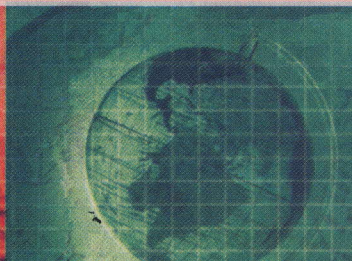
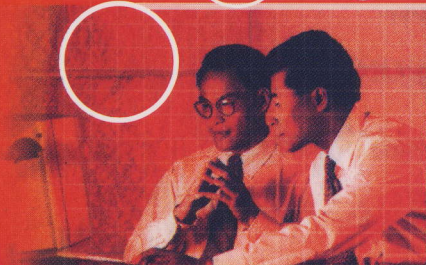




DEPARTMENT OF ENVIRONMENT
Ministry of Natural Resources and Environment, Malaysia

CLEANER PRODUCTION BLUEPRINT FOR MALAYSIA



Cleaner Production Blueprint For Malaysia



DEPARTMENT OF ENVIRONMENT
Ministry of Natural Resources and Environment, Malaysia

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TABLE OF CONTENTS	PAGE
Cleaner Production Blueprint for Malaysia	
Foreword	ii
1. CP in Perspective	1
2. Rationale of CP Blueprint	2
3. Strategic Plan for Action	3
3.1 CP Action Plans	3
3.1.1 CP Action Plan: Formulation of National Policy	4
3.1.2 CP Action Plan: Educational and Awareness Campaign	7
3.1.3 CP Action Plan: Establish of Networking and Dissemination of Information	8
3.1.4 CP Action Plan: Training and CP Audit	10
3.1.5 CP Action Plan: Incentives	12
3.1.6 CP Action Plan: Strengthen Regulatory-Policy Framework	12
3.1.7 CP Action Plan: Capacity Building	14
3.1.8 CP Action Plan: CP Coordination Centre	19
4. Regulatory Framework	20
5. Incentives	21
5.1 Present Incentives that can be used for CP Investment	21
5.2 Present Grants that can be used for CP Investment	23
5.3 Economic Instruments	24
6. Conclusion	26

FOREWORD

Cleaner Production (CP) is synonymous with best practice environmental management. It is the continuous application of an integrated preventive environmental strategy applied to processes, products and services to increase overall efficiency and reduce risks to human and the environment.

The Department of Environment (DOE) is the main regulatory agency in the country to enforce the Environmental Quality Act 1974 and its subsidiary legislations. Its main responsibilities are to prevent, control and abate environmental pollution. Thus serious steps have been taken to control industrial pollution mainly through the use of "end of pipe" technologies and enforcement of prescribed standards.

And in recent years, DOE has progressively focused its attention to yet another environmental management strategy, which is the cleaner production concept to try to reduce the quantity of effluents and emissions being discharged as well as to achieve efficient use of raw materials and energy.

As part of the efforts to steer industries towards adoption of more efficient waste management and cleaner production technologies, the Department of Environment (DOE) with the cooperation of SIRIM has embarked on a study of implementation of CP in Malaysian industries in 2002. The study involved a survey of waste management and overview of existing situation in several industries. Some industries were selected for actual CP implementation.

The study was then continued in 2003 by the appointment of Universiti Technology Malaysia (UTM) experts to develop a national program and action plans for promotion of cleaner production in Malaysia.

The study is designed towards finding the conceptual framework for the promotion and implementation of CP in Malaysia, including (Small and Medium Industries (SMIs). The overall objectives of the study is to formulate, establish and develop a comprehensive "National CP Promotion Program" for Malaysia that encompass strategic and action plans for the promotion of concept and practices of CP and diffusion of cleaner technology in Malaysia. The study also addresses the need for CP technologies in priority manufacturing industrial and other related economic sectors of the country and amongst the SMIs.

DATO' HAJAH ROSNANI IBARAHIM

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Cleaner Production Blueprint for Malaysia

'Cleaner Production Blueprint for Malaysia' will be the basis for future policy document in the implementation and presentation of CP practices in Malaysia.

1. CP in Perspective

Rapid industrialisation in Malaysia requires a National CP Blueprint for its sustainability. In the Malaysian's Outline Perspective Plan Three (OPP3), the importance of CP has been clearly recognised. In specific, it touches on the utilisation of energy and materials, and pollution intensity per unit of production resulting from industrial-urban based growth and development that has been identified as a national environment-related issues. A critical challenge is then to reduce the energy, water, materials, pollution and waste intensity of urban-industrial economic activity. As such, corresponding policy, agenda or focus, action plan and activities need to be formulated to bring efforts to reduce industrial pollution and to promote and spread CP principles and practices, to achieve higher level of environmental performance.

The Blueprint presents eight strategic action plans to address the implementation of CP, and its required regulatory, policy and financial commitments. While it is generally recognised that Malaysia has strong economic foundation, the most urgent and critical need is to improve the existing framework to meet the requirement of sustainable development and globalisation. The drive towards sustainable development and globalisation has also brought into focus the product life-cycle, incorporating its production modes, as well as product quality.

There is also an urgent need for Malaysia to establish a National CP Blueprint for the promotion and implementation of associated activities on CP, while rectifying inherent and improving weaknesses in the existing framework, in particular, coordination and integration of various policies, strategies and activities, which are already in place at various agencies. This should set the phase for the next stage of Malaysia's industrial development.

