UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project of the People's Republic of China

PROJECT DOCUMENT

Project number:	GF/CPR/08/X01
Project title:	Environmentally sound management and disposal of obsolete POPs pesticides and other POPs wastes in China
GEFSEC Project ID:	2926
Starting date:	January 2009
Duration:	5 years
Project site:	China
Government Co-ordinating agency:	China Ministry of Environmental Protection (MEP)
Executing Agency/ cooperating agency:	MEP/Foreign Economic Cooperation Office (FECO)
Project Inputs:	
GEF grant:	**US$ 9,973,000** excluding PPG of US$ 231,000
	US$ 10,204,000 including PPG
Support costs (10%):	*US$ 1,020,400*
***UNIDO inputs** (in-kind):*	*US$ 100,000*
Counterparts input:	
MEP (cash & in-kind)	*US$ 6,400,000*
MOF (cash)	*US$ 3,900,000*
Local EPBS (cash & in-kind)	*US$ 7,400,000*
Pesticides owners and other private sectors (cash & in-kind)	*US$ 14,300,000*
Total co-financing	***US$ 32,100,000***
Grand Total:	**US$ 42,073,000 (excluding support costs)**

Brief description:

The project will enable environmentally sound management (ESM) and disposal of targeted obsolete POPs pesticides and associated wastes in fulfilment of China's commitments under the Stockholm Convention. The presence of geographically dispersed stockpiles of obsolete POPs pesticide waste and PCDD/PCDFs rich incinerator fly ash presents an ongoing pollution source and pathway risk to environmental receptors, especially groundwater and surface water resources. The scale of this risk and its global consequences make it a uniquely Chinese issue with significant trans-boundary impact. The project will directly provide for treatment in accordance with Stockholm Convention and Basel Convention guidelines of a minimum of 10,000 tons of identified targeted POPs pesticide wastes and 1,000 tons of PCDD/PCDFs rich fly ash. The project will also introduce regulatory reforms and strengthen national capacity to identify, assess, manage, and treat other such wastes in an environmentally sustainable manner by use of new analytical and organizational techniques such as qualitative environmental risk assessment and public-private partnerships (PPP).

Approved:

	Signature:	**Date:**	**Name and title:**
On behalf of			
The Government of the People's Republic of China:	_____	_____	_____
UNIDO:	_____	_____	_____

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LIST OF ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AIDS	Acquired Immure Deficiency Syndrome
APCD	Air pollution control device
APCS	Air pollution control system
APR	Annual Project Report
AQSIQ	Administration of Quality, Supervision, Inspection and Quarantine
BAT	Best available techniques
BEP	Best environmental practices
BOO	Build-Operate-Own
BOT	Build-Operate-Transfer
CAS	Chinese Academy of Sciences
CCCEPI	China Certification Centre of Environmental Protection Industry
CEMS	Continuous Emission Monitoring System
CICG	Convention Implementation Coordinating Group
CIO	Convention Implementation Office
COP	Conference of Parties
CSC	China Standard Certification Centre
CTA	Chief Technical Advisor
DEHP	Diethylhexylphthalate
EMS	Environmental Management System
EPA	US Environmental Protection Agency
EPB	Environmental Protection Bureau
EIA	Environmental Impact Assessment
ESM	Environmental Sound Management
EU	European Union
FECO	Foreign Economic Cooperation Office
GAC	General Administration of Customs
GEF	Global Environment Facility
HWDC	Hazardous Waste Disposal Centre
MW	Medical waste
IHB	Institute of Hydrobiology
IR	Inception Report
MI	Medical Institution
MOA	Ministry of Agriculture
MEP	Ministry of Environmental Protection
MOHURD	Ministry of Housing and Urban-Rural Development
MOF	Ministry of Finance
MOFA	Ministry of Foreign Affairs

LIST OF ACRONYMS AND ABBREVIATIONS

MOFCOM	Ministry of Commerce
MOH	Ministry of Health
MOST	Ministry of Science and Technology
NCG	National Coordination Group
NDRC	National Development and Reform Commission
Ng	Nanogram
NGOs	Non-governmental Organizations
NIP	National Implementation Plan
NHMWP	National Hazardous and Medical Waste Disposal Facility Construction Program
NTA	National Technical Advisor
OP	Operational Program
OPP	Obsolete POPs pesticides
PW	POPs waste
PPW	POPs pesticide waste
PCDD/PCDFs	Polychlorodibenzo-para-dioxins and Polychlorodibenzofurans
PPP	Public-private partnership
PIR	Annual Project Implementation Review
PM	Particulate matter
PMO	Project Management Office
POPs	Persistent Organic Pollutants
SARS	Severe Acute Respiratory Syndrome
SC	Stockholm Convention
SERC	State Electrical Regulation Commission
SAWS	State Administration of Work Safety
TCDD	Tetrachlorodibenzo-p-dioxin
TCG	Technical Coordination Group
TEQ	Toxic Equivalent (dioxin emissions)
TOT	Transfer-Operate-Transfer
TTR	Terminal Tripartite Review
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNIDO	United Nations Industrial Development Organization
UP-POPs	Unintentionally produced POPs
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WB	The World Bank
WHO	World Health Organization

SECTION A. CONTEXT

A.1 Context/History

a. Overview

1. China has urgent need of an on the ground program for managing stockpiles of obsolete POPs pesticides and associated contaminated wastes in an environmentally sound manner. China's large agricultural sector with its heavy dependence on agro-chemicals resulted in about 574,000 tons of POPs pesticides being manufactured up to 2004 when production was banned. Although POPs pesticides production has been prohibited by domestic regulations, lack of a targeted national program providing capacity building and technical assistance to manage these chemicals has resulted in significant stockpiling of obsolete POPs pesticides.

2. Based on the research and surveys conducted in conjunction with the preparation of this project, obsolete POPs pesticide and associated wastes have been identified in 44 POPs pesticide manufacturing plants and a number of distribution and end user sites. In the past, plant owners and end users have been largely unregulated and responsible for managing their own POPs pesticides, which have resulted in stockpiles of obsolete pesticides and associated wastes, the distribution and scope of which has been unknown to central and local environmental protection agencies.

3. The absence of adequate capacity and infrastructure for environmentally sound management (ESM) and disposal of POPs pesticide wastes in China poses significant risks to human health and the environment. In most POPs pesticide manufacturing plants and end user sites, there are no storage facilities specifically designed for obsolete pesticides and pesticide wastes. Large amounts of obsolete POPs pesticides are therefore often stored in improper conditions, such as outdoor storage, simple enclosure, or open-air disposal with municipal solid waste, all of which constitute a serious threat to human health. This serious risk of environmental contamination and human exposure is further exacerbated by natural disaster, such as the flooding and earthquakes, which China has recently experienced.

4. Current practices for hazardous waste disposal have been dominated by incineration and therefore generate secondary pollution such as dioxins and furans. It is estimated that fly ash containing a high level of dioxin from incineration of hazardous wastes and medical wastes amounts to 11,000 tons per annum. Incineration plants generally dispose of this dioxin rich fly ash in open dumps or non-sanitary landfills mixed with municipal wastes, thereby increasing the potential POPs pollution risk to water resources.

5. The Chinese government acceded to the Stockholm Convention on May 23, 2001. The Tenth National People's Congress Standing Committee ratified the Stockholm Convention on June 25, 2004. Under Article 6(1) (c), China is required to manage POPs wastes in an environmentally sound manner. However, surveys and reports have shown that lack of institutional, technical, and financial capacity inhibits the sound management of obsolete POPs pesticides and associated wastes.

b. Obsolete POPs pesticides

6. China has historically produced six of the nine POPs pesticide in Annex A and B of the Convention, including toxaphene, hexachlorobenzene, chlordane, heptachlor, mirex and DDT. Accumulated output of those pesticides was about 574,000 tons through the end of 2004. Aldrin, dieldrin and endrin were never produced industrially. Production and use of toxaphene and heptachlor ceased in the 1970's, and production and use of hexachlorobenzene in 2004. Small scale production of chlordane, mirex and DDT still exits in China but is expected to completely stop in 2009 given that China has not re-applied for exemption for these chemicals.

7. Obsolete POPs pesticides refer to unusable pesticides stored or abandoned by manufacturers, distributors and end-users, with no remaining market value. Obsolete POPs pesticides and

associated wastes are generated when new products render old ones obsolete, when stocks exceed market demand and as a result of waste generated during the production process.

8. In conjunction with the development of this project, MEP initiated a survey program for production, consumption, stockpile and disposal of POPs pesticides. The program updated initial manufacturer and distributor surveys conducted during the preparation of the NIP, and expanded upon the NIP by inclusion of additional distributor sites. To date, the program has identified 3840~4380 tons of obsolete pesticides in the production field, including about 2400~2800 tons of DDT, 60~70 tons of HCB/PCP-Na and 1380~1510 tons of chlordane and mirex. Distributor surveys and follow-up site visits were conducted nationwide during preparation of China's NIP, identifying 13 POPs pesticide waste sites in 13 provinces. Additional detailed survey work completed during the preparation of this project has focused on three target provinces (Chongqing, Jilin and Jiangsu), identifying 29 additional sites in Chongqing. The 42 sites identified to date have 4219~5713 tons of obsolete pesticides (mostly DDT). Table 1 below is given for further details regarding sites information collected to date and Table 6 in Annex 8 – Baseline Analysis for POPs pesticides and fly ash for detailed listing of identified sites and site data.

Table 1. Identified Obsolete POPs Pesticides Sites

Area		DDT	Chlordane/Mirex	HCB	Sub-total
Production	Pesticide manufactures	2400~2800	1380~1510	60~70	3840~4380
Distributors	Agriculture	4164~5640			4164~5640
	Healthcare	55~73	-	-	55~73
	Subtotal	4219~5713			4219~5713
Total		**6,619~8,513**	**1380~1510**	**60~70**	**8,059~10,093**

9. Among the pesticide manufacturers with obsolete POPs pesticides and contaminated workshops in the production sites, one will be covered by the GEF funded Termite Project (WB) and three by the GEF funded Dicofol Project (UNDP). The remaining sites (18 manufacturers and 42 distributors) and additional sites identified during project implementation will form the project's target universe, neutralizing a minimum of 10,000 tons of obsolete pesticides and associated wastes. Figure 1 below shows the geographic distribution of major target sites.

Figure 1: Geographic Distribution of targeted obsolete POPs pesticides

10. Obsolete pesticides and associated wastes are hazardous wastes. Owing to the absence of environmentally sound disposal facilities in China, the quantity of obsolete pesticides and associated wastes are constantly on the increase. Most waste sites are located in areas with high population density where obsolete POPs pesticides were dumped in the vacant buildings, abandoned water towers and caves. Storage conditions rarely meet internationally accepted standards. Chemical drums are often stored in the open, exposed to harsh weather conditions which accelerate their deterioration and leak their contents to the soil, severely contaminating groundwater and the environment, while powdered chemicals in bags and cardboard boxes are dispersed by wind and rain as their containers deteriorate. Most sites are located in or near population centres and/or bodies of water. This high degree of environmental contamination is demonstrated by one manufacturing site in which chemical analysis of contaminated soils was undertaken, identifying 18,000 tons of highly polluted soil (DDT>50 ppm). Annex 8 – Baseline analysis for POPs pesticides and fly ash and China NIP give additional information regarding the current and historical production and use of POPs pesticides.

c. ***Regulatory context***

11. The Stockholm Convention entered into force in China on 11 November 2004. Article 6 of the Convention requires Parties to take measures to ensure that POPs wastes are handled, collected, transported, stored and disposed of in an environmentally sound manner; to identify POPs-contaminated sites; and to ensure that any remediation of contaminated sites is undertaken in an environmentally sound manner. Article 5 of the Convention requires the Parties to take measures to reduce or eliminate releases of unintentionally produced POPs in Part I from sources listed in Parts II and III of Annex C of the Convention, including reduction/elimination of dioxin releases from incineration of POPs pesticides and risks posed by dioxin-rich fly ash resulting from incineration processes.

12. China has also acceded to the Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and their Disposal in 1991 and will continue to adhere to its requirements controlling management of hazardous waste exports to Basel Convention countries and prohibiting exports to non-Basel countries. In implementing this project, China will also draw on Basel Convention "*Technical guidelines on environmentally sound management of persistent organic pollutants*" with respect to processes for destruction and irreversible transformation of POPs wastes in response to the request by the Open Ended Working Group of the Basel Convention in September 2007 (OEWG-VI/6).

13. According to the current hazardous waste management licensing system, a license must be obtained for collection, transport, and storage, and/or disposal of hazardous waste. For treatment of hazardous waste streams over 10,000 tons per year or involving transporting hazardous materials across provincial lines, central government approval by MEP is required. For treatment facilities under these thresholds, provincial or municipal approval is adequate. A special MEP-issued license is also required for PCB or mercury contaminated waste or "other toxic substances highly dangerous to the environment and human health." The special license required for PCB waste management and treatment has enabled China to better control and dispose of those wastes. Currently, processing of obsolete POPs pesticide and other POPs contaminated wastes does not include a clear approval requirement for a special operating license by MEP or Local Environmental Protection Bureaus (EPBs), which constitutes a barrier to the implementation of ESM in POPs pesticide waste. The project will therefore support work within MEP to develop and implement such a licensing system for the treatment of obsolete POPs pesticides and associated POPs contaminated wastes.

14. China does not currently have any take-back requirements for obsolete or otherwise unusable pesticides and contaminated used pesticide containers, which often results in improper disposal of these wastes by end-users. The project will therefore work with legislative and regulatory authorities to develop such a requirement so that pesticide suppliers (manufacturers and/or distributors) would be required to take back such contaminated wastes, which could then more efficiently and effectively be channeled into the hazardous waste management system. The

project will also consider implementation of a buy-back requirement for both obsolete and unused pesticides, which would tend to result in reduced pesticide use by end-users. While such a requirement may appear to be in conflict with supplier interests, take-backs can benefit suppliers in the long term since they improve customer relations, and are significantly less expensive than the clean-up costs, which the supplier can potentially become wholly or partially responsible for if unused or obsolete pesticides are not properly managed and disposed of.

15. Table 2 below list the key laws, regulations and standards related to obsolete POPs pesticides and associated wastes.

Table 2. Key Laws, Regulations and Standards related to Obsolete POPs Pesticides and Associated Waste

Law/regulation/standard		Issued by	Date of issuance
Laws	Environmental Protection Law of China	SCNPC	December 1989
	Law of China on the Prevention and Control of Environmental Pollution Caused by Solid Waste	SCNPC	April 2005
Policies	National Implementation Plan for POPs Convention in China	State Council	April 2006
	Technical Policy for the Prevention and Control of Pollution Caused by Hazardous Waste	SEPA	December2001
	Circular Concerning Implementation of Charging System for Disposal of Hazardous Wastes to Promote Industrialization of Hazardous Waste Disposal	NDRC, SEPA, MOH, MOF, MOC	April 2005
Regulations	Pesticide Management Rules	State Council	July 2001
	Regulation on Safe Use of Pesticides	MOA, MOH, etc	October 1982
	National Catalogue of Hazardous Waste	SEPA, the former SETC, the former MOFTEC	July 1998
	Measures for the Administration of Operating Licenses for Hazardous Waste	State Council	May 2004
	Measures for Manifest Management on Transfer of Hazardous Waste	SEPA	October 1999
	Measures for the Prevention and Control of Environment Pollution by Discarded Hazardous Chemicals	SEPA	October 2005
	National Programme for Hazardous and Medical Waste Disposal Facilities Construction	State Council	January 2004
Standards	Standard on Identification of Hazardous Waste	SEPA	October 2007
	Pollution Control Standard for Hazardous Waste Incineration	SEPA	January 2002
	Standard for Pollution Control on Hazardous Waste Storage	SEPA	July 2002
	Standard for Pollution Control on the Safe Landfill for Hazardous Waste	SEPA	July 2002
	Technical Requirements on Engineering Construction for Safe Landfill and Disposal of Hazardous Waste	SEPA	January 2004

* See Annex 9 for additional laws, regulations and standards related to POPs pesticides and contaminated sites.

e. Institutional settings

16. As designated hazardous wastes (category "HW04" in the *National Catalogue of Hazardous Wastes*), obsolete pesticides are managed under China's solid waste management system, as shown in the Figure 2 below.

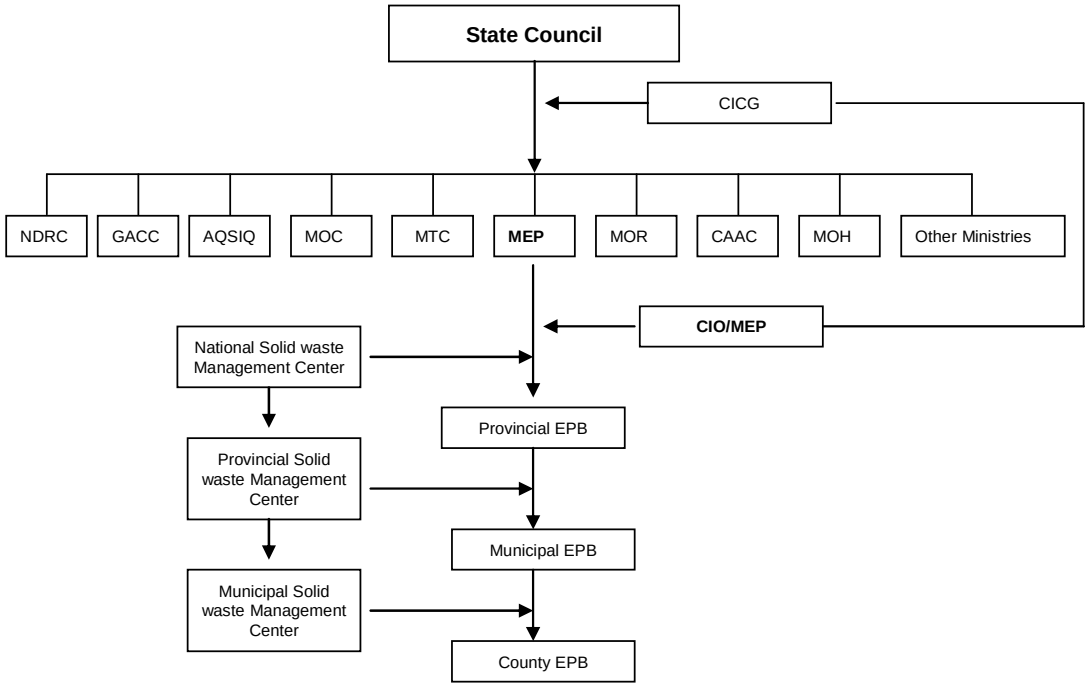


Figure 2: Institution settings concerned with solid waste management

17. The Ministry of Environmental Protection (MEP) is the national level authority for environmental protection and pollution prevention. MEP's Solid Waste Division under the Department of Pollution Control is responsible for solid waste management, including obsolete POPs pesticides. MEP also has a National Solid Waste Management Centre, which provides technical and policy support to MEP. At the provincial, municipal, and county levels, solid waste is managed by the EPB's Pollution Control section or Solid Waste Management Centre. Other government ministries such as the NDRC, MOHURD and AQSIQ work with MEP to support implementation of the Solid Waste Law within each ministry's sphere of responsibility.

f. Disposal of POPs wastes

18. At present, high-temperature incinerators are the most common facilities used for treatment of hazardous wastes because there are few disposal alternatives with regulatory approval. Incinerators are generally designed to accept consistent waste feedstocks with low chlorine content in order to achieve the current national emission standard (0.5 ngTEQ/Nm^3) and are not capable of meeting ESM requirements.

19. Cement kiln co-processing of hazardous waste provides high temperature, long residence time, surplus oxygen, good mixing, and an alkaline environment for high efficiency destruction of POPs. For China, co-processing of POPs in rotary cement kilns has been used in limited applications and is still at the demonstration stage, although it has been practiced for more than 30 years in developed countries. As rule of thumb, chlorine should be limited to 350 to 500g/t

cement clinker for a kiln without by-pass and 400-750 g/t for a kiln with by-pass, and the feeding ratio has to be controlled carefully to avoid the high-level dioxin emission. In most cases, the cement kiln must be equipped with a special feeding system, flue gas treatment equipment, and a continuous environmental monitoring system for treatment of POPs emissions. The quench process is also an essential step to achieve lower PCDD/Fs emissions.

20. Limited research and pilot demonstration have been undertaken in the application of plasma technology for treatment of POPs in China. China's first facility using domestically manufactured plasma treatment technology with a capacity of 3 tons/day was constructed in late 2006 for disposal of PCB by-products and residues from a chemical plant in Sichuan Province. The flue-gas system was designed to recover HCl; the natural gas-fueled secondary combustion chamber is placed directly after the plasma pyrolysis furnace. Carbon and combustible gases are incinerated with natural gas; hydrochloric acid is recycled through a three-stage acid gas scrubber/recycling tower and then recovered. A pilot 3 ton/day plasma system for fly ash treatment has also been demonstrated in Anhui province, achieving PCDD/Fs emissions levels of 0.02 ngTEQ/$Nm^{3.}$.

g. Private-Public Partnership (PPP) in the management of obsolete POPs pesticides

21. China will need to invest billions of dollars for identification, collection, transportation, treatment, and disposal of obsolete POPs pesticides and associated wastes. The Chinese government is facing both a "capital bottleneck" and low efficiency in the existing government-run system for developing the necessary infrastructure to address environmental pollution. Investment needs will further increase as new POPs are included under the auspices of the Stockholm Convention. A long term and sustainable financial strategy is therefore needed. To meet this need, the project will introduce and develop PPP.

22. PPPs are innovative mechanisms for delivery of new or improved facilities and services. Traditionally, local government own facilities are responsible for providing services, procuring support services on a piecemeal basis from the private sector as needed. With PPP, a single private sector provides the complete range of services to build and operate a facility under a long term contract. The PPP approach has often been adopted in other countries, but is relatively new in China. This approach allows the private sector to contribute its expertise and for both sectors to harness their energies in finding innovative and cost-effective solutions.

23. PPP will be applied in this project through a Special Purpose Company (SPC), which will build the hazardous waste disposal facility and then operate it through provision of technology transfer, in-plant training, environmental monitoring, maintenance, and other necessary services. The SPC will be responsible to the procuring government agency in meeting contractual targets and other requirements, and will be required to follow relevant environmental protection and other regulations. Beyond that, the SPC will have a high degree of independence in managing its internal operations and providing services. In return, the SPC will receive contractual payments and/or revenue sharing.

24. The project will provide additional incentives and legislative support for the PPP mechanism through a variety of measures, potentially including:

    a) Introduction of fee-based system for disposal of obsolete POPs pesticides and pesticide wastes;
    b) Implementation of shared savings bonuses to SPCs for successful implementation of new, cost-effective approaches;
    c) Subsidize capital investment costs of introducing environmentally sound disposal technologies; and
    d) Introduction of tax incentives for new facilities, technologies and jobs in the hazardous waste treatment industry.

A.2 Barrier Analysis

25. The proposed project has been designed to address a variety of barriers in order to ensure its successful implementation and the achievement of project objectives. These barriers, listed in the order of project outcomes, include:

a) Existing laws and regulations related to hazardous wastes are too general and their implementation is not supported by detailed regulations and technical guidelines.

26. In order to prevent POPs-contaminated wastes from polluting the environment, the Chinese government has promulgated *Measures on Prevention and Control of Environmental Pollution Caused by Abandoned Hazardous Chemicals*. China has also formulated and implemented a series of standards, including the *Standard on Hazardous Wastes Identification,* the *Standard for Pollution Control on Hazardous Waste Storage,* the *Pollution Control Standard for Landfilling of Hazardous Wastes,* and the *Pollution Control Standard for Hazardous Wastes Incineration.* The implementation of these Standards plays a very important role in promoting and regulating hazardous wastes management of the country.

27. Though China has established a basic regulatory framework for hazardous waste management and treatment, existing laws and regulations are too general and their implementation is not supported by detailed orders and technical guidelines. The project will address this issue through technical support, policy support, and capacity building for regulatory development. Regulatory development will also be coordinated in both content and timing with other project activities in order to provide a nurturing and sustainable policy environment.

Operating license for hazardous wastes

28. Issuing operating licenses for hazardous waste management is an important administrative tool for supervision of hazardous wastes disposal facilities. According to the *Measures for the Administration of Operating Licenses for Hazardous Wastes* promulgated on 1 July 2004, hazardous wastes disposal facilities must first demonstrate that its facility meets national and/or local environmental protection standards in order to obtain an operating license.

29. The *Measures for the Administration of Operating licenses for Hazardous Wastes* contain general provisions relating to the basic resource requirements for hazardous waste disposal facilities, but lack specifications for POPs pesticide wastes. In practice, due to application backlogs and lack of enforcement, many facilities are still operating without a license. There is no detailed guidance for processing POPs pesticides, transportation of waste across provincial boundaries, or use of mobile facilities. The project will address these deficiencies by supporting development of detailed implementation rules for licensing POPs pesticide wastes treatment and disposal facilities.

Hazardous waste consignment

30. The generation, collection, transports and disposal of PW forms a complex system involving multiple economic actors. Implementation of a consignment system for PW is an important means to organize this process so as to prevent loss of wastes and ensure that wastes are treated and disposed of safely and properly at each stage of the process. Aspects of China's current system comprise a barrier in reaching this goal.

31. According to the *Measures for Manifest Management on Transfer of Hazardous Wastes*, the present PW transfer manifest system requires a hazardous waste transfer manifest in quintuple copies, which is overly complicated for management of PW waste transfers. Some provinces modified shipment requirements and changed the manifest to three copies, which greatly reduced the system's effectiveness. The manifest system is not implemented in some regions increasing the possibility of unaccountable loss and unauthorized disposal of PW is increased with the consequent potential health and environmental pollution risk.

32. To bring the role of the PW transfer manifest system into full operation, the project will develop and introduce a dedicated PW transfer manifest that should be formulated based on the present hazardous waste transfer manifest. This new PW transfer manifest system should clearly define responsibilities of waste generation units, transport units and disposal units in the management

on transfer of waste, explicitly specify information required to be filled in, establish data reporting and archiving systems, and make use of advanced information technology tools.

Legal Liability System

33. While the *Environmental Protection Law* stipulates the "polluter pays" principal, China does not currently have a well-developed system for establishing the legal and financial liability for environmental contamination and health impacts due to improperly disposed of pesticides and pesticide wastes. This lack of clear accountability reduces the deterrent impact of legal prohibitions, leading to a greater incidence of improperly managed wastes, and reduces national, provincial, and local government ability to finance waste management and clean-up operations, thereby compounding the problem and increasing health and environmental impacts. The lack of clear legal and financial liability is particularly pronounced for "orphaned" obsolete POPs pesticides, where the owner or other party responsible for the wastes either can not be determined or no longer exists.

b) Existing standards for hazardous waste pollution control are too broad and specific standards for POPs pesticides do not exist

34. The Government of China has not yet established a system of standards for PW. Such a system is crucial to assure appropriate management and disposal of PW, and its absence constitutes a barrier to environmentally sustainable management.

35. Current environmental legislation was developed prior to China's accession to the Stockholm Convention. This led to an inadequate consideration of the requirements of ESM for all aspects of POPs wastes.

Lack of standards for alternative treatment technologies

36. Standards for testing and assessing alternative disposal technologies have not yet been developed in China due to lack of knowledge and technical support regarding those technologies. This lack of prescribed standards makes it difficult for China's environmental protection departments to identify, apply and regulate alternative technologies and their application.

Loose standards for the incineration pollution control

37. China's *Pollution Control Standard for Hazardous Wastes Incineration* establishes 0.5 ng TEQ/Nm^3 as the emission limit of PCDD/PCDFs in flue gas from incineration, while most countries in the world have adopted a PCDD/PCDFs emission below 0.1 ng TEQ/Nm^3 through application of best available techniques and best environmental practices (BAT/BEP) under the Stockholm Convention. China's high incineration emission limits allows prolonged use of outdated incineration equipment and acts as a barrier to implementation of new and improved equipment, technologies and techniques, and consequently impedes China's fulfilment of its obligations under the Stockholm Convention.

c) China's Nationwide Hazardous Waste Treatment Facility Construction Program has been developed without considering technology and knowledge transfer of ESM measures particularly in considering alternative technologies

38. The National Hazardous and Medical Waste Disposal Facility Construction Program (NHMWP) commenced in 2003, when China has not yet acceded to the Stockholm Convention. It was developed based on environmental protection and health standards in force at that time, which adopted incineration technology as the primary disposal technology. The Program principally emphasized elimination of the health and safety threats posed by medical hazardous wastes, and gave less consideration to the application of ESM to total process management of POPs wastes and minimization of unintentionally produced POPs (UP-POPs) and other pollutants.

39. Article 5 of the Convention requires the Parties to take measures to reduce or, where feasible, eliminate releases of UP-POPs, and to apply BAT for new sources and existing sources listed in Part II: Source categories of Annex C of the Stockholm Convention. In the NIP of China, the on-

going management and incremental disposal of identified POPs pesticide wastes is also listed as a specific action (Table 3-14, Specific action 16) and, pursuant to the "*action plan for identification and disposal of POPs stockpiles, wastes and contaminated sites*" priority should also be given to demonstration activities for ESM application.

40. However, the application of ESM in the whole process of management and disposal of obsolete POPs pesticides and POPs pesticide wastes in China still faces a series of barriers.

41. The project will address this omission in the NHMWP by working closely with national, provincial, and local officials responsible for the implementation of the NHMWP to provide capacity building and technical assistance in the development of waste management plans and in technology selection. This support will allow selection of the most cost-effective, environmentally beneficial technologies, coupled with the implementation of the ESM to minimize overall system costs, inefficiencies, and POPs emissions.

d) Lack of policy instruments promoting adoption of ESM in a market economy

42. Technical policies for environmental protection are technical guidelines formulated by governments to guide industries to take self-regulatory actions in choosing and upgrading their technologies in light of the principles of sustainable development. ESM recommended by the Convention should be incorporated into a country's technical policy.

43. Economic policies for environmental protection make use of economic instruments such as pricing, taxation, credit and insurance. They are designed to regulate or influence the behavior of market players in favour of sustainable develop. The United Nation's Rio Declaration on Environment and Development states that countries should adopt economic policies to internalize environmental costs into the production and consumption processes.

44. In 2001, China promulgated the *Technical policy for the prevention and control of pollution caused by hazardous wastes*. This policy is applicable to technology selection for the total process of pollution prevention and control from the generation, collection, transport, segregation, testing, packing, recycling, storage, treatment, and disposal of hazardous wastes, and can be used to provide guidance on the planning, project justification, location selection, design, construction, operation and management of relevant facilities.

45. China promulgated waste fees and taxation preference policies for the operation of hazardous wastes facilities. In November 2003, the National Development and Reform Commission (NDRC), MEP, Ministries of Health, Finance and Construction jointly promulgated the Advice Concerning Implementing Fee Charging System to Promote Industrialization of Hazardous Waste Disposal, which includes provisions on implementation of the fee system for hazardous waste disposal. However, the fee-based system has not yet been applied to obsolete pesticide disposal.

46. However, a variety of deficiencies remain in technical and economic policies. Current technology selection standards promoting incineration as the preferred disposal method are outdated and do not reflect current international trends or Stockholm Convention ESM requirements. Economic policies are also incomplete, and limited in their ability to promote market-based operation of obsolete pesticides management and disposal. Tax preferences have not been provided to reflect the public goods nature of pesticide waste management, nor are government agencies equipped to employ special funds, subsidies, or other economic incentives to encourage enterprises to carry out environmentally safe disposal of obsolete pesticides.

e) Historical pesticides manufacturing sites that stopped production long ago might not have production records based on which the size of contaminated areas and level of contamination can be estimated

47. Prior to the *Measures on Prevention and Control of Environmental Pollution Caused by Abandoned Hazardous Chemicals* in 2005, pesticides manufacturing companies were not obliged to rehabilitate contaminated sites when they stopped production and therefore often did not keep historical records regarding the location and size of contaminated areas within their facility perimeters. Hence detailed field surveys must be carried out to obtain this information.

f) Weak institutional capacities for supervision and inspection of POPs waste owners' sites and dedicated disposal facilities in the areas of pollution monitoring, environmental impact assessment, and risk assessment of disposal operations

48. During completion of the NIP, development of this project, and through undertaking related bilateral projects, the Ministry of Environmental Protection has begun to strengthen its capacity for supervision of POPs pesticides manufacturing companies and dedicated hazardous wastes disposal facilities in the areas of pollution monitoring, environmental impact assessment, and risk assessment of disposal operations. However, much additional work needs to be done to enhance monitoring, assessment, and enforcement capabilities, both at the national and local levels.

49. Currently, environmental protection departments at various levels of government suffer from inadequate guidelines for supervision. As a result, pesticides management varies from official to official and region to region, giving rise to confusion on what constitutes proper waste management practice. It is therefore necessary to formulate guidelines for obsolete pesticides and associated waste supervision and management in order to regularize and strengthen management and supervisory activities.

50. Because the manifest system for pesticides transfer has not been implemented effectively, such important basic data as source, type, composition, and quantity of obsolete pesticides and associated wastes is unavailable for many stockpiles throughout the country. This lack of data restricts the ability of environmental protection departments to supervise pesticides management, and develop programs and policies for obsolete pesticides disposal. It is therefore necessary to establish a more comprehensive data reporting system requiring regular reporting by pesticides manufacturers, distributors, and transporters. Use of advanced information management techniques can both increase the system's effectiveness and usefulness, and reduce the administrative burden, which the system imposes on reporting entities, particularly when compared to the more cumbersome aspects of the current reporting system.

Weak capacity for pollution monitoring of dedicated disposal facilities

51. The supervision and monitoring of pollutant releases constitute an important means to ensure ESM application and adequate emission controls in the pesticides management and disposal sector. Work is required to establish online monitoring systems directly linked to the government's environmental protection supervision departments. Without such data, the departments are unable to monitor the operating status of obsolete pesticide waste incineration facilities.

52. The Chinese Government has moved fast to issue initial regulations and standards for pollution control at pesticide waste disposal facilities and capability exists to monitor emissions of general pollutants. However, gaps still exist in supervising and monitoring implementation of these regulations and standards, including:

    - Lack of technical specifications and instruments for supervision and monitoring;
    - Lack of capacity building and training for enforcement personnel;
    - Lack of capacity to monitor POPs pollutants such as PCDD/PCDFs from incineration; and
    - Lack of continuous emissions monitoring systems (CEMS).

Insufficient environmental impact assessment (EIA)

53. Environmental impact assessment is one of China's basic environmental protection requirements. In 1998, the Chinese Government promulgated the *Management Regulations for Environmental Protection of Construction Projects*, which sets forth the system of environmental impact assessment. In 2003, it promulgated the *Chinese Environmental Impact Assessment Law* and the *Technical Guidelines for Environmental Impact Assessment*. China has a certification system for EIA engineers, of which a large pool has been established.

54. In 2003, in order to address EIA for construction of hazardous wastes disposal facilities in conjunction with the NHMWP, MEP formulated the *Technical Principles for Environmental*

Impact Assessment of Construction of Hazardous Waste and Medical Waste Disposal Facilities. These guidelines specify environmental management requirements for pollutants emission, technology selection and provide other guidance on EIA for hazardous waste disposal facilities.

55. To date, EIA has been carried out for a majority of hazardous waste disposal facilities in accordance with the guidelines, but problems remain:

- Incomplete contents. The *Technical Principles* focus on incineration and do not consider alternative technologies, making their adoption more difficult.
- Insufficient follow-up assessments and post-assessments. Though the present EIA system includes requirements for follow-up assessment and post-assessment, they are either given inadequate emphasis or not executed in practice. This inhibits implementation of environmental impact mitigation measures proposed by the EIA during facility construction.
- Professional development of EIA personnel. In spite of the certification system, many EIA agencies and personnel still lack expertise and experience.

Lack of risk assessment of disposal operations

56. Ensuring effective operation of hazardous wastes disposal facilities is one of the key requirements for achieving ESM of obsolete POPs pesticides. Experience in other developed countries reveals that strengthening risk assessment at hazardous waste disposal facilities is an effective measure to ensure their safe operation. China currently does not undertake such risk assessment.

57. Inappropriate operation of disposal technologies can increase risks to the environment. For example, inappropriate control of incineration technical parameters and pollution caused by tail gases leads to higher PCDD/PCDFs releases, with concomitantly greater risks to public health and the environment. It is difficult to identify these problems through routine site inspections. By using risk assessment methodologies, inspectors can identify otherwise unknown problems and require new procedures, modification, or shut down for non-compliant facilities.

g) Lack of effective personnel training systems to provide qualified human resources for ESM based lifecycle management of POPs pesticides

58. Experience of developed countries proves that effective training is necessary to improve managerial and operating personnel capabilities in ESM based lifecycle pesticides management. The Stockholm Convention requires each Party to promote such training of workers, scientists, and technical and managerial personnel. China has no such training system, and it is therefore important that an effective system be established, particularly given the training needs that implementation of the Stockholm Convention requirements entails. Most disposal facility operators lack the knowledge and capabilities to comply with these requirements and require training in correct operation of equipment, emergency response, record keeping and reporting.

h) Lack of stakeholder awareness raising and education

59. ESM of obsolete pesticides in China involves the following groups:

i) Governmental personnel from multiple agencies, whose role is to carry out effective regulation and management of waste treatment and disposal through regulatory, administrative, economic and other instruments;

ii) Professional bodies and individuals including scientific and technological research personnel for obsolete pesticides treatment and disposal, waste disposal equipment manufacturers, and disposal facility operators;

iii) End-users, including small scale agricultural end-users who often resort to open burning or other improper methods to dispose of unused POPs pesticides; and

iv) Members of the general public who, if properly educated, are in a position to reduce contamination risk and exercise public supervision over treatment and disposal facilities.

60. While members of these groups play a crucial role in ESM, their awareness and knowledge are currently inadequate. For example, due to lack of knowledge about the secondary pollution from uncontrolled incineration of obsolete pesticides and the availability of alternative technologies, many government officials wrongly believe that incineration is the only way to treat obsolete pesticides. They actively promote incineration technologies and neglect the research, development, and application of alternatives. As a result, inappropriate incineration disposal has generated considerable amounts of toxic and hazardous substances such as PCDD/PCDFs.

