Report on
Promoting Cleaner Production in
Developing Countries

May 2001

Committee for the Promotion of Cooperation on Cleaner Production

Japan International Cooperation Agency (JICA)

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Introduction - Objectives of the Committee and the Make-Up of this Report -

The Japan International Cooperation Agency (JICA) formed the Committee for the Promotion of Cooperation on Cleaner Production (called simply "the Committee" hereinafter) to discuss the measures for and effective cooperative approaches to the promotion of cleaner production (CP) in developing countries. In discussion on cooperative approaches, consideration is given to possible collaboration among the relevant organizations in Japan.

The Committee, chaired by Professor Tsugio IDE, Keio University, met a total of four times starting in June 2000, including a site visit in Republic of the Philippines attended by experts and representatives of relevant organizations through the cooperation of the Ministry of Economy, Trade and Industry and the Ministry of Foreign Affairs.

The background on how the Committee has come to address this subject, the themes involved, the steps for discussion, and the structure of this report are outlined below.

■ Background

CP has been adopted by numerous donors in line with environmental management programs in developing countries as a Win-Win approach to industrial environmental management. CP realizes the enhancement of plant production performance and the reduction of environmental loads. In fact, there is an increasing demand for CP-related cooperation with Japan for industrial environmental management.

On the other hand, since the 1970s Japan has been accumulating know-how in pollution control techniques compatible with an increase in productivity in the course of active promotion of measures for resource saving, energy saving, transformation of production methods and recycling of wastes. This suggests that CP will be one of the key tools in Japan’s cooperation in environmental management.

■ Issues involved in the discussion

Cooperation for industrial environmental management in developing countries

typically involves the following potential problems.

1. Enterprises in developing countries are reluctant to make an investment in pollution control, and also less conscious of production control and environmental management.
2. There are only a limited number of governments and private organizations that provide effective consultation services for industrial environmental management, including enhancement of production performance.
3. Environmental regulations are ineffective to motive enterprises to introduce an environmental management system.
4. Donors are also groping for any effective approaches (including prevention of global warming) other than strengthening of regulations.

To date, only limited discussions have been held in Japan regarding effective and cooperative approaches for adopting and promoting CP in developing countries. In addition, the sharing of experience among relevant organizations in Japan is still insufficient, suggesting the pressing need for integration of the knowledge of cooperative techniques. This is especially true inasmuch as many enterprises in developing countries are actually noncompliant with environmental regulation standards — a key factor in determining an efficient and effective means of promoting CP, which is expected to be a promising incentive for increases in the productivity of various enterprises.

■Key discussion topics

The Committee held four sessions in total, with each session focusing on different topics for presentation by Committee members and external resource experts, followed by discussions that included reports on site visits to CP projects in developing countries and overseas investigations.

The specific topics discussed by the Committee were as follows.

1. Concepts of CP
2. CP activities in developing countries and cooperation projects by donors
   (1) Cooperation activities undertaken by JICA, JBIC, NEDO, etc.
   (2) Cooperative approaches by other donors
   (3) Ongoing activities in the Philippines, etc.

3. Policy and tools for promotion of CP
   (1) Promotion and environmental regulations by the government
   (2) Financial assistance
   (3) Economic instruments

Although the concept and the range of CP are based on the definition by UNEP, the target domain was selected as follows, in order to ensure conformity between the Committee objectives and the activities of relevant organizations.

Targeted sectors and processes: Although CP covers agriculture, service and related sectors as well as products and design, this Committee focuses on the production processes in the industrial sector.

Interconnection with End of Pipe (EOP) treatment: Generally, CP is defined as conceptually opposed to EOP. However, this Committee regards CP as an approach to improving industrial pollution, and thus does not categorically reject a combination of CP and EOP in order, for example, to ensure compliance with environmental regulations. Nonetheless, the Committee does place greater emphasis on CP.

Recycling: This Committee addresses recycling. In practice, however, in-process recycling in a plant is targeted first, followed by recycling among plants.

■Organization of this report

This report presents the results of discussions conducted by the Committee and the results of overseas investigations. Promotion of CP directly involves industrial environmental management, and thus the approaches to promotion of CP will include those for industrial environmental management. Major topics focused on in individual chapters are listed below.

Chapter 1: Why Cleaner Production

This chapter describes the necessity of CP with emphasis on the aspects of Win-Win approaches and corporate activities.

Chapter 2: Cleaner Production Activities in Developing Countries

This chapter presents lessons from the activities of overseas donors and potential barriers to the promotion of CP. Programs of overseas donors and Japanese organizations are also introduced.

Chapter 3: Cooperation by Japan for Promotion of Cleaner Production in Developing Countries

This chapter discusses the direction and cooperative approaches of JICA, as well as Japan's economic and technical cooperation, and presents numerous CP promotional measures. Available interactions among relevant organizations in Japan are also discussed.

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Abbreviations

ADB	Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
APO	Asian Productivity Organization
CAC	Command and Control
CDM	Clean Development Mechanism
CP	Cleaner Production
EOP	End of Pipe
EMS	Environmental Management System
GAP	Green Aid Plan
GISPRI	Global Industrial and Social Progress Research Institute (Japan)
GP	Green Productivity
ICETT	International Center for Environmental Technology Transfer (Japan)
JBIC	Japan Bank for International Cooperation
JCOAL	Japan Coal Energy Center
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
NCPC	National Cleaner Production Centre
NEDO	New Energy and Industrial Technology Development Organization (Japan)
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
PRTR	Pollutant Release and Transfer Register
SMEs	Small and Medium Enterprises
TPM	Total Productivity Management
TSL	Two Step Loan
UN	United Nations
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
ZERI	Zero Emission Research Initiative
WB	World Bank
WCPS	World Cleaner Production Society (Norway)
5S	SEIRI (in Japanese): Arrangement, SEITON: Order, SEISO: Cleaning, SEIKETSU: Hygiene and SHITSUKE: Discipline

Executive Summary

1. Why Cleaner Production

1.1 The so-called Win-Win approach constitutes an essential component of industrial environmental management, since such management both reduces pollution loads and increases corporate earnings.

1.2 Cleaner production (CP) contributes to the reduction of environmental loads and reinforces economic profits without placing complete reliance on End-of-Pipe (EOP) treatment, thereby essentially creating a Win-Win approach that enhances both development and the environment .

1.3 CP allows reduced production costs to serve as an incentive for enterprises to introduce a proper environmental management system by providing feasible measures with minimal investment, creating an enterprise-friendly approach.

2. Major barriers to promotion of Cleaner Production

2.1 Although there are a variety of ongoing activities for CP promotion in developing countries — especially technical cooperation by donors — self-sustainable promotion mechanisms have not yet been established.

2.2 The greatest barriers to CP promotion are the difficulty of communicating information and lack of human resources in developing countries.

3. Future cooperation for Cleaner Production

3.1 To realize the cooperative efforts of JICA and of other economic and technical cooperation entities in Japan toward industrial environmental management, the following strategic approaches should be adopted.

Strategy 1: Changing priority from a regulation- and EOP-oriented approach to a market mechanism- and CP-oriented approach

Strategy 2: Development of CP promotion policies with emphasis on private sector

activities

Strategy 3: Development of promotion measures interrelated to SME promotion policies

Strategy 4: Organizing Japanese experiences

3.2 Development of each CP promotional measure must be made under consideration of the following.

・Market-friendly measures

・Partnership with the private sector

・Planning (combination and linkage) of appropriate promotional measures reflecting each national situation

3.3 For possible collaboration among relevant organizations in Japan, the practical approach will be that which allows sharing of information from accumulated specific attempts with consideration given to which form of collaboration is feasible in which case. An important element will be the sharing of information among local offices. Close collaboration will also be accelerated by disclosure of information by relevant organizations.

Chapter 1 Why Cleaner Production

The most important component for industrial environmental management is the so-called Win-Win approach, through which pollution loads can be decreased while simultaneously increasing corporate earnings, thereby advocating both improved productivity and environmental protection. To realize a Win-Win approach, CP is emphasized.

1.1 Issues with Sustainable Economy and Society

Environmental problems include not only regional challenges such as surface water pollution, ground water degradation, air pollution and accumulation of hazardous wastes, but also global scale concerns such as global warming, acid rain, ozone layer depletion, reduction of tropical rain forests, desertification, species extinction, and exhaustion of water resources.

These regionally specific and global-scale environmental problems must both be resolved in order to build a sustainable economy and society. The 1999 White Paper on the Environment issued by the Japanese Government suggests three key requirements as follows.

1. To reduce the amount of materials and primary energy loaded into economic activities.
2. To change the quality of loading materials and energy (from consumption of subterranean resources to utilization of ground resources).
3. To minimize, detoxify or neutralize emissions of materials (total waste generation) into the environment and to reduce the ultimate energy consumption.

To fulfill these requirements as part of environmental protection in industrial activities, we should consider not only the treatment of generated pollutants but also life cycle environmental assessment from loading of resources through disposal of wastes. This suggests the need for environmental soundness, improvement of cost-effectiveness, and further enhancement of eco-efficiency (environmental load per function and role of goods and services) and resource productivity (provision of goods and services per input of resources) even when using the same resources. These challenges must be met by both developed and developing countries. In addition, any consideration of environmental

impacts must henceforth emphasize both the consumption and production phases.

1.2 Win-Win Approach

Industrial environmental management measures have so far relied chiefly on a "command and control" (CAC) approach in which both the establishment and monitoring of regulatory requirements are under the control of governments. In practice, however, in many developing countries, such regulatory compliance has not been monitored due to lack of capacity in the governments, and/or there are quite a few monitoring systems that involve corruption (for example, a penalty imposed for violating the regulations without any sampling and/or analysis). In addition, most regulations are intended to control the emission of pollutants, thereby promoting an End of Pipe (EOP) treatment that aims only to remove pollutants. The EOP is capable of effectively reducing the emission of pollutants as long as relevant facilities are properly operated and maintained. In practice, however, the EOP involves increasing costs for capital investment and O&M and thus has not been favorably introduced by the private sector. In addition, the EOP treatment facilities require operation and management techniques, meaning that some EOP facilities will be suspended after introduction. As a result, EOP has not successfully attained the goal of proper regulatory compliance.

On the other hand, enterprises in developing countries have similar problems with regard to environmental management — e.g., a lesser awareness of environmental issues, a lack of proper production control resulting in substandard introduction of environmental management, a shortage of human resources, and a shortage of capital for investment (see section 2.2).

Considering all the factors described above, greater importance must be attached to selection of proper instruments that offer profit and other beneficial incentives to the enterprises. This again suggests the importance of a Win-Win approach that allows the twin goals of reduction in pollution loads and increase in corporate profit. Such an approach will increase corporate earnings by improving productivity as well as through the campaign for environmental protection.

CP seeks a Win-Win approach that minimizes possible loads on the environment without simply relying on the EOP and, at the same time, improves the financial standings of individual enterprises involved. In this way, the Win-Win approach is an excellent model for realizing both development and environmental protection. CP allows reduced production costs as an incentive for the enterprises to adopt

environmental management, and provides feasible tools at the required minimum investment, thus providing an instrument friendly to corporate activities.