The benefits of adopting and implementation of the CP Blueprint are as follows:

- Reduce production costs through greater efficiency in the use of raw materials;
- Increase productivity and often improve product quality;
- Reduce energy consumption and achieve higher energy efficiency;
- Good profitable return on investment, savings in capital costs;
- Compliance with governmental regulations and enhance public acceptance.

2. Rationale of CP Blueprint

- CP is an effective management tool for improvement of productivity enhancement and profitability, as well as environmental conservation.
- CP promotes continuous application of an integrated preventive strategy to processes, products and services, which in return, improve eco-efficiency and reduce risks to human and the environment. This concept overlaps the concepts of pollution prevention, waste minimisation, cleaner technology, eco-industrial engineering, industrial ecology design for the environment, life cycle analysis, green technology, and green accounting, etc.
- CP component activity is able to support the present initiatives by the Malaysian Government in preventing, minimising and control of industrial environmental pollution problems through legislative approach. In the past, the Malaysian Government has adopted the "end-of-pipe" approach in industrial pollution control, in which human resource capital and environmental resources are invested in pollution discharge control at the end of the production line to meet the regulatory requirements. The emphasis of the approach has many limitations, primarily not providing incentive for further environmental protection initiatives, as well as - indirectly - discouraging industries from implementing cost-effective control measures.
- CP implementation could substantially reduce, and in certain cases eliminate industrial pollution.
- CP could also significantly reduce cost through higher production and more efficient resource utilization, and by reducing the cost of waste treatment and disposal.

- CP implementation will improve the public image of industrial sector in Malaysia, thus increase the product competitive at global market.

3. Strategic Plan for Action

The Blueprint shall set a clear direction on the strategic action plans to be taken. Although the measures and line of actions are grouped into separate categories, it is useful to bear in mind that there are highly interrelated rather than falling into watertight compartments. The successful implementation of one set of measures under a particular objective will also have beneficial effects on meeting the other objectives.

In order to effectively implement the CP Blueprint, a comprehensive strategic plan for action is needed. The strategic plan is based on the following aspects:

- Productivity-driven improvement
- Enhancing competitiveness of SMLs a global market
- Addressing technological know-how among SMLs
- Achieving sustainable development

The main components of the strategic plan for action are as follows:

- Formulation of National Policy
- Educational and Awareness Campaign
- Networking and Dissemination of Information
- Training and CP Audit
- Incentives
- Strengthen Regulatory - Policy Framework
- Capacity Building
- CP Coordination Centre

3.1 CP Action Plans

The promotion and implementation of CP by the industries require comprehensive and concerted efforts by various agencies. An effective method for the implementation of CP can be realised by the formulation of Action Plan which place strong emphasis on implementation, their time schedule and the objectives needed to achieve specific targets. The Action Plan provides the implementation guide and forms the milestone whereby lead agencies can immediately undertake to prepare the budgets and allocation of human resources.

The Action Plan for CP is aimed at enhancing business activities through environmental protection and adopting CP. The main features of Action Plans consist of:

- Specific proposed actions
- Target output and objectives
- Year of implementation
- Identification of lead and support agencies
- Specify time frame of action

The Action Plans were formulated to consist the following specific tasks and projects: covering the aspect of policies, awareness, information dissemination, training and audits, incentives and regulatory requirements. The Action Plans are listed below:

3.1.1 CP Action Plan: Formulation of National Policy

The success of any policy is normally dependent on the involvement of four major parties, i.e. Government agencies, private enterprises, non-governmental organisations (NGOs) and the general public. The Government agencies are responsible as policy implementation and regulation, and these functions correspond to private enterprises' aspiration and expectation. On the other hand, the NGOs are the environmental vanguard to sustain a balanced implementation of any CP policy. The general public, in addition, will be able to guide or give feed back on the policy implementation and deficiencies.

In general, the formulation of CP national policy requires four main items, as follows:

i) Formulation of institutional strategic action plan

The national policy on CP requires integration and cooperation among Government agencies, which are presently responsible to manage sustainable environmental protection and industrial development. In this scenario, there is a need to formulate an institutional strategic plan which specific objectives, i.e.:

- To promote and implement CP at institutional level;
- To clarify the roadmap & responsibility of relate organizations.

The strategic action plan requires a policy document (CP blueprint for selected industries) and incorporate CP policies into existing manufacturing practices.

ii) Formulation of CP national policy

The formulation of a CP National Policy is critical to illustrate the commitment of the Government and private sectors to implement CP practices. The specific objective is to promote and implement CP in an integrated manner. The CP National Policy will form the blue-print for the Government to establish a transparent mechanism to genuinely implement a practical approach in CP.

CP policy will provide a clear guideline on procedure, implementation and incentives available to the industries.

iii) Strengthening the existing legal framework

Incorporating CP requirements into the existing regulations would enable immediate application of recommendations made in this study and products developed herein.

The existing regulations of relevance are:

- Environmental Quality Act 1974
 - Environmental Quality (Sewage and Industrial Effluents) Regulations 1979
 - Contravention licence
 - Licence to operate
 - Environmental Quality (Environmental Impact Assessment) Regulations 1987
 - Environmental Quality (Scheduled Wastes) Regulations 2005

In order to evaluate the proposed industrial project, "CP Tech-Database" need to be establish for getting feedback pertaining to the proposed project. The review will be carried out by Department of Environment (DOE) together with the expert panel as illustrated in **Figure 3.1**.