61. Public information materials for those without a professional or scientific background are few and inadequate. Little has been invested in public information and educational campaigns through radio, TV, and other effective ways to reach the general public.

i) Lack of effective mechanism to promote research, development, and application of technically feasible and locally affordable processes, techniques and equipment

62. Some researches about the disposal of PW received international financial assistances. For example, the Institute of Hydrobiology (IHB) and Chinese Academy of Sciences (CAS) received funding from the Volkswagen Foundation and established China's first dedicated laboratory complying with international standards for the testing and research of PCDD/PCDFs-like compounds.

63. Overall, China's research and development in PW processes, technologies and equipment mainly focus on incineration technologies, particularly the pyrolysis incineration technology, and there are only very few studies on alternative technologies.

64. However, centralized disposal of hazardous wastes only started recently in China, and the country's capacity for research and development of disposal processes, technologies, and equipment remains in its infancy. The project preparatory phase surveys found the following gaps in incineration technologies of China compared with the international advanced level:

- The automation level of incineration disposal facilities is low in the waste feeding system. Many facilities are incapable of automatic feeding resulting in poor sealing at the feed inlet.
- Neither the furnace body design nor the manufacturing technology of rotary kilns and pyrolysis furnaces are up to international standards. Furnace walls are frequently overheated, which consequently damages the seals of incinerators, affects temperature control and severely shortens the service life of furnace body.
- The state of pyrolysis and combustion is not stable enough. The automatic control system cannot respond to the fluctuation of combustion conditions in time.
- The design of the principal body and nozzles of quenching tower is inappropriate, which influences the effect of quick quenching.
- Design technologies for selective catalytic reaction equipment and catalysts associated are still missing in China.
- The continuous emission monitoring system (CEMS) is not up to standard, incapable of real-time monitoring of pollutant releases in the combustion process.
- Poor integration of related individual technologies into system.

65. With the technological gaps in incineration, China cannot fulfill the international achievable limits for PCDD/PCDFs emissions from the hazardous waste incinerators, below the standard value of 0.1ngTEQ/Nm^3. The severely inadequate supply of various alternative technologies makes them difficult to adopt as recommended by the Convention. Therefore, China needs to properly introduce, digest and absorb foreign advanced technologies to close up these technological gaps. A long-term strategy on independent or joint research and development has to ensure that equipment in demand is locally available, thus reducing costs for the implementation of the Convention.

66. Based on the above analysis, a strategy should be put in place to mobilize the needed fund for research and development by means of:

- Divert investment of the national scientific research funds to research and development activities of this project by establishing a policy dialogue mechanism with the fund management authorities;
- Tap resources from enterprises for research and development of disposal equipment in need by creating and regulating domestic market; and
- Encourage joint research and development among international technology vendors and domestic enterprises by establishing a mutually equitable benefit sharing mechanism

j) Lack of POPs waste disposal capacity

67. Incineration is the principal technology for hazardous waste treatment in China. Compared to developed countries, China lacks environmentally sound management (ESM)-qualified incineration facilities and operating experience. Most of the facilities have a capacity less than 10 tons per day, but are still unable to consistently operate at full capacity level. Some facilities are capable of incinerating POPs wastes under the current national dioxin emission standard (0.5 ngTEQ/Nm^3). Such operations always have very high operating costs and require regular government subsidies. At the current stage of hazardous waste disposal industry development, it would not be technically feasible to dispose of the identified 10,000 tons of stockpiled POPs pesticides according to international BAT/BEP standards (0.1ngTEQ/Nm^3). China also has limited knowledge of and experience with co-processing of hazardous waste in cement kilns, which constitutes a barrier in considering this disposal option and implementing it in accordance with the ESM guidelines.

68. For POPs wastes, only PCB is identified as special hazardous waste in the Technical Policy for the Prevention and Control of Pollution Caused by Hazardous Wastes and other regulations and required to be treated at 1200 ºC for at least 2 seconds according to the Pollution Prevention Standard of Hazardous Waste Incineration, as requires very complex equipments, sophisticated controls and dangerous processes.

69. Although two POPs treatment centres have been planned in NHMWP approved in 2004, their construction has started with some delays. The only incineration facility that will meet the Convention operating standards is located in northeast China and dedicated to PCBs disposal at the unit cost of 2,000 Euros per ton. This facility has not yet been commissioned, and when operational, the demand on this facility will be beyond its capacity hence will not be available for this project. No other incineration facility that is currently in operation in China meets the Convention's standards for the disposal of POPs waste.

70. In addition, it is not economically feasible to export the POPs stockpiled pesticides and other POPs waste to other countries for final disposal in hazardous waste incinerators within the EU that meet the Convention's standards. In addition, the assembly and in-country transport costs of the waste and other pre-disposal activities including packaging to international standards, shipment cost, and compliance with transboundary with shipment regulations impose significant costs. On one side, the amount of POPs wastes is too big to transport to other countries, e.g. more than 110,000 tons POPs wastes were found from 2 typically high contaminated sites of pesticides of the total 44 POPs pesticide plants already closed. On the other side, relying on this option will delay or prevent the development of China's own capability to dispose of stockpiled pesticides and other POPs wastes in an environmentally sustainable manner. An analogue comparison would be the in-country unit transport cost to the dedicated PCB disposal incinerator in northeast China.

k) Slow commercial application of innovative POPs waste disposal technologies

71. Toxic emissions and the related health risks resulting from incineration have given rise to increasing concerns in China. Incineration is a major source of dioxins in China, and the risk of dioxin generation will increase significantly when additional POPs wastes are treated via incinerator. Demonstration and promotion of alternative technologies for the treatment of POPs contaminated waste is therefore a high priority.

72. Surprisingly, the commercial application of novel POPs disposal technologies in China has not been as successful as in other countries. Recently, several alternative technologies for POPs wastes disposal have been studied and applied in China such as pyrolysis, plasma arc technologies, supercritical water oxidation and molten salt technologies. Out of these technologies, plasma arc has been deeply researched and developed, such as the Plasma pyrolysis gasifying apparatus (Institute of Mechanics, Chinese Academy of Sciences – CAS-IMECH), High Power Plasma Technology for Hazardous Waste Treatment (Institute of Plasma Physics of CAS) and Plasma Medical Waste Treatment System (Research Institute of Tsinghua University in Shenzhen). However, the spread of these technologies are quite limited in the area of POPs waste treatment.

73. CAS-IMECH began its plasma research as early as 1960's. In 2002, the chemical warfare agent destruction experiment was taken in this furnace for Chemical Defense Institute of PLA. In 2003, it developed its plasma arc technology for medical wastes treatment sponsored by National Hi-Tech Project 863 and completed plasma-arc pyrolysis system with reductive atmosphere in the laboratory. The load capacity is 60 kg/h and the vitrified slag with very stable physio-chemical property was obtained. Furthermore, it was also used to treat PCBs and HFC23 at Zhonghao Chenguang Research Institute of Chemical Industry (ZCRICI), Sichuan Province. Tests showed the destruction efficiency (DE) is higher than 99.99%. PCBs content in the residue was lower than 1.28 mg/kg PCBs.

74. The operating cost for PCBs treatment for a plasma facility with the capacity of 5 ton/day was much lower than the PCB disposal fee by high temperature incineration (about 20,000 RMB/ton). However, the technology has not been widely used for other POPs and in other plants till now because the high temperature incineration was regarded as the only authorized technology for PCBs wastes based on a national standard.

l) Distribution and properties of obsolete pesticides and dioxin-rich fly ash

75. According to the current inventory of obsolete pesticides, the owners namely 20 pesticide manufacturers, 8 pesticide dealers for agricultural used and 5 disease control centres for vector control distributed in 14 provinces. POPs wastes include obsolete pesticides, solid residues, liquid wastes, soil and sediment of DDT, HCB, PCP-Na, toxaphene, chlordane, mirex and dicofol. The large number of pesticide sites, great disparity of waste amount at each site, the matrices contaminated with wastes makes their collection, packaging, transportation, storage and disposal a serious challenge for China having relatively little experience in hazardous waste management.

76. In addition, the handling, transportation, storage and disposal of PCDD/PCDFs rich fly ash is also a very new issue to be addressed since in most of the cases, they were disposed at landfill. The high content of PCDD/PCDFs and heavy metals make the disposal more difficult than the normal POPs wastes. The project requires broad-spectrum of highly efficient disposal technologies to be able to treat effectively many kinds of POPs wastes that would make the technology selection and cost control difficult. For a description and analysis of environmentally sound technologies for fly ash management, see Annex 3 – Environmentally sound technologies for fly ash management.

m) Lack of experience in operating mobile disposal facilities

77. For widely dispersed distribution of obsolete POPs pesticides and associated wastes it is a reasonable choice to select mobile POPs disposal facilities. Although the stationary disposal units are the optimal choice of selection for POPs waste, mobile units of low capacity are more economic due to their lower costs and are acceptable by the public due to their "temporary outfit".

78. New alternative technologies can be installed as mobile or semi-mobile units. The main processing plant and control room are constructed within two standard 40 foot ISO containers. These ISO containers have been issued with CFC plates for all modes of transportation. Various support facilities required for the operation of the mobile unit are located adjacent to the processing plant. As for a semi-mobile units concerned, it takes 2-3 months to dismantle, move and re-erect them somewhere else with a capacity of 3,000 tons/year. The cost of re-location is in the range of 15-25% of initial capital costs with additional costs required for sampling,

analysis, and transportation. For Plasma Arc (PLASCON), the footprint of the skid is 12 m^2. The height is 2 m, allowing transportation via shipping containers. Site preparation costs are approximately US$100,000 and accounts for 10% of equipment price. The Startech Plasma's footprint of 5, 10, 20 TPD converter is 10.47$m^{2;}$ height is 3m, again allowing transportation via shipping container.

79. Although wide experience had been accumulated in developed countries, designing, manufacture, operation and maintenance are still a challenge in China. It should be noted that the mobility of the unit and its effectiveness required to be well balanced.

n) Lack of cooperative and coordinated ESM for POPs waste disposal

80. In China, the hazardous waste management is based at provincial level and each province has a solid waste management centre and at least one hazardous waste disposal centre, which are responsible for the management and disposal nearly all the hazardous waste in that particular province. However, the disposal of obsolete POPs pesticides requires a regional mechanism and coordination. The frequent transboundary movement for POPs waste among provinces and operating a mobile disposal facility in several provinces (actually in 14 provinces) requires a strong policy and regulatory support.

81. With the aim to complete the construction of PW disposal facilities across the country as fast as possible and to set up a suitable framework of administrative rules, the NHMWP defined the scheme for the construction of disposal facilities focusing on incineration technology in cities at the prefecture level. In addition, the Program during its implementation has put in its agenda disposal facilities applying alternative technologies pointing out that disposal of different types of PW must be evaluated with demonstration projects.

82. The efficient use of waste disposal equipment capacities during maintenance period can be secured by strengthening cooperation among regional hazardous waste disposal centres. The cooperative disposal of hazardous wastes involving disposal facilities in adjacent cities can have significant benefits. Apart from the economies of scale and the breakdown of administrative barriers, the concept reinforces regional planning and coordination. At a practical level regional facilities including incineration and alternative technologies that can deal with the various waste streams of POPs wastes may provide an ideal model to improve environmental benefits and to ensure environmental safety within the region. The integrated regional capacity allows for the maintenance time without loss of service, the capacity to deal with a variety of specialized hazardous wastes and an enhanced capacity to deal with emergencies.

83. As mentioned above, the promotion of the cooperative disposal of POPs wastes has multiple economic, social and environmental benefits. However, to achieve these benefits, it is required to remove the present administrative barriers to establish a regional cooperation mechanism aiming at overall optimization of the facility resources in the region.

o) Lack of certification program to provide open, reliable and comparable information for reviewing technical and environmental performance of POPs waste treatment and disposal facility owners

84. The certification of environmental protection products (including POPs wastes disposal equipment) is conducted by an independent certification agency to certify that equipment and instruments preventing and controlling environmental pollution used specially for environmental monitoring comply with relevant standards or technical requirements. To carry out independent, objective and fair certification of environmental protection products has the following benefits:

- Lift the market threshold for environmental protection products to prevent inferior products to enter the market so that users can choose and buy good quality products.
- An environmental product manufacturer may promote the label issued by a certification agency among consumers to show and prove its products in compliance with related technical requirements. This helps to improve the environmental image of the enterprise and promote sales of its products.
- The inspection and survey during the certification help to find defects and problems of the environmental protection product and urge the manufacturer to improve the manufacturing technology and product performance.

85. A complete organizational system for the certification of PW disposal equipment should include an accreditation authority, an accredited certification agency and accredited testing institutes or laboratories.

86. At present, the China Certification Centre of Environmental Protection Industry (CCCEPI) and China Standard Certification Centre (CSC) are certification agencies accredited for certification of hazardous wastes disposal equipment. CCCEPI is accredited by MEP and Certification and Accreditation Administration of the People's Republic of China to carry out certification of environmental protection products. It can perform certification for a variety of products for PW disposal including industrial waste incinerators and dust removal devices. CSC is subordinate to China National Institute of Standardization. It is a third-party certification agency accredited to carry out certification of products for energy conservation, water conservation and environmental protection. So far, only incinerators and a few types of dust precipitator have been included in the list of products subject to certification.

87. Presently, 28 testing agencies such as the Quality Supervision and Testing Centre for Environmental Monitoring Instruments under MEP and the National Flue Gas Control Engineering and Technical Centre of Environmental Protection Industry have been examined and approved by CCCEPI as qualified testing agencies. However, incinerator has not been included in their testing capacity.

88. Most hazardous waste disposal facility owners do not fully understand the significance of buying certified equipment. To reduce purchase cost, they generally choose to buy cheap equipment that cannot meet the certification requirements. For facilities currently in operation, great majority have significant quality problems. For example, most pyrolysis furnaces cannot operate in an uninterrupted way; the quenching tower cannot be installed and run and equipment service life is extremely short. These have severely affected effective operation of disposal facilities and make them difficult to achieve the safe disposal of PW.

89. In order to establish a certification and labeling programme for PW disposal equipment, the following work has to be undertaken:

- Develop technical requirements for the certification of PW disposal equipment;
- Strengthen the existing certification agencies to include PW disposal equipment into their certification catalogue;
- Develop certification procedures and criteria;
- Strengthen the existing testing agencies to include PW disposal equipment into their testing catalogue; and
- Encourage the manufacturers to apply for the certification and promote the facility owners to buy certified equipment.

p) Lack of inter-ministerial mechanism to provide coordination and guidance upon cross-sectoral policy and implementation issued

90. An inter-departmental coordination mechanism is often used as an effective means to address comprehensive environmental protection issues by many countries in the world in their work on environmental protection. Like most other comprehensive environmental protection work, disposal of POPs wastes is also cross-sectoral. Various aspects such as construction of POPs waste disposal facilities, management of facility operation, and development of charging policy involve the responsibilities among different departments of environmental protection, development, agriculture, health, safe production, communications, construction, industry and commerce, and pricing.

91. In China, various departments are responsible for the environmental protection work within their jurisdictions, and the environmental protection department carries out unified supervision and management. Due to administrative barriers existing among different departments and lack of a cross-sectoral coordination mechanism in place, the process of PW disposal is constrained. For example, coordination efforts have long been needed in such key segments as charging policy, facility construction, validation and market-based operations in order to achieve the goal of sustainable environmental management of PW.

92. To meet the obligations under the Convention as well as addressing ESM of PW, cross-sectoral coordination mechanism composed of relevant departments is required to provide guidance and coordination in the development of unified national and local policies and programs for PW management and disposal. To date, China has no inter-ministerial mechanism to provide this coordination among ministries at the national level and with local agencies. The project will rectify this problem through creation of inter-agency supervisory and working bodies to ensure communication and coordination between ministries and governmental levels.

q) Stakeholder conflict of interests

93. The waste management sector includes a large number of stakeholders, many of which have diverging (and sometimes conflicting) interests. For example, at the most basic level, hazardous waste treatment facilities may prefer high waste treatment fees in order to maximize revenues, while POPs wastes owners prefer low fees in order to reduce their costs. The project will attempt to address such risks by developing and implementing approaches that minimize total system costs, and then distribute those costs equitably among stakeholders in order to allow operation of the waste management programs in an environmentally sound manner.

94. Other conflicting interests that may pose a particular threat to the project is when local waste management agencies may resist alternative technologies because they are heavily invested in or committed to incineration technologies and believe that alternative technologies would be implemented outside their sphere of influence. This perception might be particularly true for introducing innovative technologies to treat and dispose dioxins rich fly ash generated from hazardous and medical waste incinerators. The project will address such risks by working with stakeholders to develop win-win approaches, including PPP and alternative ownership and operating approaches that will give all parties the incentives to select the most economically and environmentally sound technologies.

A.3 Local, Regional and Global Benefits

95. Obsolete POPs pesticides are a class of toxic chemicals that resists degradation, bio-accumulates and with potential for long-range transport. Their release into the environment therefore constitutes a significant risk, impacting human and ecosystems locally, regionally, and globally. Numerous studies have confirmed that exposure to DDT, HCB, and other POPs pesticides can result in cancer, reproductive impacts (such as decreased fertility and reduced sperm counts), and developmental problems such as birth defects, inability to maintain pregnancy, and lowered testosterone levels.

96. ESM based lifecycle management of hazardous obsolete POPs pesticides and associated wastes have not yet been achieved in China. Lax enforcement of pesticide waste management regulations and disposal facility standards have resulted in continuous increase in the amount of improperly managed POPs pesticide wastes. Most obsolete POPs pesticides are just dumped untreated on pesticide manufacturer property or in the surrounding area, or mixed with municipal wastes.

97. Where obsolete pesticides are collected, they are generally either disposed of in landfill isolation without measures to prevent leachate infiltration into soils and ground water, or treated in incinerators without effective pollution controls or emissions monitoring to minimize the potential for adverse environmental impacts. Many incinerators are equipped only with out-of-date APCDs that are unable to adequately control release of air pollutants such as particulate matters (PMs), PCDD/PCDFs, heavy metals (Pb, Hg and Cd), acid gases (HCl and SO_2), CO, and NO_x, all of which result in serious adverse impacts to worker safety, public health, and the environment.

98. With GEF support, the proposed project will address these issues through regulatory enhancement, capacity building, technology transfer, a novel PPP mechanism, and direct treatment of obsolete POPs pesticides and associated wastes. The combination of these approaches will not only address the immediate, high priority need to mitigate the imminent local, regional, and global environmental risk posed by the obsolete pesticides identified during the project preparation, but will also provide for the regulatory framework, institutional capacity, and technical capacity to improve management of POPs pesticides on a long-term sustainable basis, with concomitant benefits to local communities, China, the region, and the world.

99. In summary, the project will generate significant local, regional and global benefits, including:

- Safe disposal of a minimum of 10,000 tons of obsolete POPs pesticides and 1,000 tons of dioxin-rich fly ash, which in and of itself is of significant local, regional, and global significance.
- Avoided emissions of 8.97 gTEQ PCDD/PCDFs releases into the water and atmosphere through improved emissions control technology and direct destruction of 30.67 gTEQ of dioxins.
- Additional local, regional, and global environmental benefits accruing from long-term capacity building and regulatory reform activities.
- Innovative approaches providing a model for sustainable management of obsolete POPs pesticides and other POPs both in China and in other developing countries.

A.4 Special Features

100. The proposed project is the first one in China to directly address the issue of accumulated obsolete POPs pesticides and associated wastes. The project will directly provide for cleanup of at least 10,000 tons of these wastes, plus 1,000 tons of dioxin-rich fly ash, and will develop national capacity to identify, manage, and treat other such wastes in an environmentally sustainable manner in the future.

101. The project is a national priority project addressing an important Stockholm Convention requirement, which it does in a highly cost-effective manner. A novel PPP mechanism will be introduce to mobilize resources from both the public and private sectors and encourage innovation.

102. The cost to the GEF for treatment of obsolete POPs pesticides and associated wastes directly addressed by the project will be under US$1000/ton, which is similar to treatment cost in the European Union and compares favorably to cost figures from other POPs waste treatment projects in China. Given that GEF funds are leveraged at 1:3 ratio and considering the additional long-term capacity building and other benefits which the project will provide, the project's cost effectiveness from a GEF perspective is even greater.

103. Given the high risk to public health that POPs contaminated waste entails, the project will also provide significant health benefits to such vulnerable populations as women and children, which international research shows are often exposed to POPs pesticide contaminants and contaminated containers at a higher incidence.

104. The project will coordinate with and draw on the lessons learned from other bilateral and multilateral projects in the POPs pesticides and related areas, including in particular the Sino-German pesticides project. The project has also benefited from input received from Germany and Japan at the GEF Council meeting in response to the PIF submission, from comments and technical information provided by industry experts from Germany, Italy, and the Netherlands, and from comments and other project developmental support being provided by the Netherlands Soil Partnership, the Sino-Dutch Centre for the Management and Remediation of Contaminated Land, and the International HCH & Pesticides Association.

SECTION B: REASONS FOR UNIDO ASSISTANCE

105. UNIDO is committed to assist its developing country Member States in accordance with Article 12 of the Stockholm Convention. The GEF has approved Enabling Activities proposals submitted by UNIDO for about 43 countries, including China and India that have opted to undertake the NIP development through GEF full project cycle. In addition, UNIDO is executing or developing a range of demonstration and capacity building projects geared to support Stockholm Convention implementation in a wide range of developing countries and countries with economies in transition. These activities are compatible with UNIDO's mandate and corporate strategy and will lead towards the Millennium Development Goals.

106. UNIDO has significant past experience with environmentally sound waste management projects in China. The municipal solid waste management project that resulted in the formulation of a nationwide municipal solid waste management strategy had of particular significance. Recently UNIDO took the lead in implementing BAT/BEP measures in several industrial source categories (iron and steel industry, medical waste incineration and production of pulp and paper) of the potential for comparatively high formation and release of UP-POPs to the environment. Based on the favourable experience gained, MEP jointly with UNIDO formulated and submitted for GEF funding a full sized BAT/BEP project on environmentally sustainable medical waste management in China. This project was approved and its Inception Workshop was held in Beijing in March 2008.

107. China is UNIDO's largest recipient of technical cooperation assistance. Activities undertaken by UNIDO in China include a range of measures related to investment, industrial efficiency and waste management. It is noteworthy to mention that China, through the National Pesticide Centre (NPC) in Nantong, which deals with the formulation technologies of pesticide, is a participating country in UNIDO RENPAP programme (Regional Network for Pesticides Formulations in Asia and the Pacific) that has a strong element of pesticide waste management. Close cooperation between NPC and UNIDO POPs unit on promotion of alternatives to POPs pesticides will be established. The experience gained in these projects will be of relevance in the proposed project in China.

108. UNIDO's in-kind contribution to the project will comprise the establishment of a project focal point and the provision of the part-time assistance of senior staff within its Environmental Management Branch to ensure the effective implementation of the project and to support project implementation.

109. In addition, UNIDO will continue to seek co-financing or associated financing for activities that further the objectives of the project and of implementation of the Stockholm Convention in China.

SECTION C: THE PROJECT

C.1 OBJECTIVE OF THE PROJECT

Overall Objective of the Project

110. The project's overall objective is to implement environmentally sound management (ESM) and disposal of 10,000 tones of accumulated POPs pesticide wastes and 1,000 tones dioxin rich incinerator fly-ash in fulfilment of China's obligations under the Stockholm Convention. If not addressed, the presence of these geographically dispersed accumulations of POPs wastes constitutes a significant source and ongoing pathway risk to environmental receptors, particularly groundwater and surface water resources, with concomitant negative impact on human and ecosystem health.

111. The objective will be achieved through a combination of strategies, including legislative and regulatory development, capacity building, public education, technology transfer, training, technical support, and introduction of new advanced environmental risk assessment tools. For additional detail, see Annex 1: Project Logical Framework. For a graphic illustration of this conceptual framework, see Figure 3 below.

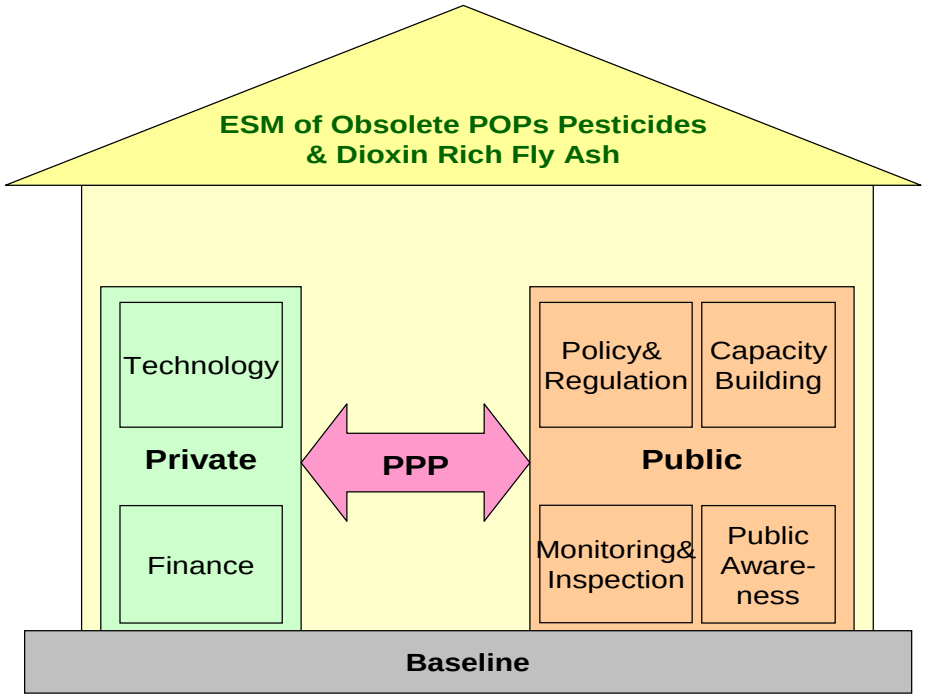


Figure 3: Project Conceptual Framework

112. The full participation of stakeholders is required to properly characterise the pesticide stockpiles and to ensure that appropriate disposal technologies are used.. PPP mechanisms will be introduced to promote technology transfer. National and international experts will be recruited to facilitate the technology transfer process by expanding the scope of technology selection and candidate vendors. Owners of facilities and technology vendors will be selected through an open bidding process. The experts will also help to clarify and define the participation models of the relevant and in particular the waste disposal business models

113. Transparency and competitiveness in the ownership and modus operandi of facilities will be guaranteed by two rounds of transparent and open tendering processes. The first round is for the national selection of the owners/operators of suitable host facilities through important criteria assessment including, but not limited to operating license, co-finance, relationship with local government (to satisfy PPP criterion) and previous experiences in hazardous waste business. The second round is the international tendering process for the technology selection. The

selected national host entities will participate in the technical evaluation of the bids for the technology selection. The process will then be completed by opening the commercial bids and equipment procurement. All processes will be jointly organized, executed and supervised by UNIDO and MEP/FECO through the above mentioned national and international open bidding processes.

Immediate Objective of the Project

114. The immediate objectives of the project are to:

a. Strengthen the legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste

b. Improve institutional capacity at all levels of POPs waste disposal management

c. Remove POPs pesticide wastes dioxin rich incinerator fly ash from targeted contaminated sites, and transport them to disposal unit

d. Dispose of wastes in an environmentally sound manner

e. Complete qualitative environmental risk assessment (QERA) site prioritization.

C.2 THE UNIDO APPROACH

Project Implementation Arrangements

115. UNIDO will be the GEF Implementing Agency (IA) for the project. A project focal point will be established within UNIDO to assist with project execution. This focal point will consist of dedicated core staff, supplemented by support from professional and support staff colleagues on a part-time as needed basis, including in particular senior staff engaged in the management and coordination of UNIDO's POPs program. UNIDO will make these services available as part of its in-kind contribution to the project.

116. ESM of obsolete pesticide wastes and dioxin rich fly ash involves a wide spectrum of stakeholders both vertically and horizontally distributed throughout China's administrative framework. While the principal responsibilities will be undertaken by environmental sector stakeholders, a variety of stakeholders from other sectors will play an important role in the project. Annex 5 lists these stakeholders and describes their mandates, providing the administrative context under which these mandates will be translated into specific responsibilities. The project management structure is given in Figure 4 below.

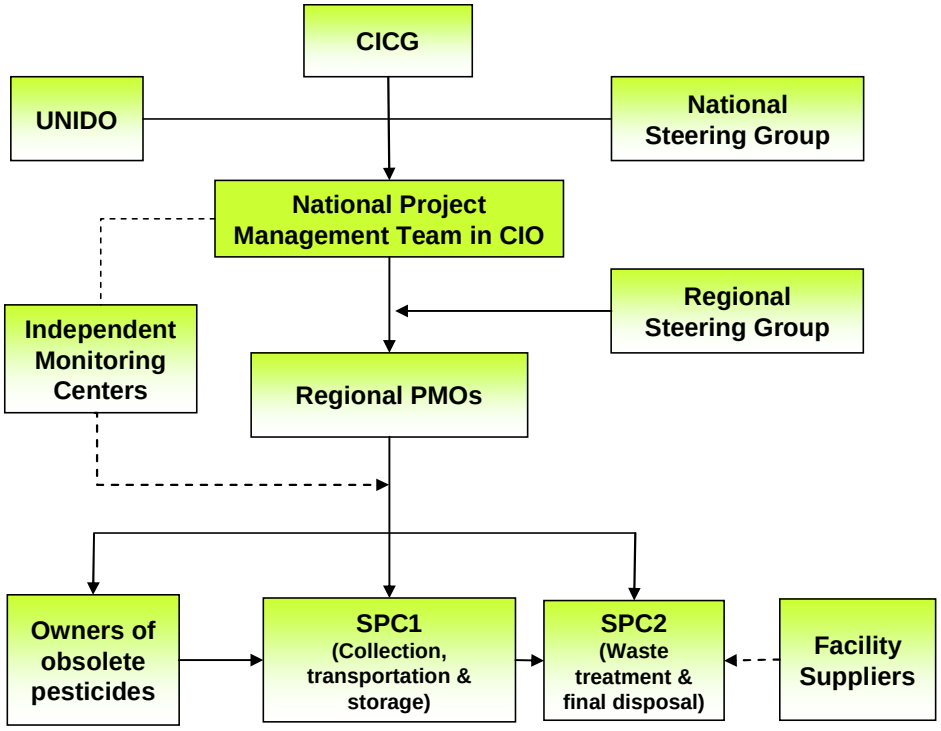


Figure 4: Project Organogram

117. **Convention Implementation Coordination Group (CICG)**. China established the National NIP Development Leading Group in September 2003. This Group became the National Leading Group for Implementation of the POP Convention when China ratified the Convention on 13 August 2004, which was formally approved by State Council in April 2005 and renamed the National Technical Coordination Group (TCG) for Implementation of the Stockholm Convention, or Convention Implementation Coordination Group (CICG). The CICG will provide (i) review of significant policies related to POPs management and control, (ii) guidance and coordination for POPs management activities and Convention implementation. The CICG consists of the following 13 agencies:

i. Ministry of Environmental Protection (MEP)
ii) Ministry of Foreign Affairs (MOFA)
iii) National Development and Reform Commission (NDRC)
iv) Ministry of Finance (MOF), which is the GEF Focal Point in China
v) Ministry of Commerce (MOCom)
vi) Ministry of Science and Technology (MOST)
vii) Ministry of Agriculture (MOA)
viii) Ministry of Public Health (MOH)
ix) Ministry of Housing and Urban-Rural Development (MOHURD)
x) General Administration of Customs (GAC)
xi) State Electricity Regulatory Commission (SERC)
xii) General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ)
xiii) State Administration of Work Safety (SAWS)

118. UNIDO is coordinating all POPs activities of all UN, multi- and bilateral POPs activities in the country, jointly with the Ministry of Environmental Protection (MEP) through the annual Technical Coordination Group (TCG) meetings. This includes World Bank, UNDP, UNITAR, UNEP and others.

119. **Convention Implementation Office (CIO)**. The CIO is part of MEP and is responsible for coordinating the day-to-day management of the Stockholm Convention implementation in China. The CIO's responsibilities include: (i) provision of technical support for international negotiations and policy studies on the Stockholm Convention, (ii) provision of support for development and implementation of POPs-related policy and regulations, as well as coordination of key governmental stakeholders, (iii) mobilization of co-financing from bilateral, international, and national sources, (iv) collecting data and information, compiling reports, organizing training activities, and publishing information. The CIO will provide guidance to ensure the successful implementation of the project, including regular monitoring and enforcement inspections. As the CIO is not an independent legal entity, **Foreign Economic Cooperation Office (FECO)** will be the national executing agency (NEA) and will represent MEP and the CIO in the management and completion of contracts for project implementation.

120. **National, Provincial and Municipal Steering Groups**. The project will establish a national steering group by drawing upon resources from related ministries or commissions in charge of development and reform, environment, health, construction, and pricing to provide the project team with political guidance and inter-ministerial coordination support. To facilitate the extensive demonstration and replication activities at provincial and municipal levels, the National Steering Group will encourage and assist provincial and municipal governments in the establishment and operation of their own corresponding steering groups.

121. **National Project Management Team (NPMT)** will be composed of staff from MEP, NDRC, MOHURD and other relevant agencies. MEP will designate a coordinator/team leader. The Project Management Team will be responsible for the day-to-day management and execution of the project, and will oversee local project management offices. The NPMT's responsibilities will include (i) assignment and supervision of project activities; (ii) recruitment of national consultants; (iii) providing guidance to local PMOs; (iv) coordination with stakeholders, donors, the IA, relevant national agencies and the private sector; (v) preparation of terms of reference (TORs) for project activities, (vi) review of project progress reports submitted by the local PMOs, (vii) supervising project procurement and financial resources in accordance with UNIDO procedures, (viii) organizing and convening project coordination stakeholder meetings, and (ix) review of project outputs. Detailed description of the work to be performed by the NPMT is given in Annex 5 - Terms of References.

122. **Project Expert Team (PET)**. The project will recruit an international **Chief Technical Advisor (CTA)**, a **National Technical Advisor (NTA)**, policy experts, waste management industry experts, chemists, monitoring & evaluation experts and other technical experts. These experts will form a Project Expert Team to assist the CIO and NPMT through the following activities:

    i) Introduction of successful experiences gained from foreign countries;

    ii) Management and coordination of all project activities;

    iii) Provision of technical support for policy framework, institutional strengthening, demonstration activities, technology selection, market promotion, awareness raising and education, results and experience dissemination, project monitoring and evaluation, replication program development, and project management;

    iv) Periodic project implementation progress appraisal;

    v) Support for development of training materials; and

    vi) Liaison for international symposia and field research.

    Detailed description of the work to be performed by the project expert team is given in Annex 5 - Terms of References.

123. **Regional Project Management Offices (PMOs)** will be responsible for coordination of project activities that transcend provincial boundaries. The project will involve a large number of

obsolete pesticides owners, incinerator fly ash owners and dedicated treatment and disposal facilities operating across municipal and provincial lines. Extensive awareness promotion and training activities will be conducted in coordination with local officials. Implementation of new regulations will rely on local administrative agencies. Treatment of obsolete POPs pesticides and dioxin rich fly ash and disposal at provincial hazardous waste disposal centres will be regionally optimized to improve efficiencies, reduce costs, and reduce environmental risk. In addition there will be extensive demonstrations of BAT/BEP for integrated waste management that will cluster obsolete POPs pesticides, associated wastes, and incinerator fly ash generators and waste treatment and disposal facilities.

124. Regional PMOs will be composed of staff from relevant provincial governmental agencies. Their responsibilities will include (i) management of the provincial level activities; (ii) oversight of provincial and municipal implementation; (iii) dissemination of the experience emanating from demonstration sites; (iv) coordinating treatment activities with the mobile treatment facility and base stations; (v) coordinating transportation of waste materials over provincial lines; and (vi) collecting information and preparing progress reports. Their specific responsibilities will be defined by the NPMT supported by the PET after the inception workshop.

125. Private sector stakeholders and other potential project participants will be actively recruited and integrated into the project, as follows:

- Waste owners will be provided with technical assistance and financial support on a cost-sharing basis to adopt ESM in obsolete pesticides management and to treat existing stocks of obsolete POPs pesticides and associated wastes;
- Waste transporters and treatment and disposal facilities will be provided with technical assistance and capacity building support to ensure implementation of obsolete POPs pesticide waste management requirements, and provided with targeted incentives to adopt ESM practices beyond current regulations;
- Private sector contractors selected under the PPP program to provide facilities and services will form an integral part of the project;
- End-users will be educated in proper pesticides management and risk minimization/ avoidance, supported by new policies and programs (e.g., possible manufacturer/distributor take-back requirements) to encourage ESM practices.

C.3 RATIONALE FOR GEF INTERVENTION

126. Storage of obsolete pesticide wastes containing POPs constitutes a major problem in China. These wastes have been accumulating for decades and are estimated at over 10,000 tons, including approximately 6,000 tons of DDT and approximately 4,000 tons of HCB, chlordane, and mirex.

127. Obsolete POPs pesticide wastes are widely distributed throughout China. High priority locations identified during development of China's NIP and preparation of this project include 44 POPs pesticides manufacturing plants and a number of distributor sites. Unsound storage conditions at these sites entail high risk of POPs release, with concomitantly high risk of POPs contamination of ground water and soil. Capacity does not currently exist to dispose of these contaminated wastes in an environmentally sound manner. Current regulatory requirements and waste disposal facilities do not take ESM practices and Stockholm Convention requirements into consideration.

128. Where disposal does take place, current disposal practices are dominated by direct incineration without consideration of Stockholm Convention requirements, resulting in secondary pollution such as dioxin and furan formation and release into the atmosphere. In addition, incineration of hazardous and medical waste results creates large amounts of fly ash (an estimated 11,000 tons per annum) containing high levels of dioxin. While current regulations require that fly ash resulting from these wastes be either destroyed or de-contaminated prior to landfill, incineration plants lack the understanding and technology to do so, and hence generally either store the resulting fly ash or landfill it without treatment, thereby increasing the risk of POPs releases.

