

Persistent organic pollutants control strategy in China

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Abstract: The development of Persistent Organic Pollutants (POPs) control policy in China in the context of international concerns on POPs was reviewed. The aspects of the Chinese POPs control strategies were analyzed, and compared with those of developed counterparts (e.g. US, EU, Japan). Currently, while the legal framework on POPs management, which complies with international guidelines has been established, it should be improved in the areas of special POPs management, risk assessment, the precautionary principle, life-cycle management and technical support capacity. The analysis of Chinese POPs policy and suggestions for strengthening the science-based decision making capacity are not only useful for Chinese decision-makers, but also a case study for developing world and make a great contribution for the global elimination of POPs to make a toxic-free future.

Keywords: Persistent Organic Pollutants (POPs); POPs policy; dangerous chemicals management; pesticides management; Persistent Bioaccumulative Toxic Chemicals (PBTs)

Introduction

Persistent Organic Pollutants (POPs) are a set of organic compounds that: (1) possess toxic characteristics; (2) are persistent; (3) are liable to bioaccumulate; (4) are prone to long-range transport and deposition; and (5) can result in adverse environmental and human health effects at locations near and far from their source (Jones, 1999; Birnbaum, 1994; Frank, 1993).

In the early decades of the twenty century, POPs were virtually non-existent in the environment. Production, generation and use of POPs, many of which are associated with the convenience and flexibility of modern living, expanded dramatically following World War II. Several decades later, concern has focused globally on the elimination of POPs due to its adverse effects on human health and environment, with the Stockholm Convention on Implementing Action on Certain Persistent Organic Pollutants (2001) as the formal startup.

Because of cheap price and effectiveness, such POPs as Organic Chlorinated Pesticides (OCPs) including DDT, lindane, and toxaphene are still used in the developing world, although their danger to humans and animals is well known. However, a few regulations have been set to restrict and eliminate the use of POPs in the developing countries. In order to implement the international obligation for the elimination of POPs, decision-makers in developing countries either formulate sketchily the strategies, which maybe not effective, or copy the counterparts from developed countries, which maybe not fit for themselves.

Taking China as an example, the use of OCPs was prohibited in 1983. Until 1983, the use of OCPs, with HCH and DDT as representatives, has been 50% of the total usage of pesticides in China. Growing scientific research shows that

the remnant level of HCH and DDT in China is higher than that in developed countries (Wong, 2002; Zhong, 2000). The use and production of aldrin, dieldrin, endrin, mirex, toxaphene, chloradane, and heptachlor were limited. The production of pentachlorophenol (PCP) and PCP-Na are the continuing source of 100 kg/a PCDDs and PCDFs (Xie, 2002). However, the status of the POPs management in China cannot meet the demands for the elimination of POPs, and there is a great challenge for China to implement the relevant international obligations.

In this paper, the status of Chinese POPs control policy was analyzed, suggestions for strengthening the science-based decision making capacity were provided. The analysis is not only useful for Chinese decision-makers, but also a case study for developing world and make a great contribution for the global elimination of POPs to make a toxic-free future.

1 Development of China's POPs management in the context of international concerns

1.1 Proposing a framework/principle for the gradual phase out of POPs (1960's to 1982)

In 1962 worldwide attention was attracted to declining bird populations caused by pesticides depicted in *«Silent Spring»* by Ms. Rachel Carson, 1962. In the late 1960s, scientists and researchers began to compile evidence of injury to fish, birds, and mammals in or around the Great Lakes of North America. In some cases, the predominant POPs sources were even thousands of kilometers distant. Documented injuries were especially prevalent in high predator species with the reproductive failure, hormone and immune systems dysfunctions and so on.

Once the harmful effects of pesticides and PCBs on the environment and humans were scientifically established in the 1970s, policy makers in developed countries (e.g. US,

Japan, and EU) began to introduce laws and regulations for the control of POPs (Table 1). These dealt with the area of classification, and packaging and labeling, essential factors in POPs control.

