caroline Cook, ERM; Mr. Jürg Grütter, Grütter Consulting; Mr. Alfred Dinkel, Carbotech AG; Mrs. Else-Marie Andersen, Mrs Le Thi Huyen and Mr. Do Kim Cuong from SEAQIP; Mr. Tran Van Nhan, VNCPC; Mrs. Ngo Thi Nga, VNCPC; Mr. Heinz Leuenberger, VNCPC/FHBB.

Curriculum Development at University Level

In 2000 Viet Nam Cleaner Production Centre organized a workshop on how to integrate Cleaner Production into university curricula. Thirty-nine participants from 18 universities and 3 ministries attended the workshop with keynote speakers from Australia, Thailand, Switzerland and Viet Nam. The participants from universities expressed their interest and willingness to bring Cleaner Production into their curricula; however, the following constraints were addressed: tight timetables; lack of background material; lack of good teaching material; and lack of teachers who have in-depth knowledge of Cleaner Production.

3.2 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 train-the-trainer programme.

The in-plant demonstration programme started in July 1999 with fifteen companies and was completed in August 2000 with thirteen successful companies.

Overview of In-Plant Demonstration Companies

Sectors	Textile	Food	Paper	Metal
Location	2 in the North	2 in the North	1 in the North	2 in the North
		1 in Da Nang		
	2 in the South	1 in the South	2 in the South	
Products	Dyed fabric	Agar-agar	Printing paper	Wires and nets
	Dyed zippers	Beer	Tissue paper	Steel pipes
	Dyed thread	Seafood	Carton	
Trained in CP	33 team members and trainees	38 team members and trainees	38 team members and trainees	24 team members and trainees

A detailed list of the companies can be found in Annex.

Results of the Programme

As of August 2000, all 13 companies have received the first results of the programme and the company managers are planning to expand the cleaner production activities to other parts of their production to gain more economic and environmental benefits.

“The most valuable achievement of the Cleaner Production programme in our company is that we have learned to assess our production process systematically as instructed by the Viet Nam Cleaner Production Centre. Benefits and cleaner production options are all coming from there” –Viet Tri Paper Company.

“Cleaner production measures are not only complicated, but can also be quite simple like insulation of steam pipes, using water properly in the right time, right place ... and these measures have saved us a lot of money already” – Ninh Binh Brewery.

“In our company, we have started with the easy and cheap cleaner production measures. These have brought quite high economic and environmental benefits. The feasible, but more expensive and complicated options will definitely be implemented.” – Mai Lan Paper Company

After the first round of Cleaner Production Assessments, with about a quarter of the identified options being implemented, the companies have achieved very positive results.

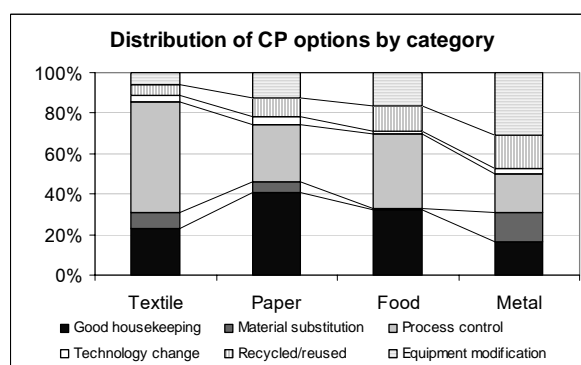
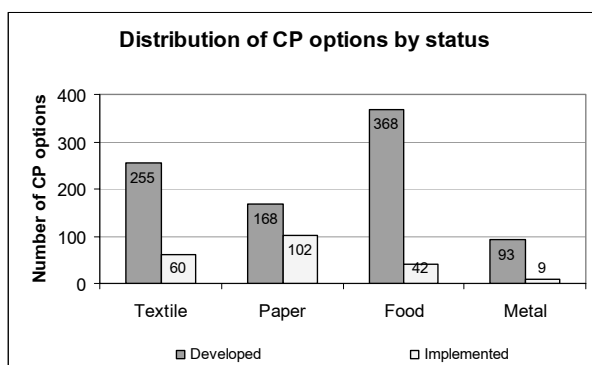
Expected annual savings per company (based on results until December 2000)

Textile:	2,800-73,000 USD/year
Paper:	91,000-159,000 USD/year
Food:	6,700-24,600 USD/year
Metal:	9,900-261,600 USD/year

In total the 13 companies are expecting to save around 770,000 USD annually. All in all they have invested less than 140,600 USD, which gives a short overall pay back period of less than 2.5 months. The calculation of the payback period does not take the cost of the consulting service nor the internal staff costs of the company into account.