129. In May 2001, the Stockholm Convention on Persistent Organic Pollutants (POPs) was adopted with the aim of protecting human health and the environment from POPs. The GEF became the principal financial mechanism by the decision of the Conference of Parties (COP). In October 2002, the GEF Assembly approved the addition of POPs as a new GEF focal area, and in November 2003, the GEF Council approved a GEF Operational Program on POPs – OP 14.

130. Article 5 of the Convention requests that Parties shall take measures to reduce releases of unintentionally produced POPs listed in Part I Annex C with the goal of their continuing minimization and, where feasible, ultimate elimination. Part II of Annex C is a list of source categories that "have the potential for comparatively high formation and release of these chemicals (i.e. dioxins) to the environment" and the "Waste incinerators, including co-incinerators of municipal, hazardous or MW or of sewage sludge is the first source in the list.

131. For new sources listed in Part II (including any new or any substantially modified facility for treatment of POPs contaminated wastes), Parties are required to use best available technology. This requirement is to be "*phased in as soon as practicable but no later than four years after entry into force of the Convention for the Party.*" The Convention entered into force for China on 11 November 2004, which means that waste treatment facilities built or modified on or after 10 November 2005 will be required to adopt BAT/BEP by 10 November 2008. Furthermore, in all existing facilities, China is required by the Convention to promote BAT and BEP.

132. During the implementation of the project, GEF contribution is needed to remove the barriers in particular in the area of technology selection and promotion as well as the need to improve policy and institutional defects. GEF's contribution will play a catalytic role in the selection and promotion of technologies in compliance with the Stockholm Convention and other international environmental agreements. GEF's contribution is also necessary to initiate national concern and awareness for ESM of POPs pesticide and other POPs wastes and to leverage co-finance of other major stakeholders to demonstrate a fee charge system that defines the roles and responsibilities of each player (government, private companies and the GEF) and supports the related disposal market. GEF grant will be used to ensure adequate interests and participation of the private sectors to construct and operate the facility during the project implementation.

133. When a Party implements this obligation, it should assure that priority consideration is given to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of chemicals listed in Part I of Annex C. Subparagraph (f) in Para. A Part V Annex C provides: "*When considering proposals to construct new waste disposal facilities, consideration should be given to alternatives such as activities to minimize the generation of municipal and MW, including resource recovery, reuse, recycling, waste Separation and promoting products that generate less waste. Under this approach, public health concerns should be carefully considered.* "

134. Open burning of waste, including burning of landfill sites, is included in Part III Annex C as a source from which UP-POPs may also be formed and released. In China's rural and remote rural areas the common practice of open burning of obsolete POPs pesticides should therefore be banned.

135. Pursuant to Strategic Programs 2 and 3 in the POPs focal area for GEF-4, the GEF will co-finance investments needed for NIP implementation in order to reduce POPs production, use and releases, and reduce the stress on human health and the environment caused by POPs, including promotion of the use of alternative practices that prevent or reduce generation and/or release of POPs. The project will support this work by application of ESM in the management and disposal of obsolete POPs pesticides and associated POPs wastes.

136. For a detailed review of the project rationale and approach, please see Annex 1 (Project Logical Framework). The project will facilitate assessment of POPs waste stockpiles and systematically manage integrated predisposal activities and processes such as waste characterization, collection, packaging, labeling, storage and transportation. The ultimate generic disposal options are illustrated in the tables below where the relative environmental risks, feasibility and costs of each option are weighted. Within each generic disposal option, there are many individual technologies. For example more than 30 technologies can be identified as non-combustion by USEPA and UNEP. However the commercially available ones suitable for transformation and irreversible destruction of the POPs waste matrices mentioned above, needs to be closely verified.

137. The project will strengthen the overall management and disposal of POPs containing products and wastes in an environmentally sound manner and eliminate the risk of POPs to human health and the environment in China and globally. Methodologies for POPs waste site risk assessment, handling, clearance, collection, labeling, packaging, transportation, disposal, and emergency response procedures will be developed according to strict internationally accepted technical standards and guidelines including those developed by COP to the Basel Convention. The emphasis will be put on the cost-effectiveness and sustainability of the proposed measures.

138. The expected global environmental benefits to be delivered include the complete irreversible destruction and transformation of a minimum of 10,000 tons of obsolete POPs pesticides and POPs pesticide wastes and 1,000 tons of dioxin rich fly ash from waste incinerators in an environmentally sound and cost-effective manner.

139. The GEF4 Strategy in POPs focal area also states that coordination and synergies with countries' responses to related multilateral environmental agreements addressing chemicals issues will be encouraged. The design of activities regarding BAT/BEP demonstration and replication has taken into account Technical Guidelines on Environmentally Sound Management of Persistent Organic Pollutants issued by the Secretariat of Basel Convention.

140. The GEF intervention can be justified as follows:

    i. Project objectives, outcomes and outputs meet the goals and objectives of GEF Strategic Programs 2 and 3 in POPs focal area for GEF-4;

    ii. The leverage ratio of the project financing is 1:3;

    iii. Project outcomes are in line with the requirements of the Stockholm Convention and follow Basel Convention Technical Guidelines;

    iv. Project applies ESM and BAT/BEP in management and disposal of POPs wastes that poses a major public health and environmental threat;

    v. Opportunity to apply project results and capabilities created to new POPs pesticides (e.g., linden) currently under consideration for inclusion under the Stockholm Convention;

    vi. Project will significantly reduce UP-POPs releases into the atmosphere; and

    vii. Project will ensure the sustainability and replicability of its outputs, significantly increasing global environmental benefits.

Table 3. Risk assessment matrix

Generic management options	Handling	Collection	Packaging	Labeling	Storage	Transportation	Disposal	Overall risk rating
Baseline scenario	NA	NA	NA	NA	NA	NA	NA	H
Temporary engineering containment	H	H	M	L	M	M	M	M
Incineration as recommended by National HW Program	H	H	M	L	M	M	M	M
Export for treatment abroad	H	H	M	L	M	H	L	M-H
Non-combustion based alternative scenario	H	H	M	L	M	M	L-M	L-M

Legend: Risk level symbol H = High, M = Moderate, L = Low, NA = Not Applicable.

Table 4. Conceptual illustration/Feasibility assessment matrix

Generic management options	Convention requirement	National policy and institutional support	Infrastructure	Stakeholder transaction cost	Pre-disposal cost	Disposal cost	Application potential through innovation, R&D, and joint ventures	Global environmental benefit	Overall feasibility and cost
Baseline scenario	1	1	1	3	1	1	1	1	10
Temporary engineering containment and landfill	1	2	2	3	2	2	2	2	16
Incineration as recommended by National HW Program	3	4	3	4	4	4	5	2	29
Export for treatment abroad	4	1	3	1	2	1	1	4	17
Non-combustion based alternative scenario	5	3	2	3	4	4	5	5	31

Legend: 1 = Least feasibility, 5 = Highest feasibility

C.4 RBM CODE AND THEMATIC AREA CODE

RBM code: CE17 Stockholm Convention

Thematic Area code: FG50

C.5 EXPECTED OUTCOMES

141. Five substantive outcomes have been developed to achieve the project objectives.

Outcome 1 will result in a stronger legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste. Current laws and regulations do not specifically address POPs pesticide wastes and dioxin-rich fly ash, and were not designed in view of China's obligations under the Stockholm Convention. The project will work with legislative and regulatory agencies to modify existing laws and regulations and, where necessary, develop new regulatory approaches to specifically address POPs pesticide wastes and dioxin-rich fly ash.

142. Relevant international regulations, standards, guidelines or tools, which have been established internationally, will be fully reviewed during the regulation development to avoid conflicts with them. Since a variety exits in environmental quality, management system, supervision and monitoring and engineering capacity in the world as a country has its own political, economic, technical, social, historical and cultural orientation, which resulted in different environmental regulations, policies and guidelines adopted. Those international technical documents can be used as reference and be adapted to fit with the current situation and future development in China.

Outcome 2 will result in improved institutional capacity at all levels of POPs waste disposal management. POPs pesticide waste and dioxin-rich fly ash generators and contaminated site owners are often unaware of the potential environmental, legal, and human health risks that their current and past operations entail. In addition, waste generators and owners lack the managerial and technical capacity to manage POPs wastes in an environmental sound manner.

143. The foundational chemical management will also be strengthened by the project as ESM system design is just based on the current framework of foundational chemical management and hazardous waste management, including the laws, regulations, policies and standards and institutional settings. Although the targeted pesticide wastes are mainly composed of obsolete POPs pesticide and associated wastes, the establishment of ESM strategy for both POPs and non-POPs pesticide will be considered in the following aspects in the project (a) life cycle management system based on ESM covers both categories, including collection, packaging, labeling, transportation and disposal; (b) selection and utilization of wide-spectrum of disposal technologies capable of destructing mixed pesticides; (c) PPP mechanism established in the project will facilitate ESM of pesticide waste including new-POPs chemicals.

144. The project will address the above through training, supported by regulatory and market-based measures that provide waste generators and owners with both the capability and the incentive to manage POPs waste in an environmentally sound manner. In addition, a mass media based public education program will be designed and implemented in order to raise public awareness of the risks posed by POPs contaminated wastes, and educate members of the public in ways to reduce exposure risks. The project will also hold hearings and establish a hotline to field POPs waste related questions and reports.

Outcome 3 will support the clean-up of POPs pesticide wastes and their transportation from targeted POPs-contaminated hot spots to new waste disposal facilities in compliance with Stockholm Convention requirements. Activities under this outcome will include training and technical support for identification and characterization of POPs wastes at target sites, collection of those wastes, containment for safe storage and transportation, transportation of wastes to designated treatment facilities, and survey of hot spot sites to confirm their successful remediation. Through technology investigation and consultation with international consultants, it was noted that some non-combustion technologies are being commercially used and some are still in a premature stage. Technology choice will be implemented according to a detailed feasibility study during the project implementation.

145. The project will also directly support development and commissioning of one stationary and one mobile disposal facility and development of PPPs for construction and operation of these facilities, including but not limited to such PPP approaches as Build-Operate-Transfer (BOT),

Build-Operate-Own (BOO), and other such cooperative forms of development and operation not currently in common use in China. Activities to establish these new facilities will include Environmental Impact Assessment (EIA) for the facilities, technology evaluation and selection, development of technology specifications and guidance documents, site preparation, installation of facilities at the disposal sites, and technical support for disposal of targeted POPs wastes in an environmentally sound manner at the new facilities. In this manner, activities under this outcome will mitigate the high risk of POPs releases from the target cleanup sites and allow for the treatment of wastes from the target sites at Stockholm Convention compliant facilities. The project's ultimate direct outcome will be environmentally sound disposal of at least 10,000 tons of POPs pesticide wastes and 1,000 tons of dioxin rich fly ash. As an important global environmental co-benefit, the project will also seek to identify and make use of technical processes to extend POPs waste disposal capacity to CFCs destruction, so that the facilities can be made dual capable at little or no additional cost in order to enable their future use for CFC destruction.

146. The project while addressing ESM of obsolete POPs pesticide, will also seek for possibilities to extend POPs waste disposal capacity to CFCs destruction, thus creating co-benefits for compliance of both Stockholm Convention and Montreal Protocol.

147. In December 2004, the China refrigeration servicing sector CFC phase-out plan (CRSSP) was approved to help the said sectors to recover, reclaim and recycle CFC while maintaining and disposing of CFC containing equipment. A component of the plan is to destroy contaminated CFC, which needs application of high temperature thermal destruction technology. The project designs an activity to conduct a feasibility study on dual capability of destruction unit to treat both CFC and POPs wastes.

Outcome 4 will support completion of qualitative environmental risk assessment (QERA) site prioritization. Activities under this outcome will include training and technical assistance to establish an inventory of contaminated sites, prepare human health and ecological risk assessment, carry out site surveys, identify POPs exposure scenarios and concentrations, perform GIS analysis, collect necessary data, and complete a quantitative environmental risk assessment, and train CIO staff to maintain the system and transfer it to EPBs. The result of China's first soil pollution survey jointly launched in July 2006 by MEP and the Ministry of Land and Resources will be fully considered in the QERA.

148. In addition to the above substantive activities, project owners will provide ongoing project management, monitoring, and evaluation under Outcome 5, including establishment of a Steering Group composed of national and local stakeholder agencies, establishment and staffing of the project management team at the national and local levels, recruitment of national and international consultants, execution of a management training program for project staff (particularly at the local level), and ongoing monitoring and reporting of project activities.

Innovativeness of Approach

149. Collection and treatment of dioxin rich fly ash represents a new and innovative project approach. Fly ash is generally not collected in China, but is instead emitted in flue gases, the danger of which to human health is significantly increased when the particulate matter is contaminated with dioxin. The project approach will be to recover dioxin rich fly ash through electro-static precipitation and other abatement technologies and treat it in order to remove dioxin contamination. The treated fly ash can then be used as a valuable construction material additive, thus avoiding a serious airborne public health risk or hazardous solid waste residue requiring sanitary landfill.

150. The project will support technological innovation in treatment of POPs pesticides and other POPs contaminated waste. The project will promote environmentally sound alternative technologies not currently in use in China, which has historically relied predominantly on incineration, often without air pollution abatement controls.

151. The project will also introduce and support an innovative approach for hazardous waste management through a Public Private Partnership (PPP) mechanism for construction and operation of new hazardous waste management and treatment facilities, including but not limited to such PPP approaches as Build-Operate-Transfer (BOT), Build-Operate-Own (BOO),

and other such cooperative forms of development and operation not currently in common use in China.

152. PPP is an innovative method of procuring public services and infrastructure combining the strengths of both the public and private sectors. With PPP, the government moves from being the direct infrastructure and service provider to being market creator, promoter, supervisor and manager. The government focuses on creating the regulatory framework, setting up the necessary institutional structures, establishing fee levels, and providing subsidies and guarantees. Private-sector partners take primary responsibility for financing, designing, building, operating and maintenance.

153. The primary objective of introducing PPP into this project is to create opportunities for enhanced private sector involvement in constructing and operating facilities and delivering the services needed for environmentally sound management and disposal of obsolete POPs pesticides and other POPs wastes. The project will use PPP structures to create streams of revenue for private companies to recover investments through collection of disposal fees from POPs waste producers in accordance with the polluters pay principle, or from other responsible parties when it is impossible to identify the owners of the wastes. The project will also consider development of revenue streams in the form of subsidies and/or incentives.

154. Finally, the flexible, non-regulatory nature of the PPP approach will encourage private-sector partners to improve technologies and/or develop new technologies in order to meet current and future market needs in a more efficient, cost effective, and environmentally sustainable way. See Figure 5 below on a graphic illustration of the PPP approach and its function within the project.

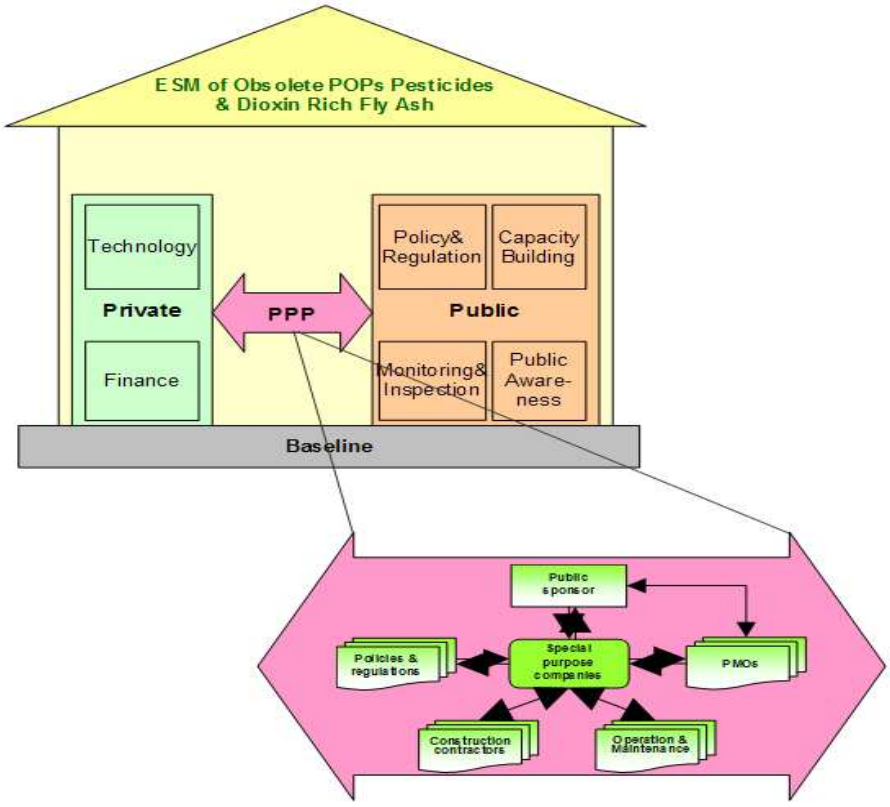


Figure 5: Public-Private Partnership for Environmentally Sound Management of Hazardous Waste

Methodological Approach

155. The project's objective of implementing environmentally sustainable management of POPs pesticides and other POPs contaminated waste will be achieved through a combination of strategies, including legislative and regulatory development, capacity building, public education, technology transfer, training, technical support, and introduction of new advanced environmental risk assessment tools.

156. The project will develop and implement regulatory reforms, coupled with the innovative approaches described above (public-private partnerships), so as to create an enabling environment for POPs pesticides treatment facilities to operate on a sustainable basis.

157. The project will deliver extensive training programs to enhance technical competencies, establish and promote the achievement of project objectives. Principal training activities include:

- Management training classes for national and local project management staff
- Training on new technological and economic policies, guidelines, standards, and specifications so as to implement ESM for provincial EPB managerial staff
- Training to provincial HWDCs staff concerning collection, packaging, and transportation of POPs pesticide wastes
- Staff training for safe disposal of POPs pesticides and dioxin rich fly ash to the managerial, technical and operational staff in the selected province.

158. The project will also undertake extensive stakeholder awareness raising and education activities, including:

- Develop TV and broad broadcasting program to disseminate knowledge of POPs
- Prepare articles and reports for dissemination in national and local newspapers
- Develop and produce brochures for awareness raising regarding health and safety protection from POPs pesticide wastes and dioxin rich fly ash
- Hold public hearings regarding POPs waste stockpile reporting, emergency response, and health and safety protection
- Establish hotline to allow reporting of POPs related health and safety issues.

159. Figure 6 below further illustrates the project methodology, focusing in particular on the relationship between private and public sector participants. For additional detail on the project methodology, see Annex 1: Project Logical Framework.

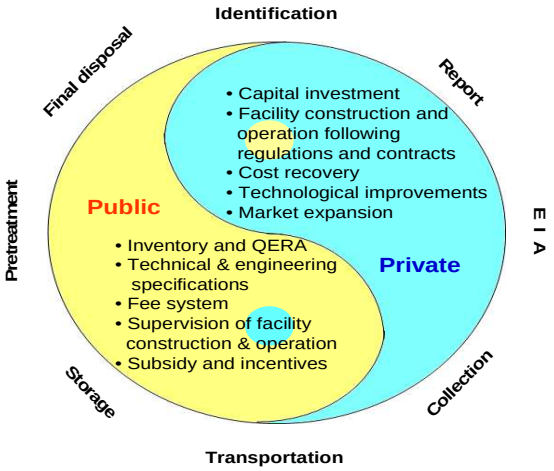


Figure 6: Project Methodology Graphic

C.6 Outcomes, outputs and Activities

160. The table below lists project outcomes, outputs, and activities, along with responsibility for each activity, under each project outcome.

Outcome 1: Strengthened legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste

Output/Activity	Responsibility
Output 1.1 Technological and economic policies and regulations in place for promoting environmentally sustainable management and disposal of POPs wastes	
1.1.1 Develop and formulate technological and economic policies through inter-departmental coordination, public awareness raising, public hearings, and NGO outreach	MEP, UNIDO
1.1.2 Provide training on new technological and economic policies for managerial staff from provincial EPBs	FECO/MEP, UNIDO
1.1.3 Raise awareness of new technological and economic policies and enforcement mechanisms	FECO/MEP, UNIDO
Output 1.2 Technical standards and guidelines developed for ESM of POPs waste	
1.2.1 Develop and formulate guidelines, standards and specifications for ESM of POPs waste	FECO/MEP, UNIDO
1.2.2 Provide training on guidelines, standards and specifications for managerial staff from provincial EPBs	FECO/MEP, UNIDO
1.2.3 Develop standard operation procedures for analysis and monitoring	FECO/MEP, UNIDO

Outcome 2: Improved institutional capacity at all levels of POPs waste disposal management

Output/Activity	*Responsibility*
Output 2.1 Communication and coordination sustained between stakeholders in waste management and disposal	
2.1.1 Establish national, regional, and local coordination framework for integrated POPs waste management	FECO/MEP, Local EPBs, UNIDO
2.1.2 Periodically review stakeholder recommendations and action proposals related to POPs wastes ESM	FECO/MEP, Local EPBs,UNIDO
2.1.3 Hold periodic fora for public and private stakeholders, NGOs, and the general public to promote good governance and increased effectiveness	FECO/MEP, Local EPBs, UNIDO
Output 2.2 Institutional capacity enhanced for POPs waste management at local level	
2.2.1 Enhance overall institutional capacity for program development	FECO/MEP, Local EPBs, UNIDO
2.2.2 Adapt and implement national policy and regulatory framework at local level	FECO/MEP, Local EPBs,
2.2.3 Develop trial local-level responsibility system for obsolete POPs pesticide management and disposal	FECO/MEP, Local EPBs, UNIDO
2.2.4 Develop and test pricing mechanisms for POPs waste disposal	FECO/MEP, Local EPBs, UNIDO

Output/Activity	*Responsibility*
2.2.5 Establish and implement reporting system to collect and analyze data on creation, transport, and treatment of POPs waste	FECO/MEP, UNIDO
2.2.6 Establish inspection and prosecution system for discarded POPs wastes and contaminated sites	FECO/MEP, Local EPBs
2.2.7 Promote widespread local participation through increasing local input of personnel and financial resources	FECO/MEP, Local EPBs, UNIDO
2.2.8 Incorporate ESM principles, norms and requirements into current EIA guidelines	FECO/MEP, UNIDO
2.2.9 Prepare ESM inspection manuals, including: (a) Evaluation, registration and authorization of facility operating licenses for POPs waste treatment, (b) Monitoring of POPs waste disposal facility operation	FECO/MEP, UNIDO
2.2.10 Provide training for local solid waste management centres to implement ESM	FECO/MEP, Local EPBs, UNIDO
Output 2.3 Public awareness on POPs activities undertaken	
2.3.1 Develop TV and other mass media programs to disseminate knowledge of POPs	FECO/MEP, UNIDO, Local EPBs
2.3.2 Publish articles or reports for public education in national and local newspapers.	FECO/MEP, UNIDO
2.3.3 Develop and produce brochures to raise awareness regarding health and safety protection from POPs pesticide wastes and dioxin rich fly ash	FECO/MEP, UNIDO
2.3.4 Hold public hearings regarding POPs waste stockpile reporting, emergency response, and health and safety protection	FECO/MEP, Local EPBs, UNIDO
2.3.5 Hotline established for POPs related health and safety issues	FECO/MEP, Local EPBs, UNIDO

Outcome 3: Environmentally sound disposal of targeted POPs pesticide waste and dioxin rich incinerator fly ash

Output/Activity	*Responsibility*
Output 3.1 Safe and effective collection, packaging, and transportation of POPs pesticide wastes for disposal adopted	
3.1.1 Identify location, type, status of POPs pesticide wastes and associated waste matrices at targeted hot spots	FECO/MEP, Local EPBs, UNIDO
3.1.2 Develop operating manual for collection, packaging, and transportation of the POPs pesticide waste	FECO/MEP, Local EPBs, UNIDO
3.1.3 Prepare detailed terms of reference and contracts for the provincial HWDCs according to expertise in the fields of waste management and occupational health and safety.	FECO/MEP, Local EPBs, UNIDO
3.1.4 Provide training to staff from the provincial HWDCs concerning the collection, packaging, and transportation of the POPs pesticide wastes	FECO/MEP, Local EPBs, UNIDO
3.1.5 Collect, package, and transport POPs pesticide wastes from hot spots	FECO/MEP, Local EPBs, UNIDO

Output/Activity	*Responsibility*
3.1.6 Store POPs pesticide wastes safely to prevent release of POPs contaminants to the environment	FECO/MEP, Local EPBs, UNIDO
Output 3.2 Assessment of technologies for POPs waste disposal carried out	
3.2.1 Detailed feasibility study for final disposal units based on the waste type, destruction efficiency, emissions, residues, energy/material requirements, portability, state of commercialization, and site selection	FECO/MEP, Local EPBs, UNIDO
3.2.2 Preparation of detailed Terms of Reference for technology selection and Request for Proposal from vendors	FECO/MEP, UNIDO
Output 3.3 Technology transfer promoted through PPP mechanisms	
3.3.1 Identify potential PPP arrangements for design, construction and operation of POPs waste treatment infrastructure	FECO/MEP, Local EPBs, UNIDO
3.3.2 Promote cooperative relationship among technology vendors and facility designers, constructors, and operators to achieve cost-effective options	FECO/MEP, Local EPBs, UNIDO
Output 3.4 Construction, certification, operation, and supervision of stationary and mobile treatment facilities arranged	
3.4.1 Environmental Impact Assessment (EIA) for one stationary and one mobile unit	FECO/MEP, Local EPBs, UNIDO
3.4.2 Invite bids from potential vendors to transport POPs wastes, construct stationary and mobile units and operate disposal facilities	FECO/MEP, Local EPBs
3.4.3 Prepare disposal sites for deployment of selected technology, including construction of storage facility and commissioning of equipment	FECO/MEP, Local EPBs, UNIDO
3.4.4 Installation of the stationary unit at the selected site and mobile unit at selected base stations	FECO/MEP, Local EPBs, UNIDO
3.4.5 Transportation of POPs wastes to the POPs treatment locations in an environmentally sound manner	FECO/MEP, Local EPBs, UNIDO
3.4.6 Final disposal of POPs pesticide wastes in an environmentally sound way	FECO/MEP, Local EPBs, UNIDO
3.4.7 Monitoring during facility construction and operation	FECO/MEP, Local EPBs, UNIDO
3.4.8 Establishment of equipment ownership arrangements	FECO/MEP, Local EPBs, UNIDO
Output 3.5 Dioxin rich fly ash disposal implemented	
3.5.1 Target province selected for non-landfill pilot disposal of dioxin rich fly ash	FECO/MEP, Local EPBs, UNIDO
3.5.2 Development of operating manual for non-landfill disposal of dioxin rich fly ash	FECO/MEP, UNIDO
3.5.3 Staff training for safe disposal of dioxin rich fly ash in the selected province	FECO/MEP, Local EPBs, UNIDO
3.5.4 Implementation of pilot for safe disposal of dioxin rich fly ash by non-landfill options	FECO/MEP, Local EPBs, UNIDO
Output 3.6 Exploration of the feasibility to extend POPs waste disposal capacity to CFCs destruction undertaken	
3.6.1 Complete technical and policy review	FECO/MEP, UNIDO

Output/Activity	*Responsibility*
3.6.2 Identify potential technical processes and arrangements for the extension of POPs wastes disposal capacity to CFCs destruction	FECO/MEP, UNIDO
3.6.3 Treatment of CFCs contaminants in the POPs destruction unit to demonstrate feasibility of the dual capability of the facility at little or no additional cost	FECO/MEP, UNIDO

Outcome 4: Qualitative environmental risk assessment (QERA) site prioritization

Output/Activity	*Responsibility*
Output 4.1 Inventory of contaminated sites prioritised	
4.1.1 Review existing national and international best practice guidelines for human health and ecological risk assessment	FECO/MEP, Local EPBs, UNIDO
4.1.2 Develop a project-fit methodology, including QA/QC procedures for quantitative environmental risk assessment (QERA)	FECO/MEP, UNIDO
4.1.3 Train staff in provincial solid waste management centres	FECO/MEP, Local EPBs, UNIDO
4.1.4 Carry out on-site surveys following removal activities, focusing on identification of exposure scenarios	FECO/MEP, Local EPBs, UNIDO
4.1.5 Qualitatively predict POPs concentrations in identified exposure scenario and characterize risks by comparing target POPs risk factors	FECO/MEP, UNIDO
4.1.6 Analyze information needs for quantitative environmental risk assessment	FECO/MEP, UNIDO
Output 4.2 Establishment and maintenance of an Internet-based information processing, display and dissemination system in place	
4.2.1 Design Internet-based system to process and display QERA results and facilitate modeling of environmental risks and remediation decision-making	FECO/MEP, UNIDO
4.2.2 Purchase, install, and test system, maximizing use of existing hardware, software, and topographic data from the current POPs MIS	FECO/MEP, UNIDO
4.2.3 Input data and operate, maintain and update system	FECO/MEP
4.2.4 Conduct internet-based training and software dissemination	FECO/MEP, UNIDO

Outcome 5: Project management, monitoring and evaluation

Output/Activity	*Responsibility*
Output 5.1 Project management structure established	
5.1.1 Establish Project Steering Group	FECO/MEP, UNIDO
5.1.2 Establish the National Project Management Team under CIO	FECO/MEP, UNIDO
5.1.3 Recruit Chief Technical Advisor (CTA), a National Technical Advisor (NTA) and other local personnel	FECO/MEP, Local EPBs, UNIDO
5.1.4 Establish local project management offices in target provinces	FECO/MEP, Local EPBs, UNIDO

Output/Activity	*Responsibility*
5.1.5 Hold management training classes for national and local project management staff	FECO/MEP, Local EPBs, UNIDO
Output 5.2 An M&E mechanism designed and implemented according to GEF M&E procedures	
5.2.1 Hold the Inception Workshop	FECO/MEP, UNIDO
5.2.2 Prepare Inception Report	FECO/MEP, UNIDO
5.2.3 Measure impact indicators on an annual basis	FECO/MEP, UNIDO
5.2.4 Prepare Annual Project Reports and Project Implementation Reviews	FECO/MEP, Local EPBs, UNIDO
5.2.5 Hold annual tripartite review meetings	FECO/MEP, UNIDO
5.2.6 Hold biannual Project Steering Group meetings	FECO/MEP, UNIDO
5.2.7 Carry out mid-term external evaluation	UNIDO
5.2.8 Carry out final external evaluation	UNIDO
5.2.9 Complete the Terminal Report	FECO/MEP, Local EPBs, UNIDO
5.2.10 Carry out annual project financial audits	FECO/MEP, UNIDO
5.2.11 Carry out biannual visits to selected field sites	FECO/MEP, Local EPBs, UNIDO
5.2.12 Establish a project management information system (MIS), including a project website to disseminate information to stakeholders	FECO/MEP, UNIDO

C.7 ACTVITIES TIMELINE

Year	1				2				3				4				5			
Outcome/Output/Activity / Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outcome 1: Strengthened legal and regulatory framework for *environmentally sound management* (ESM) and disposal of POPs waste																				
Output 1.1 Technological and economic policies and regulations in place for promoting environmentally sustainable management and disposal of POPs wastes																				
1.1.1 Develop and formulate technological and economic policies through inter-departmental coordination, public awareness raising, public hearings, and NGO outreach																				
1.1.2 Provide training on new technological and economic policies for managerial staff from provincial EPBs																				
1.1.3 Raise awareness of new technological and economic policies and enforcement mechanisms																				
Output 1.2 Technical standards and guidelines developed for ESM of POPs waste																				
1.2.1 Develop and formulate guidelines, standards, and specifications																				
1.2.2 Provide training on guidelines, standards and specifications for managerial staff from provincial EPBs																				
1.2.3 Develop standard operation procedures for analysis and monitoring																				
Outcome 2: Improved institutional capacity at all levels of POPs waste disposal management																				
Output 2.1 Communication and coordination sustained between stakeholders in waste management and disposal																				
2.1.1 Establish national, regional, and local coordination framework for integrated POPs waste management																				
2.1.2 Periodically review stakeholder recommendations and action proposals related to POPs wastes ESM																				
2.1.3 Hold periodic fora for public and private stakeholders, NGOs, and the general public to promote good governance and increased effectiveness																				

Year	1				2				3				4				5			
Outcome/Output/Activity / Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 2.2 Institutional capacity enhanced for POPs waste management at local level																				
2.2.1 Enhance overall institutional capacity for program development																				
2.2.2 Adapt and implement national policy and regulatory framework at local level																				
2.2.3 Develop trial local-level responsibility system for obsolete POPs pesticide management and disposal																				
2.2.4 Develop and test pricing mechanisms for POPs waste disposal																				
2.2.5 Establish and implement reporting system to collect and analyze data on creation, transport, and treatment of POPs waste																				
2.2.6 Establish inspection and prosecution system for the discarded POPs wastes and contaminated sites																				
2.2.7 Promote widespread local participation through increasing local input of personnel and financial resources																				
2.2.8 Incorporate ESM principles, norms and requirements into current EIA guidelines																				
2.2.9 Prepare ESM inspection manuals, including: (a) Evaluation, registration and authorization of facility operating licenses for POPs waste treatment, (b) Monitoring of POPs waste disposal facility operation																				
2.2.10 Provide training for local solid waste management centers to implement ESM																				
Output 2.3 Public awareness on POPs activities undertaken																				
3.2.1 Develop TV and other mass media programs to disseminate knowledge of POPs																				
3.2.2 Publish articles or reports for public education in national and local newspapers.																				
3.2.3 Develop and produce brochures to raise awareness regarding health and safety protection from POPs pesticide wastes and dioxin rich fly ash																				
3.2.4 Hold public hearings regarding POPs waste stockpile reporting, emergency response, and health and safety protection																				
3.2.5 Hotline established for POPs related health and safety issues																				

Year	1				2				3				4				5			
Outcome/Output/Activity / Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outcome 3: Environmentally sound disposal of targeted POPs pesticide waste and dioxin rich incinerator fly ash																				
Output 3.1 Safe and effective collection, packaging, and transportation of POPs pesticide wastes for disposal adopted																				
3.1.1 Identify location, type, status of POPs pesticide wastes and associated waste matrices at targeted hot spots																				
3.1.2 Develop operating manual for collection, packaging, and transportation of the POPs pesticide waste																				
3.1.3 Prepare detailed terms of reference and contracts for the provincial HWDCs according to expertise in the fields of waste management and occupational health and safety.																				
3.1.4 Provide training to staff from the provincial HWDCs concerning the collection, packaging, and transportation of the POPs pesticide wastes																				
3.1.5 Collect, package, and transport POPs pesticide waste from hot spots																				
3.1.6 Store POPs pesticide waste safely to prevent release of POPs contaminants to the environment																				
Output 3.2 Assessment of technologies for POPs waste disposal carried out																				
3.2.1 Detailed feasibility study for final disposal units based on the waste type, destruction efficiency, emissions, residues, energy/material requirements, portability, state of commercialization, and site selection																				
3.2.2 Preparation of detailed Terms of Reference for technology selection and Request for Proposal from vendors																				
Output 3.3 Technology transfer promoted through PPP mechanisms																				
3.3.1 Identify potential PPP arrangements for design, construction and operation of POPs waste treatment infrastructure																				
3.3.2 Promote cooperative relationship among technology vendors and facility designers, constructors, and operators to achieve cost-effective options																				

Year	1				2				3				4				5			
Outcome/Output/Activity / Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 3.4 Construction, certification, operation, and supervision of stationary and mobile treatment facilities arranged																				
3.4.1 Environmental Impact Assessment (EIA) for one stationary and one mobile unit																				
3.4.2 Invite bids from potential vendors to transport POPs wastes, construct stationary and mobile units and operate disposal facilities																				
3.4.3 Prepare disposal sites for deployment of selected technology, including construction of storage facility and commissioning of equipment																				
3.4.4 Installation of the stationary unit at the selected site and mobile unit at selected base stations																				
3.4.5 Transportation of POPs waste to the POPs treatment locations in an environmentally sound manner																				
3.4.6 Final disposal of POPs pesticide wastes in an environmentally sound way																				
3.4.7 Monitoring during facility construction and operation																				
3.4.8 Establishment of equipment ownership arrangements																				
Output 3.5 Dioxin rich fly ash disposal implemented																				
3.5.1 Target province selected for non-landfill pilot disposal of dioxin rich fly ash																				
3.5.2 Development of operating manual for non-landfill disposal of dioxin rich fly ash																				
3.5.3 Staff training for safe disposal of dioxin rich fly ash in the selected province																				
3.5.4 Implementation of pilot for safe disposal of dioxin rich fly ash by non-landfill options																				
Output 3.6 Exploration of the feasibility to extend POPs waste disposal capacity to CFCs destruction undertaken																				
3.6.1 Complete technical and policy review																				

Year	1				2				3				4				5			
Outcome/Output/Activity / **Quarter**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
3.6.2 Identify potential technical processes and arrangements for the extension of POPs waste disposal capacity to CFCs destruction																				
3.6.3 Treat of CFCs contaminants in POPs destruction unit to demonstrate feasibility of making facilities dual capable at little/no additional cost																				
Outcome 4 Qualitative environmental risk assessment (QERA) site prioritization																				
Output 4.1 Inventory of contaminated sites prioritised																				
4.1.1 Review existing national and international best practice guidelines for human health and ecological risk assessment																				
4.1.2 Develop a project-fit methodology, including QA/QC procedures for quantitative environmental risk assessment (QERA)																				
4.1.3 Train staff in provincial solid waste management centers																				
4.1.4 Carry out on-site surveys following removal activities, focusing on identification of exposure scenarios																				
4.1.5 Qualitatively predict POPs concentrations in identified exposure scenario and characterize risks by comparing target POPs risk factors																				
4.1.6 Analyze information needs for quantitative environmental risk assessment																				
Output 4.2 Establishment and maintenance of an Internet-based information processing, display and dissemination system in place																				
4.2.1 Design Internet-based system to process and display QERA results and facilitate modeling of environmental risks and remediation decision-making																				
4.2.2 Purchase, install, and test system, maximizing use of existing hardware, software, and topographic data from the current POPs MIS																				
4.2.3 Input data and operate, maintain and update system																				
4.2.4 Conduct internet-based training and software dissemination																				

Year	1				2				3				4				5			
Outcome/Output/Activity / Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outcome 5. Project management, monitoring and evaluation																				
Output 5.1 Project management structure established																				
5.1.1 Establish Project Steering Group																				
5.1.2 Establish the National Project Management Team under CIO																				
5.1.3 Recruit Chief Technical Advisor (CTA), a National Technical Advisor (NTA) and other local personnel																				
5.1.4 Establish local project management offices in target provinces																				
5.1.5 Hold management training classes for national and local project management staff																				
Output 5.2 An M&E mechanism designed and implemented according to GEF M&E procedures																				
5.2.1 Hold the Inception Workshop																				
5.2.2 Prepare Inception Report																				
5.2.3 Measure impact indicators on an annual basis																				
5.2.4 Prepare Annual Project Reports and Project Implementation Reviews																				
5.2.5 Hold annual tripartite review meetings																				
5.2.6 Hold biannual Project Steering Group meetings																				
5.2.7 Carry out mid-term external evaluation																				
5.2.8 Carry out final external evaluation																				
5.2.9 Complete the Terminal Report																				
5.2.10 Carry out annual project financial audits																				
5.2.11 Carry out biannual visits to selected field sites																				
5.2.12 Establish a project management information system (MIS), including a project website to disseminate information to stakeholders																				

C.8 RISKS, SUSTAINABILITY AND REPLICABILITY

Possible Risks

161. The risks are identified with reference to project objectives as follows:

Outcomes	Risks	Level	Mitigation measures
Strengthened legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste	➢ Government at national, provincial, and local levels, as appropriate, would not endorse and adopt the required standards, guidelines and specifications according to the project timeline	Low	Ensure laws, regulations, standards, guidelines and specifications are practical and enforceable and support with institutional capacity building and training
	➢ Key stakeholders could not be effectively involved throughout the process	Low	Arise public awareness and enforce monitoring and inspection
Improved institutional capacity at all levels of POPs waste disposal management	➢ NGOs and enterprises might not be willing to actively participate.	Low	Focus on stakeholder awareness raising as a priority
	➢ Key agencies might not attach sufficient importance and allocate sufficient resources to POPs waste management supervision	Low	Arise public awareness, enforce monitoring and inspection, and provide enough trainings
Environmentally sound disposal of targeted POPs pesticide waste and dioxin rich incinerator fly ash	➢ Vendors and other parties might not be willing to cooperate	Low	A policy for POPs disposal fee will be issued and a proper price mechanism will be introduced to allow suitable revenue for the contractors.
	➢ Health and environmental risks that POPs removal, transport, and destruction entail	Low	The following activities will be implemented to reduce the risks related: (a) Hire specialized and licensed waste treatment companies to implement the waste clean, transport and destruction. (b) Prepare detailed guidelines and operation manuals. (c) Strengthening capacity and training for the staff in those activities (d) Pre- and post-monitoring and evaluation by independent institutions.
Qualitative environmental risk assessment (QERA) site prioritization	➢ Adequate data could not be obtained to complete analyses	Low	Carefully design the investigation program and enforce monitoring and inspection during the implementation

Sustainability and Replicability

162. The continuously increasing demands for disposal of high chlorine containing and toxic pesticide waste will create a broad waste market for the facilities to be constructed in the project. China has a big pesticide industry for its agriculture development and a large amount of pesticide wastes are produced each year in the pesticide production and use. The treatment of high toxic pesticide wastes is a serious and unresolved problem, especially for the organochlorine and high toxic pesticides, such as: heptachlor epoxide, endosulfan, endosulfan sulfate and HCH, although they are still not classified as POPs. The disposal facilities to be constructed through the project will extend their special advantages in the above area. Also, the increasing amount of dioxin containing fly ash will be another direct waste source to ensure the continuous operation of the facilities in the future.

