Journal of Environmental Sciences Vol.13, No.3, pp.346—350, 2001

ISSN 1001—0742
CN11—2629/X

Article ID: 1001-0742(2001)03-0346-05 **CLC number**: X32 **Document code**: A

Design of policy mechanism to promote cleaner production in China

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Abstract: In order to promote cleaner production in China, a package of policy options was presented based on the identification of the barriers encountered in the CP demonstration project and the effectiveness and feasibility of policy options for the CP implementation were analyzed. Furthermore, the policy mechanism framework was given, which composes of compulsory, economic incentive, social pressure and supportive function. Finally, the implementation strategy of the policy mechanism, in which the emphasis will be changed from compulsory policy options towards economic and social pressure policy options, was proposed.

Key words: cleaner production; barrier identification; policy mechanism; China

Introduction

Cleaner production (CP) holds great promise as an effective strategy in the face of double challenges of environmental protection and economic development. In 1993, a demonstration project (B-4 project), designed and executed by the State Environmental Protection Administration (SEPA), World Bank, and UNEP, was carried out to promote CP in China. As the first systematic CP practice in China, the experiences of the B-4 demonstration project prove that CP will not happen automatically in spite of the remarkable results and observable potential. There are a series of obstacles and problems in the existing conditions. To implement CP on the long term, it is essential to establish an integrated policy mechanism towards CP. Therefore, a policy study was conducted, which focused on the identification of the obstacles that influence the implementation of CP in the demonstration enterprises and the formulation of the policy options that disseminate the demonstration achievements effectively in the broader context in China.

1 Policy options to promote cleaner production

1.1 Identification of barriers to CP practice

As a necessary first step in the process leading to the formulation of an effective package of CP policy options, the influence factors, especially, the various barriers factors in the CP practice were identified through surveys, case studies and reviews based on the selected enterprises in the CP demonstration project as well as China's current environmental, industrial, and technological renovation policies and regulations.

The major barriers are summarized as follows in terms of conceptual, organizational, economic, technology and information, and methodology categories: (1) Conceptual barriers: lack of pollution prevention and environmental awareness; strong conventional development ideas with high input and consumption in energy and resources. (2) Organizational barriers: lack of a management system fit in with CP in the enterprises; lack of the specific objective and implementation planning for CP; national environmental management(regulations and measures) focused on end of pipe treatment; lack of the support and cooperative actions among the governmental departments. (3) Economic barriers: lack of financial support to CP(both the banks and enterprises); lack of economic management policies(taxes, discharge fee, etc.) for promoting CP; unreasonable price system. (4) Technology and information barriers: backward production processes and equipments; lack of R&D and transfer mechanism for CP technology; limited access to CP information; lack of professional for CP. (5) Methodology barriers; lack of CP audit procedure and guidelines to adapt to the various differences and sizes of the enterprises

1.2 Formulation of CP policy options

To overcome the identified barriers and to further develop stimulating factors, a set of policy options for promoting CP is presented through the informal discussions/seminars and questionnaires with the different representatives from the enterprises and the departments of the central as well as local governments. A general inventory of policy options is listed in Table 1.

2 Analysis of policy options

2.1 Actors and target group to CP policy options

The actors are those who execute the policies and/or exert influence on some target group. According to the responsibility and role in the execution of CP policy options, two kinds of actors will be involved, one for governmental actors