Furthermore, prices of fuel and raw materials, as well as the costs of other resources and treatment of pollutants and wastes are expected to continue to rise, and thus there will be increasingly growing needs for resource-efficient tools to prevent pollution. Also from this point of view, CP should be given priority to facilitate the implementation.

CP may be a springboard for the adoption of an environmental management system in conformity with the ISO 14000 Series, EMAS (Eco Management & Audit Scheme) and other international standards. The ISO 14000 Series, EMAS and other international standards contribute to environmental protection, whereas CP facilitates the introduction of the ISO 14000 Series through identification of material balance and energy balance in production processes and through the review of such processes.

Here, it should be noted that CP is only a single part of any comprehensive pollution management system, rather than a simple inexpensive alternative to the expense of EOP. This suggests that in some cases, a combination of CP and EOP will be needed to attain the goals of proper regulatory compliance.

In recognition that the above-described Win-Win approach is crucial for technical cooperation in industrial environmental management, donor countries and relevant organizations have been shifting their emphasis from EOP to CP.

1.3 Involvement of Small and Medium Enterprises in Environmental Management

Small and medium enterprises (SMEs) in developing countries are at a great disadvantage due to shortage of available human resources, information and funds. Most SMEs suffer from a lack of expertized personnel, and a lack of experience with cost and production control, funds for capital investment, and other management resources involved, and thus are less conscious of environmental preservation.

The pollution management system in SMEs in developing countries constitutes an important challenge to be resolved in the future, and CP will be a promising tool for the solution. CP requires no investment in some areas, and allows relatively reduced investment in others, meaning that CP will be easily accepted by SMEs.

In general, for small and medium pollution sources that are numerous and widespread, economic instruments are expected to be more effective than regulation-based (command and control: CAC) instruments, and CP will easily adapt to these economic instruments.

Chapter 2 Cleaner Production Activities in Developing Countries

In developing countries, donors have made a wide variety of efforts to promote cleaner production (CP), especially through technical cooperation. However, a strong and self-sustainable mechanism for the widespread introduction of CP has not been established.

The greatest barriers to CP have been a lack of human resources and funds, and an underdeveloped system for disseminating information.

2.1 Lessons from Donors' Activities

The cooperation by external donors has played an especially prominent role in developing countries since the 1990s. In fact, several implemented projects programs and their results have been verified at the Development Assistance Committee (DAC) of OECD to share lessons obtained, thereby contributing to formation of a base for intercommunication among donors through accumulated achievements and information about cooperation.

* The information in the following subsections refers to observations based on donors by donors investigations and reference materials, and is thus sometimes inconsistent.

2.1.1 Features of Projects

- SMEs are the primary target.
- Demonstration programs are provided for education and communication of CP concepts, and training programs are provided to create consultant services.
- Activities are not limited to promotion of CP but also combine the Environmental Management System (EMS) and other institutional programs.
- The governments in the recipient countries are not targeted for destination of technology transfer. The main parties to whom technology is transferred include NGOs, and in many cases, private sector consultants.
- Every effort is made to achieve self-sustainable promotion without any external assistance. Marketing is included in the projects to encourage targeted organizations to finance their own activities.

2.1.2 Lessons from Activities

1. Capacity-Building of Involved Organizations

- For promotion of CP, the first essential step is to provide adequate capacity-building for the local staff in the counterpart organization. (In some cases, the counterpart organizations have broken up and promotion projects failed because the activities were initiated without a satisfactory completion of technology transfer by the donor-employed consultant.)
- Steady, stable and sustainable promotion requires the involvement and capacity-building of not only the counterpart organizations, but also the local government. The governments must set rules to encourage the smooth progress of promotion activities, as well as increases in transparency and reliability. At the same time, they must clearly define the guiding principles by which enterprises will attain to appropriate environmental performance. In this context, donors should be called to assist the governmental efforts.

2. Incentives and Market Mechanism

- Capacity-building for involved organizations cannot in itself provide an incentive to continue the promotion efforts. A more effective approach is to encourage demand for CP technology and develop environment-related businesses, making the most of the market mechanism while the donor activity is in progress.
- It is more effective to afford incentives to control at the generation of pollution than reliance on the command and control (CAC) approach. Because the CAC approach requires heavy expenditures and advanced technologies, the regulation capacity is not high in developing countries.
- For selection of economic instruments, consideration should be given to individual targeted countries in terms of the actual circumstances, degree of industrialization and ability to accommodate the system.
- Development process of the market mechanism for promotion of CP involves the selection of optimal means, planning of an action plan for adoption, experimental adoption, assessment and decision making, and final acceptance of adoption. Such trial-and-error requires a considerable period of time before a successful system can be adopted to accommodate the targeted countries. For this reason, the donors must prepare themselves for a prolonged commitment. (In the long run, an ideal condition refers to increasingly added value to the environment and enterprises pursuing self-help efforts in response to social pressures.)

- Economic instruments have a theoretical advantage over the standardized CAC approach due to their higher flexibility and cost-effectiveness.[1)]
- CP is profitable. It therefore provides the greatest efficiency when promoted within the framework of a market economy. Whereas any subsidy might be initially effective in promoting adoption, continuous provision of a subsidy can cause distortion of the market economy and impaired efficiency.
- CP should be operated on a commercial base.

3. Role of Government

- The government in a targeted country is responsible for developing a framework to promote CP and for setting rules for the proper performance of the market mechanism.
- For integrated regulations and incentives, a national strategy is important; in some cases, however, even a properly established national-level plan does not work effectively.

4. Implementation of Activity

- Improvement of management is one of the best options in the Win-Win approach, particularly in the case of SMEs. [1)]
- Performance sought refers to improved enterprise management and environmental management rather than acquired skills in individual techniques of CP. CP is only one of the required tools for management.
- There is anecdotal evidence that practical implementation of CP fell short of the level anticipated, although it is believed that the situation is improving. There is no accepted way to measure the overall impact of CP programs, but typical figures suggested by experts in the field indicate that 15%–20% of the identified measures were put into practice within a reasonable time after the completion of the audits or investigation.[1)]

2.2 Barriers to Promotion of Cleaner Production

CP is a Win-Win approach (reducing pollutants and costs at the same time) that involves a wide variety of action programs. In actuality, however, these action programs have not yet led to widespread adoption of CP in developing countries (especially by SMEs).

In fact, past investigations by JICA suggest the following potential problems with CP and industrial environmental related management.

1. Enterprise Business Management

Enterprises in developing countries are less conscious of business management and production control, which can lead to numerous problems not only on environmental management. For example:

- Unit values and costs are not clearly identified.
- Inadequate or neglected maintenance causes the production facilities to fail to function as intended, leading to increased environmental loads.
- There are not many enterprises that incorporate the 5S approach, the KAIZEN (improvement) plan and/or other action programs that encourage employees to participate in productivity improvement. State-owned enterprises are especially not motivated to improve.
- Enterprises respond to command and control, by considering that it is more profitable to pay a penalty than to invest in the pollution control facilities.
- General Managers are aware of the need to improve their business management, but less reluctant to bear the expenses for external consultants.
- In SMEs in particular, the top management responsible for decision making is busy with day-to-day dealings and funding, leaving no time to spare for improvement of management. They are also reluctant to change the production processes itself.

2. Government Action for Promotion of CP

- Government fails to offer proper incentives that precisely meet the needs of the enterprise. (This is also the case with fostering SMEs.)
- There are limited government and private-sector organizations which provide enterprises with effective consulting services to assist them to introduce environmental management including productivity increase.
- Access to funding — including bank-loan and mortgage systems — is difficult.

3. Ineffective Enforcement of Environmental Regulations

Although many developing countries have established their own regulatory frameworks, including effluent standards and emission gas standards, often the enforcement of these regulations is so loose that the regulatory frameworks fail to work properly.

- Monitoring of environment and pollution sources is sporadic, and the analytical skills remain at a low level.

・In the event of violation of any regulation standards, the involved enterprise does not rely on suggestions from regulatory organizations, but responds only to the immediate case (for example, by paying a penalty).
・There are problems of corruption (for example, imposition of a penalty for violation of regulation standards without proper sampling and analysis).

4. Lack of Partnership between the Government and Private Sector

・The government office responsible for environmental regulations has few opportunities to set up a dialogue with the private sector, and it does not check the feasibility of regulation standards.
・The government office in charge of the industries shows little interest in pollution control in enterprises. It has a limited number of staff engaged in environmental concerns, and tends to prioritize state-owned enterprises.
・Although the long-term benefits of CP are understood, at present no visible benefits are experienced at either the government or enterprise level.

Reasons for the delayed adoption of CP by the SMEs of developing countries

Problems relating to CP	Main barriers causing problems
SMEs are unaware of environmental issues and the impact of their operation on the environment.	Information
SMEs have little knowledge of the many benefits of CP.	Information
SMEs have limited experience in adopting CP.	Information, human resources, and funding
SMEs are reluctant to adopt CP, because they are unconvinced of the benefits.	Human resources
SMEs know EOP rather than CP, based on their knowledge and experience.	Information
SMEs lack data to identify material balances and other quantitative references for the proper assessment of possible environmental loads.	Information and human resources
There is no powerful policy to encourage SMEs to adopt CP.	Information, human resources, and funding

In summary, the main barriers to promotion of CP are a dearth of information, human resources and funding. Among these main barriers, poor communication of information is the barrier most related to other problems. Because human resources are an essential component for acquisition of information, operation control, and decision-making, lack

of human resources also causes a large obstruction to promotion of CP. In some cases, CP may require no additional capital investment, while a need may arise for funding in the other cases in which facility improvement is involved. Funding in developing countries is very difficult, especially for SMEs, and limited access to funding (especially that due to an underdeveloped financing system for SMEs) constitutes a barrier to promotion of CP.

2.3 Overseas Donor Activities

This section outlines the activities by UNEP/UNIDO and APO, both of which are considerably experienced in promotion of CP and are expected to provide future references in relation to international cooperation.

2.3.1 UNEP and UNIDO

UNEP has also been involved in implementation of the CP Program, such as through their information exchange program called "The International Cleaner Production Information Clearinghouse." The "National Cleaner Production Centres Programme (NCPCs)" has been essentially playing the most important role in cooperation with UNIDO.

1. National Cleaner Production Centres Programme (NCPCs)

Since its first foundation in Czech Republic in 1994's, the NCPC has been introduced into a total of 19 countries, including Brazil, China, India, Mexico, Slovakia, Tanzania, Zimbabwe, Tunisia, Costa Rica, El Salvador, Guatemala, Hungary, Nicaragua, Vietnam, Croatia, Ethiopia, Morocco, and Mozambique, with additional expansion expected in the future. In large countries such as China, India and Brazil, regional centres have been planned to make up for insufficient coverage by a single NCPC.