163. According to the latest promulgated standard for pollution control on the landfill site in China, wastes with dioxins content of > 3ng-TEQ/g is prohibited to landfill. So there is a growing market for disposal of high dioxin content waste such as rich fly ash, which cannot be treated by landfill. In addition, landfill of dioxin rich waste is an intermediate way, which cannot make the waste destroyed or irreversibly transformed.

164. The project will help to mainstream the disposal of POPs wastes into implementation of national programs that will be supported by national governmental funding sources. The project also has a close linkage to the current government study that will lead to the development of a program for the treatment of contaminated soils. Through the QERA process, the project will identify and prioritize POPs contaminated sites. The government of China has allocated a budget to undertake a national survey of contaminated land and land use. This survey, if altered and intervened by the project may catalyze a nationwide soil remediation program, which will surely sustain the outreach of the project results and bring more global environmental benefits.

165. The sustainability of the project outputs will be also ensured by the following:

- Strengthening and adaptation of policies, laws, and regulations related to POPs waste management and more specifically POPs pesticide waste management will ensure the sustainability of the regulatory environment. By assuring the practicality of laws and regulations, enforcement will also be improved if supported by adequate and targeted capacity building.
- Market-based mechanism established by the project will have the polluters and beneficiaries pay to internalize the incremental cost. Legal responsibility of POPs owners and price regulation for POPs waste treatment will be enacted and implemented in and after the project. The disposal fee from the newer pesticide waste producers will cover the cost of facility operators.
- Compliance with ongoing monitoring and reporting requirements under the Stockholm Convention will be improved by increasing the capacity to collect and process data and to formulate reports to fit to the format and to meet the standards required by the Convention.
- The momentum generated by the mobilization of stakeholders at national and local levels becomes self-sustaining given the critical mass of project activities both at the levels of nationwide dissemination and the location-specific treatment activities.
- The relevance of the project in the context of environmental and public health issues resulting from unsafe storage of obsolete POPs pesticides and POPs pesticide wastes guarantees the sustainability of the project outputs.
- Experience gained through successful application of the BAT/BEP requirements for collection, storage, transport and disposal of POPs pesticide wastes will provide a solid base for introducing sustainable life-cycle management for a wide range of hazardous wastes.
- Experience gained through BAT/BEP treatment of dioxin-rich fly ash will ensure the sustainability of ongoing disposal of this particular type of hazardous waste on a larger scale.

166. In addition, the sustainability will be a dynamic process evolving during and after the project. During the implementation of the project, GEF grant is needed because of the barriers to remove. The GEF contribution, together with sufficient co-financing leveraged from other major stakeholders, including central and local governments and facility owners will build up necessary disposal facility, which will create a pilot and demonstration effect and stimulate the replication of same practice nationally.

167. The project will draw special attention to infant and emerging local efforts in building up a pesticide like waste disposal market, where different funding sources from central and local governments, private sectors, BOT and BOO business could be pooled in. It is expected that the charge system for waste disposal and the related practices would mature during the implementation of the project.

168. The emergence of industrial and service sectors dedicated to the technical and technological support of ESM in POPs waste management will generate economic activity and employment. The development and promotion of different commercial models (e.g. BOT, BOO, TOT, etc.) for construction and operation of POPs waste treatment and disposal facilities will assure continuing capital investment in the sector.

169. After the end of the project, the capital investment and equipment will be handed over to the government to enable new arrangements for a PPP to continue in a sustainable manner. The commitment from the government and the co-financing used to subsidize the initial stage of the project will be factorize for the new business plan to offset the remaining costs of disposal of stockpiles that are still under the custody of the government, public and private enterprises.

170 The project also offers potential replicability of the project results will be ensured by benefits, including but not limited to:

- ESM will be introduced in life-cycle management of other types of POPs wastes and hazardous wastes;
- Successful implementation of incentives for POPs pesticides disposal will, wherever feasible, be extended to other hazardous wastes disposal;
- BAT will be introduced in waste disposal of other types of POPs wastes;
- BAT will be introduced in waste disposal of dioxin-rich fly ash at nationwide;
- Successfully introduced and demonstrated alternative technologies will be applied for disposal of other types of POPs and chemical wastes;
- Replication of project results to new POPs pesticides (e.g., linden) currently under consideration for inclusion under the Stockholm Convention;
- The experience and lessons learned through this project will be applied for other ESM projects in the region outside China, particularly in comparable large countries such as India; and
- Whenever feasible and reasonable the lessons learned through this project will be applied globally in developing countries and countries with economies in transition.

SECTION D: INPUTS

D.1 COUNTERPARTS INPUTS

171. The GEF, as the financial mechanism for the Stockholm Convention, will provide a proposed US$9.973 million incremental cost funding for the project. The Government of China has committed to provide US$ 10.3 million where US$ 3.9 million is cash from MOF and US$ 0.22 million (cash) and US$ 6.18 (in-kind) from MEP. In addition, local EPBs will contribute US$ 7.4 million (cash & in-kind) co-financing, and obsolete pesticides owners and other private sectors will contribute a projected US$14.3 million, for a total co-funding of US$32.0 million.

Baseline

172. In the absence of this project, the POPs pesticides waste disposal sector in China is characterized as follows:

- A regulatory framework is not focused on the particular features of POPs pesticide waste management and disposal.
- Under-developed institutional capacities, in terms of both hardware (infrastructure) and software (skills and expertise) for supervision and inspection of owners and storage sites of POPs pesticide waste and POPs waste disposal facilities in terms of pollution control and monitoring, environmental impact assessment, and operation risk evaluation.
- Incinerators continue to play the predominant role in the disposal of POPs waste and generate unintentional POPs releases that significantly exceed BAT performance levels.
- Alternative technologies, which can avoid formation of PCDD/PCDFs have not been adopted.
- Integration and coordination of POPs waste management, treatment and disposal systems have not been explored to achieve optimal social, economic and environmental benefits.
- National debts and local government investments remain the principal financial source for construction of dedicated hazardous waste disposal facilities, but are unsustainable.
- Stakeholder awareness regarding secondary pollution from POPs waste disposal is insufficient.
- The fee-based system supporting POPs pesticide waste management, treatment and disposal systems has not yet been developed.

173. Incineration is the major method for hazardous waste treatment in China and the disposal cost for the common hazardous waste that has low chlorine content and low toxicity is US$ 700/tone. These incinerators are required to operate in line with national emission limit of PCDD/Fs of 0.5 ng/Nm3 (GB18484-2001) but many of them could not meet the requirements in the day-to-day operation.

174. The only incineration facility that will meet the Convention operating standards is located in the northeast of China, and is dedicated to PCB disposal at a unit cost of US$ 2,930/tone. This facility is not yet commissioned, and when operational, the demand on this facility will be beyond its capacity, and in practice will not be available for this project. No other incineration facility currently in operation in China meets the Convention's standards for the disposal of POPs waste.

175. The baseline cost is US$ 700/t for common hazardous waste destruction with the national emission limit of PCDD/Fs of 0.5 ng/Nm^3 and US$ 2,930/tone for PCBs wastes.

Global Environmental Objective

176. Obsolete POPs pesticides refer to pesticide POPs listed in Annexes A and B of the Stockholm Convention and stored for long periods by producers, sales sites and users, which have already lost their original value, basically have no market value and are discarded or

abandoned, not in condition for distribution and use. Due to their unique properties, obsolete POPs pesticides are easy to entire into the food chain and pose a serious eco-environment and human health risk. POPs pesticides such as DDTs are endocrine disruptors, which can cause severe reproductive and developmental internal disorders and damage the immune system and interfere with hormonal systems.

177. Obsolete POPs pesticides and associated wastes are hazardous wastes. Owing to the absence of environmentally sound disposal facilities in developing countries, the quantity of obsolete pesticide stocks is constantly on the increase. Storage conditions rarely meet internationally accepted standards and drums are often stored in the open exposed to harsh weather conditions which accelerate the wear and tear of containers. Many containers deteriorate and leak their liquid contents into the soil, eventually severely contaminating groundwater and the environment while the powder contents of worn or torn bags and cardboard boxes are often dispersed into the environment by wind or rain. Most stores are in the centres of populated urban areas or close to public dwellings or bodies of water.

178. The overall objective of the project is to constitute a regulation platform and finance mechanism for the environmental sound management obsolete pesticide and POPs wastes, install necessary waste treatment capacity for POPs waste, safely dispose the obsolete POPs pesticides and associated wastes, destruct the high content PCDD/PCDFs fly ash generated during the hazardous waste and medical waste incineration, reduce and ultimately eliminate the release in the treatment process into environment of PCDD/PCDFs from the obsolete POPs pesticides and associated wastes, and to assist China in implementing its obligations under the Stockholm Convention.

Alternative

179. Through the project, obsolete POPs pesticides and POPs pesticide waste owners will adopt ESM for POPs pesticides waste management. It will achieve great reduction of air pollutant emission from POPs pesticide waste incineration through the application of ESM and through application of innovative alternative technologies to avoid unintentional PCDD/PCDFs formation.

180. The capacity incubated through interaction with NPDFCHWMW can lay a foundation for upgraded life cycle management of hazardous waste, which would further encourage central and local government to develop and implement more projects and programs to address the needs of environmentally sound management of hazardous waste. China has a rapid economic growth and a rapidly increasing input on environmental protection and the project will make its contribution to the trend by guiding the right direction of the related environmental protection input.

181. The technology selection and facility construction will fully follow the BAT/BEP of Stockholm Convention and technical guidelines of Basel Convention to meet the international environmental standards and project requirements. In summary, the basic criteria are:

- PCDD/Fs 0.1 ng/Nm^3
- DRE >99.9999%
- Comparable disposal cost with incineration technology (US$1000-1500/t)
- Appropriate for the overall hazardous waste management system in China
- Enough co-finance for the potential technology and equipment providers

182. Experiences from other countries showed that the unit costs of non-combustion technology are about US$1000 and US$1500 for common and high-strength POPs wastes (see Annex 2). Considering that low-strength takes major part of the POPs stockpile and wastes, US$1000 is preliminarily determined as the alternative disposal cost

183. The project will significantly contribute to the POPs focal area as follows:

- Safe management of obsolete POPs pesticides and associated wastes to avoid the release of those pollutants to local and global environment;

- Disposal of 10,000 tons of POPs waste in an environmental sound way to avoid the formation and releases of about 8.97 gTEQ PCDD/PCDFs;
- Destruction of 1,000 tons of dioxin-rich fly ash by means of BAT/BEP demonstration and adoption of alternative treatment processes to reduce releases of 30.67 gTEQ PDCC/PDCFs.

184. In addition, the project has a close linkage with the ongoing National Program of Disposal Facilities Construction for Hazardous Wastes and Medical Wastes, which was approved in 2004 as a pure engineering construction program in which 31 hazardous waste treatment and disposal centers will be constructed to dispose of hazardous waste by incinerators. The project will interact with and influence the Program by:

- Introducing life cycle management into current hazardous waste management systems, including qualitative site environmental risk assessment, waste characterization, and pre-disposal treatment involving handling, collection, packaging, labeling, transportation, and storage of stockpiled POPs pesticides;
- Mainstreaming relevant Stockholm Convention requirements for ESM of POPs stockpiles and wastes into current legal and institutional management structure; and
- Expanding technology selection for destruction of stockpiled obsolete POPs pesticide waste thereby generating global environmental benefits.

185. The project could also have a close linkage to the current government study eventually aimed at developing a program for the treatment of contaminated soils. Through the QERA process the project will identify and prioritize POPs contaminated sites. The government of China has allocated a budget to undertake a national survey of contaminated land and land use. This survey, if altered and intervened by the project may catalyze a nationwide soil remediation program, which will surely sustain the outreach of the project results and bring more global environmental benefits.

Table 5. Summary Incremental Cost Matrix in US$

	Baseline	**Increment**	**Alternative**
Outcome 1: Strengthened legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste	2,069,650	852,600	2,922,250
Outcome 2: Improved institutional capacity at all levels of POPs waste disposal management	1,841,175	953,100	2,794,275
Outcome 3: Environmentally sound disposal of targeted POPs pesticide waste and dioxin rich incinerator fly ash	26,400,825	7,074,000	33,474,825
Outcome 4 Qualitative environmental risk assessment (QERA) site prioritization	1,051,100	584,700	1,635,800
Outcome 5. Project management, monitoring and evaluation	737,250	508,600	1,245,850
Total	**32,100,000**	**9,973,000**	**42,073,000**

D.2 UNIDO INPUTS

186. UNIDO will provide an in-kind contribution of US$100,000 for Outcomes 3 and 5, in particular, providing advice on UNIDO previous experience in implementing Slovakia and Philippines projects; providing training course on contracts and purchase procedures to nationals in line with the component of technology transfer; monitoring of overall project activities specially equipment procurement and dissemination of lessons learnt in the region.

SECTION E: BUDGET

E.1 Project Budget in US$

GEF Outputs	Budget lines	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 1.1: Technological and economic policies and regulations in place for promoting environmentally sustainable management and disposal of POPs wastes	11-50	Short-term consultants (international)	68,800	4.0									68,800	4.0
	11-01	Chief Technical Advisor	17,200	1.0									17,200	1.0
	15-00	Project travel	5,000										5,000	
	21-00	Subcontracts	166,400										166,400	
	51-00	Printing/translation	2,000										2,000	
		Sub-total	***259,400***	***5.0***									***259,400***	***5.0***
Output 1.2 : Technical standards and guidelines developed for ESM of POPs waste	11-50	Short-term consultants (international)	17,200	1.0									17,200	1.0
	11-01	Chief Technical Advisor	10,320	0.6									10,320	0.6
	17-50	National experts	5,160	1.0	5,160	1.0							10,320	2.0
	17-01	National Technical Advisor	3,096	0.6	3,096	0.6							6,192	1.2
	15-00	Project travel	3,000		2,000								5,000	
	21-00	Subcontracts	320,000		216,168								536,168	
	51-00	Printing/translation	4,000		4,000								8,000	
		Sub-total	***362,776***	***3.2***	***230,424***	***1.6***							***593,200***	*4.8*
Output 2.1 : Communication and coordination sustained between stakeholders in waste management and disposal	11-50	Short-term consultants (international)	1,600	0.1	1,600	0.1	1,600	0.1	1,600	0.1	1,600	0.1	8,000	0.5
	11-01	Chief Technical Advisor	1,600	0.1	1,600	0.1	1,600	0.1	1,600	0.1	1,600	0.1	8,000	0.5
	17-50	National experts	2,200	0.4	2,200	0.4	2,200	0.4	2,200	0.4	2,200	0.4	11,000	2.0
	17-01	National Technical Advisor	1,400	0.3	1,400	0.3	1,400	0.3	1,400	0.3	1,400	0.3	7,000	1.5
	15-00	Project travel	5,300		5,300		5,300		5,300		5,100		26,300	
	35-00	Workshop/meetings	12,000		12,000		12,000		12,000		12,000		60,000	
	Sub-total		***24,100***	***0.9***	***24,100***	***0.9***	***24,100***	***0.9***	***24,100***	***0.9***	***23,900***	***0.9***	***120,300***	***4.5***

GEF Outputs	Budget lines	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 2.2: Institutional capacity enhanced for POPs waste management at local level	11-50	Short-term consultants (international)	16,000	0.9	16,000	0.9							32,000	1.8
	11-01	Chief Technical Advisor	12,000	0.7	12,000	0.7							24,000	1.4
	17-50	National experts	8,400	1.6	8,400	1.6							16,800	3.2
	17-01	National Technical Advisor	7,200	1.4	7,200	1.4							14,400	2.8
	15-00	Project travel	21,000		21,000								42,000	
	21-00	Subcontracts	43,600		43,600								87,200	
	33-00	In-service training	220,000		220,000								440,000	
	Sub-total		***328,200***	***4.6***	***328,200***	***4.6***							***656,400***	***9.2***
	17-50	National experts			4,000	0.8	4,000	0.8	4,000	0.8			12,000	2.4
	17-01	National Technical Advisor			2,000	0.4	2,000	0.4	2,000	0.4			6,000	1.2
	15-00	Project travel			12,400		12,400		12,400				37,200	
	21-00	Subcontracts			10,400		10,400		10,400				31,200	
	35-00	Workshop			25,000				25,000				50,000	
	45-00	Equipment			20,000				20,000				40,000	
	Sub-total				***73,800***	***1.2***	***28,800***	***1.2***	***73,800***	***1.2***			***176,400***	***3.6***
Output 3.1: Safe and effective collection, packaging, and transportation of POPs pesticide wastes for disposal adopted	11-50	Short-term consultants (international)			32,000	1.9	32,000	1.9					64,000	3.8
	11-01	Chief Technical Advisor			10,000	0.6	10,000	0.6					20,000	1.2
	17-50	National experts			19,000	3.7	18,800	3.7					37,800	7.4
	17-01	National Technical Advisor			6,000	1.2	6,000	1.2					12,000	2.4
	15-00	Project travel			4,000		4,000						8,000	
	21-00	Subcontracts			474,000		473,800						947,800	
	33-00	In-service training			10,400								10,400	
	Sub-total				***555,400***	***7.4***	***544,600***	***7.4***					***1,100,000***	***14.8***

GEF Outputs	Budget lines	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 3.2 Assessment of technologies for POPs waste disposal carried out	11-50	Short-term consultants (international)	1,300	0.1	2,700	0.2							4,000	0.3
	11-01	Chief Technical Advisor	1,300	0.1	2,700	0.2							4,000	0.3
	15-00	Project travel	1,300		2,700								4,000	
	21-00	Subcontracts	10,000		20,000								30,000	
	Sub-total		***14,000***	***0.2***	***28,000***	***0.4***							***42,000***	***0.6***
Output 3.3: Technology transfer promoted through PPP mechanisms	11-50	Short-term consultants (international)			8,600	0.5	8,600	0.5					17,2000	1.0
	17-50	National experts			9,000	1.7	9,000	1.7					18,000	3.4
	15-00	Project travel			1,400		1,400						2,800	
	Sub-total				***19,000***	***2.2***	***19,000***	***2.2***					***38,000***	***4.4***
Output 3.4: Construction, certification, operation, and supervision of stationary and mobile treatment facilities arranged	11-50	Short-term consultants (international)	5,400	0.3	21,600	1.3	10,800	0.6	10,800	0.6	5,400	0.3	54,000	3.1
	11-01	Chief Technical Advisor	2,800	0.2	11,200	0.7	5,600	0.3	5,600	0.3	2,800	0.2	28,000	1.7
	17-50	National experts	3,200	0.6	13,000	2.5	6,500	1.3	6,500	1.3	3,200	0.6	32,400	6.3
	17-01	National Technical Advisor	1,700	0.3	6,700	1.3	3,400	0.7	3,400	0.7	1,600	0.3	16,800	3.3
	15-00	Project travel	10,000		12,000								22,000	
	21-00	Subcontracts	343,300		1,373,000		686,600		686,600		343,300		3,432,800	
	35-00	Workshop	18,000										18,000	
	45-00	Equipment			2,000,000								2,000,000	
	Sub-total		***384,400***	***1.4***	***3,437,500***	***5.8***	***712,900***	***2.9***	***712,900***	***2.9***	***356,300***	***1.4***	***5,604,000***	***14.4***
Output 3.5 Dioxin rich fly ash disposal implemented	11-50	Short-term consultants (international)					4,000	0.2	4,000	0.2			8,000	0.4
	11-01	Chief Technical Advisor					4,000	0.2	4,000	0.2			8,000	0.4
	17-50	National experts					1,800	0.4	1,800	0.4			3,600	0.8
	17-01	National Technical Advisor					1,200	0.2	1,200	0.2			2,400	0.4

GEF Outputs	Budget lines	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
	15-00	Project travel					4,000		4,000				8,000	
	21-00	Subcontracts					114,700		114,700				229,400	
	33-00	In-service training					14,600						14,600	
	Sub-total						***144,300***	***1.0***	***129,700***	***1.0***			***274,000***	***2.0***
Output 3.6 Exploration of the feasibility to extend POPs waste disposal capacity to CFCs destruction undertaken	11-50	Short-term consultants (international)							4,000	0.2			4,000	0.2
	11-01	Chief Technical Advisor							6,000	0.4			6,000	0.4
	17-50	National experts							800	0.1			800	0.1
	17-01	Nat. Technical Advisor							1,200	0.2			1,200	0.2
	15-00	Project travel							4,000				4,000	
	Sub-total								***16,000***	***0.9***			***16,000***	0.9
Output 4.1 Inventory of contaminated sites prioritised	11-50	Short-term consultants (international)			4,000	0.2	4,000	0.2	4,000	0.2	4,000	0.2	16,000	0.8
	11-01	Chief Technical Advisor			3,000	0.2	3,000	0.2	3,000	0.2	3,000	0.2	12,000	0.8
	17-50	National experts			2,400	0.5	2,400	0.5	2,400	0.5	2,400	0.5	9,600	2.0
	17-01	National Technical Advisor			1,800	0.4	1,800	0.4	1,800	0.4	1,800	0.4	7,200	1.6
	15-00	Project travel			13,600		13,600		13,600		13,500		54,300	
	21-00	Subcontracts			14,300		14,300		14,300		14,100		57,000	
	35-00	Workshop			20,000		20,000		20,000		20,000		80,000	
	33-00	In-service training			80,000								80,000	
	Sub-total				***139,100***	***1.3***	***59,100***	***1.3***	***59,100***	***1.3***	***58,800***	***1.3***	***316,100***	***5.2***
Output 4.2 Establishment and maintenance of an Internet-based information processing, display and dissemination system in place	11-50	Short-term international consultants							2,000	0.1	2,000	0.1	4,000	0.2
	11-01	Chief Technical Advisor							2,000	0.1	2,000	0.1	4,000	0.2
	17-50	National experts							1,200	0.2	1,200	0.2	2,400	0.4
	17-01	Nat. Technical Advisor							1,200	0.2	1,200	0.2	2,400	0.4

GEF Outputs	Budget lines	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
	15-00	Project travel							10,200		10,200		20,400	
	21-00	Subcontracts							47,700		47,700		35,400	
	35-00	Workshop/meetings							30,000		30,000		120,000	
	33-00	In-service training									60,000		60,000	
	45-00	Equipment							20,000				20,000	
		Sub-total							***114,300***	***0.6***	***154,300***	***0.6***	***268,600***	***1.2***
Output 5.1 Project management structure established	11-01	Chief Technical Advisor	8,600	0.5			8,600	0.5					17,200	1.0
	17-50	National experts	10,400	2.0	10,400	2.0	10,400	2.0	10,400	2.0	10,400	2.0	52,000	10,0
	17-01	National Technical Advisor	15,600	3.0	15,600	3.0	15.600	3.0	15,600	3.0	15,600	3.0	78,000	15.0
	15-00	Project travel	4,000		2,000		4,000						10,000	
	45-00	Equipment			38,300								38,300	
	51-00	Printing/translation	500		500								1,000	
		Sub-total	***39,100***	***5.5***	***66,800***	***5.0***	***38,600***	***5.5***	***26,000***	***5.0***	***26,000***	***5.0***	***196,500***	***26.0***
Output 5.2 An M&E mechanism designed and implemented according to GEF M&E procedures	11-50	Short-term consultants (international)	4,000	0.2	24,600	1.4	4,000	0.2	4,000	0.2	21,200	1.2	57,800	3.2
	11-01	Chief Technical Advisor	3,400	0.2	3,600	0.2	3,400	0.2	3,400	0.2	3,400	0.2	17,200	1.0
	17-01	National Technical Advisor	1,400	0.2	1,800	0.2	1,400	0.2	1,400	0.2	1,400	0.2	7,400	1.0
	15-00	Project travel	8,800		8,800		8,800		8,800		8,800		44,000	
	21-00	Subcontracts			54,700								54,700	
	35-00	Workshop/Meetings	69,400		14,400		14,400		14,400		14,400		127,000	
	51-00	Printing/translation	800		800		800		800		800		4,000	
	Sub-total		***87,800***	***0.6***	***108,700***	***1.8***	***32,800***	***0.6***	***32,800***	***0.6***	***50,000***	***1.6***	***312,100***	***5.2***
TOTAL			***1,499,776***	***22.3***	***5,011,024***	***32.2***	***1,604,200***	***23.0***	***1,188,700***	***14.4***	***669,300***	***10.8***	***9,973,000***	***102.7***
PPG													***231,000***	
GRAND PROJECT TOTAL													**10,204,000**	**102.7**

E.2 Co-financing budget in US$

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPB	Private sectors	MEP	Local EPB	Private sectors	UNIDO	
Outcome 1: Strengthened legal and regulatory framework for *environmentally sound management* (ESM) and disposal of POPs waste									**2,069,650**
Output 1.1 Technological and economic policies and regulations in place for promoting environmentally sustainable management and disposal of POPs wastes					***721,075***	***613,875***			***1,334,950***
1.1.1 Develop and formulate technological and economic policies through inter-departmental coordination, public awareness raising, public hearings, and NGO outreach					107,200				
1.1.2 Provide training on new technological and economic policies for managerial staff from provincial EPBs					578,250	578,250			
1.1.3 Raise awareness of new technological and economic policies and enforcement mechanisms					35,625	35,625			
Output 1.2 Technical standards and guidelines developed for ESM of POPs waste					***716,350***	***18,350***			***734,700***
1.2.1 Develop and formulate guidelines, standards, and specifications					265,300				
1.2.2 Provide training on guidelines, standards and specifications for managerial staff from provincial EPBs					432,700				
1.2.3 Develop standard operation procedures for analysis and monitoring					18,350	18,350			
Outcome 2: Improved institutional capacity at all levels of POPs waste disposal management									**1,841,175**
Output 2.1 Communication and coordination sustained between stakeholders in waste management and disposal					***175,600***				***175,600***
2.1.1 Establish national, regional, and local coordination framework for integrated POPs waste management					48,500				
2.1.2 Periodically review stakeholder recommendations and action proposals related to POPs wastes ESM					61,800				

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPB	Private sectors	MEP	Local EPB	Private sectors	UNIDO	
2.1.3 Hold periodic fora for public and private stakeholders, NGOs, and the general public to promote good governance and increased effectiveness					65,300				
Output 2.2 Institutional capacity enhanced for POPs waste management at local level						***1,537,775***			***1,537,775***
2.2.1 Enhance overall institutional capacity for program development						187,300			
2.2.2 Adapt and implement national policy and regulatory framework at local level						98,100			
2.2.3 Develop trial local-level responsibility system for obsolete POPs pesticide management and disposal						116,700			
2.2.4 Develop and test pricing mechanisms for POPs waste disposal						111,175			
2.2.5 Establish and implement reporting system to collect and analyze data on creation, transport, and treatment of POPs waste						167,100			
2.2.6 Establish inspection and prosecution system for the discarded POPs wastes and contaminated sites						194,600			
2.2.7 Promote widespread local participation through increasing local input of personnel and financial resources						100,100			
2.2.8 Incorporate ESM principles, norms and requirements into current EIA guidelines						144,100			
2.2.9 Prepare ESM inspection manuals, including: (a) Evaluation, registration and authorization of facility operating licenses for POPs waste treatment, (b) Monitoring of POPs waste disposal facility operation						226,100			
2.2.10 Provide training for local solid waste management centers to implement ESM						192,500			

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPB	Private sectors	MEP	Local EPB	Private sectors	UNIDO	
Output 2.3 Public awareness on POPs activities undertaken					***127,800***				***127,800***
2.3.1 Develop TV and other mass media programs to disseminate knowledge of POPs					31,200				
2.3.2 Publish articles or reports for public education in national and local newspapers.					35,200				
2.3.3 Develop and produce brochures to raise awareness regarding health and safety protection from POPs pesticide wastes and dioxin rich fly ash					25,600				
2.3.4 Hold public hearings regarding POPs waste stockpile reporting, emergency response, and health and safety protection					22,800				
2.3.5 Hotline established for POPs related health and safety issues					13,000				
Outcome 3: Environmentally sound disposal of targeted POPs pesticide waste and dioxin rich incinerator fly ash									**26,400,825**
Output 3.1 Safe and effective collection, packaging, and transportation of POPs pesticide wastes for disposal arranged		***50,000***			***391,000***	***950,000***	***652,100***		***2,043,100***
3.1.1 Identify location, type, status of POPs pesticide wastes and associated waste matrices at targeted hot spots		50,000							
3.1.2 Develop operating manual for collection, packaging, and transportation of the POPs pesticide waste					135,700				
3.1.3 Prepare detailed terms of reference and contracts for the provincial HWDCs according to expertise in the fields of waste management and occupational health and safety.					106,900				
3.1.4 Provide training to staff from the provincial HWDCs concerning the collection, packaging, and transportation of the POPs pesticide wastes					148,400				
3.1.5 Collect, package, and transport POPs pesticide waste from hot spots							652,100		

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPB	Private sectors	MEP	Local EPB	Private sectors	UNIDO	
3.1.6 Store POPs pesticide waste safely to prevent release of POPs contaminants to the environment						950,000			
Output 3.2 Assessment of technologies for POPs waste disposal carried out					***96,000***			***20,000***	***116,000***
3.2.1 Detailed feasibility study for final disposal units based on the waste type, destruction efficiency, emissions, residues, energy/material requirements, portability, state of commercialization, and site selection					74,600				
3.2.2 Preparation of detailed Terms of Reference for technology selection and Request for Proposal from vendors					21,400			20,000	
Output 3.3 Technology transfer promoted through PPP mechanisms					***236,100***				***236,100***
3.3.1 Identify potential PPP arrangements for design, construction and operation of POPs waste treatment infrastructure					100,700				
3.3.2 Promote cooperative relationship among technology vendors and facility designers, constructors, and operators to achieve cost-effective options					135,400				
Output 3.4 Construction, certification, operation, and supervision of stationary and mobile treatment facilities arranged	***3,900,000***	***72,000***	***850,000***	***5,500,000***	***1,972,725***	***3,000,000***	***7,499,800***	***25,000***	***18,919,525***
3.4.1 Environmental Impact Assessment (EIA) for one stationary and one mobile unit		22,000					152,600		
3.4.2 Invite bids from potential vendors to transport POPs wastes, construct stationary and mobile units and operate disposal facilities		50,000						15,000	
3.4.3 Prepare disposal sites for deployment of selected technology, including construction of storage facility and commissioning of equipment							667,700		
3.4.4 Installation of the stationary unit at the selected site and mobile unit at selected base stations	3,900,000			3,500,000	1,972,725	1,500,000	6,009,300		

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPB	Private sectors	MEP	Local EPB	Private sectors	UNIDO	
3.4.5 Transportation of POPs waste to the POPs treatment locations in an environmentally sound manner							174,000		
3.4.6 Final disposal of POPs pesticide wastes in an environmentally sound manner			850,000	2,000,000		1,500,000	400,900		
3.4.7 Monitoring during facility construction and operation							95,300	10,000	
3.4.8 Establishment of equipment ownership arrangements									
Output 3.5 Dioxin rich fly ash disposal implemented		***70,000***	***180,000***	***480,000***		***250,000***			***980,000***
3.5.1 Target province selected for non-landfill pilot disposal of dioxin rich fly ash		30,000							
3.5.2 Development of operating manual for non-landfill disposal of dioxin rich fly ash				48,700					
3.5.3 Staff training for safe disposal of dioxin rich fly ash in the selected province				112,100					
3.5.4 Implementation of pilot for safe disposal of dioxin rich fly ash by non-landfill options		40,000	180,000	319,200		250,000			
Output 3.6 Exploration of the feasibility to extend POPs waste disposal capacity to CFCs destruction undertaken		***28,000***					***168,100***	***10,000***	***206,100***
3.6.1 Complete technical and policy review							84,100		
3.6.2 Identify potential technical processes and arrangements for the extension of POPs waste disposal capacity to CFCs destruction							84,000	10,000	
3.6.3 Treatment of CFCs contaminants in POPs destruction unit to demonstrate feasibility of the dual capability of the facility with little or no additional cost		28,000							

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPB	Private sectors	MEP	Local EPB	Private sectors	UNIDO	
Outcome 4 Qualitative environmental risk assessment (QERA) site prioritization									**1,051,100**
Output 4.1 Inventory of contaminated sites prioritised					***548,700***				***548,700***
4.1.1 Review existing national and international best practice guidelines for human health and ecological risk assessment					37,800				
4.1.2 Develop a project-fit methodology, including QA/QC procedures for quantitative environmental risk assessment (QERA)					61,600				
4.1.3 Train staff in provincial solid waste management centers					180,600				
4.1.4 Carry out on-site surveys following removal activities, focusing on identification of exposure scenarios					157,300				
4.1.5 Qualitatively predict POPs concentrations in identified exposure scenario and characterize risks by comparing target POPs risk factors					72,400				
4.1.6 Analyze information needs for quantitative environmental risk assessment					39,000				
Output 4.2 Establishment and maintenance of an Internet-based information processing, display and dissemination system in place					***502,400***				***502,400***
4.2.1 Design Internet-based system to process and display QERA results and facilitate modeling of environmental risks and remediation decision-making					102,300				
4.2.2 Purchase, install, and test system, maximizing use of existing hardware, software, and topographic data from the current POPs MIS					114,400				
4.2.3 Input data and operate, maintain and update system					133,100				
4.2.4 Conduct internet-based training and software dissemination					152,600				

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPBs	Private sectors	MEP	Local EPBs	Private sectors	UNIDO	
Outcome 5. Project management, monitoring and evaluation									**737,250**
Output 5.1 Project management structure established					***499,250***				***499,250***
5.1.1 Establish Project Steering Group					75,700				
5.1.2 Establish the National Project Management Team under CIO					109,000				
5.1.3 Recruit Chief Technical Advisor (CTA), a National Technical Advisor (NTA) and other local personnel					109,000				
5.1.4 Establish local project management offices in target provinces					109,000				
5.1.5 Hold management training classes for national and local project management staff					96,500				
Output 5.2 An M&E mechanism designed and implemented according to GEF M&E procedures					***193,000***			***45,000***	***238,000***
5.2.1 Hold the Inception Workshop					36,000				
5.2.2 Prepare Inception Report					600				
5.2.3 Measure impact indicators on an annual basis					600				
5.2.4 Prepare Annual Project Reports and Project Implementation Reviews					2,400			10,000	
5.2.5 Hold annual tripartite review meetings					30,000				
5.2.6 Hold biannual Steering group meetings					16,000				
5.2.7 Carry out mid-term external evaluation					3,000			20,000	
5.2.8 Carry out final external evaluation					3,000			15,000	
5.2.9 Complete the Terminal Report					0				
5.2.10 Carry out annual project financial audits					1,200				

Outcome/Output/Activities	Co-financing in cash (US$)				Co-financing In-kind (US$)				Total (US$)
	MOF	MEP	Local EPBs	Private sectors	MEP	Local EPBs	Private sectors	UNIDO	
5.2.11 Carry out biannual visits to selected field sites					26,400				
5.2.12 Establish a project management information system (MIS), including a project website to disseminate information to stakeholders					73,800				
GRAND TOTAL CO-FINANCING	**3,900,000**	**220,000**	**1,030,000**	**5,980,000**	**6,180,000**	**6,370,000**	**8,320,000**	**100,000**	**32,100,000**

187. Co-financing leverage will be secured covering almost all project activities, including but not limited to:

- Real estate value the operating site of stationary disposal unit
- Real estate value the operating sites at the four base stations of the mobile disposal unit
- Costs of disposal sites preparation for stationary and mobile disposal units
- Cost of collecting, packaging and transport of POPs pesticide wastes to temporary storage facilities at POPs waste owner site
- Cost of special transport vehicles for POPs pesticide wastes
- Costs of improving current storage facilities for obsolete POPs pesticides and POPs pesticide wastes
- Costs of constructing environmentally sound storage facilities for obsolete POPs pesticides and POPs pesticide wastes
- Costs of carrying out further surveys at polluted sites
- Project administration expenses.