Table 1 General inventory of policy options to promote CP

No.	Option	Category
1	Cleaner production is identified as key concept and priority area of the national industrial policy	2-a
2	The promotion of cleaner production will be jointly coordinated by SETC and SEPA	2-d
3	Cleaner production will be identified as one of the important contents for industrial development in the plan for economic and social development	2-c
4	The supervision and control of SEPA over the enforcement of local environmental departments will be increased and strengthened	1-i
5	The strategy for increased publicity and education about cleaner production will be developed and implemented	2-h
6	Technical training for CP will be conducted	2-j
7	Specific targets and requirements for cleaner production will be incorporated into the regulations and technical policies of the departments of industries	2-e
8	Demonstration projects on CP will be conducted	2-k
9	The department of science and technology will identify CP as a key research area when formulating the national and sector plans for science and technology	2-m
10	High-level management responsibilities and management systems to implement cleaner production will be required in all enterprises by the departments of industry	2-f
11	The pollution license system will be reformed	1-e
12	The guidelines for cleaner production auditing will be improved and made specific for industrial sectors	2-l
13	The concept of cleaner production assessment will be transferred to polluting enterprises in some key areas	1-b
14	Requirements for environmental reporting by enterprises will be established	1-c
15	The rule of environmental impact assessment and the rule of three simultaneousness for construction projects will be reformed	1-f
16	The system of pollution levies will be reformed	3-a
17	Added taxes will be levied to raw materials and products containing hazardous materials	3-g
18	Favorable taxation policy will be adopted for cleaner products	3-b
19	Investments for cleaner production equipment will be allowed to be depreciated in a shorter period	3-c
20	The indicators of cleaner production should be added to the examination of enterprises' economic performance	2-g
21	A national CP-revolving fund will be established	3-d
22	Environmental standards for relevant raw materials, processes, equipment and products will be developed and heavily polluting processes and equipment will be eliminated gradually	1-d
23	Financial institutions will provide favorable loans for cleaner production	3-f
24	The sectoral and regional centers and information networks of cleaner production will be set up	2-i
25	The article concerning cleaner production will be added to the revised law of environmental protection of the People's Republic of China	1-a
26	A product-oriented policy will be developed and implemented	2-b
27	Cleaner production audits will be incorporated into the rule of "controlling pollution within a fixed time"	1-g
28	Best available technologies for cleaner production will be assessed, selected and promoted	2-o
29	The national policy for technical innovation will be reformed by allocation part of the national and local funds for technical innovation specifically for CP	3-e
30	Governments at all levels should take the lead in procurement of cleaner products	4-a
31	Research institutions will strengthen research and development of new technology for cleaner production	2-n
32	Voluntary agreements between the government and the industries will be extensively employed to promote CP	1-i
33	Participation of NGOs and the general public will be increased to put more pressure on enterprises to implement cleaner production	4-b

SEPA: States Environmental Protection Administration; STEC: State Economic and Trade Commission

and one for non-governmental actors. In this policy study, the enterprises are seen as the target group regulated by the recommended policies. The question how the policies affect the behaviors of these target group can be considered from three perspectives: to increase the willingness of implementing CP, to improve the ability of implementing CP and to make CP a necessity. The results of combining the above consideration with the proposed policy options are summarized in Table 2. From the vertical point of view in the table, it could be seen easily that most of the policy options are aiming at improving the ability

to implement CP, and then the necessity and willingness policy options follow. If looking at table from the horizontal point of view, the governmental departments as major actor will play a basic role in the execution of the policies for promoting CP.

Table 2 Actors and policy option effects on target group

Actors	Willingness	Ability	Necessity
The National Peoples Congress			4,25
Environmental department	2,5,16,17,18,24,26,30,32	5,6,8,9,12,14,15,18,21,24,28	2,4,11,13,14,15,16,22,25,27
Departments of comprehensive economic affairs	1,2,5,10,17,18,24,30,32	5,6,8,10,12,18,19,21,23,24,29	2,3,13,20,22,27
Departments of industries	5,10,24	5,6,8,9,10,12,24,28	7,20,22
Professional associations	24	24,28	
Labour unions	5	5	33
Financial institutions		21,23	
Provincial, municipal and local governments	24,30,32	8,9,21,24,29	4,20,25,27
Environmental organizations	5	5	33
Consumers' organizations	26		33
Intermediate institutions	5,24,26	5,6,12,24	
Education commission	5	5	
Science and technology commission		9,28	
International organizations		9,28	
Research institutions		28,31	

2.2 Effectiveness and feasibility analysis to policy options

Table 3 Expected effectiveness of policy options vs. expected possibility to implement policy options

Difficulty of implementation	Expected degree of effectiveness	
	High	Medium
Easy	2,5,6,8,11,13,24,32	1,3,7,9,12,20,25
Medium	4,10,14,15,16,22,26,28,29,31	27,30
High	17,18,19,21,23,33	

Table 4 Expected effectiveness of policy options vs. expected degree of resources needed