It should be noted that each NCPC is owned by its host country. For each host country, UNIDO selects a host institution to assume ownership of the NCPC. The NCPC is set up on a small scale, with only two staff members in some cases. The host institution is responsible for provision of required facilities and staff members other than the director.

Each NCPC forms an advisory board or a combination executive board/advisory committee, members of which are composed of representatives from the Ministry of

Environment, the Ministry of Industry and other local government offices, industrial organizations, education and research institutions, and UNEP/UNIDO. This advisory board provides guidance and assistance in regard to the NCPC activity.

In the early phase after establishment of an NCPC, a counterpart institution providing technical assistance is needed to provide technical expertise and technical assistance for NCPC activity. This counterpart institution comes from a support institution in the donor country to assist NCPC under the contract with UNIDO.

UNEP, UNIDO and the host country government work together to operate the NCPC, to appoint the director, deputy director and other required human resources, and to determine the counterpart institution.

Host institutions and counterpart institutions are shown in the table below.

Host Institutions	Counterpart Institutions
Brazil: National Industrial Training Association	IVAM Environmental Research (Netherlands)
Costa Rica: CEGESTI, the Chamber of Industry and the Technological Institute of Costa Rica	Erasmus University (Netherlands)
China: China Research Academy for Environmental Science	Stenum (Austria)
El Salvador: Chambre of Industry	Danish Technological Institute (Denmark)
Guatemala: Chambre of Industry	Technical University of Denmark (Denmark)
Hungary: Budapest University of Economics Science	University of Massachusetts at Lowell (USA)
India: National Productivity Council	World Cleaner Production Society (Norway)
Mexico: National Polytechnic Institute	FachHochsvhule Beider Basel (Switzerland)
Morocco: General Confederation of Moroccan Enterprises	EMPA (Switzerland)
Tanzania: Tanzania Industrial Research and Development Organization	BOb Partners (Switzerland)
Tunisia: Tunis International Center for Environmental Technologies	Urbaplan (Switzerland)
Viet Nam: Hanoi University of Technology	

(source) http://www.unido.org/doc/331356(and 331357).htmls

UNIDO responds to the request for establishment of an NCPC from any recipient country by inviting donors for fund-raising and signing a financing agreement with a selected donor. UNIDO is responsible for budgetary control by allocating a portion of the funds from the donor to the activity. This type of fund-raising for the NCPC Program has been adopted by the Netherlands, Norway, Austria, Italy and Switzerland.

Financial assistance from UNIDO is offered for three to five years. During this period of time, NCPC must open up its own markets (education and training, demonstration, consulting, etc.) aiming at self-sustainability. Then, as a general rule, NCPC takes the responsibility for covering the operating funds with incomes chiefly from its own activities. The NCPC in Czech Republic, established in 1994 as the world's first NCPC, is now running by the income gained from its own activities.

However, there is controversy as to whether the original aims of the NCPC will be compromised if the NCPC is transformed to a CP-consulting firm and discontinues nonprofit activities such as dissemination of CP-related information. This suggests that commercialization of the NCPC has two possible effects. The first, favorable effect is that commercialization of the NCPC will result in successful technology transfer; the second, unfavorable effect is that the commercialized NCPC can monopolize the market, thereby obstructing the expansion of externally introduced CP expertise. The evaluation of which effect is more likely to attain varies according to even subtle differences in the circumstances of the country in question. It may thus be considered that, even after the expiration of assistance by the donor institution, the host country should be responsible for reviewing the activities of the NCPC.

2. NCPC Activities

The NCPC provides coordinating and facilitating capabilities in connection with the promotion of CP, and serves as the core of a network of organizations and individuals involved in CP programs. The major activities are as follows.

- To raise the awareness of CP
- To implement demonstration projects in enterprises
- To promote training in CP
- To provide information about CP
- To review and evaluate CP policy
- To assist enterprises in searching for loan sources
- To build up a network among NCPCs

NCPC implements training programs and demonstration projects, and provides enterprises with consultant services and information exchange, while taking actions to keep up with market needs for self-earnings.

Training programs aim principally to train and qualify consultants competent in giving CP consultations (i.e., Train the Trainers) rather than to provide technical staff in

individual enterprises. The qualified consultants serve as human resources for the implementation of projects.

In addition to the activities for private enterprises described above, the NCPC in Czech Republic encouraged the host countries to draft an official CP master plan and to assist the local governments in screening applicants for CP funds.

As a result, some NCPCs have developed to the point that they can assist those in other countries. The Czech NCPC helps those in Croatia and Macedonia, the India NCPC supports those in Vietnam and Sri Lanka, and the Mexico and Brazil NCPCs support those in the Central and South American countries.

The table below lists typical demonstration projects and training programs that have been implemented by NCPCs.

	China	Czech	Slovakia	Zimbabwe	Tanzania	India	Mexico	Brazil
The Number of Demonstration Projects								
1995	8	12	10	65	0	4	0	0
1996	30	4	-	5	16	5	6	5
The Number of Participants for Training Programs								
1995								
Demonstration Training	89	57	15	5	0	16	0	0
Intensive Training	120	-	-	68	0	-	0	0
P.R. Program	-	-	-	200	0	200	0	0
1996								
Demonstration Training	49	90	-	4	-	70	-	-
Intensive Training	-	-	-	43	35	37	25	-
P.R. Program	1000	44	0	98	47	350	500	600

*The table shows the number of projects and programs launched by NCPCs in the eight countries first targeted by UNEP (as of September 1996).

3. Promotion of Investment in CP

Together, the CP programs/projects implemented by UNEP have made the following contributions.

- Increased awareness on CP, with emphasis on the necessity for and opportunities of application of CP.
- Development of human resources and capacity-building for CP, including CP assessment mainly at host institutions in developing countries.
- Presentation of successful CP projects to various categories of businesses through demonstration projects and case studies.
- Providing information on CP-related techniques and issues and distribution of reference materials for training programs.

Most of these outputs are from the NCPC programs mentioned above. UNEP regards these achievements as successful as intended and attributes their success to CP promotional efforts focusing on "the prevalence of technology."

Subsequently, however, barriers to promotion of CP have included the lack of appropriate financing schemes and a shortage of funding knowledge on the part of enterprises.

Since its 1997 review on CP investment, UNEP has been taking the initiative in implementing a project called Strategies and Mechanisms for Cleaner Production Investments, which is scheduled from 1999 through 2002 and aims at promotion of CP investment. The project has the following main components.

- Demonstrate CP in five developing countries, including methods of applying for loans and promoting investment in CP.
- Show financial institutions and industrial authorities how to assess the merits of CP investment proposal.
- Persuade financial institutions to introduce credit schemes customized to CP investments.
- Train CP assessors in making creditworthy loan applications.
- Motivate the international public and private financial institutions to promote investment in CP in developing countries.
- Implement the project at two levels: the demonstration-country and global levels. The demonstration country-level portion of the project targets three to four key industry sectors in five countries (Guatemala, Nicaragua, Tanzania, Vietnam, and Zimbabwe) for demonstrations of CP investment fundraising and training of financial institutions and assessors. The global-level project is designed to assist the professionals in relevant organizations to develop appropriate financing schemes based on investigational results in developing countries, and to draft strategies for promotion.
- Form a project-implementing system composed of an Advisory Board or Project Coordinators in each developing country targeted; this resource will act to supervise investigations and to establish a liaison with NCPCs in different countries.
- Establish an International Advisory Board for comprehensive guidance of the project with members of representatives from UNEP, the Norwegian Government, UNIDO, UNDP, IFC, WB, the International Chamber of Commerce and commercial banks.

Conclusions cannot be drawn because the project is currently underway. However, interim findings have reported that the term "Cleaner Production" is unfamiliar in

financing institutions, and that the prolonged period of time between loan application and loan approval constitutes another barrier.

4. International Declaration on Cleaner Production

International declaration on CP was adopted at the 5th International High-Level Seminar on Cleaner Production held in autumn of 1998 in Seoul, Republic of Korea, with the intention to promote CP worldwide, and appealed to various organizations and institutions to support the declaration. To date more than 240 organizations have endorsed the declaration, which expresses the following commitments.

・LEADERSHIP: Using our influence
・AWARENESS, EDUCATION AND TRAINING: Building capacity
・INTEGRATION: Encouraging the integration of preventive strategies
・RESEARCH AND DEVELOPMENT: Creating innovative solutions
・COMMUNICATION: Sharing our experience
・IMPLEMENTATION: Taking action to adopt CP

(source) http://www.uneptie.org/Cp2/declaration/translations/english.htm

5. International Seminar

In order to review the CP activities in progress worldwide and identify guiding principles for future efforts, UNEP has been running a biennial international seminar called the International High-Level Seminar on Cleaner Production. First conducted in 1990 in Canterbury, the seminar has since been held in 1992 in Paris, in 1994 in Warsaw, in 1996 in Oxford, in 1998 in Seoul and in 2000 in Montreal. The next seminar is scheduled for 2002 in Prague.

In addition, to facilitate the exchange of information about CP in different regions, Roundtables for Cleaner Production have been set up in relevant regions and information exchange seminars have been organized.

2.3.2 Asian Productivity Organization（APO）

APO, an international organization with the Secretariat in Japan, launched the Special Program for the Environment in 1994 with a special fund from the Japanese government and formed the Environment Department. Since then APO has been implementing programs based on the concept of “Green Productivity” (GP). GP is a strategy for enhancing productivity and environmental performance simultaneously.

・Green Productivity Promotion Missions (GPPM): GPPM aims to develop awareness of GP, to identify the feasibility of GP opportunities, and to establish interconnection with cooperative organizations (GP partners) interested in GP promotion.
・Green Productivity Demonstration Program (GPDP): GPDP is chiefly intended to provide small and medium size plants and farms with an empirical demonstration of the feasibility of enhancing productivity and environmental performance with a fair profit gained, and ultimately to communicate the results of such demonstration.
・Green Productivity Dissemination Assistance (GPDA) : GPDA, by utilizing the results obtained from GPDP, establishes guidelines and produces video films, arranges seminars and training courses, and dispatches inspection teams to pilot plants and farms, thereby informing all the member countries of specific measures for enhancement of GP.

APO held the First World Conference on Green Productivity in Manila in 1996, and adopted the Manila Declaration on GP.

GP demonstration programs begun in 1998 in Thailand, Vietnam, Singapore and Taiwan. As of the year 2000, seventeen programs have been implemented, indicating a high estimation by the public. In 2001, seven additional programs are scheduled for implementation.

2.4 Activities by Organizations Involved in Japan

Based on the past cooperative performance, cooperation by the Japanese organizations in industrial environmental management may be characterized by:

・Capacity-building of the governments in recipient countries for monitoring of pollution sources and the environment
・Technology transfer at the operational level
・Control of pollution with an emphasis on EOP technology
・Cooperation focusing on energy (energy saving, pollution control at power stations, etc.)