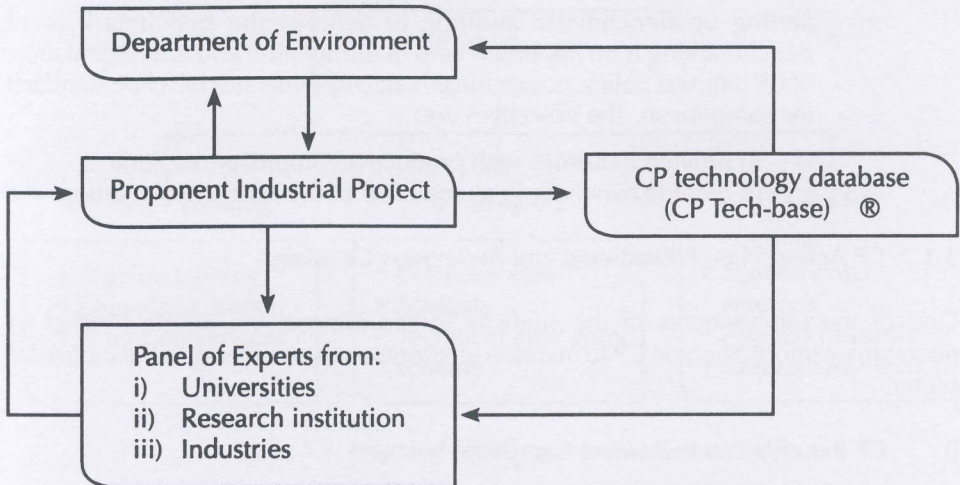


Figure 3.1: Procedure to review proposed industrial projects by DOE

- Industrial Coordination Act (1975)

This Act ensures an orderly development and growth in the manufacturing sector. It could also be enhanced to include CP technologies. In specific, ICA is being for approval of industrial projects; hence it could also conveniently amended to incorporate CP application.

- Promotion of Investment Act (1986)

- Income Tax Act (1967)

- Customs Act (1967)

- Sales Tax Act (1972)

- Excise Act (1976)

- Free Zone Act (1990)

These Acts in one way or another influence the funding of manufacturing sector, and changes or amendment incorporating CP applications could be relatively convenient to introduce.

- Setting up benchmark: auditing to achieve the benchmark level
Benchmarking is an important item in formulation and implementation of CP national policy. In specific this activity generates baseline standard for comparison. The objectives are:
 - To provide industries with productivity improvement indices
 - To provide benchmarks as indicator of the CP implementation

3.1.2. CP Action Plan: Educational and Awareness Campaign

One of the requirements of the study is to recommend the efforts needed to disseminate information on CP to increase environmental awareness in the industrial sector.

i) CP Benefits and Incentives Campaign

Continuous and concerted efforts are needed to raise awareness in both corporate boardroom and industries about CP. One example is to campaign on the benefits of good housekeeping, which is cheap and fundamental basis for CP implementation. The campaign should emphasize that losses in the production processes can be reduced through simple data collection and meticulous daily control of losses thus identified.

Information dissemination on CP must be continuous to instil interest among the corporate managers. Methods of information dissemination include newsletters, TV programs, newspaper articles, seminars and workshops, information database and establishment of a website in the internet.

ii) Pilot CP Implementation

To ensure the success of the implementation of the CP by the Department of Environment, a pilot CP implementation or a demonstration programme is needed. The pilot CP implementation using a few chosen industries would be an effective method in convincing corporate managers to carry out CP in their organizations. A pilot or demonstration programme would be composed of a study tour to a relevant pilot factory and a seminar to disseminate the results of the programme. A corporate manager would learn more and would also be most encouraged when shown a successful demonstration programme adopting CP measures. The success would even be more relevant if successful demonstration programme is in the same business.

The proposed seminar could be used to disseminate information and data collected in the demonstration project. The information and data would include:

- Incentives used successfully in the project;
- CP options recommended;
- CP measures successfully implemented;
- Benefits reaped by the demonstration project using the CP measures.

The implementation of pilot or demonstration projects for the various industries would need some financial grants from the government or international organizations.

3.1.3. CP Action Plan: Establish of Networking and Dissemination of Information

The creation of a network should be initiated immediately after the inception period. The network is based mainly on the trade and manufacturers' associations, government agencies, foreign organisations, financial and other relevant institutions. The networking activities are implemented to establish linkage for the dissemination of information and for marketing purpose. These are intended to serve purposes which include, among others, direct mailing of marketing materials, organising seminar and workshop, distribution of brochures and newsletters, arrangement of visits, questionnaire survey, etc.

Proposed Action:

- Setting up of CP demonstration projects
- Enhance CP networking
- National CP roundtable

i) Setting up of CP demonstration projects

This will assist in highlighting the benefits of implementing CP options through CP demonstration projects and case studies. The objective is to raise corporate managers' awareness concerning CP. The target outputs are as follows:

- Prepare a new funding scheme for demonstration projects
- Campaign for the CP audit and conduct audit
- Campaign for the CP demonstration project scheme
- Select model factories from targeted factories for CP audits and implement CP measure at selected model factories
- Conduct demonstration activities including information dissemination on effective CP measure implemented and benefits achieved by CP measure and project assessments

Implementing Agencies involved are SIRIM (as Lead Agency), Economic Planning Unit and DOE. It is hoped that the agencies could work out a new funding scheme for demonstration project scheme. In collaboration with CP consultants, SIRIM will endeavour to conduct CP audits and demonstrations.

ii) Enhance CP Networking

The objectives are to enhance the efficiency of awareness raising and information dissemination in CP. The target outputs are:

- Establish a forum on regular or non-regular basis
- Prepare and distribute materials on CP case studies, incentives and sector-based benchmark through industrial association
- Establish a Pollution Prevention Partnership (P3) committee

DOE is responsible to set up the P3 committee in order to facilitate the exchange of opinions and information among the members on environmental regulations, institutions, incentives and / or CP related topics. Besides that, National CP Centre (NCPC) and SIRIM can be the supporting agencies. SIRIM or the NCPC upon its founding is responsible in establishing the network with industrial associations.

iii) National CP Roundtable

The objectives are to set up linkages among stakeholders on how to implement CP blueprint and to provide a forum-developing consensus on industry standard. Through the CP roundtable meeting, industries would be encouraged to adopt cleaner technology in its production and manufacturing processes. The target outputs are:

- Annual forum workshop on CP issues
- Proceeding published showing up dates information on CP

A roundtable meeting will be called by DOE where discussion forum can be carried out among the relevant stakeholders and the supporting agencies – SIRIM, FMM, SMIDEC, SMI Association, Universities.

It is essential that a high level representation from stakeholders is needed (CEO must attend). The supporting agencies should ensure that the representatives are gathered for the discussion forum to be successful. In order to disseminate CP information, SIRIM together with the study team will organise seminars in the course of the study.

3.1.4. CP Action Plan: Training and CP Audit

CP technology is a crucial aspect in reducing plant-operation costs and in cutting down process emissions. What is the best way to minimise waste and make the best use of the resources available? Are good housekeeping, proper maintenance, and improvement of the utility systems the answers to a company's waste problems? The answer usually depends on the nature of a company's process, the types of equipment and the types of utilities employed. All in all, the CP measures must offer a wide range of practical and cost effective options for companies to consider for implementation.

Most chemical process industries (CPI) in Malaysia have relied on end-of-pipe treatment to reduce their process wastes. These treatment technologies reduce the quantity of wastes being released to the atmosphere once they have been generated but do not point to techniques to prevent them in the first place. Efforts to minimise waste generation in existing plants has received very little attention. It is therefore important to consider a holistic approach to CP technology which includes all activities to avoid, eliminate, or lessen waste generation and prevent the release of pollution to the environment.

In this course, we emphasize on the adherence to the concept of zero emissions and waste minimization hierarchy as outlined by United States Environmental Protection Agency (US EPA). In the order of importance, elimination of waste from its source will be the most preferred option, followed by waste reduction, recycling and treatment. Waste treatment programme has been widely looked upon as part of a companies' social responsibility which always incur unavoidable additional investment costs. With emphasis on minimising as opposed to treating waste, these additional costs can be reduced or avoided. Minimizing waste from its source of generation can help a company achieve the dual benefit of cleaner environment and more economic operation due to improved raw material consumption, efficient energy usage, improved recycling and enhanced process control.

This course provides a holistic approach to managing waste to achieve the objective of CP. The techniques for analysis and improvement are simple and practical. Above all, the solutions offered cover a wide range of practical schemes to reduce waste, and hence, the operating costs for companies to consider.

i) This workshop on CP provides:

- The background of the CP technology; the conceptual understanding of cleaner technology; the latest technological developments involving cleaner technology; and the case studies on the successful implementation of cleaner technology.
- The techniques for applying cleaner technology. Case studies involving the application of cleaner technology on small to large scale industrial are demonstrated. Problem sessions will enable participants to independently apply some simple applications of cleaner technology.
- A study trip to expose the participants to a process operation where some aspects of cleaner technology is implemented while other potentials are highlighted. The trip is followed by discussions and problem sessions related to the industrial visit.
- The application of cleaner technology for the management of solid wastes; followed by a case study on waste incineration.
- Some key waste treatment technologies related to cleaner technology.

ii) Training Outcomes

On completion of the course, participants will be able to:

- Understand the significance and incentives for CP technology and zero emission in the process industries.
- Recognise the various levels of waste minimisation projects involving the reaction system, reaction-separation interactions, separations systems, and utility systems.
- Apply the techniques associated with each level of a process to prevent waste and to improve process performance.
- Implement good housekeeping techniques and environmental audit methodologies during process plant and factory operations.
- Use state-of-the-art tools for waste analysis and prevention.

iii) Content of Training

- CP technology and waste minimisation - Background, concepts and state of the art; problem, solution and incentives. Implementation issues; Examples of successful applications in the developed countries.
- Sources elimination (e.g. from reaction system) - Changes in input materials, reaction chemistry, and process equipment.
- Source reduction - Improving yields and selectivity through process changes and reactor design improvement.

- CP involving industrial clustering and resource and waste recycling techniques.
- CP from separation system. Elimination of extraneous components from separation system. Waste exchange - Mass Exchange Network (MEN) Synthesis.
- Minimising waste from utility system - Process energy integration, water pinch.
- CP in the minimization of solid wastes. Treatment technologies in CP.
- Waste minimisation in the process operations. Plant audit, good housekeeping practices, material recycling.

The module consists of lectures, discussions, working sessions and demonstration of equipment and software related to auditing and implementation of cleaner technology as well as worked case studies. Participants will have hand-on experience in solving practical problem involving cleaner technology using state-of-the-art techniques for simple and complex chemical processes throughout the course. The course duration will take about five (5) days. The target group that should attend are environmental officers, managers and technologists chemical, process, environmental and other engineers / technologists, university lecturers, managers, chemists and other scientists, technicians and plant operators.