Resources Needed	Expected degree of effectiveness	
	High	Medium
Low	2,5,6,10,19,24,32	1,3,7,9,12,20,25
Medium	4,8,11,13,14,15,16,17,18,21,22,23,26,28,29,31,33	27,30
High		

Table 5 Expected effectiveness of policy options vs. expected time-lag between implementation and effect of policy options

Time-lag between implementation and effect	Expected degree of effectiveness	
	High	Medium
Short	2,6,8,10,14,15,17,18,21,22,23,24,28,29	20
Medium	4,5,11,13,16,19,26,31,32,33	7,9,12,25,27,30
Long		1,3

The final purpose of policy formulation is to make cleaner production an ongoing process of implementation in China, so the fundamental criteria for judging whether these policy options are good or bad should be the expected effect they will have on promoting cleaner production. In the following analysis, the expected effects are divided into some levels, such as high and medium (perfect and general), and then are used to each policy option. For example, some of the national macro-level policies are classified as medium level in effectiveness. This is due to the facts that the chain of their effect on the enterprises is very long and their implementation will be affected by many other factors. Also, some policy options can have an effect on more than one of the main factors (willingness, ability or necessity) at the same time. So, such a compound policy options will have a relatively high effect, namely we classify it as highly effective. In addition, the feasibility of these policy options needs to be assessed. The components of feasibility include: (1) the possibility of their implementation (easy, medium, difficult); (2) the resources needed for their implementation (few, medium, many); (3) the period needed to see the effects after implementation (short, medium, long); (4) the level of acceptance by the target group

(high, medium, low). Combining the aspects of feasibility mentioned above with the criteria for the expected effects of implementation, the results of extensive discussion between the researchers and related actors are presented in Table 3, 4, 5 and 6.

Table 6 Expected effectiveness of policy options vs. expected degree of acceptance by target group

Degree of acceptance by target group	Expected degree of effectiveness	
	High	Medium
Medium	2,5,6,8,18,19,21,23,24,28,29, 31,32	9,12,30
Medium	4,10,11,13,15,16,22,26,33	1,3,7,20,25,27
Low	14,17	

Generally speaking, the options having a combination of high effectiveness and easy implementation are needed the most. Also we strive for those options that have a combination of high effectiveness and a need for low or medium amounts of resources. Besides this a combination of high effectiveness which have effect shortly after implementation seems valuable. Last but not least, there is high interest in those combinations of policy options that have a high effectiveness and are well accepted by the target group.

3 Policy mechanism to promote CP

According to the function of policy, all 33 CP policy options that aim at increasing the willingness, the ability and the necessity can be divided into four different categories of mechanisms: (1) compulsory (regulatory) mechanism: 4, 11, 13, 14, 15, 22, 25, 27(32); (2) supportive mechanism: 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 20, 24, 26, 28, 31; (3) economic incentive mechanism: 16, 17, 18, 19, 21, 23, 29; (4) social pressure mechanism: 30, (32), 33.

The regulatory/compulsory mechanism is recognized as essential for CP because it can provide basic CP requirements with some direct intervention measures for the enterprises to implement cleaner production. The proposed measures include, for example, the forceful elimination of heavily polluting production processes and equipments, in particular in township and village industrial enterprises (TVIEs); restricted use of toxic and harmful substances; and requirements for adopting pollution prevention plan and releasing environmental performance report etc. This initiative will be highly effective even on the short term. Obviously in the starting phase of CP implementation in China these policies are heavily needed.

The supportive mechanism aims at providing expertise, information, technologies and fund for CP implementation. It has contributed to improving the willingness and capability of the enterprises to implement cleaner production and catalyzing the establishment of a self-continuous cleaner production oriented environmental management system in the enterprises.

The economic mechanism is mainly utilized to reward or punish the enterprises for their environmental performance in economic terms. If the interests of the enterprises is directly related to the implementation of CP, the enterprises will be stimulated to implement cleaner production. The current considered options include preferential policies for access to loans and environmental funds in favor of CP, price reforms and financial supports etc. If applied well, the economic instruments will play an important role for CP, especially under market conditions.

The pressure mechanism can be characterized as instruments to encourage CP adoption in enterprises through some social actors, such as contractors, social groups, consumers and the public. For example, the instruments could include releasing environmental information of enterprises, greener government purchasing, voluntary agreements etc. With the awareness raising in the social force such as the public and NGOs, the pressure policies will be a useful tool to promote CP.