2.4.1 Japan International Cooperation Agency（JICA）

The cooperative efforts of JICA on behalf of the environment are detailed on the JICA web site (http://www.jica.go.jp/). In fiscal 1999-2000, JICA conducted the Secondary Environmental Sectoral Study for Development Assistance, with the intention to provide recommendations on cooperative strategies for addressing environmental issues.

JICA has been involved in CP through a development study,*[1] project-type technical cooperation,*[2] dispatching of experts, training in Japan and provision of equipment and materials, thereby establishing promotion systems and developing human resources.

Typical development studies in connection with CP are as follows.

- Malaysia: The Study on Promotion of Cleaner Production in the Industrial Sector; launched in Nov. 2000 in progress
- Vietnam: The Master Plan Study for Industrial Pollution Prevention in Vietnam (Waste Water); from Oct. 1999 and to Sep. 2000
- Colombia: The Study for Industrial Pollution Abatement by Cleaner Production Technology in Santafe de Bogota; from Oct. 1998 to Aug. 1999

The project-type technical cooperation for CP includes the Argentina Project on Establishment of Control Capacity for Industrial Wastewater and Waste (from Apr. 2001 to Mar. 2005).

JICA has also been engaged in assistance in institution building and human resources development for industrial pollution control (wastewater treatment and emission gas control), energy saving, waste management and recycling, optimized water utilization and productivity enhancement.

In addition, JICA has been providing assistance for urban environment management master plans, and also for environmental management centres to monitor and analyze environmental conditions.

*[1]Development study includes pre-investment studies that examine the feasibility of proposed projects and the formulation of master plans for regional or sectoral development.

*[2]Project-type technical cooperation is a package of three types of cooperation: trainee acceptance, expert dispatch, and provision of equipment; this type of cooperation requires a relatively long period of time, making it possible to identify and transfer those technologies that are best suited to local conditions.

2.4.2 Green Aid Plan

The Ministry of Economy, Trade and Industry (METI) has been introducing the Green Aid Plan (GAP) Program into developing countries in Asia since 1992. GAP has the express goal of simultaneously implementing development and environmental protection. This includes transfer and dissemination of environment- and energy-related technologies based on Japanese experience and technical expertise for pollution control. In addition, GAP supports self-help efforts in targeted developing countries in order to encourage the local governments and private enterprises to enhance their environmental consciousness and strengthen pollution control.

GAP was first launched in FY 1992 in China and Thailand, then in FY 1993 in Indonesia, FY 1994 in the Philippines and Malaysia, FY 1995 in India and FY 1996 in Vietnam. At present, GAP is underway in these seven countries.

GAP is intended to prevent industrial pollution with a focus on the four major challenges: 1) Prevention of water pollution; 2) Prevention of air pollution; 3) Waste management and recycling; and 4) Energy saving and renewable energy (i.e., those options contributing to reduced CO_2 emissions).

GAP is conducted in two phases. First, a "policy dialogue" is held to determine the course of cooperation and individual projects. Second, steps are taken to implement the actual project.

In this way GAP promotes effective and efficient cooperation consistent with the varying needs of the targeted recipients.

1. Policy Dialogue

GAP is intended only to support self-help efforts, and cannot in itself solve whole energy and environmental problems. With this understanding, GAP focuses on five areas in order to realize effective and efficient cooperation on a limited budget: 1) Full recognition of the current situation; 2) Consideration of the needs and priorities of the recipient; 3) Consideration of whether the current Japanese expertise and experience will be effective at providing a solution; 4) Effectiveness of the project; and 5) Selection of a suitable project that will continue to contribute to sustainable development even after its termination.

Based on these requirements, the Japanese side fully discusses with each recipient country the priority areas in need of cooperation and schedules middle to long-term programs. Prior to the policy dialogue, information about various potential issues,

questions and answers, and suggestions are provided through the local office of the Japan External Trade Organization (JETRO).

The policy dialogue involves exchange of ideas about problems in the recipient country, past projects and data in Japan, and makes a final decision on the project(s) to be implemented in the following fiscal year and on the course of cooperation to be provided. For projects defined as critical but not adoptable in the current fiscal year due to limited budget, negotiations for budget allocation and other additional operations are carried out to ensure eventual implementation.

2. Implementation of Projects

Every project adopted in the policy dialogue will be carried out by JETRO, the New Energy and Industrial Technology Development Organization (NEDO) and other involved organizations. The projects fall roughly within the following four categories.

(1) Cooperation for Feasibility Study and Master Plan Study

Projects in this category include study to determine the needs for control of industrial pollution, feasibility studies for projects on environmental management or energy conservation, or drafting of master plans for specifically selected regions/industries.

(2) Cooperation for Human Resources Development

This category of projects intends to encourage the improvement of environmental performance in the recipient countries by enhancing the consciousness of engineers and management representatives in regard to environmental preservation, energy conservation and prevention of industrial pollution, and the improvement of technical capabilities. Trainees competent in planning of programs for environmental management and energy conservation are invited to Japan and/or Japanese technical experts are dispatched to the recipient countries to offer technical assistance, arrange seminars, and provide other appropriate cooperative programs.

(3) Cooperation for Research and Development

Projects in this category involve joint research and development between Japan and individual recipient countries on the technical approaches to prevention of industrial

pollution in conjunction with provision of technical knowledge and expertise accumulated in Japan.

(4) Technology Demonstration

Projects in this category address development, demonstration, feasibility testing and other appropriate programs that contribute to optimized utilization of energy and other challenges, thereby encouraging the acquisition and spread of technical skills in the recipient countries.

Typical examples include the Project for Rationalization of Energy Use (Model Projects for Energy Conservation) on energy utilization, rationalization techniques to be conducted jointly with those recipient countries who anticipate a massive increase in energy consumption, and a project to support the adoption and technical demonstration of the advanced Japanese "Clean Coal Technology" (Environmentally-friendly Coal Utilization Technology), including desulphurization of flue gas.

2.4.3 Japan Bank for International Cooperation（JBIC）

1. Overseas Economic Cooperation Operations

JBIC implements ODA loan projects on the basis of the Execution Policy of Overseas Economic Cooperation Operations. The Execution Policy does not refer directly to CP, but rather discusses means of enhancing coping efforts and capabilities in regard to environmental protection. These efforts are considered integral to developing sustainable economies and environmentally friendly societies.

ODA loans relating to environmental issues include CP issues and many other projects, such as the mitigation of traffic congestion, flood control, drinking water supplies and sewage treatment, the improvement of living environments, and afforestation. These projects for pollution control in developing countries can be considered relatively new, with the environmental pollution initiatives beginning as recently as the 1990s. Loans for the projects are of two types: a project-type loan and a two-step loan.

(1) Project-Type Loan

The implementing agencies of the Yen loan are mainly governmental agencies or state-owned enterprises. On the other hand, the polluting organizations are operating enterprises. This type of state-owned enterprise has undergone privatization in developing countries. Thus it is rare for the enterprises to receive a Yen loan directly. Nevertheless, businesses in countries that do not proceed to privatization and in the

specific sectors that have not yet experienced privatization in many developing countries are still covered by the Yen loan.

An example of the former are the businesses in China, and a typical example of the latter is an electricity supply business.

(2) Two-Step Loan (TSL)

To date, TSLs in the field of industrial pollution have been received by the following Asian countries: Indonesia, Thailand, India, the Philippines, and Sri Lanka. In the case of Indonesia, Thailand, and the Philippines, the second stage of TSL has already begun.

In the case of TSLs, the Yen loan is implemented by governmental financial institutions. These institutions formulate a scheme to support industrial pollution control by private enterprises. In many cases, the institutions select and finance the Yen loan for more than one private financial institution. The financial institutions provide a loan to final customers, who invest for environmental mitigation. In TSL, because the managing capability of financial institutions and companies is a vital factor, the consulting service for financial institutions is sometimes included in the Yen loan.

2. International Financial Operations

(1) Project Loans

As for International Financial Operations, JBIC has financed projects that help to upgrade or improve the efficiency of plants and facilities for private/public organizations through Export Credits, Overseas Investment Credits and Untied Loans. These measures are conducted in accordance with the activities of Japanese companies, such as overseas investments and the receipt of export contracts. Project loans provided by JBIC contribute to the promotion of CP by improving energy efficiency and modernizing industrial plants (e.g., oil refinery plants and steel manufacturing plants) and infrastructure (e.g., power plants and railroads).

(2) Two-Step Loan（TSL）

TSL enables the efficient provision of funds not only for large-scale projects but also for small or medium-size projects by supplying loans to end-users through domestic financial institutions and by utilizing domestic financial systems. In regard to International Financial Operations, JBIC has provided TSLs to governmental financial institutions in Central and South American countries

(Mexico and Brazil), and Central and East European countries (e.g., Hungary) for projects that promote CP through pollution control and environmental improvements.

2.4.4 Relevant Organizations

The organizations listed below are also involved with GAP projects and other CP-promotional activities in developing countries.

New Energy and Industrial Technology Development Organization (NEDO)
Japan External Trade Organization (JETRO)
Japan Coal Energy Centre (JCOAL)
Water Re-Use Promotion Centre
Global Industrial and Social Progress Research Institute (GISPRI)
Japan Consulting Institute
International Centre for Environmental Technology Transfer (ICETT)
Engineering Consulting Firms Association, Japan (ECFA)
Japan Environmental Management Association for Industry
Kitakyusyu International Techno-cooperative Association (KITA)
Central Research Institute of Electric Power Industry
APEC Virtual Centre for Environmental Technology Exchange

(Reference)

1) World Bank, Pollution Prevention and Abatement Handbook, 1998

Chapter 3 Cooperation by Japan for Promotion of Cleaner Production in Developing Countries

This chapter discusses the cooperative approach taken by JICA — and consequently Japanese economic and technical cooperation — for promotion of CP in developing countries.

The chapter is organized as follows.

Section 3.1 describes the basic strategy for cooperation for industrial environmental management including CP.

Section 3.2 discusses specific approaches to promotion of CP in developing countries.

Section 3.3 details individual promotional measures for CP.

And Section 3.4 discusses collaboration among relevant organizations in Japan.

3.1 Strategy Setting

Cooperation by JICA — and consequently Japanese economic and technical cooperation in industrial environmental management — should focus on those instruments which provide incentives for enterprises to engage in beneficial activities, including CP. Each cooperative effort must give careful consideration to potential interaction with a wide variety of policies and systems that can affect private sector activities and promotion measures for SMEs (small and medium enterprises).

Strategy 1: Changing Priority from Regulation and an End-of-Pipe(EOP)Oriented Approach to a Market Mechanism- and Cleaner Production-Oriented Approach

1. Motivation of Enterprises

In developing countries, it is a matter of common practice to neglect regulatory standards or to leave wastewater treatment facilities suspended. To overcome such practices, approaches must be adopted which encourage enterprises to engage in beneficial activities through the introduction of environmental management, per se, while also strengthening the enforcement of regulations. This suggests that greater importance be placed on CP, which is expected to contribute simultaneously to minimized pollution

loads and increased corporate profit. In this way, corporate earnings can be increased through improved productivity, and the environment can be protected at the same time.