Table 1 Development of POPs policy in China in the context of international concerns

International agreements/conventions	Laws concerning POPs in developed countries	Laws concerning POPs in China
1960s— 1982	Japan: Chemical Substances Control Law (1973) US: 1. Toxic Substances Control Act (TSCA) of 1976 2. Resource Conservation and Recovery Act (RCRA) of 1976 EU: 1. 67/548/EEC, classification, packaging and labeling of pesticides (1967) 2. 79/831/EEC, classification, packaging and labeling of dangerous chemicals (1979)	China Environmental Protection Plan (1974) Environmental Protection Act (1979)
1982— 1995	US: 1. Emergency Planning & Community Right-To-Know Act (EPCRA) of 1986 2. EPA worker protection standard (1992) 3. Amendment (1990) to Clean Air Act (CAA) of 1970, 4. Amendment (1990) to Clean Water Act (CWA) of 1972 Japan: 1. Agricultural Chemicals Laws and Regulations (1984) 2. Amendment to Chemical Substances Control Law (1986) EU: 1. 88/1734/EEC, import and export of dangerous chemicals (1988) 2. 92/32/EEC, registration, risk assessment (1992) 3. EEC/793/93, risk assessment of dangerous chemicals (1993)	1. Statute on Pesticide Registration (1982) 2. Statute on Safe Use of Pesticide (1982) 3. Regulation on Safety Management of Dangerous Chemicals (1987) 4. Statute of Preventing the Electric Power Equipment and its Waste with PCBs from Polluting Environment (1991) 5. Environment Management Rule on Chemical First Import and Export of Noxious Chemicals (1994)
1995— now	US: 1. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 1996 2. Federal Food Quality Protection Act of 1996 (FQPA) Japan: 1. Law Concerning Special Measures Against Dioxins (1999) 2. Law for the Promotion of Environmentally Sound Destruction of PCB Waste (2001)	1. Solid Wastes Pollution Prevention and Control Act (1995). 2. Regulations on Management and Control of Chemicals (1995) 3. Regulation on Pesticide Management (1997) 4. Statute on Safe Use of Chemicals in Working Location (1997) 5. National Catalogue of Hazardous Wastes (1998) 6. Statute on Dangerous Chemicals Registration (2000) 7. Regulation on the Labor Protection for the Working Location in Which Hazardous Substances Being Used (2002) 8. Measures on Registration and Management of Dangerous Chemicals (2002) 9. Regulation on Pesticide Management, amended in 2001 10. Regulation on Safety Management of Dangerous Chemicals, amended in 2002

During this period, an initial approach to understanding POPs on the basis of scientific evidence was launched in China. China developed the theoretical and technical expertise to determine its POPs policy. The principle calling for the gradual phase out of POPs was proposed in its Environmental Protection Plan (1974) and Environmental Protection Act (1979).

1.2 Forbid the use of OCPs, and establish relevant regulations and laws (1982—1995)

The last 20 years have seen the development of a number of important international agreements aimed at controlling global aspects of chemicals safety in the area of production, use, marketing, international trade, information

exchange, waste disposal and worker safety etc. (Table 1). The international guidelines which were formulated in these documents became the law of nations in this field, and later provided the foundation for the international POPs legislation, including information exchange on dangerous chemicals in international trade, the prior informed consent procedure, international cooperation in monitoring illegal cross-boundary transfer of dangerous waste and its treatment, preventing or decreasing disease and injury at work caused by chemicals, and so on.

Policy makers in developed countries reinforced their legal systems on POPs, within the areas of information exchange, international trade of dangerous chemicals, work

safety, risk assessment, and so on (Table 1).

China is a signatory to all these conventions and established its relevant regulations and laws. After the Statute on Pesticide Registration and the Statute on Safe Use of Pesticides were issued in 1982, the use of OCPs was prohibited in 1983. With the promulgation of some regulations (Table 1), many standards and implementation measures, issues on the production, use, storage, trade, transportation, import and export of dangerous chemicals were addressed, both operationally and specifically.