188. The co-financing from the public and private sectors will be ensured through the national selection of host entities. The whole process of disposal facility construction and operation, including the co-finance, will be under the supervision and inspection of the local government.

Co-funding Source Breakdown in US$

Co-financing source	**Cash**	**In-kind**	**Total co-financing**
Central Government (MEP)	4,285,600	6,350,135	10,635,735
Local EPBs		8,168,779	8,168,779
UNIDO inputs		100,000	100,000
Private sectors		12,228,386	12,228,386
Total Co-financing	**4,285,600**	**26,847,300**	**31,132,900**

SECTION F: MONITORING AND EVALUATION, REPORTING AND LESSONS LEARNED

Monitoring and Evaluation

189. Monitoring of project activities and evaluation of their results in the project will serve a dual function. First, it will facilitate tracking implementation progress toward the outcomes and objectives. Second, it will facilitate learning, feedback, and knowledge sharing on results and lessons among the primary stakeholders to improve knowledge and performance.

190. This section of the project document presents a concrete and fully budgeted monitoring and evaluation plan of this project (see table below).

Table 6: Monitoring and evaluation plan

Type of M&E activity	Responsible Parties	Budget US$ (Excluding project team staff time)	Time frame
Hold the Inception Workshop	CIO	55,000	Within 3 months after GEF CEO approval
Prepare Inception Report	CIO with support of CTA and NTA	4,000	Within 6 months after the IW
Measure impact indicators on an annual basis	CIO with support of CTA and NTA	9,500	Annually
Prepare Annual Project Reports and Project Implementation Reviews	CIO and UNIDO	9,500	Annually
Hold annual tripartite review meetings	CIO and UNIDO	47,500	Annually, upon receipt of APR and PIR
Hold biannual Steering group meetings	CIO and UNIDO	24,500	Biannually
Carry out mid-term external evaluation	Independent consultants	20,600	At the mid-point of the project implementation
Carry out final external evaluation	Independent consultants	17,200	Within 12 months after the completion of the project implementation
Complete the Terminal Report	CIO, UNIDO with support of NTA and CTA	4,600	
5.2.10 Carry out annual project financial audits	Independent audit entity	20,000	Annually
5.2.11 Carry out biannual visits to selected field sites	CIO and UNIDO	44,000	
5.2.12 Establish a project management information system (MIS), including a project website to disseminate information to stakeholders	CIO supported by subcontractor	54,700	Throughout the project implementation
Total		312,100	

Project Inception Phase

191. A Project Inception Workshop (IW) will be conducted with the full project team, relevant government counterparts, co-financing partners, UNIDO and representative from the UNIDO Country Office (CO), as appropriate.

192. The fundamental objective of this Inception Workshop will be to assist the project team in understanding and assimilating the goals and objectives of the project, as well as to finalize the preparation of the project's first annual work plan on the basis of the project's logical framework matrix. This work will include reviewing the logical framework (indicators, means of verification, assumptions), imparting additional detail as needed, and completing an Annual Work Plan (AWP) for the first year of project implementation, including measurable performance indicators.

193. Additionally, the IW will: (i) introduce project staff to the UNIDO team, which will support the project during its implementation; (ii) delineate the roles, support services, and complementary responsibilities of UNIDO staff vis-à-vis the project team; (iii) provide a detailed overview of UNIDO reporting and Monitoring & Evaluation (M&E) requirements, with particular emphasis on Annual Project Implementation Reviews (PIRs), the Annual Project Report (APR), Tripartite Review (TPR) meetings, as well as mid-term and final evaluations. Equally, the IW will provide an opportunity to inform the project team on UNIDO project related budgetary planning, budget reviews and mandatory budget rephrasing.

194. The IW will also provide an opportunity for all parties to understand their roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines and conflict resolution mechanisms. The Terms of Reference (TOR) for project staff and decision-making structures will be discussed, as needed, in order to clarify each party's responsibilities during the project's implementation phase.

Monitoring responsibilities and events

195. A detailed schedule of project review meetings will be developed by the project management team in consultation with the project implementation partners and stakeholder representatives and incorporated in the Project Inception Report. The schedule will include: (i) tentative time frames for Tripartite Reviews, Steering Committee Meetings, and (ii) project related Monitoring and Evaluation activities.

196. Day to day monitoring of project implementation progress will be the responsibility of the National Project Manager based on the project's Annual Work Plan and its indicators. The Project Team will inform UNIDO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion. In order to avoid risk of duplication or overlapping, the project would seek reporting of major milestones to UNIDO country office for information.

197. The Project Manager, the NTA and the CTA will fine-tune the progress and performance/impact indicators for the project in consultation with the full project team at the Inception Workshop. Specific targets for the first year implementation progress indicators together with their means of verification will be developed in this workshop. These will be used to assess whether implementation is proceeding at the intended pace and in the right direction and will form part of the Annual Work Plan. Targets and indicators for subsequent years will be reviewed annually as part of the internal evaluation and planning processes undertaken by the project team. Local/regional PMOs will also take part in the IW.

198. SMART indicators for impacts and results related to global environmental benefits are identified with baseline and target at Year 5 defined in the table below. All these impact indicators will be monitored annually at specific locations with effective means of verification. These will be undertaken through subcontracts or retainers with relevant institutions or through specific studies that are to form part of the projects activities. Indicators of project goal, progress and performance will be continuously monitored and evaluated throughout the whole project life.

Table 7: Key Impact Indicators

Key Impact Indicator	Baseline	Target (at Year 5)	Means of Verification	Sampling frequency	Location
Metric tons of POPs pesticide waste and associated high-strength waste matrices collected and disposed of in an environmentally sound manner	0	10,000	Check manifests for hazardous waste transportation	Annually	hot spot sites
Metric tons of dioxin rich incineration fly ash collected and disposed of in an environmentally friendly manner	0	1,000	Check manifests for hazardous waste transportation	Annually	1 target province
Avoided production and release of PCDD/F in TEQ attributable to adoption of non-combustion destruction of POPs pesticide waste	0	8.97	On-site monitoring of facility operation	Annually	Provincial hazardous waste management centers
Grams of PCDD/F in TEQ contained in incineration fly ash destructed	0	30.67	HRGC-MS monitoring	Annually	Solid hazardous waste management centre in 1 target province
Increase of POPs concentration in adjacent soil and water body, including surface water and underground water	To be determined in 1st year of implementation	0	Supervisory monitoring by local environmental authorities	Annually	hot spot sites

199. As the primary objective of this project is to carry out environmentally sound management and disposal of obsolete POPs pesticide waste and dioxin rich incineration fly ash, the most direct indicators to characterize the impacts of this project should include:

- Metric tons of POPs pesticide waste and associated high-strength waste matrices collected and disposed of in an environmentally sound manner, and
- Metric tons of dioxin rich incineration fly ash collected and disposed of in an environmentally friendly manner should be.

200. Consequential impacts from the clearance and disposal of the aforementioned POPs waste could be indicated by

- the avoided production and release of PCDD/F in TEQ attributable to adoption of non-combustion destruction of POPs pesticide waste, and
- grams of PCDD/F in TEQ contained in incineration fly ash destructed and increase of POPs.

201. The ultimate result of the project should be the decrease or stabilization of POPs concentrations in adjacent soil and water body, including surface water and underground water, following the clearance of the POPs waste stockpile sites due to the removal of sources.

202. UNIDO through quarterly meetings with project counterparts or as frequent as deemed necessary will undertake periodic monitoring of the project implementation progress. This will allow parties to troubleshoot any problems pertaining to the project in a timely fashion to ensure the smooth implementation of project activities.

203. UNIDO and/or UNIDO Country Office will conduct periodic visits based on agreed schedule to be detailed in the project's Inception Report / Annual Work Plan to assess project progress. Other members of the Steering Committee may also accompany these visits. A Field Visit Report will be prepared by UNIDO and will be circulated to the project team and all Project Steering Committee members no less than one month after the visit.

204. Annual Monitoring will occur through Tripartite Review (TPR) meetings, which will take place at least once every year. The first such meeting will be held within twelve months of the start of the full project implementation. The PMOs will prepare an Annual Project Report (APR) and submit it to UNIDO at least two weeks prior to the TPR for review and comments.

205. The TPR has the authority to suspend funds disbursement if project performance benchmarks are not met.

Terminal Tripartite Project Review

206. The terminal tripartite project review (TTPR) meeting will be held in the last month of project operation. The project proponent is responsible in the preparation of the Terminal Report and its submission to UNIDO. It will be prepared in draft at least two months in advance of the TTPR in order to allow more time for its review. This will serve as the basis for discussions in the TTPR meeting. The TTR considers the implementation of the project as a whole, paying particular attention to whether the project has achieved its stated objectives and contributed to the broader environmental objective. It decides whether any actions are still necessary, particularly in relation to sustainability of project results and acts as a means, which lessons learned can be captured for use in other projects under implementation or formulation.

Project Monitoring Reporting

207. The national project team in conjunction with the UNIDO focal point will be responsible for the preparation and submission of the following reports that form part of the monitoring process. Items (a) through (f) are mandatory and are specifically related to monitoring, while items (g) through (h) have a broader function and the frequency and nature are to be defined throughout implementation.

(a) Inception Report

208. A Project Inception Report (IR) will be prepared immediately following the IW. It will include a detailed First Year Annual Work Plan divided into quarterly timeframes, which detail the activities and progress indicators that will guide the implementation during the first year phase of the project. The Work Plan will include the dates of specific field visits, support missions from UNIDO and/or UNIDO consultants, as well as timeframes for meetings of the project's decision-making structures. The report will also include the detailed project budget for the first full year of implementation, prepared on the basis of the Annual Work Plan, and including any monitoring and evaluation requirements to effectively measure project performance during the targeted 12 month timeframe.

209. When finalized, the report will be circulated to project counterparts, who will be given a period of one calendar month in which to respond with comments or queries. Prior to this circulation of the IR, UNIDO will review the document.

(b) Annual Project Report

210. The Annual Project Report (APR) is a UNIDO requirement and part of UNIDO central oversight, monitoring, and project management. It is a self-assessment report by project management to UNIDO, as well as a key input to the TPR. The APR will be prepared on an annual basis prior to the TPR to reflect the progress achieved in meeting the project's Annual Work Plan and assess performance of the project in contributing to the intended outcomes through outputs and partnership work.

211. The format of the APR is flexible but should include the following:

- Analysis of project performance over the reporting period, including outputs produced and information on the status of the outcome
- Constraints experienced in the progress towards results and the reasons for these
- Expenditure reports
- Lessons learned
- Recommendations to address key problems in lack of progress, if applicable.

(c) Project Implementation Report

212. The Project Implementation Report (PIR) is an annual monitoring process mandated by the GEF. It is an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. Once the project will be under implementation for a year, the project team shall complete the PIR. The PIR can be prepared any time during the year (July-June) and ideally immediately prior to the TPR. The PIR should then be discussed at the TPR so that the result would be a PIR that has been agreed upon by project staff, the national executing agency and UNIDO.

(d) Quarterly Progress Reports

213. Short reports outlining the main updates in project progress should be provided quarterly to UNIDO by the project team.

(e) Periodic Thematic Reports

214. As and when called for by UNIDO, the project team will prepare Specific Thematic Reports, focusing on specific issues or areas of activity. The request for a Thematic Report will be provided to the project team in written form by UNIDO and will clearly state the issue or activities that need to be reported on. These reports will be used as a form of lessons learned exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles and difficulties encountered.

(f) Project Terminal Report

215. During the last three months of the project, the project team will prepare the Project Terminal Report (PTR). This comprehensive report will summarize all activities, achievements and outputs of the project, lessons learned, objectives met (or not met), and structures and systems implemented. The PTR will be the definitive statement of the Project's activities during its lifetime. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's activities.

(g) Technical Reports

216. Technical Reports are detailed documents covering specific areas of analysis within the overall project. As part of the Inception Report, the project team should prepare a draft Reports List, detailing the technical reports that are expected to be prepared on key areas of activity during the course of the Project, and tentative due dates. Where necessary, this Reports List will be revised and updated and included in subsequent APRs. Technical Reports may also be prepared by external consultants and should be comprehensive, specialized analyses of clearly defined areas of research within the framework of the project and its sites. These technical reports will represent, as appropriate, the project's substantive contribution to specific areas and will be used in efforts to disseminate relevant information and best practices at local, national and international levels.

(h) Project Publication

217. Project Publications will form a key method of crystallizing and disseminating the results and achievements of the Project. These publications may be scientific or informational texts on the activities and achievements of the Project in the form of journal articles, multimedia publications or other forms of distribution. Publications can be based on Technical Reports or may be summaries or compilations of a series of Technical Reports and other research. The project team will determine if Technical Reports merit formal publication and will also (in consultation with UNIDO, the government and other relevant stakeholder groups) plan and produce these publications in a consistent and recognizable format.

Independent Evaluations

218. The project will be subjected to at least two independent external evaluations as follows:

(a) Mid-term Evaluation. An independent Mid-Term Evaluation will be undertaken at the end of the second year of project implementation. The Mid-Term Evaluation will measure progress made towards the achievement of outcomes and will identify corrections if needed. The evaluation will focus on the effectiveness, efficiency, and timeliness of project implementation; highlight issues requiring decisions and actions; and present initial lessons learned on project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the second half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this mid-term evaluation will be prepared by UNIDO in accordance with the generic TORs developed by the GEF Evaluation Office.

(b) Final Evaluation. An independent Final Evaluation will take place within 12 months after the completion of the project implementation, and will focus on the same issues as the mid-term evaluation. The final evaluation will also review impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities. The Terms of Reference for this evaluation will be prepared by the UNIDO in accordance with the generic TORs developed by the GEF Evaluation Office. Though the evaluation activities in China have not yet been completed, the reporting formats will be used as soon as produced by the evaluation branch of UNIDO.

219. A Project Management Information System will be established to support the Project Manager and the project management team to ensure that all the project activities be completed on time, in quality and within budget. The MIS will keep baseline records of Annual Work Plans and contracts with consultants and subcontracts with performance indicators, result reports, responsibilities and budgets, and compare them with the progresses of the activities. A project website will be established to disseminate project information to the primary stakeholders and the general public.

Audit Clause

220. The Government will provide UNIDO with certified periodic financial statements and with an annual audit of financial statements relating to the status of the GEF funds according to the established procedures set out in the Programming and Finance manuals. The audit will be conducted by a legally recognized Government auditor, or by a commercial auditor engaged by the Government.

SECTION G: PRIOR OBLIGATIONS AND PREREQUISITES

221. The Project Document will be signed by UNIDO and the Government of the People's Republic of China. GEF assistance will be provided subject to UNIDO being satisfied that obligations and pre-requisites listed below have been fulfilled or are likely to be fulfilled. When fulfilment of one or more of these prerequisites fails to materialize, UNIDO may, at its discretion, either suspend or terminate its assistance.

G.1 Prior to Project Effectiveness

222. Legally binding co-financing agreements are signed for the private/public sector participation in the project.

G.2 During project implementation

223. Quarterly Progress reports, annual Project Reports and Project Implementation Review reports as well as measure impact indicators should be prepared. The project work plan and consequently the budget will be updated annually.

G.3 Within one year of start of project implementation

224. Annual audited financial reports should be prepared and submitted to GEF.

SECTION H: LEGAL CONTEXT

225. The project document shall be the instrument referred to the Standard Basic Agreement between the Government of the People's Republic of China and UNIDO. The project objectives shall be in line with the objectives of the Policies of the Government of the People's Republic of China.

226. The following types of revisions may be made to this Project Document with the signature of the Project Manager, provided he or she is assured that the other signatories of the Project Document have no objection to the changes as follows:

- Revision in, or addition of, any of the annexes of the Project Document; and
- Revisions that do not involve significant changes in the immediate subcomponents, objectives, outcomes or activities of the project, but are caused by rearrangement of the inputs already agreed to or by cost increases due to inflation.

ANNEXES:

Annex 1: Project Logical Framework

Annex 2: Environmentally Sound Technologies for Pesticides Disposal

Annex 3: Environmentally Sound Technologies for Fly Ash Management

Annex 4: Fee Based Waste Management System

Annex 5: Identification and responsibilities of stakeholders

Annex 6: Terms of References for Consultants/Experts

Annex 7: Terms of References for Subcontracts

Annex 8: Baseline Analysis for POPs Pesticides and Fly Ash

Annex 9: International and national experts consulted in project document development

Annex 1: Project Logical Framework

Project Strategy	Objectively verifiable indicators		
Goal	Continuously minimize and, where feasible, ultimately eliminate the releases of obsolete POPs pesticides and dioxin rich fly ash into the environment; assist China in implementing its obligations under the Stockholm Convention to protect the global environment and human health.		
Interventions	**Objectively Verifiable Indicators**	**Sources of Verification**	**Assumptions and Risks**
Objectives Environmentally sound management (ESM) and disposal of obsolete stockpile POPs pesticides associated waste matrices, and PCDD/PCDFs rich incinerator fly-ash in fulfillment of China's commitments under the Stockholm Convention (SC) and National Strategy for Hazardous Waste.	➢ At least 10,000 tons POPs pesticides stockpile and associated wastes at targeted hot spots have been identified, processed, safely transported, and disposed of in an environmentally sound manner. ➢ At least 1000 tons of incinerator fly ash produced in 1 target province collected and disposed in an environmentally friendly manner. ➢ Avoidance of release of 7.5 gTEQ dioxin from pesticide incineration and destruction of 0.9 gTEQ dioxin from fly ash; ➢ One stationary (capacity 10 tons/day) and one mobile unit (5 tons/day) will be constructed and installed for destruction of POPs pesticide wastes and dioxin rich fly ash on a national scale. ➢ Identification of potential PPP arrangements and feasibility study of private involvement in POPs destruction facilities ➢ Level of soil and underground water contamination with POPs reduced	➢ Texts of revised or new regulations, standards, and policies ➢ Bidding documents for purchase of technical services and equipment ➢ TORs for consulting services ➢ Service contracts ➢ Work plans ➢ Thematic study reports ➢ M&E reports	➢ Necessary provincial, local, and industry support is received ➢ Barriers can be successfully removed with effective interventions from this project ➢ POPs waste treatment will be an economically viable option ➢ The regulatory and policy framework established by the project will be maintained and adequately resourced after the project's completion

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Outcome 1: Strengthened legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste			
Output 1.1 Technological and economic policies and regulations in place for promoting environmentally sustainable management and disposal of POPs wastes			
1.1.1 Develop and formulate technological and economic policies through inter-departmental coordination, public awareness raising, public hearings, and NGO outreach 1.1.2 Provide training on new technological and economic policies for managerial staff from provincial EPBs 1.1.3 Raise awareness of new technological and economic policies and enforcement mechanisms	➢ Technical and economic policies to promote ESM for disposal of POPs wastes, including but not limited to: - technical policy for construction and operation of disposal units to dispose POPs waste in a cost effective and environmental friendly way; - licensing requirement for management and disposal of POPs pesticides and other POPs contaminated wastes; - legal responsibility and financial mechanism for treatment of POPs waste by operating and non-operating enterprises; - price considerations for POPs waste disposal; and - possible suppliers take back requirements. ➢ New regulations to promote ESM, including but not limited to: - Administrative and regulatory requirements for POPs waste disposal and cost effective disposal options - Licensing requirements for mobile facilities for hazardous waste, including POPs waste disposal - Development of technical specifications for mobile disposal facilities - Development of monitoring guidelines for new technologies and mobile disposal facilities - 4000 managerial and technical staff receiving ESM training	➢ Reports on regulations and policies developed, proposed and adopted. ➢ Regular project reports on training, coordination, outreach, and awareness-building activities. ➢ Training minutes and reports. ➢ News and articles in papers, TV programs, internet, and other media fora. ➢ Community activity reports.	➢ Government at national, provincial, and local levels, as appropriate, will endorse and adopt required policies and measures according to the project timeline.

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
	➢ Training materials developed ➢ Participation by 20 news media outlets and 100 communities	➢	➢
Output 1.2 Technical standards and guidelines developed for ESM of POPs waste			
1.2.1 Develop and formulate guidelines, standards, and specifications 1.2.2 Provide training on guidelines, standards and specifications for managerial staff from provincial EPBs 1.2.3 Develop standard operation procedures for analysis and monitoring	➢ Compilation of ESM guidelines for POPs waste management in line with requirements of Stockholm and Basel conventions; technological and operating guidelines for the following POPs treatment technologies: - Collection, storage, and transportation technologies - Destruction technologies including but not limited to: Incineration, Plasma Arc, Pyrolysis/gassifiers and chemical destruction technologies ➢ Risk assessment and emergency response guidelines for POPs waste disposal ➢ Technology certification standards for disposal of POPs wastes ➢ Audit manuals for the operation of disposal facilities formulated ➢ Supervision and Management Technological Specifications for cost effective options ➢ Monitoring specifications for POPs waste disposal and contaminated sites ➢ 500 specialized managerial and monitoring staff receiving training ➢ Training material ➢ 2 operational program models for monitoring of POPs waste and contaminated sites	➢ Reports on standards, guidelines, and specifications developed, proposed, and adopted ➢ Training minutes and reports ➢ Operational program model documentation	➢ Government at national, provincial, and local levels, as appropriate, will endorse and adopt the required standards, guidelines and specifications according to the project timeline ➢ Key government agencies accept and promulgate new guidelines ➢ Key stakeholders can be effectively involved throughout the process
Outcome 2: Improved institutional capacity at all levels of POPs waste disposal management			
Output 2.1 Communication and coordination sustained between stakeholders in waste management and disposal			
2.1.1 Establish national, regional, and local coordination framework for integrated POPs waste management	➢ National, regional and provincial POPs waste management committees established and in operation	➢ Meeting minutes	➢ Coordination and cooperation can be achieved among stakeholders

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
2.1.2 Periodically review stakeholder recommendations and action proposals related to POPs wastes ESM 2.1.3 Hold periodic fora for public and private stakeholders, NGOs, and the general public to promote good governance and increased effectiveness	➢ Number of recommendations/proposals related to POPs wastes ESM ➢ Local cross cutting managerial and operational coordination mechanism for integrated POPs waste management ➢ Potential conflicts of interest or disputes identified and resolved ➢ Number of NGOs and other stakeholders involved in process ➢ Stakeholder feedback and comments received	➢ Committee decisions, suggestions, and recommendations ➢ Reports on proposals submitted and reviewed ➢ Reports on resolution of conflicts and disputes ➢ Reports on stakeholder feedback and comments	➢ NGOs and enterprises are willing to actively participate.
Output 2.2 Institutional capacity enhanced for POPs waste management at local level			
2.2.1 Enhance overall institutional capacity for program development 2.2.2 Adapt and implement national policy and regulatory framework at local level 2.2.3 Develop trial local-level responsibility system for obsolete POPs pesticide management and disposal 2.2.4 Develop and test pricing mechanisms for POPs waste disposal 2.2.5 Establish and implement reporting system to collect and analyze data on creation, transport, and treatment of POPs waste 2.2.6 Establish inspection and prosecution system for the discarded POPs wastes and contaminated site 2.2.7 Promote widespread local participation through increasing local input of personnel and financial resources 2.2.8 Incorporate ESM principles, norms and requirements into current EIA guidelines 2.2.9 Prepare ESM inspection manuals, including:	➢ Creation of trial responsibility assignment system for obsolete POPs pesticide management and disposal ➢ Pricing program for POPs waste disposal demonstrated ➢ POPs waste disposal data reporting system established ➢ Prosecution and inspection system for the discarded POPs waste and contaminated site established ➢ Increasing local input of personnel, finance and resources ➢ EIA guidelines adopted ➢ ESM inspection manuals developed	➢ New or revised local policies and regulations ➢ Report on local policy establishing responsibility of obsolete POPs pesticide management and disposal ➢ Report on waste disposal pricing ➢ Report of reporting system database creation and use ➢ Report on prosecution and inspection system ➢ Training workshop reports ➢ Training materials ➢ Guidance documents ➢ Manual text	➢ Key agencies attach sufficient importance and allocate sufficient resources to POPs waste management supervision

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
- Evaluation, registration and authorization of facility operating licenses for POPs waste treatment - Monitoring of POPs waste disposal facility operation 2.2.10 Provide training for local solid waste management centers to implement ESM			
Output 2.3 Public awareness on POPs activities undertaken			
2.3.1 Develop TV and other mass media programs to disseminate knowledge of POPs 2.3.2 Publish articles or reports for public education in national and local newspapers. 2.3.3 Develop and produce brochures to raise awareness regarding health and safety protection from POPs pesticide wastes and dioxin rich fly ash 2.3.4 Hold public hearings regarding POPs waste stockpile reporting, emergency response, and health and safety protection 2.3.5 Hotline established for POPs related health and safety issues	➢ 2 TV and/or other mass media programs to disseminate the knowledge of POPs ➢ 60 articles in national and/or local newspapers ➢ 10,000 brochures prepared to raise awareness of POPs waste related health and safety protection issues ➢ 4 hearings held ➢ At least 200 attendees at hearings ➢ Number of hotline calls/reports ➢ 3-5 hot line staffers	➢ Copies of videos and recordings ➢ Copies of newspaper articles published ➢ Copies of brochures ➢ Hearing report and participant list/ summary ➢ Report on hotline activity	➢ TV programs effectively reach target population ➢ Newspaper articles effectively reach target population
Outcome 3: Environmentally sound disposal of targeted POPs pesticide waste and dioxin rich incinerator fly ash			
Output 3.1 Safe and effective collection, packaging, and transportation of POPs pesticide wastes for disposal arranged			
3.1.1 Identify location, type, status of POPs pesticide wastes and associated waste matrices at targeted hot spots 3.1.2 Develop operating manual for collection, packaging, and transportation of the POPs pesticide waste	➢ Localization of POPs pesticide wastes and associated waste matrices at targeted hot spots ➢ Operation manual for the collection, packaging, and transportation of the POPs pesticides and associated waste matrices, including emergency response plan for obsolete POPs pesticide wastes	➢ Report of waste localization and type for each hot spot targeted ➢ Training manual text ➢ Copies of TORs and contracts	➢ Provincial HWDCs represent a sufficient business opportunity to attract contractual interest

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
3.1.3 Prepare detailed terms of reference and contracts for the provincial HWDCs according to expertise in the fields of waste management and occupational health and safety. 3.1.4 Provide training to staff from the provincial HWDCs concerning the collection, packaging, and transportation of the POPs pesticide wastes 3.1.5 Collect, package, and transport POPs pesticide waste from hot spots 3.1.6 Store POPs pesticide waste safely to prevent release of POPs contaminants to the environment	➢ Terms of reference and contract templates for the provincial HWDCs ➢ Number of trained staff from the provincial HWDCs ➢ Safe collection, packaging, and transportation of identified obsolete POPs pesticides ➢ 10000 tons of pesticide wastes and associated waste matrices safely stored in designated storage facilities. ➢ inventory of pesticide wastes at storage sites created and maintained	➢ Implementation plan for collection, packaging, and transportation of POPs pesticide wastes ➢ Training materials and list of trainees ➢ Detailed implementation reports for collection, packaging, and transportation of obsolete POPs pesticides ➢ Storage implementation report ➢ Evaluation report	
Output 3.2 Assessment of technologies for POPs waste disposal carried out			
3.2.1 Detailed feasibility study for final disposal units based on the waste type, destruction efficiency, emissions, residues, energy/material requirements, portability, state of commercialization, and site selection 3.2.2 Preparation of detailed Terms of Reference for technology selection and Request for Proposal from vendors	➢ Feasibility study report of POPs destruction technologies and site selection ➢ Specifications of the stationary and mobile final disposal unit ➢ List of potential vendors for technology and equipment ➢ Terms of Reference ➢ Request for Proposal (RFP)	➢ Evaluation report for POPs destruction technologies ➢ Feasibility report ➢ TOR and RFP documents	➢ Contracts are commercially attractive to vendors
Output 3.3 Technology transfer promoted through PPP mechanisms			
3.3.1 Identify potential PPP arrangements for design, construction and operation of POPs waste treatment infrastructure 3.3.2 Promote cooperative relationship	➢ Identification report for the potential PPP arrangements for POPs destruction infrastructures in China ➢ Workshop held to introduce technology transfer/	➢ Proposal report on potential PPP arrangements for POPs waste treatment ➢ Workshop materials and report ➢ Joint venture certification	➢ Vendors and other parties are willing to cooperate

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
among technology vendors and facility designers, constructors, and operators to achieve cost-effective options	PPP concepts and promote dialogue between public and private sector groups regarding potential POPs PPP projects. ➢ Joint venture or comparable cooperative relationship established	➢ Bidding documents	
Output 3.4 Construction, certification, operation, and supervision of stationary and mobile treatment facilities arranged			
3.4.1 Environmental Impact Assessment (EIA) for one stationary and one mobile unit 3.4.2 Invite bids from potential vendors to transport POPs wastes, construct stationary and mobile units and operate disposal facilities 3.4.3 Prepare disposal sites for deployment of selected technology, including construction of storage facility and commissioning of equipment 3.4.4 Installation of the stationary unit at the selected site and mobile unit at selected base stations 3.4.5 Transportation of POPs waste to the POPs treatment locations in an environmentally sound manner 3.4.6 Final disposal of POPs pesticide wastes in an environmentally sound way 3.4.7 Monitoring during facility construction and operation 3.4.8 Establishment of equipment ownership arrangements	➢ Assessment of the environmental impact of the construction of stationary unit for POPs treatment ➢ Assessment of the environmental impact of installation and operation of mobile unit with four base stations ➢ Qualified vendors identified and contracted to transport POPs wastes and operate disposal facilities ➢ Site preparation for disposal facilities ➢ Storage facility construction and commissioning ➢ Stationary unit installed at selected site ➢ Mobile unit commissioned at four base stations. ➢ 10,000 tons of pesticide wastes safely transported to designated stationary unit or mobile base stations ➢ 10,000 tons of pesticide wastes disposed of in an environmentally sound manner ➢ Equipment purchase, infrastructure construction, facility installation, and operation ➢ Terms of Reference for post-project equipment ownership and operation ➢ Transfer of equipment title	➢ 5 EIA reports ➢ Contracts signed ➢ Progress report ➢ Monitoring reports ➢ Progress report ➢ Monitoring report ➢ Hazardous waste transportation manifests ➢ Operation report ➢ Monitoring reports ➢ Terms of reference ➢ Copies of signed contracts	➢ Contracts are commercially attractive to vendors Infrastructure and water/electric power supply at selected sites are suitable for construction of the stationary and mobile POPs treatment facilities

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Output 3.5 Dioxin rich fly ash disposal implemented			
3.5.1 Target province selected for non-landfill pilot disposal of dioxin rich fly ash 3.5.2 Development of operating manual for non-landfill disposal of dioxin rich fly ash 3.5.5 Staff training for safe disposal of dioxin rich fly ash in the selected province 3.5.5 Implementation of pilot for safe disposal of dioxin rich fly ash by non-landfill options	➢ Report on target province selection ➢ Operating manual ➢ Number of staff trained in selected province ➢ Training materials developed ➢ Capacity created for disposal of at least 300 tons per year of dioxin rich fly ash safely by non-landfill technology	➢ Report on province selection ➢ Manual text ➢ Training materials ➢ List of trainees ➢ Disposal reports	
Output 3.6 Exploration of the feasibility to extend POPs waste disposal capacity to CFCs destruction undertaken			
3.6.1 Complete technical and policy review 3.6.2 Identify potential technical processes and arrangements for the extension of POPs waste disposal capacity to CFCs destruction 3.6.3 Treat of CFCs contaminants in POPs destruction unit to demonstrate feasibility of making facilities dual capable at little/no additional cost	➢ Evaluation of technical and economic feasibility to destroy CFCs in the POPs disposal facility ➢ Technical processes developed for destruction of CFCs in POPs disposal facilities ➢ Evaluation of economic feasibility to destroy CFCs in POPs disposal facility ➢ Amount of CFCs contaminants disposed in the pilot project	➢ Evaluation report ➢ Technical report	
Outcome 4 Qualitative environmental risk assessment (QERA) site prioritization			
Output 4.1 Inventory of contaminated sites prioritised			
4.1.1 Review existing national and international best practice guidelines for human health and ecological risk assessment 4.1.2 Develop a project-fit methodology, including QA/QC procedures for quantitative environmental risk assessment (QERA) 4.1.3 Train staff in provincial solid waste management centers 4.1.4 Carry out on-site surveys following	➢ Report of international experience and applicability to QERA of POPs contaminated sites in China ➢ Copy of project-fit methodology for QERA ➢ Training agenda, course materials, trainer list, trainee list, list of qualification certificates ➢ Filled out questionnaires ➢ Report of qualitative description of exposures to POPs via environmental medias	➢ Report of international experience and applicability to QERA of POPs contaminated sites in China ➢ Copy of project-fit methodology for QERA ➢ Training agenda, course materials, trainer list, trainee list, list of qualification certificates	Adequate data can be obtained to complete analyses

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
removal activities, focusing on identification of exposure scenarios 4.1.5 Qualitatively predict POPs concentrations in identified exposure scenario and characterize risks by comparing target POPs risk factors 4.1.6 Analyze information needs for quantitative environmental risk assessment	➢ Prioritized site inventory ➢ Report of information needs for quantitative environmental risk assessment system	➢ Filled out questionnaires ➢ Report of qualitative description of exposures to POPs via environmental medias ➢ Prioritized site inventory ➢ Report of information needs for quantitative environmental risk assessment system	
Output 4.2 Establishment and maintenance of an Internet-based information processing, display and dissemination system in place			
4.2.1 Design Internet-based system to process and display QERA results and facilitate modeling of environmental risks and remediation decision-making 4.2.2 Purchase, install, and test system, maximizing use of existing hardware, software, and topographic data from the current POPs MIS 4.2.3 Input data and operate, maintain and update system 4.2.4 Conduct internet-based training and software dissemination	➢ Number of data sets for Internet-based system ➢ Bug reports ➢ Number of data entries ➢ Number of thematic maps derived by system ➢ Number of persons within CIO and local EPBs able to maintain the system	➢ Design report ➢ Specifications and TORs for system installation and testing ➢ System test report ➢ TOR for system operation and maintenance ➢ System specifications and user instructions ➢ Web pages	
Outcome 5. Project management, monitoring and evaluation			
Output 5.1 Project management structure established			
5.1.1 Establish Project Steering Group 5.1.2 Establish the National Project Management Team under CIO	➢ Steering group established with representatives from national and local stakeholder agencies ➢ National Project Management Team established ➢ Necessary office equipment procured ➢ National project expert team established ➢ 3 local project management offices established	➢ Report on establishment and operation of Steering group ➢ TORs for project management staff ➢ National and international expert recruitment notices and TORs	Project will be nationally executed by MEP/FECO.

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
5.1.3 Recruit Chief Technical Advisor (CTA), a National Technical Advisor (NTA), policy experts, and technical experts in POPs waste management, evaluation, and program development 5.1.4 Establish local project management offices in target provinces 5.1.5 Hold management training classes for national and local project management staff	➢ Training workshops held on contractual management, project management tools, and basics of POPs waste management and disposal	➢ TORs of the local project management offices ➢ Training materials	
Output 5.2 An M&E mechanism designed and implemented according to GEF M&E procedures			
5.2.1 Hold the Inception Workshop 5.2.2 Prepare Inception Report 5.2.3 Measure impact indicators on an annual basis 5.2.4 Prepare Annual Project Reports and Project Implementation Reviews 5.2.5 Hold annual tripartite review meetings 5.2.6 Hold biannual Steering group meetings 5.2.7 Carry out mid-term external evaluation 5.2.8 Carry out final external evaluation 5.2.9 Complete the Terminal Report 5.2.10 Carry out annual project financial audits 5.2.11 Carry out biannual visits to selected field sites 5.2.12 Establish a project management information system (MIS), including a project website to disseminate information to stakeholders	➢ Inception Workshop held ➢ Detailed work plans prepared ➢ Data and information against indicators input into the MIS ➢ Non-compliances identified and corrected ➢ Technical and political guidance from the Steering group ➢ Experience summarized and recommendations raised ➢ Problems identified and recommendations provided by field visits ➢ MIS established and made functional ➢ Project information, experience and lessons disseminated through website	➢ Inception workshop meeting minutes ➢ Inception Report ➢ Annual Project Reports and Project Implementation Reviews ➢ Biannual Steering group meeting minutes ➢ Mid-term and terminal external evaluation reports ➢ Terminal Report ➢ Annual project financial audit reports ➢ Field inspection reports ➢ MIS development documentations and reports generated by properly retrieving data and information from the MIS ➢ Project website development and maintenance documentation	

ANNEX 2: ENVIRONMENTALLY SOUND DISPOSAL TECHNOLOGIES FOR POPs WASTE AND PESTICIDE DISPOSAL

CONSIDERATION FOR ADAPTATION OF DISPOSAL TECHNOLOGIES IN CHINA

1.1 Status of Pesticides POPs in China

According to the project design, 11,000 tons of POPs pesticide stockpiles and related wastes and 1000 tons of fly ash from hazardous/medical waste incineration will be disposed within 3 years (2 of the 5 years for facility preparation and installation). There is spatially uneven distribution of POPs pesticide wastes in China r. Eight provinces or regions including Jiangsu, Hunan, Sichuan, Shandong, Tianjin, Shanxi, Hebei and Liaoning are the major distribution region, which accounts for 70~80% of total amount, while the distribution in other regions of China is dispersive.