3.1.5 CP Action Plan: Incentives

Incentives include all financial facilities to enhance CP implementation. The action plan programmes are following:

- Existing incentives for SMIs
- MIDA incentives for SMIs
- SMIs Access to commercial facilities by private institutions
- Award System

The existing Hibiscus Awards for industries could be extended to include CP activities. The government to make it prestigious and recognisable should endorse the awards. It is expected to improve the moral attitude of investors towards CP.

3.1.6 CP Action Plan: Strengthen Regulatory-Policy Framework

The implementation of the CP requirements is to employ the existing environmental regulations. This is to ensure the immediate implementation of recommendations made in this study. Therefore, the Department of Environment would be the lead agency to carry out the recommendations.

The management framework for CP production implementation should try to fit to the present management conditions of the Department of Environment i.e. management structure and manpower.

A few examples of how this is to be carried out are based on the recommendations given by the Regulatory Policy Framework:

i) Environmental Quality (Sewage and Industrial Effluents) Regulations 1979

Under Section 11 of the above regulation, commonly known as the Contravention Licence, the Director-General Environmental Quality may grant the licence for the purpose of contravening the acceptable conditions of effluent discharge specified if he or she is satisfied that there is no known practicable means of pollution control for the said industry, and / or the cost of pollution control is prohibitive etc. The industry is required to pay certain amount of effluent related licence fees depending on the total load of the effluents.

It is recommended that CP requirements is added to the granting of the Contravention Licence i.e. general housekeeping practices that would reduce the total load of effluents. Therefore, some kind of CP audit must be carried out by DOE officer(s) prior to granting of the licence followed by enforcement visit to be done during the period to the validity of the licence. As mentioned in the capacity building section, training and re-training of the officers are needed to allow for better administration of the CP-added Contravention Licence Management.

ii) Written permission and licence to operate

Section 4 (Prohibition against new and altered sources of effluent discharge) of the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 stressed on the need to get a written permission for construction of a new source or modifications of the present effluent discharge. Meanwhile, under section 2 of the Industrial Co-ordination Rules, 1976 any manufacturing operator need to give information about the operation of the plant using form ICA 1, ICA 2, ICA 3, ICA 4, ICA 4A, ICA 5, ICA 5A, or ICA 6 as indicated in the First Schedule of the said Rules as well as a copy of all other licences issued under any other written laws. Each of the ICA forms indicates above has a standard Section E, F and G to be filled with details of the effluents and pollution control.

CP audit can be used to ensure that the operator do give the right information and actually have the said machinery and / or processes for both of the said legislation above. Any non-compliance or deviation from the truth should be considered as an excuse for the revocation of the licence to operate. Similar to (i) above, training and re-training of the officers are needed to allow for an improvement of environmental enforcement.

3.1.7 CP Action Plan: Capacity Building

i) Introduction

In order to strengthen the implementation of CP, it is important for leading organisations which are directly involved in CP to have continuous programme in capacity building. CP promotion involves integrated course of actions such as raising of awareness, training, consultancies, enforcement of CP policies, advisory and also research capabilities. Capacity building should not be limited to government institutions but rather it requires important commercial sectors especially bank and financial institutions to play an active role in the promotion of CP.

ii) Objective

The main objective under this section of the Action Plan is to increase the capacity building of leading organisations that promote CP. In specific terms, the capacity building activities will be targeted to achieve the following objectives:

- To establish National CP Centre (NCPC)
- To develop expertise in CP Audits for selected agencies
- To strengthen enforcement capacity related to CP for DOE officers
- To develop courses and training on CP at local institution of higher learning
- To intensify more CP related R&D activities within Universities, University Colleges and also research institutes.

iii) Formation of National CP Centre

It has been highlighted previously that CP has been recognized as an effective management tool for improvement of productivity, enhancement of profitability, and as well as environmental performance. CP concept overlaps with the concepts of pollution prevention, waste minimization, eco-industrial engineering, design for the environment, life cycle analysis, green technology, and green accounting, etc. CP also requires the integration of many factors including raising the awareness among the industrial communities and guidance for the implementation of CP methods. There should be a coordinating centre where advisory services, information with regard to CP, training can be made available with easy access. Therefore, the formation of a National CP Centre (NCPC) is necessary to provide the industries with CP related services.

It is proposed that NCPC be established within DOE, which will function to develop CP expertise and to coordinate R&D related to CP applications. SIRIM can continue to play an active role in promoting CP through demonstration projects. DOE has set up a small unit on CP which need to be expanded to cater for the growing needs. With this setup, DOE can spearhead activity participation amongst SMIDEC and MOSTI.

The activities within NCPC should cover areas such as coordinating R&D pertaining to CP application, training of CP Auditors, granting of funds for CP promotion and research activities, and spearhead development of new concepts projects to enhance environmental sustainability within industrial sectors.