1.3 Full development: focus on elimination/reduction of POPs (from 1995 to the present time)

In 1995 UNEP highlighted the importance of decreasing or eliminating POPs, and identified the "dirty dozen" POPs designated for international action in its GC 18/32. Furthermore, intergovernmental negotiators were also asked to develop criteria and procedures for identifying additional POPs as candidates for future binding global action. In 1998, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was signed. Exporters trading in a list of hazardous substances were required to obtain the prior informed consent of importers before proceeding with transactions. On the basis of global intergovernmental negotiations and UNEP decisions, the Stockholm Convention on Implementing Action on Certain Persistent Organic Pollutants was adopted in 2001, a milestone that indicated the actual beginning of international action.

In developed countries, response to the international convention was rapid; special management for POPs was initiated, e. g., special laws concerning PCBs and dioxin were established in this period in Japan (Table 1).

In conformity with the international situation, China signed the Rotterdam Convention and the Stockholm Convention, revised Regulation on Safety Management of Dangerous Chemicals in 2002. The Regulation on Pesticide Management (1997) was established to strengthen the control over the registration, production, classification, and use of POPs. Work safety on dangerous chemicals provided a new aspect of the POPs legal framework. Standards about POPs began to be refined to match international standards, which became more detailed and applicable than ever (Table 1).

The Stockholm Convention has been ratified by the National People's Congress on June 25, 2004, and will take into force on November 11, 2004 in China. Accordant with the requirements of the Convention, China is developing the National Implementation Plan (NIP), which consists of government commitments to address POPs issues, strategies and action plans for reducing and eliminating POPs, and so on.

2 Overview of China's POPs policy

2.1 A legal framework relevant to POPs has been

established in China

In the last 30 years, a legal framework concerning POPs has been established in China, although special POPs legislation is not highly developed (Fig. 1). The legal framework includes 2 comprehensive laws, 4 environmental protection/work safety acts, 4 regulations promulgated by the State Council, 9 sectional regulations and 21 standards.

From both environmental pollution control and work safety points of view, POPs management falls into two interrelated categories, dangerous chemicals (or toxic chemicals) management and pesticide management. The four interrelated parts compose an integrated system (Fig. 2). Pesticide management is the buildup of 1 regulation and 3 statutes; dangerous chemicals management is made up of 2 regulations and 4 statutes. Work safety management consists of 1 regulation and 1 statute. All 21 interrelated national standards constitute the foundation of the framework (Fig. 1).

2.2 Chinese POPs policy is scientific-based and operational

The environmental problem caused by POPs can be either emergent or persistent, so POPs management must be scientific-based and operational. A series of national or local standards, guidelines, and other criteria, which are based on scientific research and provide detailed information on POPs management, has been promulgated in China. They are not only the complement, but also the foundation of the laws and regulations on POPs. They set the operational and scientific-based character for Chinese POPs policy, and provide technical support for POPs management.

E. g., with National Catalogue of Hazardous Wastes (1998) and Identification Standard for Hazardous Wastes (GB5085-1996), China can identify the existed POPs and screen the potential POPs. The risk assessment is being put in force based on environmental assessment guideline of pesticide (1989). Methods for measurement, safety use, storage and transportation, disposal, packing, and classification of POPs are stipulated in standards such as Standard for Pollution Control on Hazardous Waste Storage (GB18597-2001), Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes (GB18598-2001), and so on (Fig. 1).

2.3 China's POPs management is in compliance with international guidelines

China takes an active part in POPs international activities. Since 1990, China has signed almost all the international agreements and conventions relevant to POPs (Table 1). China participated all the five INC negotiations about POPs control and two expert panels about relative standards so far, with a positive and constructive attitude in the convention negotiation and implementation. Chinese scientists and decision makers participated the international workshops on POPs actively; exchange the experience on POPs control and the construction of national action plan.