The ingredient and quality of Pesticide POPs wastes in China have greatly changed because of being stockpiled for many years and lacking of supervision.. In most condition, they were immingled with other wastes and their ingredients are very complex, the existing status varies site by site. Simple store or direct discharge of POPs wastes have posed a big environmental and healthy threat to the communities around.

Disposal capacity building was triggered after China government promulgated the *National Construction Planning of Hazardous Waste and Medical Waste Disposal Facilities* (the National Plan) in 2004 and now it is in implementation.

Technology selection consideration

Selection of pesticide POPs wastes disposal technologies should consider those features as below based on those conditions:

- ***Broad-spectrum technology.*** The ingredient and configuration of Pesticide POPs in China are quite complex, which requires a broader technology application range that are able to accommodate and address wasted containing soil, sands, stone, sediment, metal, woods and bio-matrix etc. Moreover, the moisture content in waste should not greatly affect the final disposal efficiency.
- ***Requirement of BAT/BEP.*** The technology should be an environmental sound technology that is in compliance with BAT/BEP under the Stockholm and Basel Conventions. The disposal effect should also comply with the further requirements consistent with BAT/BEP, for instance, POPs emission, destruction efficiency, etc.
- ***Inventory and current disposal capacity***. The disposal plan for China pesticide POPs should well consider the distribution of pesticide POPs and cooperate to the extent possible the current disposal capacity.
- ***Cost-effectiveness and co-financing requirements***. The option of technologies must be based on the budget of the whole project including disposal cost and co-financing.

2. CANDIDATE DISPOSAL TECHNOLOGIES FOR ESM OF PESTICIDE POPS

Over the past ten years, intensive evaluation and investigation focus on POPs waste disposal technologies have been completed by some international organizations or research institutions, including UNEP-GEF/STAP, USEPA, BASEL convention secretariat and IHPA etc. In this report, the main candidate technologies are likely to be considered in the implementation phase of the project shall be briefly introduced. Please referred to Review of emerging, innovative technologies for the destruction and decontamination of pops and the identification of promising technologies for use in developing countries for comprehensive evaluation information.

2.1 BCD

The BCD technology was developed on the basis of earlier APEG dechlorination methodologies by EPA's Risk Reduction Engineering Laboratory from 1988 to 1993, in cooperation with the National Facilities Engineering Services Center (NFESC) of US Navy to remediate liquids, soils, sludge and sediments contaminated with chlorinated organic compounds, especially PCBs, PCDD/PCDFs.

A broad range of POPs, from PCB liquids to organochlorine pesticides can be treated by BCD technology. The treatment can be direct or by 2 separate steps, depending on the type of the feed. The first step is the indirect thermal desorption (in case of solids and contaminated matrices), which is a continuous flow process, and the second step is the intrinsic BCD reaction of POPs (condensates from the first step or liquid POPs which can be fed directly), which is a batch process.

2.2 Alkali metal reduction (sodium reduction SR)

SR was practically the first widely adopted alternative solution of PCB treatment and has been applying for nearly 20 years, being very simple in operation, requiring almost no infrastructure, and easy to transport and install on site. The process is based on the reduction of organic compounds by the use of dispersed metallic sodium, which removes the halide from the alkyl halide molecule to produce a sodium halide and a saturated aliphatic hydrocarbon. The reaction is suitable both for destruction of aliphatic and aromatic and of course of mixed aliphatic-aromatic chlorinated compounds as well.

2.3 Supercritical water oxidation

SCWO treats wastes in an enclosed system, using an oxidant (e.g. oxygen, hydrogen peroxide, nitrite, nitrate, etc.) in water at temperatures and pressures above the critical point of water (374℃ and 218 atmospheres). Under these conditions, organic materials become highly soluble in water and are oxidized to produce carbon dioxide, water and inorganic acids or salts.

2.4 Ball Milling

This type of technology is represented by two similar processes that is the MCD process by Environmental Decontamination Ltd (EDL), New Zealand and the DMCR process by Tribochem, Germany.

The Ball milling process employs the mechanochemical energy for the initiation of a reduction reaction between a chlorinated substrate (PCBs, pesticides) and a reagent.

2.5 GCPR

The technology was developed and commercialized by ELI Eco Logic International Inc. in Canada. The process can treat all types of chlorinated waste in different forms, such as bulk organic solids and liquids, high-strength PCB oils and mixed solid materials, aqueous waste, contaminated soils and sediments.

The Eco Logic's GPCR technology is based on the gas-phase thermochemical reduction of organic compounds by hydrogen at temperatures of 875℃ and low (atmospheric) pressures. The reaction between waste and hydrogen occurs only in the gaseous phase, therefore solid and liquid materials need to be pre-treated.

2.6 Plasma

Generally, plasma arc technologies can be classified as thermal destruction process ranging from pyrolysis to combustion that use heat generated by a plasma arc to destroy the organic waste content and to melt and vitrify the inorganic material.

Various plasma reactors have been developed for the thermal destruction of hazardous waste, mainly in Australia (Plascon, Parcon, Startech), USA (PACT, and PWC) Japan, Switzerland (Thermoselect) and Italy (CSM, Material Development Centre).

2.7 Incineration

High-temperature hazardous-waste incinerators are the most common facilities used for the treatment by complete oxidation of wastes consisting of, containing or contaminated with any POPs, because they are very effective and because there are few alternatives with regulatory approval.

It must be pointed out that the Stockholm Convention in Annex C, Part II identifies waste incineration as a potential source of unintentionally produced POPs. Moreover, recent studies suggest that incinerators achieve destruction efficiencies that are lower than those achieved by certain non-combustion technologies. Therefore each incinerator must be assessed very carefully for its ability to destroy contaminants and its gaseous, liquid and solid emissions.

2.8 Pyrolysis and gasification

In general these methods have been applied to selected waste streams and on a smaller scale than incineration. In addition to municipal wastes and sewage sludge, gasification can be used for some hazardous waste, while pyrolysis for contaminated soils. Specifically developed pyrolysis/gasification technologies, standard incineration technologies (i.e. grates, fluidised beds, rotary kilns, etc) may be adapted to be operated under pyrolytic or gasifying conditions i.e. with reduced oxygen levels (sub-stoichiometric), or at lower temperatures. In addition to the normal targets of waste incineration the waste), the additional aims of gasification and pyrolysis processes are to convert certain fractions of the waste into process gas (called syngas, which can be used as feedstock for other processes) and reduce gas cleaning requirements by reducing flue-gas volumes. The reduced oxygen content implies a lower formation of PCDD/PCDFs.

2.9 Cement Kilns

The primary fuel used in cement kilns is coal. A wide range of other fuels is or has been also used, including petroleum coke, natural gas and oil and it is not uncommon for kilns to be capable of multi-fuelling and for fuels to be changed from time to time based on the prevailing costs of different fuels.

In addition to conventional fuels, the cement industry uses various types of waste as a fuel, including hazardous waste, thus contributing to their destruction. This may be done at the request of national governments or in response to local demand. This co-processing can only be done if certain requirements with respect to input control (for example of heavy metal content, heating value, ash content, chlorine content), process control and emission control are met.

3 STATUS OF DISPOSAL TECHNOLOGY APPLICATION IN CHINA

3.1 Incineration technologies

High temperature incineration

About 30 hazardous waste treatment plants have the ability to treat hazardous wastes, and their total incineration capacity is about 120,000 ton/a. There are few regulations for the POPs wastes incineration in China. Only the pollution control of PCB wastes incineration is regulated. According to the technical policy for the pollution prevention of hazardous waste, PCB wastes should be incinerated in assigned incineration facilities, which should meet the requirements of the Chinese Standard for Hazardous Waste Incineration Pollution Control (GB 18482001)', related policies and regulations.

In the Chinese Standard for PCBs Waste Pollution Prevention (GB 13015-91), it was pointed out that the PCBs waste with a concentration between 50 and 500 mg/kg should be treated by safe landfilling or high temperature incineration; the PCBs waste and PCBs containing impregnator from scrap power capacitors with a concentration higher than 500 mg/kg must be treated by high temperature incineration. The requirements of PCB waste incineration were regulated by Chinese Standard for Hazardous Waste Incineration Pollution Control (GB 18482001), the temperature in high temperature zone ≥1200ºC, combustion gas residence time in high temperature zone ≥2.0 s, combustion efficiency ≥ 99.9%, DRE ≥ 99.9999% and Heat Loss of residues < 5%.

Currently, Shenyang Incineration Center is the only authorized plant for the incineration of PCBs wastes. It is located at Gujia section of Guoyingjianxian forestry center, Xinming, Shenyang. The project was applied to the former State Planning Committee of China by Shenyang Academy of Environmental Sciences, and the construction started in May 2002. The capacity of the incinerator is 15 ton/day for PCBs wastes. The construction project has passed the environmental risk assessment and the examination of Development and Reform Committee of Liaoning Province. To ensure the safe disposal of PCBs transported from Zhejiang Province in the PCBs Management Demonstration Project, a PCBs storage warehouse, a pretreatment workshop and a waste characterization discriminating unit will be added in the west part of the incineration center.

Cement kiln co-processing

In 2004, there are more than 5000 enterprises producing cement, among them 1900 enterprises have to reduce products or be shot down. The number of enterprises with annual cement output of 200,000-60,000 tons (output 550-1650 tons/day), increased from 565 in year 2000 to 973 in year 2004. The number of enterprises, with annual cement output more than 60,000 tons (including enterprises that produce clinker), increased from 102 to 265, and the number of oversized enterprises increased from 32 to 87, with annual cement output more than 1.2 million tons (daily output 3300 tons) at the same time. Hence, when choosing kiln for POP wastes disposal, cement plants, which have production capacity over 1000t/d and better management situation for production facilities can be chosen (enterprises that have passed ISO9000/14000 authentication should be paid priority consideration).

According to statistic data from SEPA, about 40 cement plants can dispose hazardous wastes during Tetramethylene Disulfotetramine (a kind of raticide) renovation action in 2003.

As far as the literature reviewed, 3 enterprises namely Hubei Huaxin cement kiln plant, Shanghai Wanan Group Ltd., Beijing cement factory group have conducted pilot incineration. Hereinto pilot incinerations of Shanghai Wanan are most on hazardous wastes and no work has been done on POPs waste. Besides that, Suzhou Huaxin cement kiln plant is reported to conduct pilot incineration soon.

Plasma incineration

Plasma Medical Waste Incineration Technology – SWIP

Southwestern Institute of Physics (SWIP) applied DC plasma torch to develop experimental facility for chemical warfare agent treatment (1kg/h), but no industrialized application. In 2002, cooperated with some engineers of SWIP, Zhen Gao Ke Industry Co., Ltd. (Shenzhen, China) developed a plasma wastes incinerator (2 ton/day), using SWIP technology and key components (plasma torch and power supply).

Actually, the capacity of the furnace cannot achieve 2 ton/day (SWIP now announced that it is only 1 ton/day) and built up a set of 1 ton/day medical wastes facility in Pingshan People's Hospital, Longgang Dictrict, Shenzhen. It was said that the incinerator can reach 2000ºC or even more in reaction area and decompose effectively the virulent materials, which make great harm to human beings. It also can be used for environmental-friendly treatment of municipal solid wastes, medical wastes, asbestos, battery, waste tire, PVC, and other hazardous industrial wastewater or waste gas. This furnace has no flue gas treatment equipment, so the flue gas is directly discharged. Furthermore, the technology uses air as plasma gas, the excess air ratio is above 5. The system is an oxidative system, like a combustion system, the energy supplied by plasma is not enough to pyrolyze waste. According to SWIP, they have started marketing promotion, but does not offer any examples except the furnace in Pingshan People's Hospital, which was donated by SWIP.

3.2 Pyrolysis

The Thermal Power Engineering and Thermal Science Key Laboratory, Department of Thermal Engineering, Tsinghua University studied the mass and energy balances of quasi-stable state continuous pyrolysis process. Based on their study, the reactor design principle and calculation procedure ware set up. Subsequently the greasy dirt waste taken as the example, the system quality and the energy balance calculation was introduced. The system mass loss is 7.93% — 19.15%. Energy balance calculation can determine not only the energy requirement of the endothermic

pyrolysis process, but also the energy recovery efficiency. The experimental equipment can be taken as the prototype reactor of rotary kiln, grate furnace and all other waste incineration process.

Guangzhou Institute of Energy. The Chinese Academy of Science, has applied chromatograph technology to study pyrolysis and gasification mechanism of municipal solid waste.

China Zhongjian Nuclear Fuel Corporation developed the inflammable radioactive solid waste pyrolytic incinerator. The company has done research in middle of 1970s on the processing technology of inflammable solid waste, which contains uranium. The research has been stopped due to funding and resource limitation. In middle of 1980s, Chinese Radiological Protection Academy (Taiyuan, Shanxi Province) has done research with consideration over the property of the radioactive waste in China and focus on the common solid waste. After laboratory testing, the bench test, pilot scale test and industrial scale test of main equipments, prototype of radioactive solid waste pyrolysis-incinerator is developed. Based on the prototype furnace, multi-function radioactive waste incineration testing facility is established and carried engineering test. China Zhongjian Nuclear Fuel Corporation and Chinese Radiological Protection Academy have jointly established the first combustible radioactive solid waste pyrolysis-incineration industrial facility in Oct. 1995. The facility has been tested with different material content discontinuously and continuously. In 2003 the original equipments have been upgraded and improved. The facility realizes the industrial scale processing of radioactive waste and processed more than 100 tons in last 8 years. The facility solves the storage problem and meets the national standard off gas emission.

The Chinese Radiological Protection Academy developed a multi-purpose radioactive waste incineration system and technical process. This systematic technical process mainly includes waste pretreatment, incineration and flue gas purification, etc. The wastes can be processed are solid combustible waste, waste resin and used oil. Solid wastes (include resin) take pyrolysis and used oil spray into furnace to burn the solid wastes. The flue gas purification system uses the combination of dry dust removal and wet acid absorption. The entire system is operated under negative pressure in normal operating mode and the maximum working pressure is ≤ 20 000 Pa. In this case, the system can be fabricated as conventional equipments. The high temperature oxidation and low temperature corrosion at the same time should be well considered during the design period for major equipments and purchasing. The major operating parameters are: for combustor, temperature 850~1100ºC, vacuum 1000~1500 Pa, furnace volume 0.36 m3 ; flue gas ~1260 m3/h, resident time 1 second, preheating from oil burning; for cool air dilutor, temperature 1000~500ºC, vacuum 1500-1800 Pa, diluting air 130~150 m3/h; and for water spray cooler, temperature 500~200 ºC, vacuum 1800~2500 Pa, water injection volume 80~100 liters/h, compressed air flow rate ~15 m3/h, compressed air pressure 0.3~0.4 MPa, flue gas resident time ~1 second, water spray injector is external air mixing nozzle.

One of the Fengquan's products is two-circuit vertical pyrolyzing furnace. The furnace only uses the inherited heating value of waste (actually is starved air incineration process) Primary combustion chamber does not need any additional fuel to sustain the incineration of municipal solid waste. Hence it can be used to process waste in wide range. The heat preservation and non-adhesion wall technology of the furnace body is a domestic leading technology. The furnace has high thermal efficiency and makes the most of heat recovery. The fine heat resistant technology guarantees waste to be burnt out thoroughly under high temperature and can utilize the high temperature flue gas energy (T ≥ 850 □) through a waste heat boiler to produce steam, which can be used according to actually need of customers.

Fengquan has developed 'vertical discontinuous feeding pyrolyzing furnace' to process medical waste, to gasify medical waste in starved air combustion, and then burn out the off gas with controlled air input. Fengquan keeps continuous pyrolysis with two or more furnaces in turn, and apply PLC or DCS system to control entire process, and monitor the pyrolysis and emission conditions on-line, which is connected to local EPA. Since waste resident time relatively longer in vertical furnace, it can be burnt out thoroughly with lower heat loss rate. During the gasification process, the heat from the burning waste in bottom dries the waste in upper layer, which can utilize the inherited heating value and decrease the fuel consumption.

Zhengzhou Wangu Machines Co. Ltd. developed an FSL-150 pyrolyzing furnace (actually, a starved air incinerator), which is mainly used in small and medium size city and towns for medical waste processing. The FSL series furnaces include a furnace body, an auxiliary combustor, flue gas processing system and an automatic control system. Its working principle is the waste first incinerated in primary combustion chamber (600ºC-850ºC) in oxygen-lean condition to gasify most part of the

waste and then the off gas is incinerated in secondary chamber (1000ºC -1200ºC). Afterwards, the bottom ash is removed from primary chamber.

3.3 Plasma arc technologies

CAS-IMECH plasma arc pyrolysis

CAS-IMECH plasma arc pyrolysis system is developed by the Institute of Mechanics, Chinese Academy of Sciences (CAS-IMECH). The technology is based on Chinese patents such as 3-phase AC plasma metallurgy furnace (ZL 96119824.9) and DC arc technology (listed in table 3), etc., it uses Hydrogen or Argon as plasma gas to get reductive atmosphere, its feasibility is confirmed by using the pyrolysis treatment experiments of various wastes such as chemical warfare agents, chemical wastes, and electronic wastes.

CAS-IMECH built up the plasma-arc medical wastes treatment system, with the capacity of 3 to 5 ton/day, is a full-scale demonstration and can be used to destruct gases, liquids and solid wastes. Since using graphite as furnace liner and electrodes, the system can be used to treat strong-corrosive CFCs wastes containing fluorine.

The system introduces H2 to form reductive atmosphere, consumes less plasma gas and produces low volume off-gas of 200 to 300 Nm3/hr.

It includes a simplified pre-treatment subsystem, a plasma pyrolysis reactor, a plasma power supply, and an off-gas treatment subsystem, a monitoring/controlling subsystem and a cooling subsystem, etc. The pre-treatment subsystem consists of a hydraulic ram feeder and a guillotine-door, the entire medical wastes pre-treatment subsystem also includes a crusher, a conveyer an additives storage tank, an additives screw feeder and a seal system. The plasma pyrolysis reactor includes an AC plasma-arc generator, a reactor tank, an set of electrode driving machine, a feed-in system, a cooling system and a taphole system etc. The temperatures can attain above 7000ºC in arc zone, 1000-1500ºC in reaction zone and 900-1100ºC at off-gas port, the output of the slag forms vitreous slag. Plasma power subsystem with power capacity of 250kW includes a transformer, an electric reactor and a controlling system, which is obligated for the capacity of 5 ton/day. The integrated off-gas subsystem in the lab is a full system, which involves an off-gas fast heat exchange cooler (to about 600ºC), an air pre-heater (heat fresh air to 150ºC, while the temperature of the off-gas reduces to around 500ºC), and then off gas enters into a carbon-fiber adsorber box to remove dioxins and furans. The fabric filter is not fixed in the system, because of small amount of off-gas taking little particles in it. However, a fabric baghouse is built up in this position in order to catch more fine particles in industrial system. The off-gas after removal of particles is turned into a wet acid gas scrubber where the acid gas in the off-gas is removed, then heated to 150ºC by hot air from air pre-heater, and then discharged to a combustor. The off-gas combustor is fixed at the end of the subsystem, and the system before the combustor is designed as sealed and explosion-resistant system.

The combustible gas recycling and syngas producing technique are not employed in this system, thus the technical process and facilities are rather simpler and the system and control strategy is much easier. The shoot diameters produced by pyrolysis progress is around 50 nm and can be collected by fabric filter, which is determined by its purity, the unrecycled shoot will be returned to the feed-in side and then re-treated.

3.4 Tio2 -Based V2O5/WO3 Catalyst Dechlorine

Northwest Research Institute of Chemical Engineering is the only domestic institution, which has researched and developed the technology to clean up dioxin from the flue gas of the medical waste incineration plant with V2O5/TiO2 as catalyst. This process uses vanadium, tungsten and other transition metal as the active ingredients of the catalyst, the titanium dioxide as the carrier, the metavanadic acid ammonium, the ammonium tungstate as the source of active ingredients. The impregnation method produces the catalyst of titanium dioxide carrying vanadium. The off gas of waste incinerator cooled down and removes dust first, and then goes through catalyzing reactor. When the air speed is 5,000 ~ 6000 m3/h, the bed temperature is 250 ~ 450ºC, the decomposition efficiency achieves 95% ~ 99%. The pilot scale equipment was installed in a hospital waste incinerator with capacity of 400 kg per day in Beijing. From Dec. 2002 to Jan. 2003, a test has been done in a MSW power plant in southern China. According to the analysis of National Environmental Analysis and Testing Center, the dioxin DME is 95~99%. After passing through the catalyzing reactor, the dioxin

concentration drops lower than 0.1 ng TEQ/m3. This technology has applied for domestic invention patent.

Catalyzed dechlorination is a commonly used chemical process, widely applied in crude oil refining, synthetic ammonia and oil refining, etc. The chlorine is the common poison to catalyst, it has very high electron affinity and migratory aptitude, easily react with the metallic ion, also often migrate along with the processing gas to the downstream process and poison the catalyst permanently. In the reforming and processing stage, the organic chloride will be converted into the hydrogen chloride after raw material goes through the hydrogenation pretreatment. The hydrogen chloride and water or ammonia forms the hydrochloric acid and the ammonium chloride separately, which will create the serious corrosion of the equipment and block the pipeline. Furthermore, in some serious condition, the facilities should be cause shutdown to be maintained, which leads to huge economic loss to the plant.

The catalyzed dechlorination technology is a relatively matured technology in existing dechlorination technology and applied widely. The organic chlorine desorption technology mainly have 2 kinds: the catalytic hydrogenation dechlorination and the catalytic hydrogen transfer dechlorination.

The reaction mechanism of catalytic hydrogenation dechlorination has 4 steps: the first, hydrogen adsorption in catalyst surface; the second, the organic chloride adsorbed on the catalyst carrier surface; the third, surface reaction – the adsorbed hydrogen and the organic chloride produce HCl and corresponding hydrocarbon compound; the last, product desorption – produced hydrocarbon compounds and hydrogen chloride detach from dechlorination catalyst surface.

The reaction mechanism of catalytic hydrogen transfer dechlorination is as follows: in the first step, the catalyst and the hydrochloric hydrocarbon to form the complex compounds via contact; in the second step, the hydrogen donor transfers hydrogen to complex compounds to take the place of chloride ion and forms new complex compounds, and the chloride ion leave complex compounds as free-stuff; in the third step, the new complex compounds decompose and then forms new complex compounds; in the last step, after the new complex compounds decompose and form catalyst and corresponding hydrocarbon compounds.

Generally, the dual-metal catalyst as dechlorination catalyst is applied for the organic chloride. At present, the iron contained compounds are used as the main catalyst, with other noble metal and corresponding ion as the auxiliary catalyst. The carrier normally is selected according to the hydrogen source, for example, when take methane series hydrocarbon as hydrogen source, normally the activated carbon, the activated carbon fiber or the activation carbonization resin are used as the carrier. When choosing Al2O3 or PVP (polyethylene base pyrrolidone) as the carrier, gaseous hydrogen is taken as the hydrogen source. Regarding to the aromatic chloride catalytic dechlorination, generally, reaction is taken in the aqueous phase and catalytic hydrogen transfer dechlorination agent is often used. There are many research about this exist in China.

The State Engineering Research Center for Urban Pollution Control, College of Environmental Science and Engineering, Tongji University, studied the technology and mechanism of catalytic reduction dechlorination of chloralkane in aqueous solution, taking the substances as the carbon tetrachloride and the tetrachloroethane as the examples. The Environmental Science Research Institute, Xi'an University of Technology, studied the technology use nickel/iron dual-metal catalytic degrade atrazine and parachlorophenol in the water body. The Henan Hsinhsiang Medical College has studied catalytic dechlorination of PCBs in isopropanolin water solution under mild condition. The Chengdu Institute of Organic Chemistry, Chinese Academy of Science, has studied the Pt/ZSM - 5 catalytic carbon tetrachloride with gas phase hydrogenation dechlorination technology. The Research institute of Environmental Chemistry and Application Technology, Hanshan Normal School, has studied the dechlorination technology for pentachlorophenol with null valence metal in soil.

Although catalytic dechlorination is a relatively matured technology in existed dechlorination technology, few POPs processing experiences have been obtained and not finish laboratory test yet.

4 COST ANALYSIS ON THE POTENTIAL DISPOSAL TECHNOLOGIES.

4.1 Economic analysis on existing disposal technologies

Incineration

Specific costs for PCB treatment (UNEP report on destruction capacity, 2004)

Technology	Type of PCB treated	EUR/ton of waste
rotary kiln + afterburning	bulk liquid, oils	50-500
	bulk packed material	750
high temp incineration	liquids, paper, wood	400-900
	capacitors	800-1500
pretreatment +incineration+	solid PCB	600-1500
efficient APCDs	liquid PCB	250-1500
	capacitors	depend on size

Low cost mobile incinerators

Prices of mobile incinerators range from US$1,500,000 to $15,000,000 depending on capacity and capabilities. Some companies provide mobile incineration services that can be contracted.

It may take up to six months to get a mobile incinerator on location (preparation, shipment, in-country transport, assembly and testing) and mobilization costs may exceed US$1,000,000 (transport, assembly, testing, disassembly, and transport).

Additional operating costs range from US$600 to $2,000 per tonne, depending on the model of incinerator and the type of waste.

Pyrolysis/gasification

The general costs for these facilities are:

Small plants =3000-4000 t/year; investment costs = $250,000 - $1,000,000 depending on applied APCDs and energy/chemical recovery

Cement kiln

Little information is available on costs for POP treatment.

The capital investment can be maintained parallel with the hazardous waste incineration. The main additional costs mainly come from retrofitting with APCD systems (dedusting or scrubbers). Generally costs are strongly dependent on pretreatment and kind of wastes.

Specific cost for chlorinated and PCB co-incineration are reported from US$1,000 up to US$ 5,000.

Plasma

Plasma technologies generally have lower capital and maintenance costs than incineration

Capital cost can vary in a large extent depending upon the configuration and upon factors such as:

- Waste feed – molecular structure, weight and concentration;
- Electricity costs;
- Argon and oxygen costs;
- Geographic location and site specific issues;
- Caustic costs; and
- Required emission limits.

BCD

Capital costs range from US$800,000 to US$1,400,000 for a 2,500 gallon BCD liquid reactor; and

Operating costs range from US$728 to US$1,772 per tonne depending on the POP concentration (10% POP) and on the design and configuration of the system for either mobile or stationary use, as reported by the vendor.

Alkali metal reduction (SR)

Different operation costs are reported for different SR technologies. Including labour and amortization costs can reach US$ 1,500 (information on BDS process from vendor). However, several other vendors report costs of less than US$1,000 per ton of pure POPs.

The SR plant costs are usually in the range of several hundred thousand USD and can be less than US$ 300,000.

Molten salt

No data are reported for installation costs. Minimum treatment cost is US$ 1,200

4.2 Determination of baseline price for POPs waste disposal

Incineration is the major method for hazardous waste treatment in China and the disposal cost for the common hazardous waste that has low chlorine content and low toxicity is US$700/t. Those incinerators are required to operate in line with the national emission limit of PCDD/Fs of 0.5 ng/Nm3 according to the current Pollution control standard for hazardous waste incineration (GB18484-2001) in China but many of them could not meet the requirement in the day-to-day operation.

The only incineration facility that will meet the Convention operating standards is located in northeast China, and is dedicated to PCB disposal at the unit cost of US$2,930/t. This facility is not yet commissioned, and when operational, the demand on this facility will be beyond its capacity, and in practice will not be available for this project. No other incineration facility currently in operation in China meets the Convention's standards for the disposal of POPs waste.

The baseline cost is US $700/t for common hazardous waste destruction with an emission of PCDD/Fs of 0.5 ng/Nm3 and US$2,930/t for PCBs wastes.

5. CONCLUSION

The considerations mentioned above will help to select the best available technology with a base of comprehensive comparison and analysis on local and international technology. However the final technologies used have to consider a number of technique parameters and performance levels.

ANNEX 3: ENVIRONMENTALLY SOUND TECHNOLOGIES FOR FLY ASH MANAGEMENT

General description

During combustion processes and flue gas polishing, solid wastes may be generated.

The amount and nature of these wastes varies, mainly according to the types of waste or materials being incinerated or combusted and the technology that is employed. These residues contain concentrated amounts of pollutants (e.g. hazardous compounds and salts) and therefore normally are not considered appropriate for recycling purposes.

The following main waste streams are commonly produced during the combustion process:

- ashes and/or slag
- boiler ashes
- filter dust
- other residues from the flue-gas cleaning (e.g. calcium or sodium chlorides)
- sludge from waste water treatment.

In some cases, the above waste streams are segregated; in other cases, they are combined within or outside the process.

The main part of the solid waste is typically called ‘ashes’. Two types are usually present; one called ‘bottom ash’, typically recovered at the bottom of the combustion chamber and another called ‘fly ash’ that is smaller and flows with the combustion fumes. This latter one is usually recovered with flue-gas cleaning equipment. Other type of ashes come in a lesser extent come from the boiler or heat recovery sections.

In municipal waste incineration bottom ashes are generally produced in the largest quantities and depending on their characteristics can be sometimes used as for re-cycling as an aggregate replacement and construction materials. In modern well-operated plants the TOC (Total organic carbon) in bottom ashes can be below 1 wt %. The relative partitioning of elements into bottom ash depends mainly on the composition of the MSW fed to the incinerator, the volatility of the elements it contains, the type of incinerator and grate system applied and the operation of the combustion system. The mass and volume reduction of waste incineration causes an enrichment of a number of heavy metals in the bottom ashes compared to their concentration in the waste feed. It is important to note that the risks associated with bottom ash are not indicated only by the presence or absence of substances but by the fact that they can be possible emissions sources of pollutants to the environment.

Residues from dry and semi-wet flue-gas treatment are a mixture of calcium and/or sodium salts, mainly as chlorides and sulphites/sulphates. There are also some fluorides and unreacted reagent chemicals (e.g. lime or sodium carbonate). This mixture also includes some fly ash that has not been removed by any preceding dust removal step. It can, therefore, also include polluting heavy metals and PCDD/PCDFs. The normal way of disposal is landfilling as hazardous waste, provided that tests of leaching are carried out

Residues from hazardous waste incineration are not fundamentally different from those of municipal waste incineration plants. However, the following differences can be observed:

- in the case of ash and slag: the incineration of hazardous waste in drums is usually performed at temperatures higher than those used for municipal waste incineration. This can result in different metal partitioning
- owing to variations in waste type and content, the specific amount of bottom ash can be subject to variations much greater than those in municipal waste incineration plants. These variations can be seen within the same plant according to the wastes fed, as well as between different plants and technologies
- in the case of filter dust/FGT residues, as the concentration of heavy metals is normally higher in hazardous waste, the solid residues produced may also contain considerably higher concentrations of heavy metals.

The fly ash produced from the burning of pulverized coal in a coal-fired boiler is a fine-grained, powdery particulate material that is carried off in the flue gas and usually collected from the flue gas by means of electrostatic precipitators, baghouses, or mechanical collection devices such as cyclones. When pulverized coal is combusted in a dry-ash, dry-bottom boiler, about 80 percent of all the ash leaves the furnace as fly ash, entrained in the flue gas. When pulverized coal is combusted in a wet-bottom (or slag-tap) furnace, as much as 50 percent of the ash is retained in the furnace, with the other 50 percent being entrained in the flue gas. In a cyclone furnace, where crushed coal is used as a fuel, 70 to 80 percent of the ash is retained as boiler slag and only 20 to 30 percent leaves the furnace as dry ash in the flue gas.(1) A

In the next table some typical data on residues from municipal waste incineration plants are summarized:

Types of waste	Specific amount (dry) (kg/t of waste)
Slag/ash (including grate siftings/riddlings)	200 – 350
Dust from boiler and de-dusting	20 – 40
FGC residues, reaction products only:	
Wet sorption	8 – 15
Semi-wet sorption	15 – 35
Dry sorption	7 – 45
Reaction products, and filter dust, from:	
Wet sorption	30 – 50
Semi-wet sorption	40 – 65
Dry sorption	32 – 80
Loaded activated carbon	0.5 – 1
Note: wet sorption residue has a specific dryness (e.g. 40 – 50 % d.s.) [74, TWGComments, 2004]	

Source: EU BREF on waste incineration

The table below gives the mass streams of solid residues for various substances per tonne of MSW incinerated. (Flanders Region of Belgium in 1999)

Type of solid residue	Percentage (%)
Bottom ash	21
Fly ash + gas cleaning residue + sludge from wet scrubbers	4.2
Scrap recuperated from bottom ash	1.2

In the table below data from a European survey of merchant Hazardous waste incinerators are provided concerning the total production of various residues:

	Residue production (kg/t waste input)			(Tonnes)
	Minimum	Maximum	Average	Total annual amount (recorded)
Bottom ash	83	246	140	193372
Boiler ash + fly ash + solid flue-gas cleaning residue	32	177	74	79060
Filter cake from ETP	9	83	30	16896

POP content in ashes

PCDD/PCDFs can be found at levels of the order of ng/g in fly ashes or pg/g in other ashes, depending on the source of production. It must be pointed out that as pollution equipment becomes more effective in removing particulate matter, the toxicity of the any kind of ash increases. This has deep consequences in the method of disposal. Some ash is treated as hazardous waste, but

sometimes, especially in developing countries, they are disposed of as ordinary waste in dumping sites.

Typical concentrations of organic compounds in the various solid residues in some modern facilities are compiled in the table shown below. (Source: EU IPPC BREF on waste incineration, 2006)

Parameter	Bottom ash	Boiler ash	Filter ash
PCDD/F (I-TEQ)	<0.001 – 0.01	0.02 – 0.5	0.2 – 10
PCB	<5 – 50	4 – 50	10 – 250
PCBz	<2 – 20	200 – 1000	100 – 4000
PCPh	<2 – 50	20 – 500	50 – 10000
PAH	<5 – 10	10 – 300	50 – 2000
All values in ng/g			

Residue	Average value in ng/kg I-TEQ	Max value in ng/kg I-TEQ	Number of samples	Total amount in 2003/tonnes
Bottom ash	46	46	1	1100000
Fly ash	2946	16900*	34	82200
Boiler ash	42	86	3	2900
Wet FGC salts	636	5400	16	25500
Filter cake	17412	66000*	30	8300
* This is a relatively old installation with modern FGT-equipment that prevents dioxin emissions to air. The residue is land filled on a hazardous waste landfill site.				

In the Dioxin Toolkit edited by UNEP four classes of emission factors for hazardous waste incinerators are defined. The highest content of PCDD/PCDFs in hazardous waste incinerators are caused by the batch-type operations, which commonly lead to a long warming and cooling phase of the furnace resulting in pyrolytic conditions in the furnace over an extended period of time.

Classification	Emission Factors - µg TEQ/t HW Burned	
	Air	Residue (Fly Ash Only)
1. Low technology combustion, no APCS	35,000	9,000
2. Controlled combustion, minimal APCS	350	900
3. Controlled combustion, good APCS	10	450
4. High technology combustion, sophisticated APCS	0.75	30

Ashes Disposal Methods

Introduction

Bottom and boiler ashes are disposed of in dumping sites in many countries but may be reused in construction and road-building material following pre-treatment. However, an assessment of content and leachability tests of persistent organic pollutants and heavy metals should be conducted. The disposal in lined and dedicated dumping sites is preferable to mixed waste facilities.

Because of the differences in pollutant concentration, the mixing of bottom and boiler ash with fly ash from filters should be avoided and is forbidden in many countries, but in developing countries still there is a lack of regulation for this kind of problem.

Combustion ashes and flue-gas treatment (FGT) residues can be treated by conditioning, stabilization and solidification processes, either in the combustion plant (e.g. in some incinerators), or on waste treatment facilities. Other methods are vitrification, purification and recycling of some components (e.g. salts).

In particular the following processes are described:

Conditioning

The substances that can only be incinerated or landfilled are conditioned by means of aggregates. Depending on the final disposal plant (e.g. incineration or landfill); diatomite, sawdust or other appropriate aggregates are added to the waste.

Wastes with certain resource contents may be passed on to the downstream plant for the recovery of recyclable substances. If necessary, the wastes may be run over a one step crushing and transferred via a conveyor system to the facility for recovery of recyclable material. Wastes that are delivered in large capacity containers are pretreated.

For dusty wastes, a third fully encapsulated two-shaft shredder is available. In the freefalling mixer, the pretreated wastes may be mixed with aggregates to produce a batch. A homogeneous mixture is prepared in a container and the abrasive forces in the mixing drum cause a quasi-dry cleaning of metal and plastic components in the waste. Then, the conditioned waste is conveyed towards the facility for the recovery of recyclable substances.

Cement solidification

On of the application of cement in waste management is for solidification/stabilization treatment of waste. This treatment of waste involves mixing cement into contaminated media or waste to immobilize contaminants within the treated material.

By mixing portland cement into a waste containing free liquids, the waste gains physical integrity or become more solid. The chemical properties of hydrating portland cement are used to lower the solubility of toxic contaminants in the waste and are some cases, to also lower the toxicity of hazardous constituents. Indeed, cement supplies a large amount of alkaline that stabilizes the heavy metals. On the other hand, it produces the reaction of cohesive, absorption, block, and fixation. Moreover, it is possible, under the condition of strong alkaline, converting heavy metals into hydroxide or carbonate compounds, through a series of physical-chemical processes, hence, retaining at solid. The cement achieves a final strength, after maturation for a certain period of time, through the formation of crystal silicate and hydrate. However, the method usually increases the pH and alkaline capacity of the mixture, therefore improving the leaching behavior of the product.

Cement solidification is used to treat industrial waste to make it safe for land disposal. It is also used to treat contaminated soil, sediment or sludge at clean-up (remediation) sites. At remediation projects, the treatment can be applied to a variety of contaminated media (ex. soil and sediment) with a variety of contaminants (ex. heavy metals, PCBs, and oil). In-situ treatment can have the added benefit of improving soil conditions for construction of structures and pavements.

Thermal treatments

Thermal treatment of FGT waste from combustion processes is used extensively in a few countries, mainly to reduce the volume and to improve their leaching properties. Most commonly, FGT wastes are treated thermally in combination with bottom ashes.