2. Recognizing the Limitations of Regulation and Utilization of the Market Mechanism

Governmental regulatory pressure on enterprises often has small effect on successful pollution control. In addition, enforcement of regulatory compliance is likely to cause enterprises to turn their attention to an EOP approach, which will not directly benefit them.

For developing countries with a low capacity for environmental management, direct regulatory instruments that require expensive monitoring and advanced techniques are not as effective as indirect (economic) instruments that provide enterprises with incentives to minimize emissions at the generation stage. To stimulate corporate activities, the most effective option is to utilize the market mechanism. This constitutes the justification for adoption of economic instruments as measures. In terms of the need to minimize greenhouse gases, a global-scale market may emerge for emissions trading, in which case there will be widespread utilization of the market mechanism.

In practical application, an approach combining direct regulation and economic instruments is often employed, such as a combination of emission standards and environmental tax/pollution charges. In this case, the direct regulation is applied as the final means to attain environmental targets, and environmental taxes and pollution charges serve as a source of funds to reduce pollution loads with lower investment cost.

3. Role of the Government in Market-Mechanism Activation

To allow the economic instruments to properly function and the CP-related services to become a business, it is necessary to establish an environment conducive to the market mechanism. Government should set rules that enhance the functioning of the market mechanism, and donors should support the efforts of the government of the developing country.

Strategy 2: Development of CP Promotion Policies with Emphasis on Private Sector Activities

Appropriate measures must be designed to bring CP promotion activities within private

sector when setting CP promotion policy, as successful promotion of CP requires the expansion of private sector activities. Such activities include increasing the number of ISO 9000/14000 certified enterprises, promoting the prevalence of consultancy services, and encouraging widespread communication of information among industrial associations. To expand private sector activities, the first priority must be placed on efforts to enhance the consciousness of enterprises regarding CP. The frequent holding of seminars/workshops and demonstrations at successful plants, and other such reinforcement of information dissemination must then be achieved within the private sector, e.g., through industry associations.

Entrusting the implementation of government promotion program to the private sector is also an important option for expanding business-friendly policy tools.

Strategy 3: Development of Promotoin Measures Interrelated to SME Promotion Policies

The lack of human resources, information and funds, identified as major problems for SMEs, are also limiting factors for promotion of CP. SME promotion policies have been adopted in many countries, and thus a more effective approach will be to make the most of existing SME promotion policies rather than to launch a new measures limited to CP. Especially in the case of financing, it will be most effective to utilize or revitalize existing SME promotion financing tools.

Strategy 4: Organizing Japanese Experiences

In terms of a cooperative program by Japan, there is the additional problem of the limited number of English-language reference materials for introducing accumulated Japanese knowledge to developing countries. Japan steadily accumulated experience on productivity enhancement, quality control, energy saving and optimization of water source utilization and so on. There is thus a pressing need for compiled materials that can introduce Japan's experience to developing countries according to their present needs. Such materials should not be limited to simple descriptions of policies and enterprise efforts, but should include rationales for selecting specific policies among possible options, requirements for successful implementation of policies and cost-benefit

analyses.

In practice, Japan has been addressing CP in line with the development of productivity enhancement, energy conservation and resource-saving. Japan's cooperation in CP promotion is strong in terms of the technical aspects of the production process. Accordingly, Japanese technical cooperation can reflect this advantage.

3.2 Development of Cleaner Production Promotion Measures

For development of CP promotion measures, careful consideration should be given to market-friendly measures, partnership with the private sector, and design (combination and linkage) of measures based on the state of affairs in individual targeted countries.

This section discusses approaches that will encourage enterprises to actively promote and adopt CP, and means of supporting enterprises in the easy implementation of these activities. Special consideration is given to means of combining the measures for optimum linking with measures, and of building up an appropriate mechanism for widespread adoption of CP. The discussion focuses on the mechanism for expanding these measures and the particular situation in individual countries.

1. Development of Market-friendly Measures

As mentioned in Strategy 1, it is essential to stimulate corporate activities through a Win-Win approach. To stimulate corporate activities, utilization of the market mechanism is effective, which suggests why economic instruments are preferred as measures. That is, economic instruments allow a combination of incentives and disincentives as well as utility prices and penalties for violating the regulatory standards.

For SMEs in particular, as mentioned in Strategy 3, it is more effective to utilize existing measures for promotion of SMEs. Regarding loans, grants, and other financing, it is more efficient to utilize or revitalize existing SME promotional measures rather than to build up a new scheme.

For utilization of the market mechanism, consideration must be given to the following.

- Improvement of the market environment

  Involves upkeep and improvement of the market environment to allow the market mechanism to function properly by, for example, setting legislative and regulatory systems for business transaction, setting a competition policy that disallows

monopoly by a single company, and abolishing price control programs.

- Available service providers

  The existence of service providers with proper capabilities to respond to the needs of enterprises is crucial. For example, lending facilities fail to work without properly functioning banking institutions.

- Implementation and enforcement of measures

  Enterprises are often poorly informed regarding particular incentive-stimulating measures. During the promotional measures design phase, careful consideration must therefore be given to methods of implementing the measures.

2. Partnership with the Private Sector

As mentioned in Strategy 2, a sustainable prevalence of CP will fail to materialize without expansion of autonomous activity by the private sector. This suggests that proper partnerships must be formed between the public and private sectors, thereby providing an opportunity for the private sector to submit a proposal of necessary and effective promotional measures or to establish a mechanism by which industry associations can disseminate information. For transfer of information and technology from the public sector, proper approaches must be designed to allow effective and efficient transfer to individual enterprises. To this end, entrusting the implementation of government promotional measures to the private sector (as, for example, by entrusting the implementation of a model project to a private company based on a competitive bidding system, or extending loans through commercial banking institutions) will contribute to expanded activity by the private sector.

In addition, in the case of any associations/organizations established for CP or networks installed between enterprises, the associations/organizations or governmental offices, works to not only disseminate information but also conduct dialogue or intermediary between the government and private sector. In fact, external donors have been exerted a great deal of effort to establish CP Centres and/or launch CP Roundtables for different regions/countries.

3. Optimum Approaches for Individual Country Conditions

CP promotional measures must be designed in accordance with the enforcement of environmental regulations and enterprise production control levels in the targeted countries. Thus the design must involve research into the present economic conditions

of the country, the means of enforcement of environmental regulations, and the enterprise production control levels.

(1) Checking the Present Conditions of the Country

The first fundamental step is to assess the conditions of the targeted country. Particularly in terms of cooperation for the development of government policy and strategy, identification of the present conditions of the targeted country is essential in order to identify priority areas and potential limiting factors. The sample checklist below is provided as a reference.

Checklist [1) 2)]

Check Items	
(Government)	
Are there any general national policies in regard to CP or comprehensive plans to promote CP?	
What current or recent regulations and programs affect the adoption of CP? What obstacles have hampered the effectiveness of the existing policies and programs?	
Identify the sectors, key organizations and key individuals that should be involved in a national effort to accelerate the adoption of CP.	
Identify critical problems, and focus on political, human, and financial resources on priorities.	
Is there a good dialogue with the private sector? Form a working group representing the identified sectors and individuals.	
Establish effective external incentives for enterprises.	
Induce all ministries to follow consistent policies.	
Be realistic in drawing up environmental regulations. (Pure coercion has not worked and will not work. Allow adequate time for compliance.)	
Strengthen environmental agencies; develop their technical and monitoring capabilities; encourage them to understand industries.	
(Enterprises)	
Good environmental practice is just good management.	
Focus on plant housekeeping, maintenance and management.	
Involve your staff and workers. (Define clear goals, provide training, and monitor performance.)	
Focus on environmental investments that can be financed out of cash flow.	

(2) Existing Environmental Regulations

Promotion of CP based on existing environmental regulations may be classified into the following four types.

・ Type 1 condition: No, or almost no environmental regulation is present.
At minimum, enterprises must be shown that they can benefit more by CP than by discharging untreated pollutants, even if they do not understand the significance of environmental protection.

・ Type 2 condition : Monitoring for conformity to environmental regulations has progressed to some extent, thus requiring response to the regulations.
In this type, a considerable number of provisions in the environmental regulations may be fulfilled by CP alone. While fulfilling the environmental regulations, enterprises will be understand that CP is more beneficial than EOP. Enterprises must also be made aware that adoption of CP is a Win-Win solution providing both environmental protection and improved management.

・ Type 3 condition : Environmental regulations are in effect and require compliance with special regulations or regulations aimed at toxic substances, and specially rigid regulations have been laid down in response to environmental conditions.
This type requires adoption of both CP and EOP. In this case, adoption of CP contributes to minimum required loads on EOP facilities. This leads to reduction in equipment costs and running costs.

(3) Enterprise's Production Control Level

One of the important considerations in the phase of introduction of CP into individual SMEs involves the production control level of the targeted enterprises. Since it is generally recommended that the first step in the actual adoption of CP should involve a 5S approach or Good Housekeeping, CP must be adopted in accordance with the conditions of enterprise production controls.

Three possible types of enterprises may therefore be involved in adopting CP according to the different levels of enterprise production control.

・Enterprises with almost no production control

For this type of enterprise, before arousing interest in CP, call the attention of the management representatives to control-level improvements, starting by providing information about the significance of the 5S approach, the necessity of productivity-enhancing programs, and the potential benefits of enhanced productivity.

・Enterprises with relatively low production control

To encourage this type of enterprise to be interested in CP, start with providing information on the profit-related benefits as well as the benefits on environmental protection. For this purpose, enterprises must be provided with a wide range of information about CP and encouraged to receive CP training services, thereby gaining the attention of the engineers and top management to the issue of CP.

・Enterprises with at least partially implemented production control and an eagerness to improve

Enterprises of this type are characterized by highly motivated owner-managers and are expected to take the initiative in promotion of CP programs. Provide them with a wide range of information about CP for encouragement, and offer dedicated training and consulting services to help the enterprise facilitate adoption of CP. In addition, support the enterprise to introduce an environmental management system for enhanced management performance.

4. Implementation of Measures in Packaged Form

Implementation of a series of measures in a packaged form will provide better results than separate implementation of individual measures. Two examples of typical packaged measures are shown below as a reference.