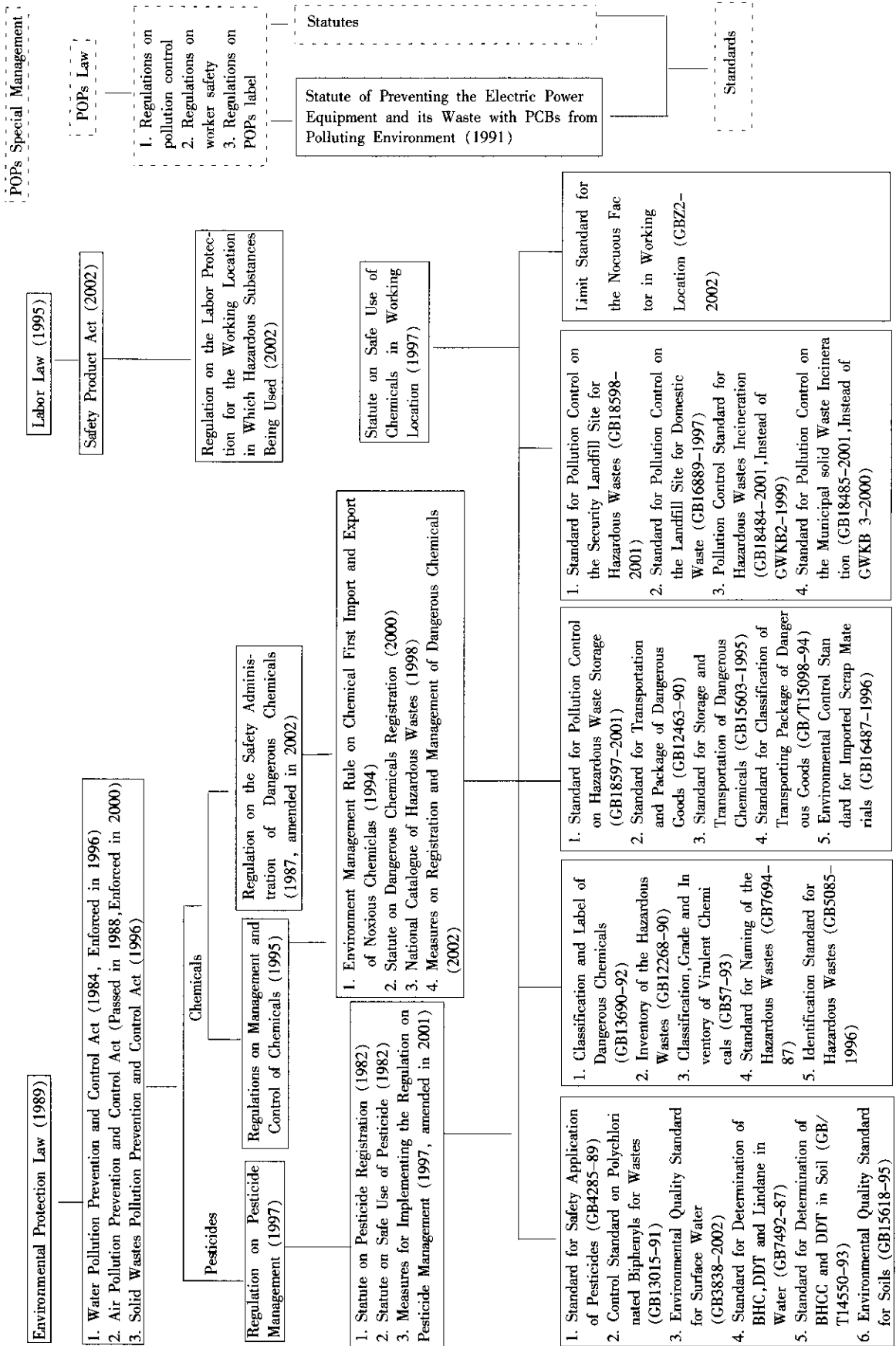


Fig.1 Chinese legal framework on POPs (Promulgated or existing laws and measures are indicated in solid-line frames; development of future measures are indicated by dotted-line frames)