Regardless of the process, the thermal treatment of FGT waste in most cases results in a more homogeneous, denser product with improved leaching properties. The thermal treatment of FGT waste requires substantial off gas treatment, thus creating a new solid residue to be treated...

High temperature treatments use heat in order to melt waste and initiate vitrification and ceramisation processes. They can be grouped into three categories: vitrification, smelting and sintering. The differences between these processes chiefly relate to the characteristics and properties of the final material

Vitrification is a proven technique in the disposal and long-term storage of nuclear waste or other hazardous wastes. It is a process where wastes are mixed with glass precursor materials and then combined at high temperatures to form a single-phase amorphous molten glass that then solidifies immobilizing the waste. Typical vitrification temperatures are 1300 to 1500 ℃. The retention mechanisms are chemical bonding of inorganic species in the waste with glass-forming materials, such as silica, and encapsulation of the constituents by a layer of glassy material. The final waste form resembles obsidian and is a non-leaching, durable material that effectively traps the waste inside. The

waste can be stored for relatively long periods in this form without concern for air or groundwater contamination. Bulk vitrification uses electrodes to melt soil and wastes where they lay buried.

Melting is similar to vitrifying, but this process does not include the addition of glass materials and results in a multiple-phased product. Often several molten metal phases are generated. It is possible to separate specific metal phases from the melted output and recycle these metals, possibly after refinement. Temperatures are similar to those used in vitrifying.

Sintering involves heating the waste to a level where a bonding of the particles occurs and chemical phases in the wastes reconfigure. This leads to a denser output with less porosity and a higher strength than the original waste. Typical temperatures are around 900 ℃. Temperatures for sintering bottom ash from MSW incinerators can be up to 1200 ℃.

Incineration

Residues from flue-gas polishing depend on the adsorbent used (activated carbon, cokes, lime, sodium bicarbonate, zeolite). The residue of activated carbon from fixed bed reactors is sometimes permitted to be incinerated in the waste incineration plant itself, if certain process conditions are fulfilled. The residue of entrained bed systems can also be incinerated, if the applied adsorbent is activated carbon or oven cokes only. If a mixture of other reagents and activated carbon is used, the residue is generally sent for external treatment or disposal, since there might be risks of corrosion. If zeolite is used, there are in principle possibilities to recover the mercury, but these techniques are not yet available in practice.

Innovative Technologies

The commercial non-combustion technologies already described in Annex 3 can be positively used for fly ashes treatment and for the removal of the POP content. The main application can be found with plasma or similar high-temperature technologies, such as GPCR (Gas Phase Chemical Reduction) or BCD (base catalytic dechlorination/decomposition). Other application are found with Molten salt technology and

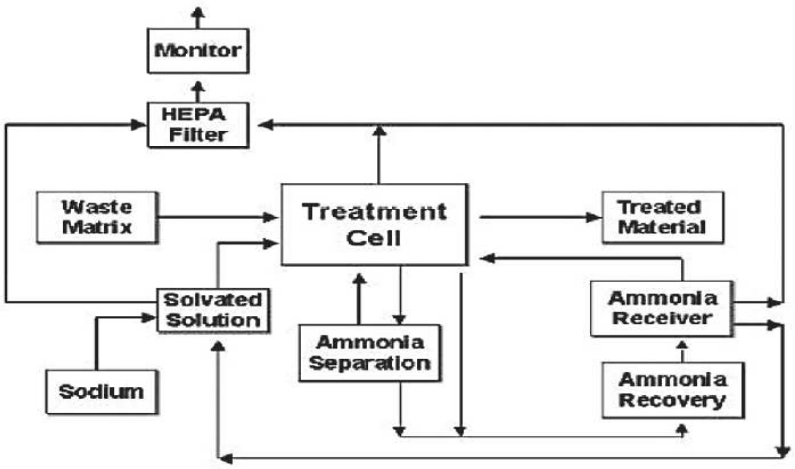
There are other promising technologies which can be used for solid waste treatment. They are as follows:

Solvated electron process

The SET process is a method of reducing halogenated hydrocarbons in a mixture of sodium or other alkali metal in liquid ammonia. Anhydrous sodium or potassium is added to liquid ammonia at nearly 100℃ that results in a blue colored solution, due to the solvated electrons. The solvated electrons are powerful reducing agents that can strip chlorine atoms, giving rise to the dechlorinated hydrocarbons and sodium chloride. The organic radicals and ions formed as result of electron and sodium attack can give rise to a variety of polymerization products. When treating concentrated solutions of chlorinated compounds, especially of polychlorinated ones, the polymerization processes might lead to a decrease of efficiency of dechlorination. Therefore, the method is only applicable to low concentrations of chlorinated organics. Full strength POPs, such as concentrated liquids or bulk solid organochlorines should be added in corresponding amounts to reach necessary concentration.

The technology is configured for treating soils, sludges, PCB oils, pesticides, and other organics. The reduction of halogenated materials from soils, oily wastes, sludge, and sediments requires almost complete removal of moisture through pre-drying, because liquid ammonia reacts quickly with water to form ammonium hydroxide, which is not only exothermic, but also inhibits production of solvated electrons. The sodium metal also has affinity for water to form sodium hydroxide. Moreover, water within debris and other inert materials prevents penetration of ammonia.

The SET technology was commercialized and patented by Commodore Solution Technologies, Inc., Marengo, Ohio.



Catalyzed Electrochemical oxidation

At low temperature and atmospheric pressure, electrochemically generated oxidants react with organo-chlorines to form carbon dioxide, water and inorganic ions with high destruction efficiencies. All emissions and residues can be captured for assay and re-processing.

An electrochemical cell is used to generate oxidizing species at the anode in an acid solution, typically nitric acid. These oxidizers and the acid then attack any organic compounds, converting most of them to carbon dioxide, water and inorganic ions at low temperature (<80 ℃) and atmospheric pressure. Compounds that have been destroyed by this process include aliphatic and aromatic hydrocarbons, phenols, organophosphorous and organosulphur compounds, and chlorinated aliphatic and aromatic compounds.

This techniques uses electrochemical cells for the generation of the active oxidant at the anode, a liquid phase reactor for primary organic destruction, a gas phase reactor to destroy any fugitive emissions from the liquid reactor and an acid gas scrubber for removal of acid gases prior to venting to the air. The processes operate at low temperature (90 – 95 ℃) and at atmosphere pressure.

Mediated electro-chemical oxidation

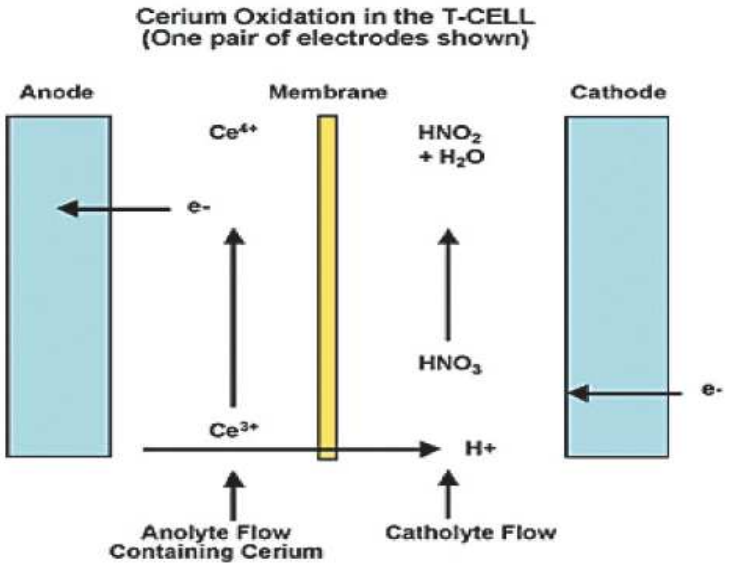
There are two main processes, not fully commercialized yet.

Mediated electro-chemical oxidation by cerium and mediated electro-chemical oxidation by silver

According to the principle of MEO, an electrochemical mediator is being brought to its higher oxidation state via electrochemical reaction, and is then being put in contact with an organic compound to be oxidized; the mediator, now in a lower oxidation state, is brought back to the electrochemical cell.
This techniques uses electrochemical cells for the generation of the active oxidant Ce4+ or Ag2+ at the anode, a liquid phase reactor for primary organic destruction, a gas phase reactor to destroy any fugitive emissions from the liquid reactor and an acid gas scrubber for removal of acid gases prior to venting to the air. The process operates at low temperature (90 – 95 ℃) and at atmosphere pressure

The Cerium technology can process only liquid or liquidized waste. Solids and sludges should be homogenized and pumped as slurries in water. No special pre-treatment equipment is provided other than sonicator mentioned above, the latter needed to further break up the particles of solids in the sludge or emulsify the organic liquids.

The applications of Silver II to POP are limited; however, the reported pilot/lab scale tests with several chlorinated organic substances (trichlorobenzene, chlorobenzene, chlorofluorobenzoic acid, methylene chloride, chloroform, chloroethylethyl sulphide) have been performed including several tests on the full scale plant. The results confirm the possibility of using the technology for destruction of polychlorinated POP waste, such as pesticides and PCBs, which is believed to become one of the future Silver II applications.



Recycling of Fly Ash, in construction materials

Fly ash is useful in many applications because it is a pozzolan, meaning it is a siliceous or alumino-siliceous material that, when in a finely divided form and in the presence of water, will combine with calcium hydroxide (from lime, Portland cement, or kiln dust) to form cementitious compounds.(4)

Portland Cement Concrete (PCC)

Fly ash has been successfully used as a mineral admixture in PCC for nearly 60 years. This is the largest single use of fly ash. It can also be used as a feed material for producing Portland cement and as a component of a Portland-pozzolan blended cement.

Fly ash must be in a dry form when used as a mineral admixture. Fly ash quality must be closely monitored when the material is used in PCC. Fineness, loss on ignition, and chemical content are the most important characteristics of fly ash affecting its use in concrete. Fly ash used in concrete must also have sufficient pozzolanic reactivity and must be of consistent quality.

Asphalt Concrete – Mineral Filler

Fly ash has been used as substitute mineral filler in asphalt paving mixtures for many years. Mineral filler in asphalt paving mixtures consists of particles that fill the voids in a paving mix and serve to improve the cohesion of the binder (asphalt cement) and the stability of the mixture. Most fly ash sources are capable of meeting the gradation (minus .075 mm) requirements and other pertinent physical (nonplastic) and chemical (organic content) requirements of mineral filler specifications.

Fly ash must be in a dry form for use as mineral filler. Fly ash that is collected dry and stored in silos requires no additional processing. It is possible that some sources of fly ash that have a high lime (CaO) content may also be useful as an antistripping agent in asphalt paving mixes.

Other innovative technologies:

Hitachi Zosen has developed a comprehensive exhaust gas / ash treatment system that removes toxic gas and dust efficiently. The equipment consists mainly of a gas cooler, a bag filter, a gas re-heater and a catalytic reduction reactor. Combustion gas from the incinerator is rapidly cooled by a water spraying process to a temperature suitable for exhaust gas treatment. As exhaust gas is rapidly cooled, the generation of PCDD/PCDFs is limited. This equipment is designed to prevent corrosion and dust obstruction by adopting a perfect evaporation cooling system. Cooled exhaust gas is introduced to the bag filter together with injected special agent and slaked lime. HCl and SOx react efficiently with the slaked lime. PCDD/PCDFs and dust absorbed by the special agent are also removed efficiently. Filter cloth material and filtering speed appropriate to the composition of exhaust gas are selected to provide high efficiency and compact filtering system.

Exhaust gas treated in the bag filter is sent to the catalytic reduction reactor with ammonia gas after it has been heated to a temperature suitable for the denitrification reaction using the gas re-heating device. The reactor, using a titanium catalyst, removes very small amounts of PCDD/PCDFs that were not removed by the bag filter. Activated carbon adsorption tower to eliminate PCDD/PCDFs more efficiently, an activated carbon adsorption tower is applied.

The residues (hereafter fly ash) generated in the above flue gas treatment system contain toxic and harmful substances such as PCDD/PCDFs and water-soluble heavy metal compounds. The following systems are designed and installed so that any problem does not occur after their final disposal:

PCDD/PCDFs thermal destruction equipment

Hitachi Zosen has developed a comprehensive exhaust gas / ash treatment system that removes toxic gas and dust efficiently.

2. Features

a. Exhaust gas treatment equipment

The equipment consists mainly of a gas cooler, a bag filter, a gas re-heater and a catalytic reduction reactor.

Gas cooler
Combustion gas from the incinerator is rapidly cooled by a water spraying process to a temperature suitable for exhaust gas treatment. As exhaust gas is rapidly cooled, the generation of dioxin is limited. This equipment is designed to prevent corrosion and dust obstruction by adopting a perfect evaporation cooling system.

Bag filter
Cooled exhaust gas is introduced to the bag filter together with injected special agent and slaked lime. HCl and SOx react efficiently with the slaked lime. Dioxin and dust absorbed by the special agent are also removed efficiently.
Filter cloth material and filtering speed appropriate to the composition of exhaust gas are selected to provide high efficiency and compact filtering system.

Catalytic reduction reactor
Exhaust gas treated in the bag filter is sent to the catalytic reduction reactor with ammonia gas after it has been heated to a temperature suitable for the denitrification reaction using the gas re-heating device. The reactor, using a titanium catalyst, removes very small amounts of dioxin that were not removed by the bag filter.

Activated carbon adsorption tower to eliminate dioxin more efficiently, an activated carbon adsorption tower is applied.

b. Ash processing equipment

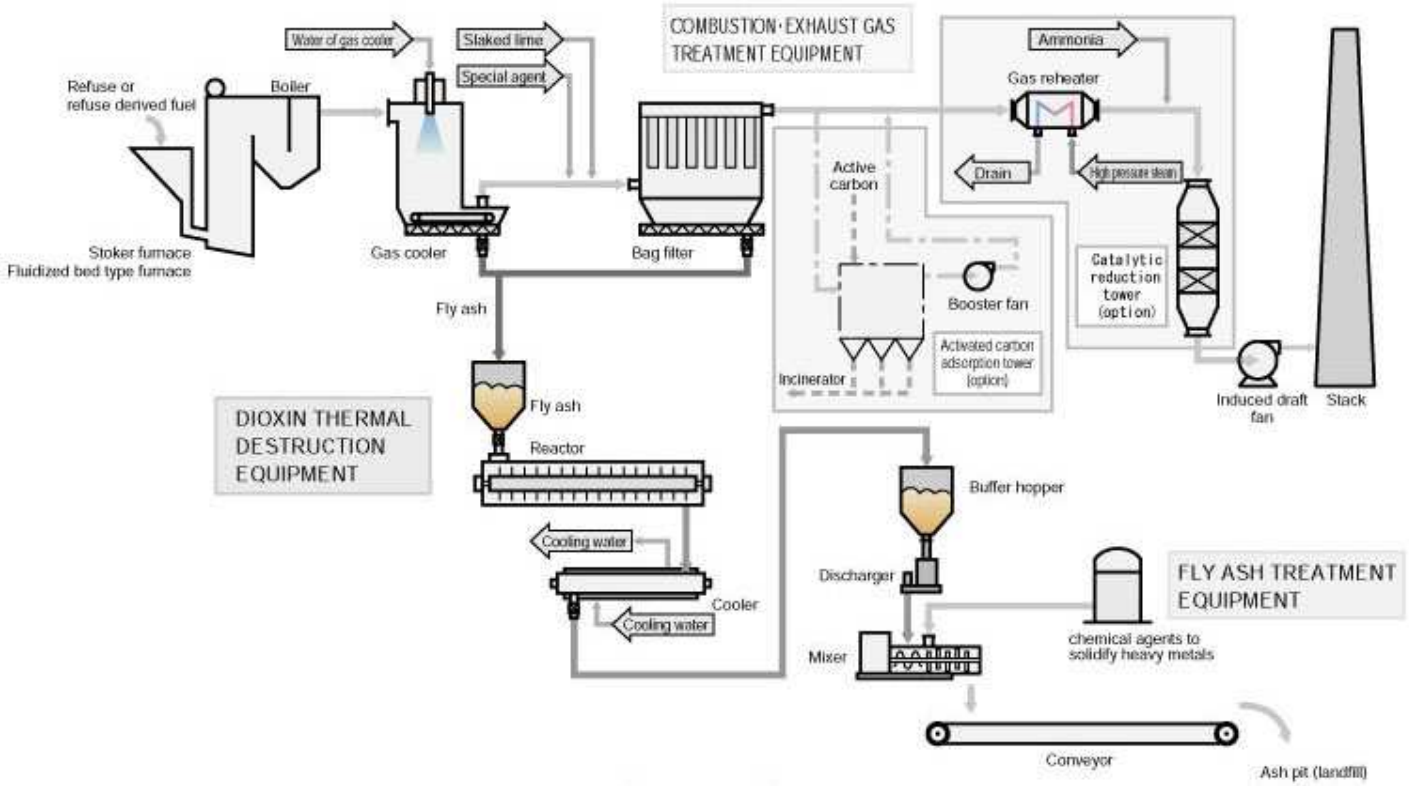
The residues (hereafter fly ash) generated in the above flue gas treatment system contain toxic and harmful substances such as dioxins and water-soluble heavy metal compounds. The following systems are designed and installed so that any problem does not occur after their final disposal:

Dioxins thermal decomposition

The fly ash is heated up to a temperature of 350-450ºC for 1hr in condition of very low oxygen concentration, and then cooled down to approx. 60ºC promptly. Dioxins' decomposition and elimination takes place in this thermal treatment. This system operates automatically without any full-time operator, is compacted and requires low operating cost.

Heavy metals stabilization

The fly ash is mixed and kneaded with moistening water and chemical agent in a twin-axle type of kneading machine which is specially designed for this use. Water soluble heavy metals react with the agent and alter into insoluble compounds.



System Flow

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Catalytic Decomposer of Dioxins in Flue Gas

1. Outline

We offer the catalytic decomposer of dioxins as reduction system of dioxins in flue gas. This system decomposes dioxins in flue gas by Titania-Vanadium catalyst. We carry out the engineering work including layout planning, design, procurement and construction.

2. Advantages

- The device is compact and suitable to install at existing incinerator. It requires short construction period.
- The catalyst has high dioxins decomposition performance at lower temperature range of 180-200ºC, therefore reheating is not required.
- The catalyst decomposes dioxins into harmless substances such as water, carbon dioxide and hydrogen chloride.
- No additional operation is required.
- Expected life of the catalyst is 3 to 10 years, and no maintenance is required in that period.
- Since the catalyst does not adsorb dioxins but decomposes them, no secondary treatment is required.

3. Performance

	Gas flow rate (m^3N/h)	Temp. (℃)	Dioxins conc. In inlet gas (ng-TEQ/m^3 N)	Dioxins conc. In outlet gas (ng-TEQ/m^3 N)	Conv. ratio (%)	Start up
A	1740	189	6.3	0.066	99	1999
B	5	200	0.6	0.04	94	1999
C	74000	225	0.3	0.03	90	1996

4. Application

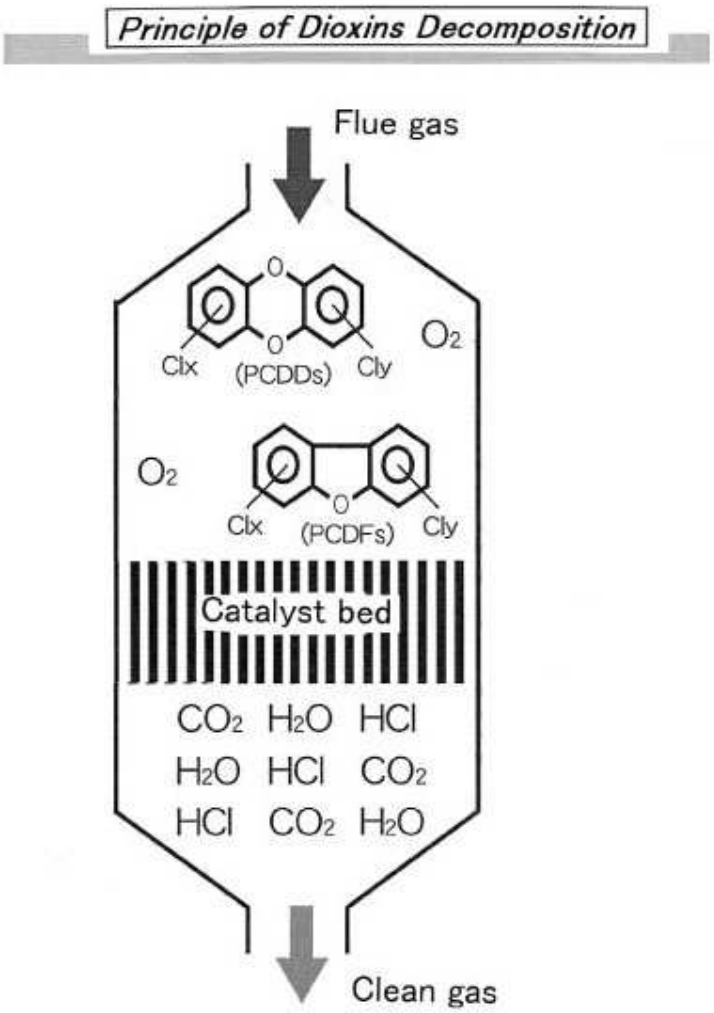
Decomposition/Removal of dioxins and NOx as below mentioned in flue gas exhausted from the following facilities.

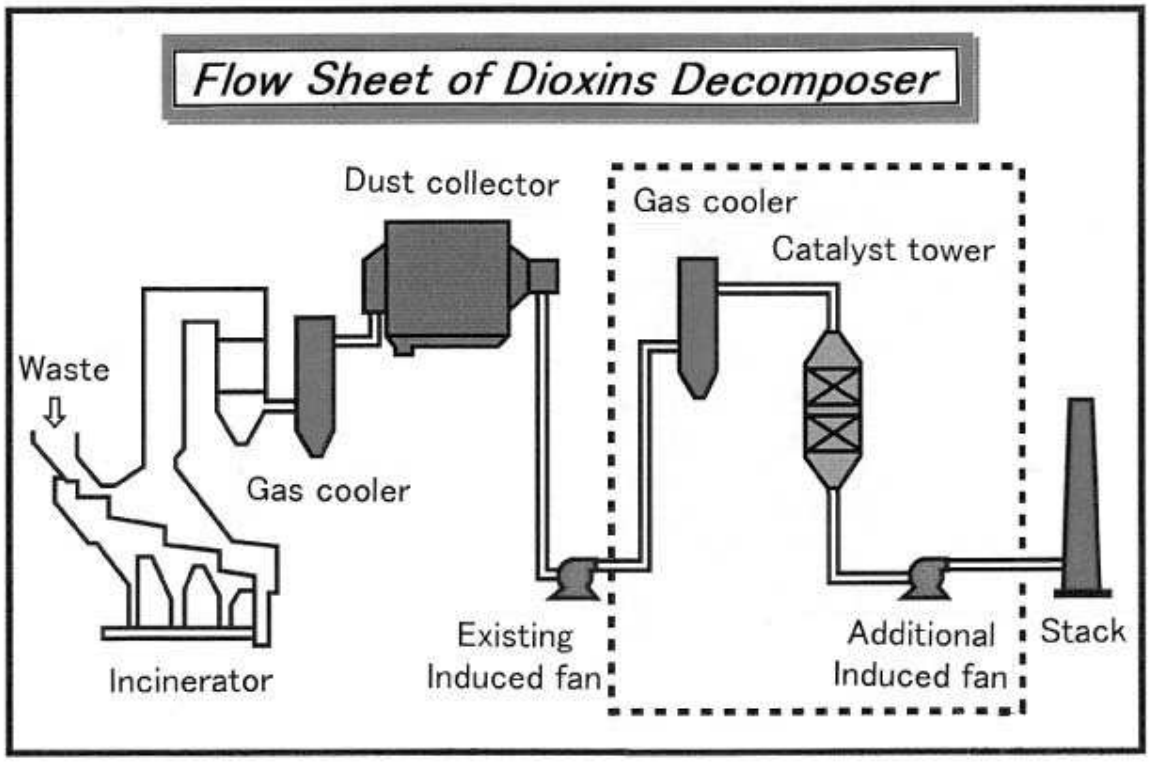
- MSW incinerator
- Industrial waste incinerator
- Production facilities in various fields
- Boiler
- Gas turbine
- Cremator

5. Others

The catalyst adapted to this device has been developed for de-NOx and then dioxins removal by a certain improvement, and has the following advantages.

- High conversion efficiency
- Applicable for dirty gas
- High resistance to Sox
- High resistance to alkali metals
- Long life
- De-NOx can be carried out simultaneously by injection of reductant agent such as ammonia.


Principle of Dioxins Decomposition
Flue gas
O
O
Clx
(PCDDs)
Cly
O2
O2
O
Clx
(PCDFs)
Cly
Catalyst bed
CO2 H2O HCl
H2O HCl CO2
HCl CO2 H2O
Clean gas



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FAX +81-47-422-8145

http://www.tecnofrontier.co.jp/

TSK Dioxin Destruction System

1. Outline

The TSK Dioxin Destruction System consists of a high active catalyst and a special type of reactor called a Lateral Flow Reactor, or LFR. The so-called Lateral Flow Reactor (LFR) is a system of gas channels and catalysis slabs (see attached figure 1). The flue gas enters the reactor through a gas channel that is open on only one side of the reactor. The gas then passes through a thin catalyst slab in a direction to enter a further gas channel that is only open on the opposite side of the reactor through which the gas leaves the system. The fact that the gas only passes through a thin catalysis layer is reason for the very low-pressure drop possible with this system.

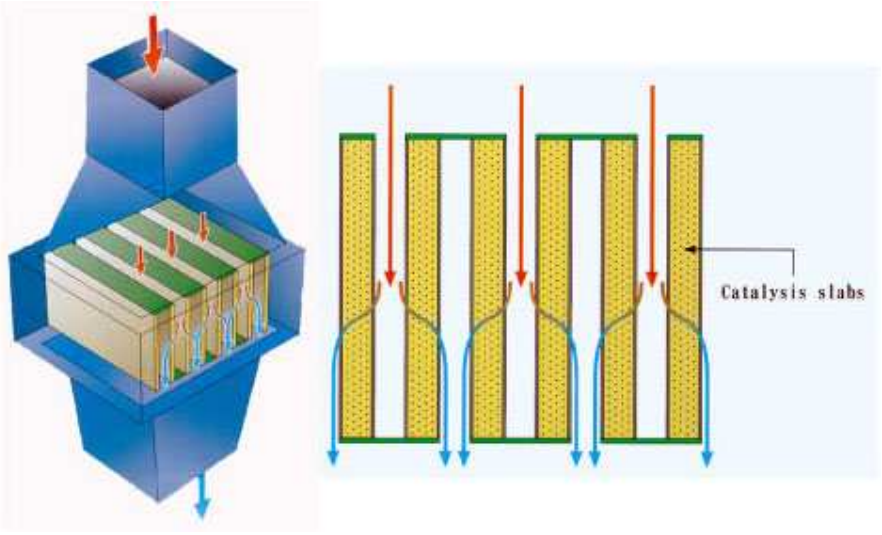

Figure 1

2. Features

The TSK catalyst system has the following features.

a. High destruction removal performance

TSK catalyst has the dioxin destruction efficiency of 99% or more. Even if the concentration of dioxin in the flue gas is so high, it is possible to meet the strict regulation value.

b. Wide range of available temperature

A high destruction rate is obtained within the range of the temperature of 160-380ºC. Therefore, extra facilities such as cooling, heating, etc. of exhaust gas need not be considered.

c. Long catalyst life

Generally, a high destruction rate can be maintained for three years or more. Therefore, the exchange frequency of the catalyst can be minimized.

d. Space-saving

Because TSK catalyst has a very wide internal surface area, space required for installation is smaller than other catalysts. In addition, there is no limitation in the direction of the gas flow.

3. Performance

a. Temperature dependency

Figure 2 shows the temperature dependency of TSK catalyst. The catalyst has the high dioxin destruction ability compared with the honeycomb type catalyst. In addition, the catalyst has high performance of 95% or more at the temperature of about 150ºC.

b. Space velocity

The space velocity does not significantly affect the destruction ability (99.5-97%) in the range of 3000-12000 [h^{-1}].

c. Pressure drop

TSK catalyst is granular type, and standard slabs thickness is 100mm, which has pressure drop of 0.5 kPa. When the allowable pressure drop is less than that volume, the slab thickness of 20-65mm can be designed. In this case, size of the reactor becomes slightly bigger and the volume of the catalyst does not change.

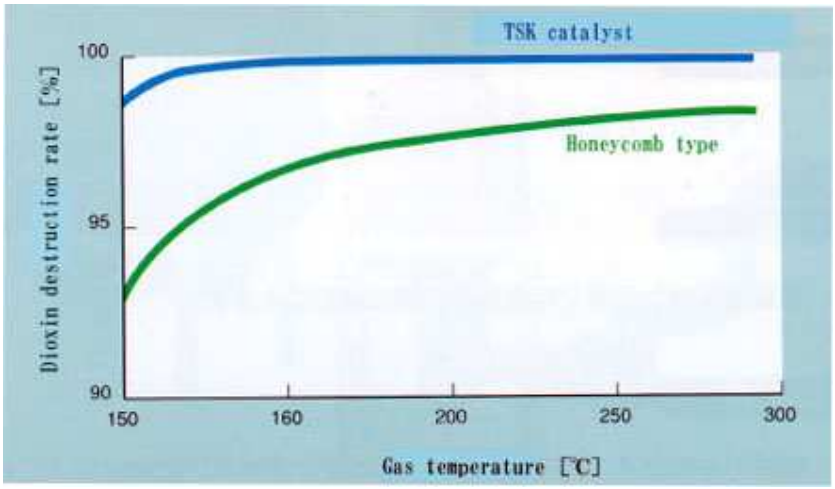

Figure 2

4. Application

This catalyst can be applied to the incineration plant for municipal wastes, industrial wastes as well as the gas from the chemical plant.

It has also an excellent De-NOx performance, so the simultaneous destruction of dioxin and NOx is possible.

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ANNEX 4: FEE-BASED WASTE MANAGEMENT SYSTEM

Current Situation

According to recent estimates over 10 million tons of hazardous wastes are annually produced in China. Strong economic development and the lack of strict enforcement of hazardous waste management regulations has resulted in continuous increase in the amount of wastes created. Only an estimated 24.2 percent of these wastes have been disposed of, and only one third is stored in environmentally sound storage facilities. Between 1996 and 2004, it is estimated that 26.34 million tons of hazardous wastes were disposed of in dumpsites.

As hazardous waste has toxic, reactive, flammable, corrosive and/or infectious properties, it poses a direct hazard to both human and environmental health. Of total hazardous wastes generated in China, 40 percent was produced by the chemical industry. The majority of hazardous waste consists of waste alkali, waste acid, inorganic fluoride waste, copper waste, and inorganic cyanide waste. In total, 44% of this hazardous waste was recycled, 27% was stored, 13.5% was treated and disposed of, and 15.4% was discharged into the environment untreated.

Legislative framework for hazardous wastes management

Since the 1990s, China has promulgated a series of solid waste management laws, regulations and standards. Since 2000, China passed and implemented new laws and policies that have specifically addressed the management of hazardous wastes. The legislative framework for hazardous waste management has 5 levels that among others include:

First Level: National People Congress/Central Government

Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal, ratified on 4 September, 1991

Law on Prevention and Control of Environmental Pollution Caused by Solid Waste, adopted on 30 October, 1995, amended on 12 December, 2004.

Second Level: State Council Regulations

- Regulation on Medical Waste Management, effective as of 16 June, 2003.
- Procedure for Applying for a Hazardous Waste Operating License, effective as of July 1, 2004.

Third Level: National Standards from Ministries

- Identification Standard on Hazardous Waste GB5085.1-3-1996
- Standard on the Pollution Control of Incineration of Hazardous Waste GB 18484-2001
- Standard on the Pollution Control in the Storage of Hazardous Waste GB 18597-2001
- Standard on the Pollution Control in Landfilling Hazardous Waste GB 18598-2001
- Rule on Tracking the Manifest of Hazardous Waste, effective as of 1 October, 1999
- National Catalogue of Hazardous Waste, promulgated by MEP, Ministry of Public Security, former Ministry of Foreign Economy and Trade, and former State Economic and Trade Committee, effective as of 1 July, 1998

Fourth Level: National Policy for Construction and Treatment Facilities

- Construction Plan on Hazardous Waste and Medical Waste Facilities, approved by State Council, issued by MEP, NDRC (National Development and Reform Commission) on 19 January, 2004
- Technical Requirement for the Construction of Facility Incinerating Hazardous Waste, issued by MEP in 2004, amended in 2005

Fifth Level Local Regulations: Provincial People's Congresses

- Shanghai's Regulation on Prevention and Control of Environmental Pollution Caused by Hazardous Waste, adopted in 1995 and amended in 2002.

Penalties for illegal disposal of hazardous wastes

In the Regulations Governing the Management of Urban Construction Waste came into force on 1 June 2005, heavy fines will be imposed on units and individuals that fail to dispose of construction waste according to relevant regulations.

Under the new regulations, waste generator units may be fined up to RMB 3,000 and individuals up to RMB 200 if they mix construction waste with household garbage or mix hazardous waste with construction waste. Units may be fined between RMB 5,000 and RMB 10,000 and individuals may be fined up to RMB 3,000 if they set up dumping grounds for construction waste without authorization. Construction waste treatment facilities that handle industrial waste, household garbage or toxic or hazardous waste may be fined between RMB 5,000 and RMB 10,000. Construction units that fail to dispose in a timely manner of construction waste produced in the course of construction, resulting in environmental pollution, may be fined RMB 5,000 to RMB 50,000. Construction units that ask individuals or unauthorized units to dispose of construction waste on their behalf may be fined between RMB 10,000 and RMB 100,000. Waste treatment facilities handling the disposal of construction waste may be fined between RMB 5,000 and RMB 50,000 for discarding or scattering construction waste in the course of transportation. Fines of between RMB 5,000 and RMB 20,000 may be imposed on acts of tampering with, illegal selling, renting out, lending or other forms of illegal transfer of urban construction waste disposal approval documents. Construction units may be fined RMB 10,000 to RMB 100,000, and project developers and construction waste transportation units may be fined RMB 5,000 to RMB 30,000 for unauthorized disposal of construction waste or disposal of construction waste over and above the approved limits. Units or individuals that dump, discard or stack construction waste randomly will be warned by the environmental and health departments and ordered to take remedial measures within a stated time. In addition, waste generator units may be fined RMB 5,000 to RMB 50,000 and individuals may be fined up to RMB 2,000.

Construction waste mentioned in the regulations refers to spoil, waste and other materials discarded by developers or construction units in new construction, reconstruction or expansion projects, or in the dismantling of buildings, structures or pipe networks, or by people decorating or refurbishing their homes.

Fee-based hazardous waste management

According to national regulations on hazardous and medical waste management, treatment facilities are permitted to charge hazardous waste generators for treatment of the wastes they generate. However, national regulations do not specify the basis for these fees, nor how they should be collected. As a result, different approaches have been adopted. For example, for hospitals generating hazardous medical waste, charges may be assessed:

- Flat fee based on number of hospital beds
- Charge based on actual hazardous and medical wastes treated, by weight

Ideally, fee-based systems can significantly improve the efficiency and effectiveness of hazardous and medical waste management system operation, as well as providing incentives to stakeholders to minimize waste. However, given the haste with which these systems have been implemented, little attention has been paid to maximizing efficiency and minimizing waste. In many cases, systems adopted may in fact reduce efficiency and provide no incentive for waste minimization. In addition to system design issues, fee systems may also be incompletely implemented and/or poorly managed, resulting in further inefficiencies, disincentives and negative financial impacts to stakeholders.

Flat fee system

As the flat fee system is mainly relevant to the medical waste management, it is not discussed in this project document. However, it may be relevant and can be considered when used as an enduser-based charge.

Weight-based system

For hazardous wastes of obsolete pesticides and particularly POPs pesticides, a weight-based fee system seems to be the most appropriate and feasible to adopt. In a simple situation the hazardous

waste treatment facilities transport and treat the pesticide wastes, and then charge the waste generators and/or owners based on the weight of the waste treated. The disposal process may, however, be more complex depending on the ownership of the waste, particularly if the entity that originally generated the waste could not be hold liable for its ownership. There could be several reasons for such a situation, e.g. the entity was shut down and does not exist any more but the wastes have remained on site. It should also be noted that the hazardous waste disposal facility and the transport service provider may belong to different entities that might particularly be the case in the private sector.

This approach has advantage and disadvantages. It gives an incentive to the waste generators to reduce the amount of wastes by reuse and recycling, but can result in illegal discharges at the manufacturing sites particularly if the penalty fees were lower than the disposal costs. A strictly weight-based approach has at least two further drawbacks:

- It does not consider physical waste volume, which is an more important determinant of total waste treatment cost, since waste transportation is often the largest cost factor and transport costs are based on physical volume rather than weight; and
- When waste volumes vary significantly, unit-based fees do not reflect total treatment costs, given that total treatment costs have both fixed and variable cost components. While the variable cost can easily be incorporated into a unit charge, allocation of fixed costs requires an estimate of total annual volume. If actual volume differs significantly from physical volume, unit costs will then vary significantly, and the unit charge will either over or under-state costs.

To address these drawbacks the weight-based approach should be refined and taken into account not only the actual quantity of the obsolete pesticides and/or pesticide wastes but also the specific medium or matrix in which the POPs pesticides are dissolved, absorbed or carried in addition to their contaminating pesticides concentrations.

Why the current fee-based system does not work

The regulations establishing the current hazardous waste disposal fee system are in the form of guidance documents, and are not mandatory. This lack of mandatory enforcement and the regulations' vagueness regarding approaches has inhibited development of consistent and optimal systems. Because of the lack of specific guidance and requirements, the decision on which fee approach to adopt is often made by the local price setting bureau based on factors not related to the ultimate efficiency and sustainability of the system.

An additional factor contributing to disfunctionality in the current approach is the difficulty of coordination among various local stakeholders in determining fee levels. Conflicting interests among the local EPB (waste disposal), the local Price Setting Bureau, the Department for Industry and Business, and other stakeholders make it difficult to arrive at an efficient outcome.