Example 1:

Phase	Initial Introduction of CP (Low-Income Country Level)
Aims to be focused on	Improvement of market environment to enhance enterprises' consciousness of cost effectiveness; Events to enhance CP awareness
Measures to be emphasized	(Market mechanism) Reduced subsidies to prices of utilities and raw materials + Privatization or conversion into public corporation of state-owned enterprises + Diversified means for financing including Environmental Fund (Provision of information about CP)

	Setting of strategies to identify priorities + Implementation of demonstration projects + Provision of consulting services for production control (Collection of basic information for environmental regulations) Preparation of inventory of pollution sources (Strengthening the liaison between the government and private sector) Setting up industrial associations; Implementation of dialogue at periodic intervals

Example 2：

Phase	Expanding Introduction of CP
Aims to be focused on	Mechanism to spread the information about CP; Utilization of economic instruments
Measures to be emphasized	In addition to those measures emphasized during the initial introduction phase of CP adoption: (Mechanism to disseminate the information about CP) Networking on CP; Promotion of CP based on sectors; Training of CP consultants (Utilization of economic instruments and promotion of investment) Loans for investment Pollution charges and taxes (Private sector) Adoption of environmental management system in major companies + Voluntary agreement

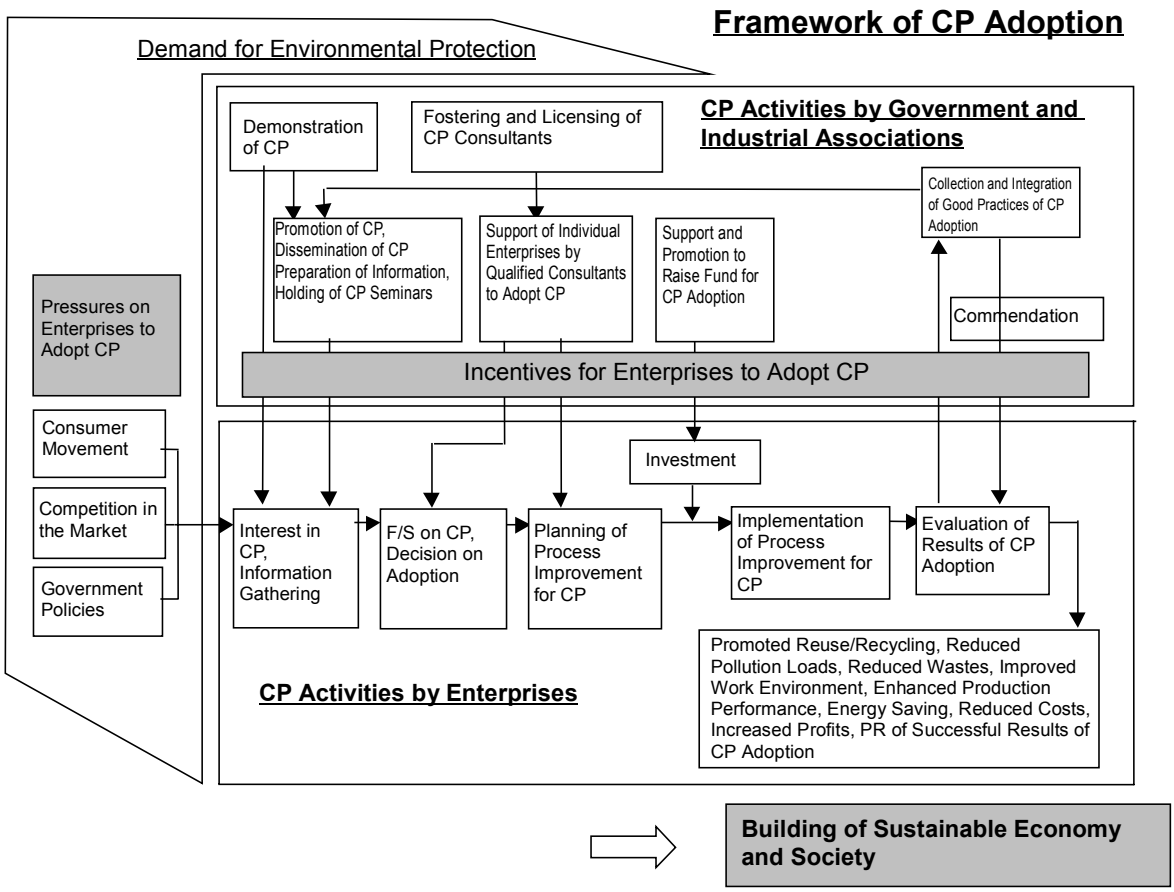
3.3 Description of Cleaner Production Promotion Measures

This section outlines individual measures intended for promotion of CP other than national policies or strategies. Although the promotional measures for CP and industrial environmental management overlap considerably, CP-specific measures are described in Section 3.3.1, and the measures for industrial environmental management are given in Section 3.3.2.

To facilitate the understanding of the descriptions of individual measures, a sequence of steps for adoption of CP by enterprises are first explained. On the part of the enterprises, adoption of CP starts with having an interest in CP, followed by gathering a wide variety of information. Then, for the specific adoption by individual enterprises, consultants or other proper professionals are asked for recommendations regarding the validation of adoption, followed by decision-making and implementation (financing). What motivates the enterprises to take action is none other than the will of their

management as inspired by information relating to CP, competition, incentives to adoption of CP, and market and environmental pressures.

A schematic view of the framework for adoption of CP by enterprises is shown below.



3.3.1 Measures Specific to Cleaner Production

Measures of this type must make up for the lack of three elements — i.e., information, human resources and funds — which have been shown to be the major barriers to promotion of CP based on the experiences of many developing countries (See Section 2.2.). Considerations on these measures are listed below for each of the three barrier elements.

Barrier Elements	CP Promotional Measures*
Lack of Information	・Networking on CP ・Implementation of Demonstration Projects ・Provision of CP Information ・Implementation of Sector-Based CP Promotional Measures ・Establishment of Responsible Agencies for CP ・Formation of CP Centres at National and/or Regional Level
Lack of Human Resources	・Provision of CP Training Services ・Training and Qualification of CP Consultants
Lack of Funds	・Grants/subsidies to CP Consulting Services ・Establishment of a CP Fund

*Some promotional measures apply to more than one barrier element, but are listed only under the most pertinent element.

1. Networking on CP

A CP information network may be set up to connect individual industries, government offices and academic institutions to complement insufficient information in individual enterprises. Individual enterprises can thus draft their own strategies based on information available through the network. The network may be reinforced by working groups established in individual industries or roundtables formed for CP.

2. Implementation of Demonstration Project

For those enterprises having no knowledge of CP or having some doubts about the effectiveness of CP, an effective approach is to demonstrate the benefits CP can offer. The demonstration must proceed based on a sequence of steps in the presence of consultants, auditing of representative processes in terms of CP, a review of possible CP options for adoption, implementation of typical measures, and assessment of results. In this way, demonstration of successful results will provide a powerful incentive to

competitors. In practice, however, an agreement must be reached with the targeted enterprise prior to each demonstration in regard to the permissible degree of information disclosure.

3. Provision of CP Information (Seminar, Informational Magazine, Exhibition, etc.)

Little or slow progress of CP adoption in developing countries may be attributable to any of the following phenomena.

a) SMEs in developing countries are scarcely aware of environmental problems or the possible environmental impacts of the operation of their plants.
b) SMEs have no knowledge of CP.
c) SMEs have little experience in the actual adoption of CP.
d) SMEs have a poor understanding of the potential benefits of CP.

Thus every effort must be made to provide extensive information on CP by means of seminars, training programs, site visits, informational magazines, exhibitions and databases.

4. Implementation of Sector-Based CP Promotional Measures

Because enterprises within particular sectors tend to use the same raw materials and apply similar production processes, sector-based CP promotion measures may have advantage. As evidenced by the CP auditing in Thailand, industry associations may take the initiative as core organizations in sector-based, nationwide audits at representative plants for material balance and energy balance in the presence of consultants to define specific improvement programs while providing the plant staff with training programs during the audit. In addition, government offices, targeted plants surveyed and industrial associations involved may form a working group to achieve better communications between the public and private sectors, thereby facilitating the response to potential problems. This working group sets up a framework for the guidance of enterprises. Within this framework, the public sector supports enterprises in their management efforts for enhanced production performance with a focus on a 5S approach and QC (Quality Control) as well as CP. On the other hand, for measures requiring capital investment, support for financing will be made available. In the end, the successful plants are commended and given wide publicity through mass media. For specific subsectors, planning of an industrial complex or industrial park may be worth considering. As mentioned above, an essential component for sector-based promotional measures is how to form an effective framework.

Based on the early experiences in Czech Republic, a region-based approach may be better for undeveloped sectors.

5. Establishment of Responsible Agencies for CP

For CP promotion by central and local governments, it is recommended that a central responsible agency be appointed and its authority and responsibilities clearly defined. Responsible agencies encourage fostering and qualification of consultants, diagnosis on plants, communication of successful results, provision of information, and prize awarding as a whole, aiming at attainment of the goals of CP programs.

6. Formation of CP Centres at the National and/or Regional Level

To date, UNEP/UNIDO have established successful National Cleaner Production Centres (NCPCs) in 19 countries worldwide. The NCPCs are performing activities such as training and qualification of consultants, implementation of demonstration projects, provision of consulting services and dissemination of information in communication with government agencies responsible for CP. NCPCs may vary greatly in form according to the different conditions of countries targeted, though it is considered effective to establish NCPCs on a central and/or regional base and commit each NCPC to carry out the activities mentioned above for promotion of CP. Each NCPC should become self-supporting within three to five years after start-up.

7. Provision of CP Training Services

It is important to provide education and training services to the top management and engineers of SMEs in developing countries. Trainees include managers and engineers who are involved in planning programs within enterprises, and consultants who offer services to enterprises.

8. Training and Qualification of CP Consultants

CP consultants play an important role in implementing CP. Consultants constitute, so to speak, an operational unit (service provider) engaged in a wide variety of activities for adoption of CP by SMEs, ranging from fact-finding surveys to program proposal and involvement in implementation. To expand services and ensure ready accessibility to suitable services, consultancy services to enterprises must be established as businesses. This will take a prolonged period of time, thus requiring additional supports, such as targeted subsidy addressed in the other promotional measures.

Consultants must be qualified through proper education and training by the NCPC or other relevant institutions. Qualified consultants can then become involved in CP promotional activities.

9. Grants/Subsidies to CP Consulting Services

For SMEs in developing countries, a powerful incentive to adoption of CP can be provided by identifying which CP programs are available for adoption and to what extent these programs will reduce environmental loads and costs. Though the assistance of a consulting service is critical for proper adoption of CP by enterprises, consulting services will not initially be lucrative as businesses, since CP is not currently popular among industries. For this reason, subsidies or grants may be considered useful to support services of this type. Ultimately, consulting services should be commercially based, so subsidies or grants should be provided in a manner consistent with the principles of a market economy.

10. Establishment of a CP Fund

As a solution to any difficult access to bank loans or other such financing, and also as an additional incentive to encourage investment in CP, establishment of a CP Fund can be considered a useful means of financing. In the Czech Republic, a revolving-type CP Fund was established in 1998 to promote investment in CP and succeeded in accelerating the adoption process. On July 1, 2000, this fund was transformed into a BAT (Best Available Technology) Fund. Details of the Czech CP Fund are as follows:

- Fund size: Approx. US$1,700,000
- Lending conditions: Interest 7%, Lending terms 8 years (20% and one year or less respectively in the market)
- Maximum credit: US$ 100,000
- Eligibility: Financial standing is assessed by the Fund and technical aspects are assessed by qualified CP consultants at the request of the CP Fund

Utilization of the CP Fund should be temporary and limited to justifiable cases contributing to accelerated environment improvement. Because environment fund-based financing could profit enterprises discharging pollutants unless eligibility is properly understood.