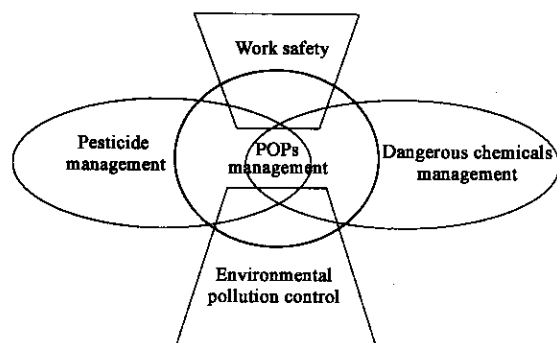


Fig.2 The integrated system of POPs management composed by four interrelated parts

In catching up with international developments and trying to implement the conventions, China has established regulations and standards relevant to the conventions. For example, the Convention on Safe Use of Chemicals in Working Environments and the Convention Concerning Safety in the Use of Chemicals at Work (1990) came into effect in China in 1994. In 1997, the Rule on Safe Use of Chemicals in Working Location was established. The Labor Protection Rule for the Working Locations in which Noxious Substances are used was established in 2002.

China's POPs policy is in compliance with international guidelines in the area, their principles and measures, has produced numerous changes. China's policy concerns the registration, production, marketing, labeling, classification, storage, transportation, use, and disposal of POPs—almost all the areas proposed in Agenda 21 and within other international guidelines.

The Chinese legal framework (Fig.1) concerning POPs is similar to that of developed countries (e.g. Japan) in its structure. Pesticides are controlled in Japan according to the Water Pollution Control Law, the Air Pollution Control Law, the Chemical Substances Control Law, and the Agricultural Chemicals Regulation Law. Dangerous chemicals (PCBs) are under the control of the Chemical Substances Control Law, The Law for the Promotion of Environmentally Sound Destruction of PCB Waste (2001), and other environmental Pollution Control Laws.

2.4 China's POPs management needs to be improved

Compared to developed countries, China's POPs management needs to be improved.

2.4.1 Special management

Since 1995, international concern on decreasing or eliminating POPs has been growing, reflecting the global need for special laws for the management of POPs. Japan has played a leading role by first adopting two special laws: the Law Concerning Special Measures against Dioxin (1999), and the Law for the Promotion of Environmentally Sound Destruction of PCB Waste (2001), which greatly improved its capacity to meet the obligations of Stockholm Conventions.

China introduced POPs management later than

developed countries (Table 2), and now it faces a great challenge as it moves to establish special POPs management. In China, special management of POPs is virtually non-existent. Most of the existing regulations do not refer to POPs directly; POPs were mentioned only in some clauses. Explicit polices or regulations against POPs related environmental accidents are in great shortage. There is only one statute that focuses on PCB management, the Statute of Preventing the Electric Power Equipment and its Waste with PCBs from Polluting the Environment, issued by the State Environmental Protection Agency (SEPA) and the Ministry of Energy in 1991, regulations on PCBs producing paint and printing ink are rare. The existing regulations have no specific requirements for unintentional POPs, dioxin and furan. The existing POPs legal framework is not consistent. Special regulations, standards and measures on pollution control, worker safety, labelling, screening, and especially an integrated POPs law are greatly needed, to harmonize all the POPs policies.