Environmental benefits so far

- Air emission reduced by 20-42% due to savings in fuel consumption;
- Total amounts of wastewater reduced around 20%; Total organic pollution in wastewater reduced by 20-30%;
- Solid waste reduced by 5-30%;
- The consumption of raw materials, coal, oil and water have been reduced significantly.



Overview of Cleaner Production Options in the four sectors

A list of the companies and their contact addresses can be found in Annex.

So far most of the CP options implemented are good housekeeping or better process control measures. To gain the full CP potential, companies must also implement in the next years options in the area of technology improvement, new production processes or cleaner technologies. Only strict, on-going production process optimization will help companies to compete in the future against foreign competitors in a global market.

3.3 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.

Public Media

In 2000, the Viet Nam Cleaner Production Centre has published 10 articles in the national press, journals and investment newspapers. Furthermore, the local television channels of Ha Noi, Binh Duong and Dong Nai, and the two radio stations Voice of Viet Nam and Voice of HCMC have broadcasted short programmes on Cleaner Production.

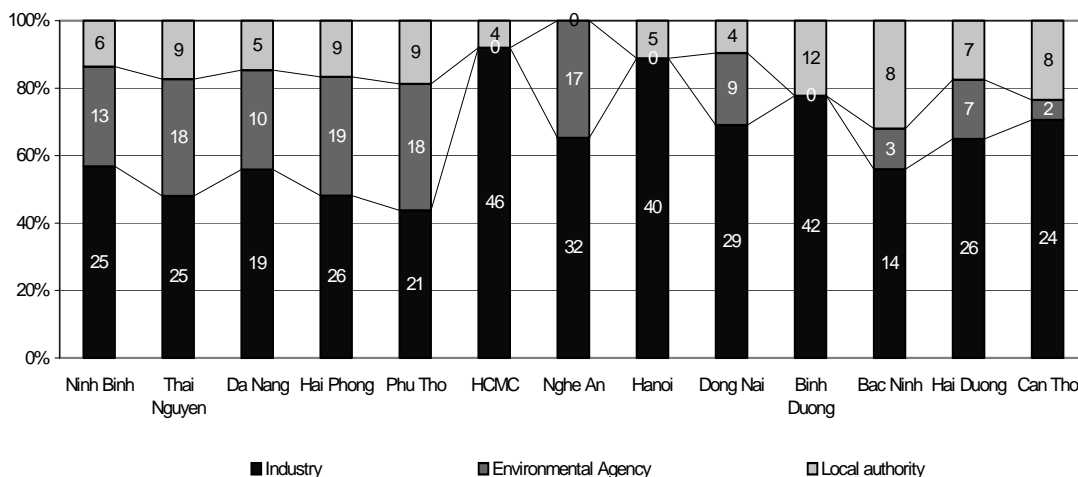
The Mini-Guide on Cleaner Production Assessment was edited and is now available in Vietnamese and English. The number of CP manuals available in Vietnamese is still limited. However, during this year one seafood and one pulp and paper manual have been added to the list.

The Centre has published its web site at: <http://www.un.org.vn/vncpc>.

Awareness Raising Seminars

In 2000, 7 awareness-raising seminars were organised, counting to 13 awareness-raising seminars for the whole of Phase I, covering all industrial concentrated provinces/cities.

Distribution of participants at awareness raising seminars



At the 13 awareness raising seminars a total of 571 members of industries, environmental agencies and local authorities attended. All seminars were organized in cooperation with DOSTE, DOI, VCCI, or the university in the province.

Besides the awareness raising seminars, Viet Nam Cleaner Production Centre presented the Cleaner Production approach at a number of workshops and seminars organized in cooperation with Governmental organisations, Non-governmental organisations and donor funded projects.