3.3.2 Measures for Industrial Environmental Management

This section discusses available measures for industrial environmental management related to CP. During the consideration of environmental protection measures, most

will be found to work favorably for promotion of CP adoption, and then these same approaches can be considered as measures for industrial environmental management. The approaches can be divided into four categories: economic instruments, direct regulations, framework regulations and voluntary approaches.

- The economic instruments either impose a financial burden on the targeted entity or afford a financial incentive to the targeted entity to encourage favorable action or restrain unfavorable action, thereby minimizing possible loads on the environment.
- Direct regulations prescribe, by legislative and regulatory rules, the musts or don'ts and criteria to be followed in relation to environmental targets. They also impose financial and/or social penalties in the case of any action that violates the rules. This approach has the advantage of uniform control of a given action through commands, controls and penalties.
- Framework regulations define rules for processes and procedures to be followed based on legislative regulations for regulatory compliance. Within this framework, economic entities and citizens are encouraged to independently and voluntarily make every effort for environmental protection.
- Voluntary approaches refer to the voluntary actions of individual enterprises, including agreements between the public sector and individual sectors or individual enterprises, industrial codes of practice, and voluntary programs.

Measures for industrial environmental management relating to CP can be summarized as shown below according to these four approaches.

Type	Measures for Industrial Environmental Management*
Economic Instruments	・Pollution charges and tax ・Preferential tax treatment ・Financing of investment ・Grant/subsidy to investment ・Diversified means for financing including Environmental Fund ・Reduction of subsidies to utilities and raw material prices ・Establishment of an emissions trading market ・Green procurement ・Financial assistance to R&D ・Privatization of state-owned enterprises
Direct	・Regulation on emissions

Regulations	・Monitoring, registration and disclosure of emissions from enterprises ・Inventory of pollution sources ・Assignment of pollution and energy control managers
Framework Regulations	・Pollutant Release and Transfer Register (PRTR)
Voluntary Approaches	・Environmental Management System (ISO14000 Series, etc.) ・Environmental performance assessment ・Voluntary agreement ・Setting industry associations ・Joint treatment and recycling of wastes ・Prize-awarding ・Consumer pressure

*Some environmental protection measures apply to more than one element, but are listed only under the most pertinent element.

1. Economic Instruments

Economic instruments include Taxes, Pollution charges, Subsidies, Preferential tax treatments, and Deposits. For large-scale pollution sources for which the sources of pollution are easily identifiable — such as power stations, smelting works, and ironworks — regulating measures may be effective. But for medium and especially small-size pollution sources, which tend to be numerous and scattered over a wide area, stringent enforcement of regulating measures is often difficult. For the latter case, economic instruments may be more suitable. In practice, however, there are only a limited number of reports on economic instruments that have been applied in developing countries.

(1) Pollution Charges and Tax

Pollution charges (including taxes) can be imposed on emissions or products; they can be levied as a fee for service or a fine for noncompliance, or as part of a broader levy such as a national energy tax. Pollution charges can be levies on actual source emissions, estimated emissions or products whose use or disposal is linked to pollution. The design of pollution charge programs entails many compromises between the advantages and shortcomings of direct and indirect instruments. The revenue-raising function of pollution charges makes this instrument appealing to environmental policy makers.[1)]

On the other hand, it should be noted that there is some controversy regarding the limiting of pollution charges to environmental protection objectives, since charges for specific purposes might cause inefficiency in the taxation system and result in rigidity of expenditures.

CP should be an effective approach in cases in which enterprises attempt to reduce the emission of pollutants with the intention of reducing the payment of charges.

Whether pollution charges can bring satisfactory results depends on the balance of the fee level against pollution control costs. The charge system on wastewater pollution in China is reportedly effective, though some problems have been revealed.[3)]

(2) Preferential Tax Treatment

Preferential tax treatment could be specially considered in the phase of adoption of a CP program requiring capital investment, though the facilities covered must be identified. It is difficult to discriminate between investment for CP and investment for the usual production-process improvements, and thus it is difficult to design any preferential tax treatment specifically for CP. An easy-to-handle approach is therefore to integrate preferential tax treatments with those for sophistication of facilities, pollution control or other appropriate purposes.

In practice, some developing countries have a problem with collection of taxes. And of course, in the absence of relatively dependable tax collection, preferential tax treatment fails to work properly.

(3) Financing of Investment

To allow financing for the CP investment, the private financial sector must first be functioning properly. Second, an appropriate systematic environment must exist with respect to accounts keeping, obligations acts and bankruptcy acts. SMEs face various

problems involving insufficient security, failure to establish personal credit, and failure to properly complete loan application forms, any of which can result in limited access to funds.

Investment for CP is difficult to discriminate from that for the usual production-process improvements, and thus it is difficult to design loans specifically for CP. An easy-to-handle approach is therefore to integrate loan lending facilities with those for sophistication of facilities, pollution control or other appropriate purposes, with requiring CP assessment .

The World Bank and other institutions have pointed out that direct credit providing preferential interest rates generally causes a distorted market, whereas the World Bank has reported that direct credit financing programs have had few adverse effects on fund allocation, and in fact might have been useful for some East Asian countries. This suggests that supply of two-step loans (TSL) by environmental ODA requires the design of an appropriate system with respect to targeted areas, interest rate levels and intermediate financial institutions. Such design will allow the TSL to complement private-sector funds, based on identification of the present conditions of the financial market and industries in the targeted countries. TSL, if supplied with due consideration as described above, could be effective for the promotion of CP adoption.

Technical support for assessment and diagnosis of the CP program and completion of application forms for loans for CP investment might be supported by subsidies or grants.

(4) Grants/Subsidies to Investment

Because subsidies for CP investment can cause market distortion, they should be used only in limited cases in which the target is clear and considerable external profit is anticipated.

(5) Diversified Means for Financing, including Environmental Fund

In cases in which there is need of investment in a specific sector, but difficult access to bank loans or other such financing, the establishment of a fund is a good option. (For CP Fund, refer to Section 3.3.1.)

When the environmental fund has a grant portion for technical assistance programs, it could be allocated for assessment and diagnosis of CP and completion of application loan forms for CP investment.

If enforcement of environmental regulations fails to be promoted in conjunction, the environmental fund may not work effectively. In addition, it is essential to define and monitor definite environment improvement goals and properly schedule the termination of the environmental fund.

(6) Reduction of Subsidies to Utilities and Raw Material Prices

Where petroleum, coal, natural gas, electricity, water supply and other such utilities and raw materials are controlled at lower-than-market prices as a result of government subsidies, energy saving, resource saving, and/or enhanced productivity can offer only limited economic benefits, thus providing little incentive to adopt CP. It then becomes essential to create increased incentives for adoption of CP in order to reduce these subsidies and bring the prices closer to the market values. This will also help remove the fiscal burden on the government of the developing country.

In Bulgaria, an energy-saving program was once carried out. The program called for energy diagnoses at individual plants, followed by advise of corrective action and imposition of penalties in the event of noncompliance. In actuality, however, energy was supplied at lower prices under a planned economy, and thus plants did not fully recognize the need for energy saving. As a result, the diagnosis program was abolished in 1991.

A utility price policy affords a powerful incentive to enterprises and top management who are sensitive to varying utility prices, and thus can be a very effective approach. On the other hand, increased utility prices have a major impact on the entire economy and society—especially on the cost of living of the citizenry—as well as on the international competitiveness of enterprises. Thus, a utility price adjustment policy should be applied only after giving careful consideration to the possible impact on the society, industrial policy and price policy.

(7) Establishment of an Emissions Trading Market

Trading of sulfur dioxide emissions has already been put into action in the US. Trading of rights to emit global warming gases is currently under discussion in regard to the possible creation of a specific market. Such emissions trading is a way of matching the market economy. In order to adopt a CDM (Clean Development Mechanism) for greenhouse gas (GHG), developing countries expect investment and technical assistance from the developed countries. There is no agreement on the CDM yet, though trading of reduced emissions of GHG will, when realized by use of CDM, promote the implementation of CDM-based projects in developing countries.

At present, there is no market established for trading of emissions in developing countries, though trading of emissions is often discussed as a solution in heavily polluted regions.

Trading of emissions requires fair and accurate assessment and monitoring of emissions, and thus it will target such emissions that readily allow fulfilment of the requirements.

(8) Green Procurement

With increasing awareness of environmental protection worldwide, the international market shows an increasing tendency to value environmentally friendly enterprises highly. Such enterprises are very well regarded and considered less liable for environmental problems. Because of their adoption of green procurement guidelines emphasizing environmental protection through the purchase of environmentally friendly materials and parts, they are given a privileged position for investment. In addition, in response to the recent trend of increasing introduction of supply-chain management systems, the CP promoting enterprises are given an advantageous position as suppliers. At present, multinational corporations are becoming particularly eager to introduce green procurement, and an increasing number of suppliers in developing countries have taken steps to obtain ISO 14000 certification.

(9) Financial Assistance to R&D

For possible financial benefits by CP, from the standpoint of the market economy, any R&D should be implemented in principle by private enterprises at their own risk. In developing countries relying on imports of equipment and materials, development of technologies suited to the local requirements is important, though there are very few opportunities available for R&D due to limited funds and human resources. Thus reliance on the private sector alone does not always lead to accelerated R&D. In such cases, a more favorable approach is to entrust any public agency—or, if this is not possible, any R&D institution formed by several enterprises—with implementation of an R&D program using funds from the government. This approach offers the advantage of possible introduction of equipment suited to the local conditions, which contributes to promotion of the environmental equipment industry in the involved countries. This advantage, however, may not be expected in countries faced with a lack of R&D competence or a shortage of human resources.

(10) Privatization of State-Owned Enterprises

State-owned enterprises face numerous problems with both environmental management and business operations. Based on government policies and/or pressures to improve management performance, state and publicly owned enterprises in many countries become increasingly privatized or are converted into public corporations. However, even the state-owned enterprises must be encouraged to adopt CP by abolishing excessive protection and regulation and leveling the playing field with private competitors. In addition, it may be a good idea to include CP assessment in any privatization project of a state-owned enterprise.

2. Regulation

(1) Regulation on Emissions

Regulation on emissions involves many challenges, such as how to properly select standard values and how to enforce proper regulatory compliance. Most developing countries have tended to select the standard values by referring to those adopted by WHO and/or developed countries, though they face many problems with enforcement of regulatory compliance. On the part of pollution sources, for strict regulatory compliance, proper control of production processes and treatment facilities is required as well as an appropriate level of operational control capability. On the part of government, monitoring for regulatory compliance is indispensable, and should involve a high level of expertise based on scientific methods, which becomes a considerable burden to developing countries. This often causes simplified or neglected procedures and a resultant breach of regulatory compliance in developing countries.