NCPC will need three main divisions to function as coordination centre, these are:

- CP Audit Training division
- CP projects division
- CP R&D division

The NCPC organisation structure is proposed in shown in Figure 3.2 as follows:

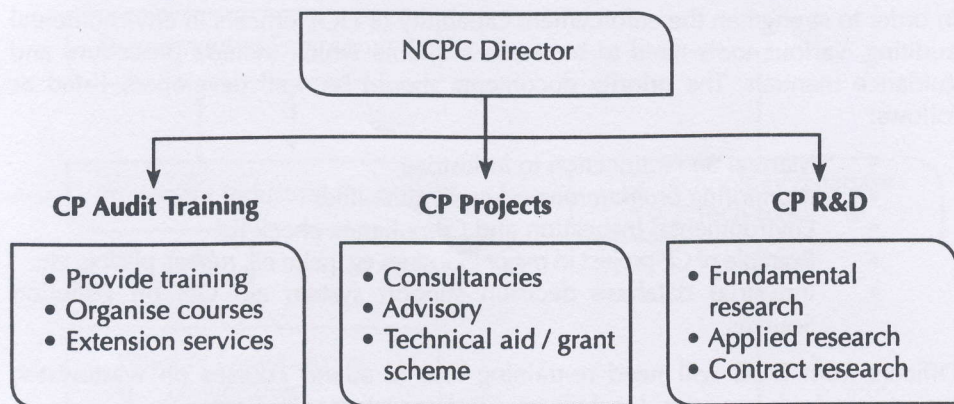


Figure 3.2: Proposed NCPC organizational structure

In future, it is expected that the Centre function as a single contact point on CP for industries and all relevant organisations.

iv) Development of Expertise on CP Audits for Selected Agencies

There is a need to develop expertise on CP for CP auditors, namely from SIRIM, University, University Colleges, and research institutes. The types of expertise needed for CP auditors are:

- CP general audit skill
- CP audit related to environmental laws and regulation
- CP audit related to Environmental Management System eg. ISO 14000
- CP audit related to production process
- CP audit related to end-of-pipe pollution control
- CP audit related to sludge and waste management

The method of developing expertise can takes the form of formal training, on the job auditing, consultancy services and also involvement in demonstration projects.

v) Strengthening enforcement capacity related to CP for DOE officers

As a primary authority for implementation and enforcement of the EQA, DOE has direct links with the industries especially SMLs which require specific advise for the adoption of CP in their processes. As such, DOE should have competent officers and adequate capacity to evaluate processes.

In order to strengthen the enforcement capability of DOE officers in environmental auditing, various tools need to be made available which include procedure and guidance manuals. The priority documents should be well developed, listed as follows:

- Manual on Notification to industries
- Monitoring programme and audit guidelines
- Environmental Inspection and Compliance check list
- Example of CP project in major industries eg. palm oil, rubber, plating, etc.
- Industrial database decision support system eg. GIS on Pollution Sources

Officers from DOE will need re-training and to attend courses on wastewater, emission, schedule wastes, legal issues, CP demonstration projects.

vi) Development of courses and training on CP at local institution of higher learning

The awareness of CP among professional and sub-professional level must be introduced at tertiary education. Industry managers and engineers working in industrial sector should have exposure in environmental management including implementation of CP method to minimize pollution. Environmental courses taught at Universities should present CP as a management tool as well as technology solution that offers great benefits. As such, the importance of CP concepts and its application should be included in environmental courses at university undergraduate as well as postgraduate levels.

Presently, CP curriculum is not offered as a course in its own but rather it forms only as a small portion in environmental pollution control courses at many Universities. Some Universities have been offering courses that may have elements of CP, for instance wastewater engineering or pollution control or process design subjects. However, CP method was never presented as a management tool to be promoted during planning, design and operation of processing plants. It has always been considered in the form of end-of-pipe system.

Therefore, it is up most vital for Universities to strengthen the capacity building to allow more CP courses to be offered. For that reason, the following pre-requisites must be implemented:

- Enhance staff's expertise in CP
- New recruitment for CP trainers or instructors

- Introduce more CP related courses
- Improve facilities for CP teaching and training
- More research topic on CP
- Intensive linkages between University and industries
- Funds to be made available to promote R&D on CP application

The ultimate objective is to provide a comprehensive educational programme or awareness on CP as well as to increase competency for the following target groups:

- Industrial managers
- Bankers
- Financial Institution officers
- Research agencies
- Government officers from MITI, SMIDEC, MIDA, etc.
- Enforcement officers for DOE
- Audit personnel from SIRIM, DOE, DOSH

vii) Intensification of more CP related R&D activities within Universities, University Colleges and also research institutes

Research activities are mainly carried out at Universities and research institutes. Unfortunately, there are very few R&D topics on CP, which was approved by the government under IRPA funding. Possible reasons can be attributed which are listed as follow:

- CP is misunderstood by many as limited to housekeeping activities
- CP has not received due importance in Malaysia
- CP expertise are scarce
- CP success stories are not widely disseminated to the industries
- CP implementation is always associated with high expenses and not a popular choice within industries.

For industries to appreciate CP, documented evidence showing success stories and monetary benefits must be made available for reference. Research outputs from R&D activities are extremely important to illustrate the CP benefits. Demonstration projects planned for CP application should have components of R&D that will aid teaching and training at institution of higher learning and research organisations.

3.1.8 CP Action Plan: CP Coordination Centre

i) Waste Exchange Centre

The Waste Exchange (or Management) Centre (WEC) is a dedicated system in buying and selling of all types of waste. WEC would benefit:

- Companies that are seeking cost effective recycling solution for their unwanted materials;
- Municipalities that are interested in finding new or alternative markets for the materials recovered through their recycling programs; and
- Manufacturers that need to secure reliable, high quality, sources of commodities.

The WEC will provide with an easy to use method for making an offer for the many commodities that the participant might have available for sale. "Looking to buy" or "Looking to sell" options would be made available to members only. If transactions are successful, a small percentage will be charged as service fee.