Table 2 The years in which important laws/acts concerning POPs were first adopted

Field	International guidelines	Japan	US	EU	China
Dangerous chemicals		1973	1976	1979	1987
Work safety	1990		1992		1997
Pesticides		1984		1967	1982
International trade	1987		986	1988	1994
Special law on POPs	1995 (UNEP GC 18/32)	1999 (Dioxin)			Empty
	2001 (Stockholm Convention)	2001 (PCBs)			

2.4.2 Risk assessment and the precautionary principle

Risk assessment and the precautionary principle are at the core of EU policy on POPs (UK Department for Environment, Food and Rural Affairs, 2001). Under EU legislation for assessing chemicals, two separate regimes have been introduced, i.e. one relating to "new" chemicals and the other relating to "existing" chemicals. The Existing Substances Regulation (793/93/EEC), and the new chemicals EC Directive (79/831/EEC), both attach high importance to the assessment of possible harmful effects on humans and the environment.

In China much attention is given to aftermath reporting, surveying and treatment, an emergency response system for chemical accidents has now been established with the coordination of government departments (Shan, 2001), on the basis of relevant regulation, such as the "Regulation on treatment of critical pollution accidents of chemical plants". Quantitative data about environmental impacts and toxicological data, especially long term effects, of new industrial chemicals have not been tested, except that pesticides and medicines need to be registered, and the toxicological data need to be tested, with the Implementation Methods for Pesticide Management (issued in 1997) and the

Environmental Assessment Guideline of Pesticide (1989) as examples. The notification of new industrial chemicals has not been stipulated in the current laws and regulations.

2.4.3 Life-cycle management

Life-cycle management in chemicals is still in its initial stages in China. Much attention has been paid to production, use, import/export management, but little to raw material, waste disposal and its ecological long-term impact. For example, China's present regulations on classification and packing of hazardous substance are very simple; some important indicators, e.g., classification, signs, and verbal descriptions on toxicity and potential hazards of chemicals, need to be improved compared with those of the UK.

2.4.4 Technical supporting capacity

In 2002, the Japanese government published the Environmental Monitoring Report on the Persistent Organic Pollutants in Japan (Ministry of the Environment of Japan, 2002). It depicted environment monitoring results of most of the 12 POPs identified by UNEP/GC 18/32 (cf. above), such as (1) wildlife monitoring on fish, shellfish and birds, (2) water and bottom sediment monitoring and the "Follow-up survey of the pollution by unintentionally formed chemical substances". The report is based on its systematic environmental survey and monitoring on chemicals over a 30-year period. It indicated the strong capability of controlling the POPs domestically and meeting the obligations of international POPs conventions.

While in China, the technical supporting capacity has become the choke point in POPs management, although China has made great achievements in POPs control. China has made several national surveys on environmental pollutants, but the data of POPs on ecosystems in China are in great shortage, most existed data are about DDT and HCH, nearly nothing to do with other pesticide POPs. The methods of monitoring and analyzing PCBs are not sophisticated in China. There is no actual monitoring system for dioxin and furan in China, and no qualified supervisory capabilities to monitor the unintentional by-products, and the exact pollution sources and pollution status of dioxin and furan are not clear until now. The national database of POPs residue, source, alternatives, potential POPs, has not yet been established. The limitation values set in the standards are not strict, which does not meet with the current environmental and health demands. Amendment is required to the standards according to the state-of-arts of national and international POPs reduction and control.

3 Perspectives

China takes an active part in international activities and

implements many international conventions on POPs. How to meet the obligation of implementing the Stockholm Convention has now become a high priority for China. At present, a legal framework on POPs management, which is close to international guidelines, has been established. China should improve its capacity building of POPs management by:

Adopting and strengthening its POPs special management system, including an integrated law focused on POPs, and other relevant regulations, to establish a harmonized legal framework on POPs (Fig. 1);

Fostering the use of life-cycle management, the precautionary principle, and risk assessment, especially the ecological long-term risk;

Strengthening the policy supporting system, including the technical standards and norms, data checking, auditing and tracking system, and public awareness and training system.

Trying to take a more prominent role in international programmes on POPs, by improving its capacity on POPs management and cooperating with international partners.

Acknowledgements: The authors thank Susan Greenwood Etienne and Veronique Plocq Fichelet for reviewing the manuscript and helpful suggestions.

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(Received for review June 16, 2004. Accepted October 24, 2004)