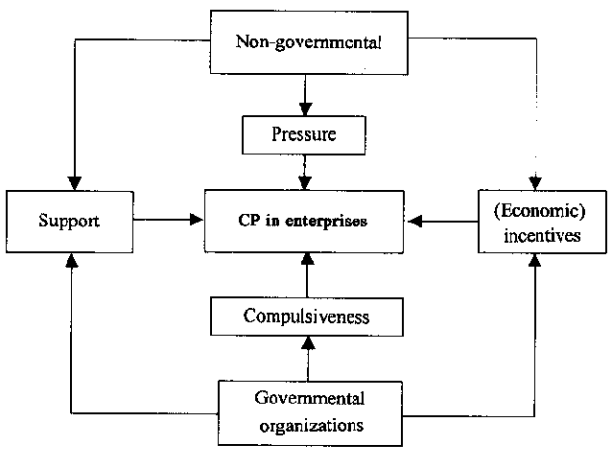

Fig. 1 Integrated policy mechanism framework for promoting CP

In view of the fact that each policy mechanism has his own advantage, only will a combination of the mechanisms be effective in promoting CP. An integrated framework composed of compulsory, economic, supportive, and pressure mechanism is proposed below (Fig. 1).

According to the results of the effectiveness and feasibility analysis of the policy options, the supportive policy should be given the priority during the whole time. Meanwhile, in the starting phase of CP, the policy mechanism based on compulsory,

especially legislation and regulations as a basis to other policy instruments, will be needed. As time goes on, the emphasis of the policy mechanism will be changed from compulsory to economic and pressure policies(Fig.2).

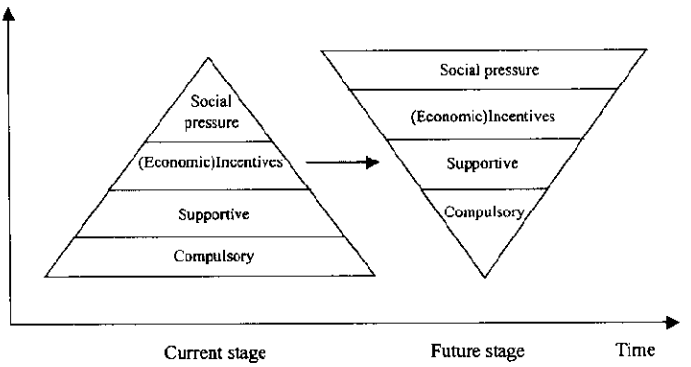

Fig.2 Structure change of integrated policy mechanism

4 Conclusion

The various barriers that unfavorable to the introduction of CP have been examined based on the demonstration projects in China. In order to overcome the difficulties, it is important to establish an integrated policy framework composed of compulsory, supportive, economic, and pressure mechanisms. Under such a framework, a package of policy options aims at increasing willingness, ability and necessity for the CP implementation are presented. First thing in the policy formulation will be to start the supportive policies in order to improve the ability and willingness of the enterprises to adopt CP. At the same time, as a base to formulate other policies, compulsory mechanism should be upheld so as to make the change over of the enterprises towards CP. The role and needs of economic and pressure policies are obvious. From longer time perceptive, it is expected that the emphasis will change from compulsory towards economic and pressure policies. Supportive tools remain of the same high importance through the time frame.

Regarding the actors, governmental departments have a crucial role to play in constructing the policy mechanism for promoting CP. Besides the compulsory, the powerful organizational function of the governments is also key factor to ensure the creation of a favorable environment for the use of supportive, economic, and pressure policies.

The final issue, and perhaps the great challenge facing CP policy study is to transform the study results into the policy action, in other word, we must get the policy recommendation implemented.

Acknowledgments: The CP policy study of B-4 project has been contributed by many researchers. Enormous gratitude is due to Mr. Wang Hanchen, Mr. Zhou Fuxiang, Mr. Qian Yong and Mr. Wang Fengchun. Special thanks are also due to Mr. Sybren de Hoo(UNEP) and Mr. Marcel Crul(ARIES) for their guide to the CP policy study.

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(Received for review May 23, 2000; Accepted July 10, 2000)