The system will also offer information - such as market trends, and requirements, including specifications. Additionally, the WEC could be linked to other website which provides valuable corporate information.

Rapid industrialization and urbanization inevitably generate significant quantities of industrial waste. Some of these could be hazardous while others may be non - hazardous. Creation of WEC would give an alternative option to minimize the waste going for treatment and disposal.

WEC will work along the stock exchange concept except that here the commodity for selling & buying in Malaysia will be waste since one industry's waste is another industry's resource. Currently very little waste exchange occurs since the information is generally not revealed and there is no system for a proper management pertaining to waste exchange.

Participants will be required to give detailed information on the waste available or required. The highest bidder may purchase the commodity. It is proposed that a WEC be established with the collaboration of Malaysian Manufacturers Association (MMA), DOE and other relevant and interested parties. This could divert the waste from just treatment and disposal.

4. Regulatory Framework

There are a few existing regulations that directly or indirectly, promote CP as follows:

- Environmental Quality (Prohibition in the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order 1993.
- Environmental Quality (Prohibition on the Use of Controlled Substances in Soaps, Synthetic Detergent and Other Cleaning Agents) Order 1995.
- Environmental Quality (Halon Management) Regulations 1999.
- Environmental Quality (Refrigerant Management) Regulations 1999.

Since CP requires a massive re-engineering conceptual and policy levels in pollution control, therefore it is a need to introduce a new regulation, under Environmental Quality Act 1974. The regulation can be known as Environmental Quality (Cleaner Production) Regulations, XXXX. There is also a need to review the present acts and regulations, e.g. Factories and Machinery Act 1967, and Occupational Safety and Health Act 1974, to be more CP-driven.

To promote CP at policy level in many ways involves exploring a much wider scope of possible activities compared to the CP efforts directed straight towards industry. Actions can be taken in a wide variety of areas including the following:

- Increase the profitability of CP measures by for example environmental taxation;
- Easy financing of CP investments;
- Introduce legal incentives for CP;
- More effective enforcement of legislation;
- Raising attention to the issue by information;
- Subsidies for CP services;
- Benchmarking of company performance;
- Training and education.

5. Incentives

5.1 Present Incentives that can be used for CP Investment

At present, there are many incentives, both direct or indirect, are provided for in the promotion of Investment Act 1986, Income Tax Act 1967, Customs Act 1967, Sales Tax Act 1972, Excise Act 1976 and Free Zone Act 1990. These incentives are important to be highlighted as part of the package incentives for promotion of CP investment.

i) Incentives for the Environmental Protection

Incentives for the Storage, Treatment and Disposal of Toxic and Hazardous Wastes

Incentives to encourage the setting up proper facilities to store, treat and dispose toxic and hazardous wastes. Among others include Pioneer Status (income tax exemption on 70 per cent of statutory income for five years), Investment Tax Allowance of 60 per cent of capital expenditure incurred within a period of five years to be set off against 70 per cent of the statutory income in the assessment year, etc. All application for these incentives are to be submitted to MIDA.

Incentives for Energy Conservation

In order to reduce operation costs and at the same time promote environmental preservation, companies providing energy conservation services qualify for Pioneer Status or Investment Tax Allowance.

Incentives for Waste Recycling Activities

Companies undertaking waste recycling activities that are of high value added and use high technology enjoy Pioneer Status or Investment Tax Allowance. This includes recycling of agricultural waste or agricultural wood-based panel boards or products.

Incentives or Utilising Biomass

To encourage the generation of energy using biomass which is renewable and also environment friendly, companies that undertake such activities, qualify for Pioneer Status or Investment Tax Allowance.

ii) Present Incentives on Exemption from Import Duty and Sales Tax on Machinery and Equipment (Existing)

Import duty and sales tax are not imposed on most machinery and equipment that are not produced locally. Where import duty and sales tax apply, exemption can be obtained for machinery and equipment used for the following:

- In the manufacturing processes or manufacturing related services or agricultural processes, etc.;
- For environmental protection, energy conservation, biomass energy, wastes recycling, storage, treatment and disposal of toxic and hazardous wastes;
- For maintenance and quality control;
- For approved R&D activities;
- In the plantation sector.

iii) Present Incentives for the Use of Environmental Protection Equipment

Companies using environmental protection equipment receive an initial allowance of 40 per cent and an annual allowance of 20 per cent on the capital expenditure incurred on such equipment. Thus, the full amount can be written off within three years. Claims should be submitted to Inland Revenue Board (IRB).

iv) Present Incentives for the Manufacturing Sector

The major incentives for companies in the manufacturing sector are Pioneer Status or Investment Tax Allowance.

Pioneer Status

A company granted Pioneer Status enjoys a 5-years partial exemption from the payment of income tax.

Investment Tax Allowance (ITA)

A company granted ITA gets an allowance of 60 per cent of qualifying capital expenditure incurred within five years from the date on which the first qualifying capital expenditure is incurred.

5.2 Present Grants that can be used for CP Investment

i) Industrial Technical Assistance Fund (ITAF) by SMIDEC

The industrial Technical Assistance Fund (ITAF) Scheme has been in operation for 10 years, since its inception in 1990. Over the period, the scheme has been reviewed and fine-tuned to meet the different needs of SMLs at different stages of their development. There are four components under this scheme namely, ITAF1, ITAF2, ITAF3, and the Factory Auditing Grant. ITAF1 is available for technology feasibility study for CP. ITAF2 is applicable for improvement and upgrading of existing process for CP. ITAF3 is applicable for productivity improvement which is one of the main schemes of CP. In addition to ITAF, the Factory Auditing Grant for assisting SMLs in auditing their capabilities of management, financial, production, logistic, marketing and R&D which is one of the applicable grants for CP promotion and potential to be linked to the large companies.

ii) Training Incentives

- **Double Deduction for Approved Training**
Manufacturing and non-manufacturing companies that do not contribute to the Human Resource Development Fund (HRDF) qualify for double deduction on expenses incurred for approved training.