Overview of 13 awareness-raising seminars

1999			2000		
City / province	No. of participants	Date	City / province	No. of participants	Date
Ninh Binh	44	27 April	Nghe An	49	18 January
Thai Nguyen	52	25 June	Ha Noi	45	12 April
Da Nang	34	3 August	Dong Nai	42	25 May
Hai Phong	54	10 August	Binh Duong	54	26 May
Phu Tho	48	18 August	Bac Ninh	25	21 July
Ho Chi Minh	50	9 December	Hai Duong	40	28 July
			Can Tho	34	19 September

3.4 Policy Advice

An effective policy framework in Cleaner Production is essential to promote this concept to industry. This involves not only administrative measures like licensing, but also economic instruments such as a duty and tax system for waste disposal and a realistic pricing system for raw materials and energy.

The Viet Nam Cleaner Production Centre is supporting decision-makers to have access to information and experiences of Cleaner Production in Viet Nam and from abroad. The Centre also supports them in developing new strategies and laws for the promotion of Cleaner Production.

Study Tour for Policymakers

After the study tour for policy makers to Slovakia, Austria and Switzerland in September 1999, a second study tour was organized in June 2000 to China and Hong Kong.

The purpose of the study tour was to see, learn and discuss:

- Environmental policy framework in China and Hong Kong;
- Implementation and enforcement of environmental laws in China and Hong Kong;
- Cleaner Production strategy and policy in China and Hong Kong; and
- Achievements and lesson learned in (i) promoting CP; (ii) market development for CP services; (iii) capacity building in CP, and (iv) policy advice at national level.

Participating in this study tour were eight representatives of DOSTE HCMC, DOI HCMC, VIZA, MOET, VCCI, INEST and VNCPC.

Overview of the study tour for policy makers (4-11 June 2000)

Country	Places to visit	Participants
China 4-8 June 2000	<ul style="list-style-type: none"> ▪ China National Cleaner Production Centre ▪ State Environmental Protection Agency ▪ Beijing Environmental Protection Bureau ▪ UNIDO office in Beijing ▪ Tsinghua University 	Mr. Nguyen Van Chien, DOSTE Ho Chi Minh City Mr. Nguyen Van Lai, DOI Ho Chi Minh city Mr. Tran Dinh Nguyen, VIZA Mr. Than Duc Hien, MOET
Hong Kong 9-10 June 2000	<ul style="list-style-type: none"> ▪ Hong Kong Productivity Council ▪ Happy Holding Company Ltd. 	Mr. Nguyen Duong Ty, DOSTE Hanoi Ms. Dinh Thi Thanh Hoa, VCCI Ms. Dang Kim Chi, INEST Ms. Ngo Thi Nga, VNCPC

Cleaner Production Action Plan

After the Government of Vietnam signed the International Declaration on Cleaner Production in September 1999, the Viet Nam Cleaner Production Centre is actively involved in preparing the Cleaner Production Action Plan for the period of 2001-2005 as requested by MOSTE and the National Environment Agency.

3.5 Cooperation

The Viet Nam Cleaner Production has provided the following Cleaner Production training activities:

- Laos Delegation of Ministry of Industry and Handicraft. Two training seminars were organized: two days for 10 participants in August 2000; four days for 20 participants in November 2000. The purpose is to teach the participants how to start up Cleaner Production in Laos.
- Project: "Strategy and Mechanism for Promoting Cleaner Production Investment in Developing Countries" of MPI-UNEP. This three-module training is organized for national experts on Cleaner Production and for enterprises' employees to teach them how to make bankable project proposals.
- Project: "Seafood Quality Improvement Program" (SEAQIP) of Ministry of Fishery. The training was organized in Da Nang and Ho Chi Minh City in September for 110 participants from the seafood sector. This course was called "Environmental Management and Cleaner Production in the Seafood Processing Industry."

The Viet Nam Cleaner Production Centre has provided CP-consultation services to the following projects:

- "Energy Conservation Program" of MOSTE;
- "Viet Nam Canada Environment Program" (VCEP) of MOSTE
- "Promotion of Cleaner Production Policies and Practices in Vietnam" of MOSTE/NEA-ADB
- "Agenda 21" of MPI-UNDP (Environmental Issues in Investment Planning)

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.

4 OTHER CLEANER PRODUCTION ACTIVITIES IN VIET NAM

Fortunately, several other projects that have focused on cleaner production or at least have had a component on cleaner production have been started or designed during year 2000.

Viet Nam Cleaner Production Centre tries to coordinate the 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 the different inputs and to build up an efficient coordination.