Regulation on emissions will be a powerful incentive for adoption of CP as long as it is properly enforced. In practice, however, as mentioned above, the enforcement often involves many potential problems, and thus industrial environmental management cannot be relied solely on emission regulations.

(2) Monitoring, Registration and Disclosure of Emissions from Enterprises

Proper environmental protection requires monitoring to understand the present condition of the environment and emissions to the ambient air and water, checking for proper compliance with the regulation standards and keeping of accurate records. It also involves an important component in the allowable extent of disclosure of these records. At present, results of environmental monitoring may be referenced in some

cases on the web sites of individual government offices, though information about the emission from individual sources is seldom accessible.

The disclosure of data on the discharge of pollutants and compliance with emission standards by individual enterprises should encourage proper regulatory compliance among enterprises, while encouraging the government to provide guidance. In this way, disclosure of information is expected to provide what is called risk communication. This affords a powerful incentive for adoption of CP. In actuality, however, such information disclosure may fail in the absence of committed government involvement, awareness of environmental issues among residents, agreement of enterprises to information disclosure, and other prerequisites.

(3) Inventory of Pollution Sources

Identification by the government of possible pollution sources is a basic requirement for selection of proper environmental measures. For this purpose, monitoring data on emissions from enterprises and administrative data from various regulatory submissions must be reviewed to draw up an inventory for the pollution sources in the targeted area. This approach will put pressure on the enterprises to introduce proper environmental measures. This allows identification of possible environmental impacts by pollution sources, provides fundamental data for enhancement of environmental monitoring and prevention of accidental environmental pollution, and facilitates the planning of on-the-spot inspection programs.

(4) Assignment of Pollution and Energy Control Managers

In the case of individual enterprises, an effective approach is to assign a pollution control manager responsible for the control of environmental loads, thereby contributing to an improved consciousness and morale in the enterprise. This approach is a key factor for adoption of CP.

In Thailand, approximately 2000 enterprises whose size exceeds a designated value are obliged to assign an Environmental Supervisor. In the Philippines, a Pollution Control Officer System is enforced.

Thailand also has a similar system in regard to energy: those enterprises whose energy consumption exceeds a specified limit are designated as Energy Control Facilities, and are obliged to employ a legally qualified energy control manager,

thereby taking the lead in energy conservation.

(5) Pollutant Release and Transfer Register (PRTR)

The PRTR is a framework regulation approach, involving the submission of reports describing the release and transfer of any pollutants as a preventive measure. PRTR is used in cases where establishment of uniform standards is difficult because production methods, usage of raw materials and technical characteristics vary according to the type of business, or where the cause-and-effect relationship of pollution is unclear or widely diverse. Introduction of such regulatory submissions encourages voluntary environmental efforts by the enterprises, thus providing a key element for adoption of CP.

3. Voluntary Approach

For enterprises in developed countries, voluntary measures for environmental protection constitute an essential component of business administration, such that business does not pay without consideration given to environmental protection. Little by little, the trend has begun to spread to developing countries as well.

(1) Environmental Management Systems (ISO 14000 Series, etc.)

Introduction of the ISO 14000 Series is expected to bring enhancement of environmental management and production control, while possibly providing financial benefits and boosting international competitiveness. However, ISO 14000 certification may be difficult to acquire in the absence of certain prerequisites—i.e., that a certification/registration body and/or consultants supporting the acquisition of ISO certification exist, and that enterprise management has reached an acceptable level.

Some reports indicate that the management required by the ISO 14000 Series is more complicated and sophisticated than in the case of CP. For this reason, it may be that CP should be considered first, before ISO certification. On the other hand, introduction of an ISO-certified management system helps facilitate the introduction of environmental accounting, Life Cycle Assessment (LCA) and Green Procurement.

(2) Environmental Performance Assessment

Environmental Performance Assessment involves actions related to determination

of energy balance and material balance (CP Audit) as a first step toward the adoption of CP, and thus serves as a starting point for planning of quantitative programs. Quantitative determination of pollution loads on the environment, if possible, will facilitate a more accurate understanding of specific impacts on the neighboring environment, and thus allow the proper planning of actions to minimize these impacts. This type of quantitative understanding and assessment also contributes to enhanced production control.

(3) Voluntary Agreement

Voluntary Agreement involves an agreement on environmental protection between an enterprise and relevant local governments or local residents in the vicinity of the enterprise. In theory, this ensures cooperative and harmonious relations with the communities, thereby encouraging the enterprise to define its attitude on environmental protection. In practice, it needs enterprise's will the enterprise to bring the agreement to a conclusion, as a too-stringent agreement might affect its management performance. Fulfillment of the agreement may require adoption of CP.

(4) Setting Industrial Associations

A CP-related information network may be formed in individual industry sub-sectors to allow each enterprise to exchange information, thereby compensating for insufficient sources of information, and allowing enterprises to develop their own strategies based on the obtained information. Because subsector-based networks tend to have similar responses to environmental management, they will share information fairly readily. However, it may be difficult to form such networks unless there is consensus regarding the teamwork and cooperation of industry associations to be involved in the information exchange.

(5) Joint Treatment and Recycling of Wastes

Adoption of joint (collective) treatment plants contributes to substantially reduced treatment costs, and assists any enterprise to solve the problem of failure to incorporate proper treatment facilities due to insufficient techniques and/or funds. In addition, in the case of treatment plant operation, the operation and engineering staff may be reduced, and more efficient wastewater treatment may be feasible depending on the

combination of effluents. In practice, however, joint treatment generally involves a difficulty unless targeted effluents from the same subsector (e.g., metal plating, dyeing, or food processing).

To promote recycling of wastes among enterprises, recyclers must assume the responsibility of upkeeping and improving recycling plants and allowing the reuse of wastes as raw materials. Any regulation on waste management will encourage the need for upkeep and improvement of recycling plants in accordance with the regulations.

(6) Prize-Awarding

Prize-awarding is an effective incentive that publicly recognizes successful results via the various workshops and organizations for widespread promotion of CP. This not only allows the commended enterprises to rank high but also encourages the commending institutions to work more actively.

After increasing the energy-saving efforts by individual enterprises, prize-awarding will support energy engineers and help to horizontally expand energy saving techniques through such initiatives as annual case-study seminars that publicize the success of energy saving programs. In a similar vein, it may also be useful for governments to officially recognize those engineers who achieve successful results in energy saving.

(7) Consumer Pressure

There is an increasing need for environmentally conscious products and production processes, and especially among the consumers and NGOs in developed countries. To meet this need, a review will be made on the products and production processes including CP. As an alternative trade, various activities have been initiated for the import/export of eco-friendly products and services. In addition, the practice known as eco-labeling, which allows identification of eco-friendly products, has gradually begun to spread through industrial countries and such developing nations as Thailand. In these regards as well, the adoption of CP is expected to be an effective measure.

3.4 Collaboration among Organizations Involved in Japan

Such an approach is practical that allows sharing of information with consideration given to which form of collaboration is feasible in which case. An important element involves sharing of information among the local offices. Close collaboration will also be accelerated by disclosure of information by relevant organizations.

3.4.1 Significance of Collaboration

The first necessity is a comprehensive approach. Corporate activities involve the capabilities and actions of three parties: the government offices, organizations such as industry associations, and financial institutions and enterprises playing a major role in economic activities. Thus, for effective provision of cooperation to developing countries, extended consideration must be given to the problems these three parties face in allowing consistent inputs. On the other hand, organizations involved in Japan are differentiated according to subdivided capabilities and/or specialties, and then they must be encouraged to share the objectives for comprehensive cooperation. In addition, cooperative PR efforts will help convey the effectiveness and availability of cooperation throughout Japan.

The second necessity is the effective utilization of resources in Japan. There are a limited number of organizations and resource professionals who can provide the needed CP knowledge and expertise. In the case of international cooperation in particular, the available resources in Japan are limited. In this context, collaboration will help reduce inefficiency due to duplicated cooperative projects and the struggle for supporting resources.

Third, the sharing of experiences and information is key. There are many developing countries and the circumstances of their private sectors vary greatly. It is thus inefficient for individual organizations to attempt to gather information and/or accumulate experience separately. Sharing information and experience will contribute to reduced costs and enhanced quality of cooperation by the individual organizations involved.

And fourth, transparency must be ensured. Collaboration will enhance the transparency of which involved organizations can provide which type of cooperation. This will help the Japanese people to better understand international cooperation and will

also increase the benefit to recipient developing countries.

3.4.2 Methods of Collaboration

As mentioned in Section 2.4, organizations involved in Japan, especially those responsible for implementation of economic cooperation, are engaged in the promotion of CP in developing countries in a wide variety of positions based on their own foundation objectives. Although such organizations may favor collaboration in principle, their actual reactions will vary on a case-by-case basis. Thus, for promotion of collaboration, such an approach is practical that allows sharing of information from accumulated specific attempts.

In order to accumulate specific cases, individual relevant organizations must first mutually understand the specialties and functions of the other parties. It is important to identify missions, functions, specialties and cooperation tools available for collaboration, as well as allowable financing ability and the flexibility and scale of possible cooperation. In the field of industrial environmental management, electronic operation of an council for the Green Aid Plan is under consideration by the Ministry of Economy, Trade and Industry. This will be accelerated by the effort of involved organizations to grant greater public access to information (including, for example, disclosure of information of individual projects on the web site). In addition, aiming at future cooperation with developing countries, such an approach may be effective that integrates various Japanese support projects for environmental protection in a well marketed package that enhances the appeal of the Japanese cooperative effort and the impact on external donors.

This Committee is composed of major Japanese organizations involved in CP, and thus it is important to continuously ensure opportunities for exchange of information and opinions even after the conclusion of the Committee. In addition, the Committee should be effective in helping to realize the Consolidation of Japanese Experience discussed in the above section on strategies.

Another effective approach will be the sharing of information among the local offices of JICA, JBIC, JETRO and other relevant Japanese organizations which serve as a liaison with developing countries. JICA drafts an annual country program for recipient countries, and the Green Aid Plan program has just started to issue basic action plans for individual recipient countries. These approaches will facilitate the exchange of information about

specific projects at the local level. Further, in the discussions with recipient countries, attendance by Japanese organizations with relevant project plans will strengthen the appeal of Japan's cooperative efforts. Sharing of information will also occur by visiting the local offices of other Japanese organizations during the dispatching of missions from Japan. This will also allow sharing of information among the specialists and missions dispatched by JICA, JETRO and the like, thereby contributing to enhanced efficiency even in the phase of project implementation.

(Reference)

1) World Bank, Pollution Prevention and Abatement Handbook, 1998
2) Warren J. Evans, A Practical Handbook For Policy Development And Action For The Promotion Of Cleaner Production, UNEP's 6th International High-level Seminar on Cleaner Production, October 2000
3) World Bank, Pricing Industrial Pollution in China: An Econometric Analysis of the Levy System, 1996