For the manufacturing sector, the training could be undertaken inhouse or at approved training institutions. However, for the non-manufacturing sector, the training should be held only at approved training institutions. Approval is automatic when the training is at approved institutions.

- **Deduction for Pre-Employment Training**
Training expenses incurred before the commencement of business qualify for a single deduction. Nevertheless, companies must prove that the trainees will be employed as their employees.
- **Deduction for Non-Employee Training**
Expenses incurred providing practical training to residents who are not employees of the company can be considered for single deduction.
- **Deduction for Cash Contributions**
Contributions in cash to technical or vocational training institutions that are not operating primarily for profit and those established and maintained by a statutory body qualify for single deduction.

- **Human Resource Development Fund**
The Human Resources Development Fund (HRDF), aimed at encouraging direct private sector participation in skills development, was launched in 1993 with a grant from the government.

The HRDF operates on the basis of a levy / grant system. Employees who have paid the levy will qualify for training grants from the fund on defray or subsidise training costs for their Malaysian employees.

- **Special Industrial Building Allowance for Training**
Companies that incur expenditure in building used for approved industrial, technical or vocational training can claim a special industrial Building Allowance (IBA) of 10% for 10 years on qualifying for the construction or purchase of a building.

5.3 Economic Instruments

Economic incentives or instruments are defined as **instruments that use financial means to motivate polluters to reduce the health and environmental risk posed by their facilities, processes, or products.** These incentives provide monetary and near-monetary rewards for polluting less and impose costs of various types for polluting more, thus supplying the necessary motivation to polluters.

This approach provides an opportunity to address sources of pollution that are not easily controlled with traditional forms of regulations as well as providing a reason for polluters to improve upon existing regulatory requirements. Under traditional regulatory approaches, polluters have little or no incentive to cut emissions further or to make their products less harmful once they have satisfied the regulatory requirements.

The objectives of the economic instruments are as follows:

- To enhance control pollution by harnessing the power of market incentives,
- To offer a more cost-effective, flexible and dynamic form of regulation than conventional regulatory measures.

Types of Economic Incentives

In general the incentives could be divided into seven categories, as follows:

- **Taxes, Fees and Charges:** In principle the generator of pollutants pays a fee or charge or taxes for each unit pollution.
- **Deposit-Refund System:** Which requires a monetary deposit at the time of sale of a product and the deposit is returned when the item is returned at the end of its useful life.
- **Marketable Permits:** There are two types of trading systems, cap-and-trade systems and credit systems.
- **Subsidies:** Normally used at all levels of government to help manage environmental pollution like grants, low-interest loans, favourable tax treatment, and preferential procurement policies for products believed to pose relatively low environmental risks.
- **Liability:** An incentive for sources to reduce or avoid pollution, since if found liable they can face extraordinarily large and unpredictable damage claims.
- **Information Disclosure:** The collection and public availability of information on environmental performances to be a strong incentive for sources to reduce their emission of pollution.
- **Voluntary Actions:** A variety of programs by DOE to encourage the sources like private companies and schools in essence to reduce specific kinds of pollution.

At present most of the incentives on taxes, fees, charges and subsidies are available in Malaysia. However, it can be further strengthened and enhanced especially on deposit-refund systems, marketable permits, liability, information disclosure and voluntary action. Table 1.1 presents various categories of economic incentives that can be considered to be implemented in Malaysia. Every category is designed to target a specific measure or sector and require a separate evaluation or study, which undertaken during an annual budget dialogue between Ministry of Finance and stakeholders of energy sectors involved.

Table 1.1: Categories of economic incentives for environmental management related to CP implementation in Malaysia

Type of Incentives	Countries adopted the policy	Example
Fees, Charge, Taxes	USA, Nordic countries*, Germany, Switzerland, UK, Japan	Double tax relief or single tax relief for several years on investment for R&D in CP; CP machinery or feasibility study; or CP implementation.
Deposit-refund system	USA, Japan, Germany, Nordic countries*	Reduction of contravention fee as stated in Environmental Quality Regulation (Sewage and Industrial Effluents) Regulations 1979 (Part 5, Section 11)
Marketable permits	USA, Japan, Germany	Recyclable products (aluminium cans)
Subsidies	USA, Japan, Nordic countries*	Reduction of BOD or carbon emissions
Liability	USA, Japan, Nordic countries*	CP project consultancy, low-interest loans
Information disclosure	USA, Germany	Regulation in liability and public health
Voluntary actions	USA, Japan, Germany, Nordic countries	Regulation on right to information by industries (ISO 14000), public and NGOs (policing)

* Nordic countries (Norway, Denmark, Sweden, Iceland)

6. Conclusion

The principle thrust for the CP Blueprint will be the improvement of commercial products in manufacturing sector. Efforts will focus on mobilisation on incentives, both directly and indirectly to attain a higher participation among SMLs. The sectoral strategies and priorities will contribute towards the building of a resilient and competitive manufacturing sector, in line with the national target to achieve a developed country status by 2020.