Project	CP content	Donor	Counterpart	Location	Period
Environmental strategy for 2001-2010	Development of the Environmental Strategy for 2001-2010	ADB	NEA	Viet Nam	2000-2001
CP-action plan	Development of a National Strategy for CP for 2001-2005	Government of Viet Nam	NEA	Viet Nam	2000-2001
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	2001-2003
Environmental Pollution Prevention in HCMC	CP Assessments. Follow-up on earlier project	SIDA	DOSTE in HCMC	HCMC	2001-2003
Industrial Pollution Management. VCEP II	CP training and demonstration projects in 4 provinces	CIDA	NEA DOSTE in Hai Phong, Hanoi, Da Nang and Binh Duong	Viet Nam	2001-2005
Agenda 21	4 CP Assessments in Hanoi	UNDP and SDC	MPI	Hanoi	2000-2001
CP Investment	10-12 bankable CP projects	UNEP, Norway	MPI	Viet Nam	2000-2001
Wastewater treatment Technology transferring and Cleaner Production Demonstration AAACP – Australia	Waste minimization audit at three candy/brewery companies	AUSAID	Institute of Brewery Research	Viet Nam	1998 – 2000

5 OUTLOOK (PHASE II)

Based on the past two years, Viet Nam Cleaner Production Centre has made a business plan for its next phase from 2001 until the end of 2003.

The mission of the Centre will be to a national focal point for the promotion and implementation of Eco-efficient Industrial Production through Cleaner Production including Cleaner Technology. The Centre will deliver high quality services such as Cleaner Production Assessments, financial engineering, technology advice, training and information mainly to service providers and to industries.

The Viet Nam Cleaner Production Centre will provide the following core services to industrial enterprises, universities, governmental, and international institutions:

Consulting: Various types of consulting services are offered such as:

- Rapid or full CP assessments including classical CP services as well as CP combined with environmental management systems (EMS), energy audits, life cycle assessments (LCA), eco-labelling etc. according to the demand of the client. In the energy field a close co-ordination is made with the UNEP-financed project for energy efficiency and the already successfully-operating Energy Efficiency Centre in Vietnam. Energy efficiency services can also be combined with the Clean Development Mechanism (CDM).
- Financial engineering for CP assessments in cooperation with the UNEP project.
- Clean technology assessments including technology gap assessments and technology transfer. Best Available Techniques (BAT) as well as Best Economic Attractive Technology (BEAT) is identified and then combined with financial engineering to offer an attractive package for the client.

Training: Special training is offered for various groups of persons such as:

- Sector-specific training for consultants and enterprise staff. This training is a combination of theory and on-the-job training, working directly in enterprises with CP Assessments. Training is spread over several months to mix theory and practical application. Next to this, shorter in-depth training is offered on specific topics such as EMS and CP, energy, risk management etc. thus upgrading the skills of already-trained CP facilitators.
- Tailored courses for specific clients (enterprises or institutions). Enterprises targeted for this service are, e.g. those that form important links in the supply chain and have a large number of suppliers.
- Training for university lecturers developing the curricula content on CP. Cleaner Production will be introduced primarily in the curricula of chemists, food and environmental engineers and industrial managers.

Information services such as CT database, web-links, technical manuals, seminars and information leaflets will be developed. Information services go beyond promotion activities as information services have value-added contents for the customers.

Support services for service providers are developed such as marketing and sales support or assistance in quality assurance. Service providers are important to achieve a broad CP application and a wide CP offering.

To provide high-quality services the VNCPC will implement ISO 9001 and ISO 14001. To further build up the capacity of the centre the staff will participate in training courses on cleaner technology in 2-3 industrial sectors, and in courses related to energy efficiency or financial services to be able to collaborate with specialists of these areas. It is also considered essential to improve the skills of the VNCPC staff in management and economics.

To realize the annual goals defined in the Business Plan, VNCPC has developed a marketing plan with assistance from Mr. Thomas Mauch, FHBB.

6 ANNEXES

6.1 List of Certificated Trainers in Cleaner Production

	Name	Contact details
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 province Tel/Fax: (650) 824-421; (650) 730-534; Mobile: 090-752-917
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
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
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
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
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6.2 Achievements of the In-Plant Demonstration Programme

Company and CP focus area	Contact details	Achievements
Textile		
Nam Dinh Silk Textile Company Dyed fabrics: 13,000 tons/year	4 Hà Huy Tập, Nam Định city Tel: 0350-849622 Fax: 0350-849652 Ms. Tran Thi Ngoan, Deputy Director	Annual savings: 39 million VND Increased high-quality product by 6%; reduced re-processing by 3%, and water consumption by 16,208m ³ / year
Nhat Tri Manufacturing Firm Dyed zippers: 720 tons/year Dyed threads: 80 tons/year	7/7 - 7/8 Lạc Long Quân, Phường 5, Quận 11, Hồ Chí Minh City Tel/Fax: 08-8600868 Mr. Nguyen Van Vien, owner	Investment: 86.44, million VND Annual savings: 1023 million VND Increased high-quality products by 8%; Reduced re-processing by 8%; consumption of raw materials (dyeing stuff) by 63%, electricity 13%, and fuel 14.3% Reduction of wastes and emissions: 4 tons dyestuff, 88 tons GHG, and 1.2 tons SO ₂ per year
Sai Gon Textile Company Sized and dyed towels: 144 tons/year	40 Lũy Bán Bích, Phường 20, Quận Tân Bình, Hồ Chí Minh City Tel: 08-8560362 Fax: 08-8580222 Mr. Duong Trong Nghia, Deputy Director Ms. Pham Thi Than, Technical engineer	Investment: 20.7 million VND Annual savings: 233 million VND Reduced auxiliary consumption by 20%, consumption of dyestuffs 25%, electricity 8%, and fuel 9% Reduced discharges of dyestuff by 514 kg / year and of GHG by 10 tons / year
Trung Thu Textile Company Dyed army fabric: 150 tons/year	Làng Thanh Liệt, Thanh Trì, Hà Nội Tel: 04-6880550 Fax: 04-6880922 Mr. Nguyen Huu Thanh, Director	Investment: 25 million VND Annual savings: 80.85 million VND Increased high qualified products (category A) by 17% and reduced re-processing by 17% Reduced consumption of chemicals: caustic 48%; acetic acid 34%; soda 46%; hydrosulfites and others 15%

Company and CP focus area	Contact	Achievements
Paper industry		
Mai Lan Paper Company Toilet paper: 1500 tons/ year	129 Âu Cơ - Phường 13 - Quận Tân Bình, Hồ Chí Minh City Tel: 08-8490754 Fax: 08-8425594 Ms. Lê Thị Yến, Deputy Director	Investment: 120 million VND Annual savings: 1314 million VND Increased production by 4% and reduced re-processing by 5% Decreased consumption of raw materials by 13%; water by 23%, electricity by 19%, and fuel oil by 16% Reduction of waste products discharged: Water 4%, air emissions 35%, and fibers in wastewater 20%
Vinh Hue Paper Company Carton and packing paper - 1653 tons/year; tissue - 643 tons/year	66/5 quốc lộ 1, phường Linh Xuân, quận Thủ Đức, Hồ Chí Minh city Tel: 08-8960006 Fax: 08-8962092 Mr. Trần Thành Phương, Chief of Technical Department	Investment: 670 million VND Annual savings: 1279 million VND Carton product: Reduced consumption of pulp by 11%, water 18%, and fuel oil 17%. Tissue product: Reduced consumption of pulp by 59%, water 17% and fuel oil 6%. Reduction of wastewater and emissions: Water 28%, pollution load 20%, and 6.6 tons SO ₂ per year.
Viet Tri Paper Company Paper production line number 2 - 9000 tons/year	Phường Thanh Miếu, thành phố Việt Trì, Phú Thọ province Tel/fax: 0210-846702; Nguyễn Văn Hiện, Deputy Director Mr. Dương Văn Chiến, Technical engineer	Investment: 245 million VND Annual savings: 2226 million VND Increased capacity by 2%. Reduced consumption of pulp 6%, caustic 2.6%, bleaching agent 29%, water 15%, electricity 3.6%, and coal 4%. Reduction of wastewater and emissions: Wastewater, 555,000 m ³ per year; organic load by 30%; 330 tons GHG per year.
Metal Products		
Nam Dinh Galvanic company Zinc plated wires - specially in cleaning steps: 9000 tons/year	67 đường Nguyễn Văn Trỗi, Nam Định city Tel: 0350-848290 Fax: 0350-843765 Mr. Phạm Văn Trí, Deputy Director	Annual savings: 139 million VND Reduced low-quality products by 39% and re-processing products by 47% Reduced consumption of HCl by 2%; iron 2%, electricity 4.6% and coal 13.3%. Increased the pH of wastewater from 4.5 to 5.0. Reduced the discharge of wastewater by 3% and air emissions by 70%
VINAPIPE Zinc galvanized pipes: 15,000 tons/year	Cây số 9, Vật Cách, Hồng Bàng, Hai Phòng city Tel: 031-850718 Fax: 031-850114 Mr. Nguyễn Tiến Tri, Technical Engineer	Investment: 191 million VND Annual savings: 3663 million VND Reduced zinc consumption from 120 kg/ton product to 93 kg/ton product (22.5%) The reduction of acid consumption is not quantifiable.

Company and CP focus area	Contact	Achievements
Food Processing		
Hai Long Company Ltd. Agar-agar: 36 tons/year	Ngõ 109 đường Trường Chinh, quận Kiến An, Hải Phòng city Tel: 031-876449 Fax: 031-837300 Ms. Trần Lan Hương, Technical Engineer	Investment: 226 million VND Annual savings: 177 million VND With the new production line, the company lost 5% of material, but gained from the reduction in consumption of: acetic acid 42%; borax 100%, Javen 25%; and caustic 35% Reduced consumption of electricity, water and coal by 216 million VND/year. Reduction of waste discharged to environment: 2880 litres acid; 1 tons borax; 19.6 tons caustic; 13.67 tons javen; and solid waste by 33.5% (4.8 tons)
Ninh Binh Brewery Bottled beer: 5 million liters / year	Đường Võ Thị Sáu, phường Đông Thành, thị xã Ninh Bình, Ninh Bình Province Tel: 030-871044 Mr. Phạm Van Hong, Director Mr. Nguyễn Xuân Hoan, Deputy Director	Investment: 37.5 million VND Annual savings: 345 million VND Increased capacity by 11%; quality by 21%; and created by-product 67.6%. Reduced consumption of materials by 7%; filter media 6.6%; water 4%; electricity 11.4%; and coal 13.4%. Reduction of waste products discharged to environment: water 14%; beer 13%; chemicals 16%; grease 38%; 16.2 tons/year COD; 67.8 tons GHG/year; 10.4 tons SO ₂ /year.
Nam O Export Special Marine Product Factory Fish filet: 3.3 tons/year (common fin fish; lined silver grunt; ebisuba) Power consumption	Quốc lộ 1A, Nam Ô, Liên Chiểu, Đà Nẵng city Tel /Fax: 0511-842670; Mr. Nguyễn Phước Vĩnh Phúc, Technical Engineer / Product Quality Controller	Investment: 0.7 million VND Annual savings: 93.45 million VND Reduced electricity consumption by 20.5%. Increased raw material to product ratio of amadai fish by 8%; lined silver grunt fish by 1.5% and ebisuba by 3.1%
Natural Foods Co., Ltd / Cau Tre Sea Food Enterprise Octopus: 360 tons/year	125/208 Hương lộ 14, Quận Tân Bình, Hồ Chí Minh City Tel: 08-8565543 Fax: 08-8550057 Mr. Võ Quang Vinh, Chief of processing section / Technical Engineer	Investment: 25 million VND Annual savings: 159.6 million VND Reduced water consumption by 48% (from 44.5m ³ /ton octopus to 23m ³ /ton) and reduced processing time from 4 hours/ton to 2.5 hours/ton. Reduced chlorine 200 litre/month.

All the achieved results are based on the data provided by the CP Team of the companies and are based on actual savings made over a short time (2 – 6 months). To confirm the correctness of these figures, VNCPC has proposed that all companies do a follow-up in the next two years.

6.3 List of Abbreviations

BAT	Best Available Technique
BEAT	Best Economical Attractive Technology
CDM	Clean Development Mechanism
CP	Cleaner Production
DOI	Department of Industry
DOSTE	Department of Science, Technology and Environment
EMS	Environmental Management System
FHBB	Fachhochschule bei der Basel
HUT	Hanoi University of Technology
INEST	Institute for Environmental Science and 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
VIZA	Viet Nam Industrial Zone Authorization
VNCPC	Viet Nam Cleaner Production Centre