Global market prices

The global market prices may be used as a benchmark when introducing a fee-based system or amending an existing system for hazardous waste disposal in China. Without transport costs the current international market price for hazardous waste disposal falls in the range of US$ 500 to US$ 1,000.

Dedicated fund approach

One option for structuring China's hazardous waste management system is to draw on the experience of the United States' Superfund system. Under Superfund, industries that have been historically responsible for creation of hazardous waste (principally the chemical and petrochemical sectors) are assessed fees based not on their generation of hazardous waste, but on their overall physical output. Three excise taxes were established by the program: (1) a per barrel tax on refinery crude oil and imported petroleum products, (2) a per ton tax on designated chemicals; and (3) a per ton tax on imports containing or derived from those chemical feedstocks. The special income tax on corporations is an additional income tax on relatively large corporations based on their alternative minimum taxable income.[1]

[1] In addition to excise taxes, a special environmental tax of 0.12% of profits was assessed on large corporations, the proceeds of which went directly into the Superfund.

This approach has several potential benefits: (1) easier administration, since total output is easier to track and verify than hazardous waste generation; (2) creation of a wider fee base, which allows for a lower fee rate per unit of output and significant collection of funds (Superfund collects over $300 million/year); and (3) removal of the possible incentive to under-report (and hence illegally and dangerously dispose of) hazardous wastes, since fees are not directly based on generation of those wastes. While other aspects of the Superfund program have been criticized, this fee-based approach should be considered, since each of these benefits might prove advantageous in China as well. If desired, the approach could be modified to take into account differing average levels of hazardous waste generation in different sectors and sub-sectors (e.g., a sector with lower levels of hazardous waste generation could be assessed a lower rate). This approach could also easily be combined with alternate approaches for select sectors, e.g., a output-based fee system for the chemical industry, with a weight or volume based approach for medical waste generators. Given the potentially high ultimate cost of remediation of contaminated sites, a special transfer tax could also be levied on real estate transfers (e.g., 1-2% of total sales price), the proceeds of which would then be used to remediate contaminated sites nationwide. As a further revenue source, the Fund could assume ownership of highly contaminated land (potentially purchasing land use rights at a reduced cost to reflect clean-up costs), and could remediate and then redevelop that land, with sales proceeds flowing back into the Fund to finance remediation work.

It should be noted that the US Superfund program generally operates according to the “polluter pays” principal, whereby the program first seeks to require those responsible for a contaminated hazardous waste site to bear the financial and legal responsibility for site clean-up. However, where no responsible party can be identified or held legally responsible, clean-up funds are drawn from funds generated by the above fee based system (the “Superfund”). As a further program option, the China hazardous waste fee could be structured to pay for either (1) only those sites for which responsible parties were not identified (or did not have the necessary funds), as with Superfund, (2) to pay for clean-up of all targeted sites, or (3) to pay all costs without solvent responsible parties and a fixed portion of costs at other sites.

Project approach

In order to maximize efficiency, equity and sustainable funding, the project will undertake to train officials and POPs pesticide waste generators/owners in fee-based waste disposal systems and their benefits, and will work with them to promote approaches, as described above, that are both efficient, equitable, and provide strong incentives to minimize waste generation, reduce overall treatment costs, reduce PCDD/PCDFs intensity in the resulting waste generated, and develop and implement systems to efficiently and effectively administer the fee program.

[1] The current international market price for hazardous waste disposal falls in the range of US$ 500 to US$ 1,000 (not including transport)

ANNEX 5: IDENTIFICATION AND RESPONSIBILITIES OF STAKEHOLDERS

With regard to hazardous waste, the National Development and Reform Commission (NDRC), Ministry of Environmental Protection (MEP), the Ministry of Finance (MOF), and the Ministry of Housing and Urban-Rural Development (MOHURD) issued a Plan for Construction of Hazardous Waste and Medical Waste Treatment Facilities in late 2003. All government-financed hazardous waste treatment projects need to go through a technology review by the Chinese Academy for Environmental Planning which is affiliated with MEP.

National Development and Reform Commission (NDRC): As a department under the State Council for macro control of national economic operation, the NDRC is responsible for advancing the sustainable development strategy, carrying forward adjustments on strategic as well as upgrading of the industrial structure and providing guidance on national industrial development policies. It plays a significant role in the comprehensive planning of the construction of dedicated disposal facilities for hazardous wastes. Pursuant to the arrangement by the State Council, the NDRC and MEP jointly formulated the NHMWP, which is an important measure to implement the Regulations on Management of hazardous wastes and ensure the realization of the goal of safe disposal of hazardous wastes.

Ministry of Finance (MOF): The MOF assumes the responsibility for foreign negotiation and consultation with regard to loans from foreign governments, the World Bank, Asian Development Bank (ADB) and banks of developed countries and joint international financial organizations on behalf of the Chinese government; supervises the implementation of guidelines, policies, laws and regulations on finance and taxation; examines and reflect material problems in government revenue and expenditure management; and propose policy suggestions on strengthening the financial administration.

Ministry of Housing and Urban-Rural Development (MOHURD): In December 2002, MOHURD ruled that the administrative departments in charge of the municipal public sector should (i) further transform the system of governmental management from direct management to macro-management; and (ii) encourage other public and private funding and foreign capital to invest in the construction of municipal public facilities to form a diversified investment pattern and consequently promote the market-based operation of the municipal public sector. Consequently, in 2003 MOHURD took part of issuance of NHMWP.

Ministry of Science and Technology (MOST): The MOST is responsible for studying major issues on science and technology promoting economic and social development; studying and deciding on key arrangements and priorities for scientific and technological development; promoting construction of the national scientific and technological innovation system and improving national capacity for scientific and technological innovation. Some topics relating to hazardous wastes management have been listed into the national program for scientific and technological development. With the implementation of this project, the Ministry will be consulted to include new topics of needs in the national program for scientific and technological development.

General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ): The General AQSIQ is a department directly under the State Council in charge of national work on quality, metrology, entry-exit commodity inspection, certification and accreditation, standardization, etc. It can formulate standards and rules for accreditation to relevant agencies and for certification of hazardous wastes treatment equipment.

Ministry of Environmental Protection (MEP): The MEP is responsible for the regulation of environmental pollution from HW management and disposal. Its primary duties for hazardous wastes management are as follows:

- Organize drafting and formulation of rules and regulations related to safe disposal of hazardous wastes and review technical standards on safety of hazardous wastes;
- Organize supervision and assessment of the safety performance of hazardous waste disposal facilities, and issue or revoke operating licenses of hazardous waste disposal facilities;
- Undertake the responsibility to investigate and solve safety accidents on hazardous wastes;
- Guide and supervise the formulation and implementation of contingency plans for hazardous waste disposal facilities, in coordination with related departments;

- Organize departments concerned to carry out scientific research, publicity and education, and liaison of international organizations with regard to safety and management of hazardous waste; and
- Organize departments concerned to carry out assessment of hazardous waste disposal technology and related technical trainings in dedicated disposal facilities.

Local Environmental Protection Bureaus (EPB) at the county level and above: The local EPBs conduct unified supervision and management on the environmental pollution prevention and control in collection, transport, storage and disposal of hazardous wastes; and in the event of any environmental pollution accidents resulting from mismanagement of hazardous wastes, or in the event that there is evidence that such accidents are likely to occur, take provisional control measures, evacuate people, control the accident site, and order to stop operations leading to or likely to lead to such environmental pollution accidents.

Pricing Bureaus: Pricing Bureaus are assisted by environmental protection departments determine and promulgate levy standards for the treatment of hazardous wastes, and coordinate pesticides manufacturing and pesticide wastes owning enterprises in reaching the agreements for the collection and transfer of the levy for hazardous wastes treatment and disposal.

Other government functional departments: Land planning departments make the planning of land used for hazardous wastes disposal facility construction. Departments in charge of urban construction are responsible for the construction and management of municipal landfills, which receive treated hazardous wastes residues. Departments for industry and commerce examine and approve business licenses for hazardous wastes disposal units.

Technical support institutions: The technical support units under the direction or designation of MEP and the scientific research institutes in the academic community undertake technological development for hazardous waste management and disposal, introduce and assess advanced technology, carry out environmental impact assessment on facility construction, provide technical trainings, and make recommendations for improvement and revision of related policies, laws, regulations and standards. All government-financed hazardous waste treatment projects need to go through a technology review by the Chinese Academy for Environmental Planning which is affiliated with MEP.

Non-governmental organizations (NGOs): NGOs are established within the scope of national laws, policies and regulations in China. Typically dependent on a governmental department or focusing on a sector, a non-governmental organization specializes in information collection and dissemination, public and stakeholder awareness raising, and promoting the implementation of environmental sound management among enterprises. In general, all the aforementioned institutions have important and indispensable roles to play in realizing the ESM of hazardous wastes. In reality, their capacities for hazardous waste management are generally low and are at an early stage of development due to the very short time since China has formally started to regulate hazardous wastes management. There is also a great disparity of capacity among different institutions. Therefore, top priorities should be given to institutional strengthening.

ANNEX 6: TERMS OF REFERENCE FOR CONSULTANTS/EXPERTS

1. Post: Chief Technical Advisor

The objectives of this assignment are to:

i. Transfer international experience in the lifecycle management of obsolete POPs pesticides and other POPs pesticide waste (PPW) through NTA and other local experts to the managerial and technical staff of PPW owners and PPW disposal facilities. Provide technical advice for the reduction of PCDD/PCDFs emission from POPs pesticides disposal, including establishing training manual and program in technical matters as well as monitoring and evaluation;

ii. Assist CIO in overall technical support of other project activities, including institutional strengthening, policy development, , technology assessment and selection, monitoring and evaluation, and inspection for enforcement and compliance;

iii. Review TORs for individual experts and implementation of project activities;

iv. Monitor progress against milestones and indicators set for the project implementation, and formulate reports for workshops of Technical coordination.

v. Advise CIO on project monitoring, evaluation, including providing comments and finalizing the English version of semi-annual progress reports on the ongoing activities, and annual action plan;

vi. Troubleshoot technical and implementation issues that may emerge.

DURATION

9.5 working months over a period of five years, which includes regular missions to China. The number and duration of missions will be determined in the course of the project in accordance with the work plan. Additional time may be added to the contract if considered necessary by the CIO.

SCOPE OF WORK

The Chief Technical Advisor (CTA) will assist CIO, together with national experts, to oversee all technical components of the Project. The Grant Agreement, Project Appraisal Document, the Project Implementation Manual and the Annual Work Plan are the basic documents describing the project and guiding its implementation. Through continuous project monitoring, the CTA will assist CIO to provide corrective measures for problems that may arise. The CTA will work together with the National Technical Advisor and a number of other individual technical experts. The CTA will report directly to the Project Manager in the MEP CIO and UNIDO.

1. The CTA will provide overall technical assistance in the following aspects:

    a. Support to workshops and trainings: including participating in all important project workshops, introducing relevant international experience in the workshops, and reviewing and commenting all relevant deliverables of the workshops. This will include the following workshops:

        - inception workshops (national and regional inception workshops)
        - technologies and techniques evaluation workshop
        - policy and regulatory framework reform workshop
        - 4 annual project implementation review meetings
        - the technical consultation and institutional coordination workshops among project stakeholders
        - the project results publicity and dissemination workshop

    b. Support to ESM of obsolete POPs pesticide including:

- providing assistance in developing R&D competition
- reviewing and finalization of training manual and training programs
- participating in the training for researchers and trainers to transfer of technologies to domestic equipment manufacturers and PPW disposal facilities
- drafting technical specifications of equipment procurement
- guiding and supervising local experts of enterprises on specific issues concerning equipment installation, operation, and monitoring

c. Monitoring and Evaluation for the whole process of the project. At this level the CTA will

- review and finalize the TORs for selection of experts and implementation of project activities in order to guarantee TORs are prepared in compliance with the requirement of the project and the principles of Stockholm Convention.
- review and finalize all key project reports as follows:
  - review draft of the 2nd, 3rd, 4th, and 5th annual work plan of the project
  - review the quarterly progress reports on the ongoing activities
  - draft the substantive terms of references for technology acquisition
  - finalize the English version of all project reports and deliverables before dissemination to relevant stakeholders

d. Provide technical advice on establishment of MIS including:

- Assist in the selection of public information
- provide corrective measures for accidental issues that may arise and provide advice on miscellaneous project matters as requested by CIO

QUALIFICATIONS:

- Extensive practical experience with reduction of PCDD/PCDFs emission from PPW disposal implementation;
- Extensive knowledge of international situation of disposal technologies, especially the new cost-effective ones;
- Experience in a field directly related to POPs pesticides management and disposal;
- Experience with implementation of international projects; and
- Good communication and writing skills in English; preferably in Chinese

The following qualifications will be helpful:

- knowledge of the Stockholm Convention on POPs;
- experience of working in China.

2. Post: National Technical Advisor

OBJECTIVES

The objectives of this assignment are to:

- Assist CIO in overall technical support of other project activities, including institutional strengthening, policy development, technology assessment and selection, monitoring and evaluation, and inspection for enforcement and compliance;
- Transfer international experience in the lifecycle management of obsolete POPs pesticides and POPs pesticide waste from CTA and other local experts to the managerial and technical staff in PPW owners and PPW disposal facilities. Provide technical advice for the reduction of PCDD/PCDFs emission from PPW disposal, including establishing training manual and program in technical matters as well as monitoring and evaluation;

- Project monitoring and evaluation, including preparation of TORs for project activities and project reports, and providing solutions to project critical tasks of the project implementation;
- Monitor the progresses against milestones and indicators set for the project implementation, and formulate reports for workshops of technical coordination.
- Help CIO with the preparation of technical aspects of workshops.

DURATION:

19 working months over a period of five years including 9 months for the field visit to participating provinces. The number and duration of missions will be determined in the course of the project in accordance with the work plan.

SCOPE OF WORK

NTA will assist CIO, working in a team with the CTA and other individual technical experts, in charge of all technical components of the Project. The Grant Agreement, Project Appraisal Document, the Project Implementation Manual and the Annual Action Plan are the basic documents to be referred to. Through continuous project monitoring, the NTA will assist CIO to provide corrective measures for accidental issues that may arise. The NTA will be the leader of the National Experts Group for the project, and will collaborate with the CTA. The NTA will report directly to the CIO and UNIDO.

The NTA will provide overall technical assistance in the following aspects:

a) Support to workshops: including participating in all important project workshops, making presentations on project progress in the workshops, and preparing, reviewing and commenting all relevant deliverables of the workshops. The workshops are specified as:
   - inception workshops (national and regional inception workshops)
   - technologies and techniques evaluation workshop
   - policy and regulatory framework reform workshop
   - 4 annual project implementation review meetings
   - the technical consultation and institutional coordination workshops among project stakeholders
   - market promotion workshop
   - the project results publicity and dissemination workshop

b) Support to ESM of obsolete POPs pesticide including:
   - draft the questionnaires for participants before trainings on managerial, technical staff
   - review and commenting on training manual and training programs,
   - participation in the training for managers, researchers, trainers and operators to give a presentation on PPW disposal technologies
   - making presentations to national and local hazardous wastes management experts in the trainings
   - assistance in preparing Request for Proposal (RFP) of equipment procurement, including TOR, Letter of Invitation (LOI), draft contract
   - guiding the local experts and enterprise technical staff on specific issues concerning equipment installation, operation, and monitoring
   - prepare annual evaluation report on ESM of obsolete POPs pesticides and PCDD/PCDFs emission reduction implementation
   - provide technical advice for the development of R&D competition.

c) Monitoring and Evaluation of the project. At this level the NTA will prepare, review and finalize all reports include:

- Review the outputs related to ESM of obsolete POPs pesticides and reduction of PCDD/PCDFs emission from PPW disposal
- Review and give comments on 2nd, 3rd, 4th, and 5th annual work plans of the project
- Review and give comments on the semi-annual progress reports on the ongoing activities.
- Review the evaluation report on national and provincial policies and regulations submitted by subcontractor
- Provide technical support and guidance for technology transfer from the R&D communities to enterprises

d) Supervision of procurement, installation, and operation of demonstration facilities, the NTA will:

- assist CIO in the preparation of subcontracts' substantive terms of references
- assist CIO in the preparation of a monitoring plan

e) Provide technical advice on establishment of MIS including:

- draft parameters for ESM of obsolete POPs pesticides and PCDD/PCDFs emission reduction monitoring
- Transfer the international information from CTA on advanced technologies to the technical and managerial staff in the field

f) Besides above assistance, the NTA will also provide corrective measures for accidental issues that may arise.

QUALIFICATIONS OF THE CONSULTANT

The consultant will have:

- Extensive practical experience with reduction of PCDD/PCDFs emission from PPW disposal implementation;
- Extensive knowledge of international situation of disposal technologies, especially the new cost-effective ones;
- Excellent communication and writing skills in English and Chinese
- Experience with management and coordination of international cooperation projects
- Excellent interpersonal skills

The following qualifications will be helpful:

- Knowledge of the Stockholm Convention on POPs
- Experience of working on POPs related projects in China

3. Post: Project Expert Team (PET)

1. To ensure the successful implementation of project, an obsolete POPs pesticides and POPs pesticide waste project team within CIO/MEP will be established. The team will be in charge of the daily operations and implementation of the Project under the guidance of the CIO, implementing activities assigned to CIO, supervision and monitoring of all activities implemented under the project, provide technical advice and support, financial management for all aspects of the project and reporting within MEP and to UNIDO.
2. Initially, the team consists of one project team leader and two project officers of MEP. Additional officers may be added, such as from Ministry of Housing and Urban-Rural Developments. The project team will receive technical support from various experts (including CTA, NTA, and other consultants) as necessary. The existing CIO financial and procurement staff will provide financial and procurement management support to the project team.

Responsibilities

The project team's responsibilities are to:

- Prepare quarterly Financial Monitoring Reports (FMR) and review FMR submitted by Local PMOs;
- Manage project procurement and financial resources for activities managed by CIO with in accordance with the UNIDO's procedures and the agreed procurement plan;
- Organize and convene project coordination and review meetings among stakeholders;
- Review project outputs;
- Collect project and national data and information and input them into project MIS and prepare FMR to the UNIDO using MIS;
- Organize training, education, and information dissemination activities;
- Provide direction to local local PMOs;
- Incorporate project quarterly financial reports from its component, and provincial components and submit withdrawal application to MOF for replenishment;
- Recruit international and national consultants in CIO-managed components;
- Prepare Annual Work Plan and Procurement Plan for the activities managed by CIO and review the Annual Work Plan and Procurement Plan submitted by local PMOs; and
- Coordinate with stakeholders, including GEF, donors, the UNIDO, and relevant domestic ministries and agencies.

The key responsibility of the team leader and each of the existing three project officers are as follows.

Team Leader: report to the UNIDO

Key qualifications:

- sufficient project management skill and experience;
- capacity in team management;
- familiarity with the project;
- familiarity with UNIDO procedures;
- excellent written and spoken ability of both Chinese and English.

Responsibilities:

a. overall management of the project implementation to ensure the quality and timeliness of project implementation;
b. communication with the UNIDO and donors concerning project implementation;
c. communication within MEP, national agencies and local PMOs;
d. organization of staff resources to ensure coordination and harmony of the team;
e. monitoring the use of counterpart and GEF funds.

Project Officer 1: responsible for MIS, M&E, and NRP, report to the team leader, demonstration and adoption of BAT/BEP

Key qualifications:

- project management experience;
- good knowledge on environmental monitoring and PPW management in China;
- knowledge or experience of information management;
- knowledge on requirement of UNIDO and China on EIA;
- good written and spoken ability of both Chinese and English.

Responsibilities:

- communication with CTA and NTA, as well as review the outputs of CTA and NTA;
- organize the bidding processes to select and acquire services and goods;
- organize the trainings on managerial and technical staff;
- organize the bidding processes to set up the training system;
- organize the implementation of EIAs supported with the newly developed guidelines and specifications for BAT/BEP adoption in the lifecycle management of obsolete POPs pesticides and PPW;
- organize M & E according to GEF's guidelines;
- communication with UNIDO and local PMOs concerning above issues.

Project Officer 2: responsible for general activities, report to the team leader

Key qualifications:

- project management experience;
- experience in organization of workshops;
- comprehensive knowledge on procurement guideline of UNIDO;
- good written and spoken ability of both Chinese and English.

Responsibilities:

- routine communication and coordination with local PMOs;
- organize the workshops and training managed by CIO;
- organize procurement of the activities managed by CIO and monitor the procurement of the activities managed by local PMOs;
- responsible for the procedure on payment of contracts and assist Finance Division of FECO to draft the finance report of FMR;
- updated the information in POPs pesticides website and MIS;
- draft the FMR concerning activities managed by CIO and consolidate the FMR;
- update annual Work Plan related to the activities managed by CIO and consolidate the annual Work Plan submitted by local PMOs;
- update the procurement plan related to the activities managed by CIO and consolidate the procurement plan submitted by local PMOs;
- Routine communication with the UNIDO and local PMOs concerning above issues.

4. International expert on POPs pesticides policies and regulations

Duration: 5.6 working months over a period of 5 years

Main duties:

1.1 Review requirements of ESM for obsolete POPs pesticides and PPW management and arising from obligations of the Stockholm Convention and other related multilateral environmental agreements.

1.2 Review laws, regulations, policies, and strategies to promote ESM for disposal of POPs wastes, including but not limited to

- technical policy for construction and operation of disposal units to dispose POPs waste in a cost effective and environmental friendly way
- licensing requirement for management and disposal of POPs pesticides and other POPs contaminated wastes

- legal responsibility and financial mechanism for treatment of POPs waste by operating and non-operating enterprises
- price considerations for POPs waste disposal
- possible supplier takeback requirements.
- Administrative and regulatory requirements for POPs waste disposal and cost effective disposal options
- Licensing requirements for mobile facilities for hazardous waste, including POPs waste disposal

1.3 Analyze the implications and applicability of international best practices and experience to China taking into account the actual technological and economic status in China.

1.4 Provide preliminary findings and recommendations for China to control PCDD/PCDFs emission from PPW disposal consistent with the Stockholm Convention.

ANNEX 7: TERMS OF REFERENCE FOR SUBCONTRACTS

Subcontract 1 Technological and economic policies and regulations promoting environmentally sustainable management and disposal of POPs waste

1. General background information

In order to prevent POPs-contaminated wastes from polluting the environment, the Chinese government has promulgated Measures on Prevention and Control of Environmental Pollution Caused by Abandoned Hazardous Chemicals. China has also formulated and implemented a series of standards, including the Standard on Hazardous Wastes Identification, the Standard for Pollution Control on Hazardous Waste Storage, the Pollution Control Standard for Landfilling of Hazardous Wastes, and the Pollution Control Standard for Hazardous Wastes Incineration. The implementation of these Standards plays a very important role in promoting and regulating hazardous wastes management of the country.

Though China has established a basic regulatory framework for hazardous waste management and treatment, existing laws and regulations are too general and their implementation is not supported by detailed orders and technical guidelines. The project will address this issue through technical support, policy support, and capacity building for regulatory development. Regulatory development will also be coordinated in both content and timing with other project activities in order to provide a nurturing and sustainable policy environment.

Operating license for hazardous wastes

Issuing operating licenses for hazardous waste management is an important administrative tool for supervision of hazardous wastes disposal facilities. According to the Measures for the Administration of Operating Licenses for Hazardous Wastes promulgated on 1 July 2004, hazardous wastes disposal facilities must first demonstrate that its facility meets national and/or local environmental protection standards in order to obtain an operating license.

The Measures for the Administration of Operating licenses for Hazardous Wastes contain general provisions relating to the basic resource requirements for hazardous waste disposal facilities, but lack specifications for POPs pesticide wastes. In practice, due to application backlogs and lack of enforcement, many facilities are still operating without a license. There is no detailed guidance for processing POPs pesticides, transportation of waste across provincial boundaries, or use of mobile facilities. The project will address these deficiencies by supporting development of detailed implementation rules for licensing POPs pesticide wastes treatment and disposal facilities.

Hazardous waste consignment

The generation, collection, transports and disposal of PW forms a complex system involving multiple economic actors. Implementation of a consignment system for PW is an important means to organize this process so as to prevent loss of wastes and ensure that wastes are treated and disposed of safely and properly at each stage of the process. Aspects of China's current system comprise a barrier to reaching this goal.

According to the Measures for Manifest Management on Transfer of Hazardous Wastes, the present PW transfer manifest system requires a hazardous waste transfer manifest in quintuple copies, which is overly complicated for management of PW waste transfers. Some provinces modified shipment requirements and changed the manifest to three copies, which greatly reduced the system's effectiveness. The manifest system is not implemented in some regions increasing the possibility of unaccountable loss and unauthorized disposal of PW is increased with the consequent potential health and environmental pollution risk.

To bring the role of the PW transfer manifest system into full operation, the project will develop and introduce a dedicated PW transfer manifest should be formulated based on the present hazardous waste transfer manifest. This new PW transfer manifest system should clearly define responsibilities of waste generation units, transport units and disposal units in the management on transfer of waste

explicitly specify information required to be filled in, establish data reporting and archiving systems, and make use of advanced information technology tools.

Legal liability system

While the Environmental Protection Law stipulates the "polluter pays" principal, China does not currently have a well-developed system for establishing the legal and financial liability for environmental contamination and health impacts due to improperly disposed of pesticides and pesticide wastes. This lack of clear accountability reduces the deterrent impact of legal prohibitions, leading to a greater incidence of improperly managed wastes, and reduces national, provincial, and local government ability to finance waste management and clean-up operations, thereby compounding the problem and increasing health and environmental impacts. The lack of clear legal and financial liability is particularly pronounced for "orphaned" obsolete POPs pesticides, where the owner or other party responsible for the wastes either can not be determined or no longer exists.

2. Aim of the project

The objective of this subcontract is to formulate and issue technological and economic policies and regulations promoting environmentally sustainable management and disposal of POPs waste

3. Activities

- Develop and formulate technological and economic policies through inter-departmental coordination, public awareness raising, public hearings, and NGO outreach
- Provide training on new technological and economic policies for managerial staff from provincial EPBs
- Raise awareness of new technological and economic policies and enforcement mechanisms

4. Outputs

- Technical and economic policies to promote ESM for disposal of POPs wastes, including but not limited to:
  - technical policy for construction and operation of disposal units to dispose POPs waste in a cost effective and environmental friendly way
  - licensing requirement for management and disposal of POPs pesticides and other POPs contaminated wastes
  - legal responsibility and financial mechanism for treatment of POPs waste by operating and non-operating enterprises
  - price considerations for POPs waste disposal
  - possible supplier takeback requirements.
- New regulations to promote ESM, including but not limited to:
  - Administrative and regulatory requirements for POPs waste disposal and cost effective disposal options
  - Licensing requirements for mobile facilities for hazardous waste, including POPs waste disposal

5. Qualifications

The contractor must:

- Have experience in drafting policies and regulations,
- Be familiar with POPs wastes management and disposal;
- Have experience in working with stakeholders in the POPs wastes disposal sector.

6. Language requirement

All reports should be in Chinese and translated to English

7. Estimated budget US$ 166,400

Subcontract 2: Technical standards and guidelines for ESM of POPs waste

1. General background information

In order to prevent POPs-contaminated wastes from polluting the environment, the Chinese government has promulgated Measures on Prevention and Control of Environmental Pollution Caused by Abandoned Hazardous Chemicals. China has also formulated and implemented a series of standards, including the Standard on Hazardous Wastes Identification, the Standard for Pollution Control on Hazardous Waste Storage, the Pollution Control Standard for Landfilling of Hazardous Wastes, and the Pollution Control Standard for Hazardous Wastes Incineration. The implementation of these Standards plays a very important role in promoting and regulating hazardous wastes management of the country.

Though China has established a basic regulatory framework for hazardous waste management and treatment, existing laws and regulations are too general and their implementation is not supported by detailed orders and technical guidelines. The project will address this issue through technical support, policy support, and capacity building for regulatory development. Regulatory development will also be coordinated in both content and timing with other project activities in order to provide a nurturing and sustainable policy environment.

The Government of China has not yet established a system of standards for PW. Such a system is crucial to assure appropriate management and disposal of PW, and its absence constitutes a barrier to environmentally sustainable management. Current environmental legislation was developed prior to China's accession to the Stockholm Convention. This led to an inadequate consideration of the requirements of ESM for all aspects of POPs wastes.

2. Aim of the project

The project's overall objective is to implement ESM and disposal of accumulated POPs pesticide wastes and dioxin rich incinerator fly-ash in fulfillment of China's obligations under the Stockholm Convention. This objective will be achieved through a combination of strategies, including legislative and regulatory development, capacity building, public education, technology transfer, training, technical support, and introduction of new advanced environmental risk assessment tools.

3. Scope of the contracting services

The objective of this subcontract is to strengthen the legal and regulatory framework for environmentally sound management (ESM) and disposal of POPs waste

Activities

The contractor shall undertake the following activities:

- Analyze and assess current POPs waste management policies, laws, regulations and standards regarding to POPs wastes identification, labeling, package, handling, temporary storage, transportation and disposal
- Propose corresponding plan in regarding to the weakness existed in current legislation framework for POPs waste management and the requirement of Environmental sound management
- Investigate the technical and economical features of commercialized disposal technologies for POPs pesticide in home and abroad
- Develop and formulate guidelines, standards, and specifications
- Provide training on guidelines, standards and specifications for managerial staff from provincial EPBs
- Develop standard operation procedures for analysis and monitoring

Outputs

- ESM guidelines for POPs waste management in line with requirements of Stockholm and Basel conventions, covering: identification, handling, packaging, labeling, Collection, storage, and transportation technologies
- Technological and operating guidelines for the following POPs treatment technologies: including but not limited to: Incineration, Plasma Arc, Pyrolysis/gassifiers and chemical destruction technologies
- Risk assessment and emergency response guidelines for POPs waste disposal
- Technology certification standards for disposal of POPs wastes
- Audit manuals for the operation of disposal facilities formulated
- Supervision and Management Technological Specifications for cost effective options
- Monitoring specifications for POPs waste disposal and contaminated sites
- 500 specialized managerial and monitoring staff receiving training and training materials

4. Qualifications

- Must have experience in drafting standards and/or norms;
- Must be familiar with POPs wastes management and disposal;
- Experience in working with stakeholders in the PPW disposal sector is strongly preferred.

5. Language requirement

All reports should be in Chinese and translated to English

6. Estimated budget US$ 536,168

Subcontract 3: Institutional capacity enhanced for POPs waste management at local level

1. General background information

Currently, environment protection departments at various levels of government suffer from inadequate capacity for hazardous waste management. Especially, POPs pesticides management varies from official to official and region to region, giving rise to confusion on what constitutes proper waste management practice. It is therefore necessary to formulate guidelines for obsolete pesticides and associated waste supervision and management in order to regularize and strengthen management and supervisory activities.

The Chinese Government has moved fast to issue initial regulations and standards for pollution control at pesticide waste disposal facilities and capability exists to monitor emissions of general pollutants. However, gaps still exist in supervising and monitoring implementation of these regulations and standards, including:

- Lack of technical specifications and instruments for supervision and monitoring;
- Lack of capacity building and training for enforcement personnel;
- Lack of capacity to monitor POPs pollutants such as PCDD/PCDFs from incineration; and
- Insufficient environmental impact assessment (EIA).

2. Aim of the project

The project's overall objective is to implement ESM and disposal of accumulated POPs pesticide wastes and dioxin rich incinerator fly-ash in fulfillment of China's obligations under the Stockholm Convention. This objective will be achieved through a combination of strategies, including legislative

and regulatory development, capacity building, public education, technology transfer, training, technical support, and introduction of new advanced environmental risk assessment tools.

3. Scope of the contracting services

The objective of this subcontract is to enhance overall institutional capacity for POPs waste management at local level through

Activities

The contractor shall undertake the following activities:

- Enhance overall institutional capacity for program development
- Adapt and implement national policy and regulatory framework at local level
- Develop trial local-level responsibility system for obsolete POPs pesticide management and disposal
- Develop and test pricing mechanisms for POPs waste disposal
- Establish and implement reporting system to collect and analyze data on creation, transport, and treatment of POPs waste
- Establish inspection and prosecution system for the discarded POPs wastes and contaminated sites
- Promote widespread local participation through increasing local input of personnel and financial resources
- Incorporate ESM principles, norms and requirements into current EIA guidelines
- Prepare ESM inspection manuals, including:

Outputs

- Trial responsibility assignment system for obsolete POPs pesticide management and disposal
- Pricing program for POPs waste disposal demonstrated
- POPs waste disposal data reporting system established
- Prosecution and inspection system for the discarded POPs waste and contaminated site established
- Increasing local input of personnel, finance and resources
- EIA guidelines adopted
- ESM inspection manuals developed

Qualifications

- engineering monitoring and supervision
- engineering cost auditing
- pricing setting and the related negotiation and organization for projects of public services
- Must be familiar with POPs wastes management and disposal;
- Experience of working with stakeholders in the sector of PPW disposal is strongly preferred.

4. Language requirement

All reports should be in Chinese and translated to English

5. Estimated budget US$ 87,200

Subcontract 4: Public awareness raising

1. General background information

ESM of obsolete pesticides in China involves the following three groups:

i) Governmental personnel from multiple agencies, whose role is to carry out effective regulation and management of waste treatment and disposal through regulatory, administrative, economic and other instruments;

ii) Professional bodies and individuals including scientific and technological research personnel for obsolete pesticides treatment and disposal, waste disposal equipment manufacturers, and disposal facility operators;

iii) Endusers, including small scale agricultural endusers who often resort to open burning or other improper methods to dispose of unused POPs pesticides; and

iv) Members of the general public who, if properly educated, are in a position to reduce contamination risk and exercise public supervision over treatment and disposal facilities.

While members of these groups play a crucial role in ESM, their awareness and knowledge in are currently inadequate. For example, due to lack of knowledge about the secondary pollution from uncontrolled incineration of obsolete pesticides and the availability of alternative technologies, many government officials wrongly believe that incineration is the only way to treat obsolete pesticides. They actively promote incineration technologies and neglect the research, development, and application of alternatives. As a result, inappropriate incineration disposal has generated considerable amounts of toxic and hazardous substances such as PCDD/PCDFs.

Public information materials for those without a professional or scientific background are few and inadequate. Little has been invested in public information and educational campaigns through radio, TV, and other effective ways to reach the general public.

2. Aim of the project

The objective is to raise the public awareness and mobilize the public participation in the ESM of POPs wastes.

3. Activities

- Develop TV and other mass media programs to disseminate knowledge of POPs
- Publish articles or reports for public education in national and local newspapers.
- Develop and produce brochures to raise awareness regarding health and safety protection from POPs pesticide wastes and dioxin rich fly ash
- Hold public hearings regarding POPs waste stockpile reporting, emergency response, and health and safety protection
- Hotline established for POPs related health and safety issues Outputs

4. Outputs

- 2 TV and/or other mass media programs to disseminate the knowledge of POPs
- 60 articles in national and/or local newspapers
- 10,000 brochures prepared to raise awareness of POPs waste related health and safety protection issues
- 4 hearings held
- At least 200 attendees at hearings
- Number of hotline calls/reports
- 3-5 hot line staffers

5. Qualifications

- Experience in reproducing project results into easy-to-understand formats for dissemination among the public
- Experience and resources to mobilize volunteers to impart knowledge about environmental issues

6. Language requirement

All reports should be in Chinese and translated to English

7. Estimated budget US$ 31,200

Subcontract 5: Safe and effective collection, packaging, and transportation of POPs pesticide wastes for disposal

1. Scope of the contracting services

   The objective of this subcontract is to collect the obsolete POPs pesticides from all the hot hits and transport the wastes to the corresponding hazardous waste disposal centers (HWDCs) for safe storage. A special purpose company will be hired under the PPP mechanism to provide the services required in this TOR

Activities

The contractor of the subcontract shall undertake the following activities:

- Identify location, type, status of POPs pesticide wastes and associated waste matrices at targeted hot spots

Develop operating manual for collection, packaging, and transportation of the POPs pesticide waste

- Prepare detailed terms of reference and contracts for the provincial HWDCs according to expertise in the fields of waste management and occupational health and safety.
- Provide training to staff from the provincial HWDCs concerning the collection, packaging, and transportation of the POPs pesticide wastes
- Collect, package, and transport POPs pesticide waste from hot spots
- Store POPs pesticide waste safely to prevent release of POPs contaminants to the environment

Outputs:

- Localization of POPs pesticide wastes and associated waste matrices at targeted hot spots
- Operation manual for the collection, packaging, and transportation of the POPs pesticides and associated waste matrices, including emergency response plan for obsolete POPs pesticide wastes
- Terms of reference and contract templates for the provincial HWDCs
- Number of trained staff from the provincial HWDCs
- Safe collection, packaging, and transportation of identified obsolete POPs pesticides
- 10000 tons of pesticide wastes and associated waste matrices safely stored in designated storage facilities.
- inventory of pesticide wastes at storage sites created and maintained

Qualifications

The contractor of the subcontract:

- Must be familiar with the related international and national regulations and requirements for hazardous waste collection, packaging, and transportation;

- Must have proven experiences on safe collection, packaging, and transportation of toxic and hazardous wastes;
- Must own enough waste treatment facilities and abilities for the safe collection and storage of 10,000 tons obsolete POPs pesticide in the required timeline;
- Experience of working with stakeholders in the sector of pesticide production and hazardous waste management is strongly preferred.
- Must have proven experiences to work effectively with provincial hazardous waste disposal centers and strong abilities to coordinate the project partners.

2. Language requirement

All reports should be in Chinese and translated to English

3. Estimated budget US$ 947,800

Subcontract 6: Evaluation of technologies for POPs waste disposal

1. Scope of the contracting services

   The objective of this subcontract is to evaluate the existing POPs waste disposal technologies and study the technical, social and economic feasibilities to apply the suggested technology and facility for the disposal of 10,000 tons obsolete POPs pesticides in the required time schedule.

Activities

The contractor of the subcontract shall undertake the following activities:

- Review the international and domestic current situation for POPs and hazardous waste disposal, including the incineration, thermal destruction, plasma arc, oxidation, reduction, catalysis and bio-degradation remediation;
- Detailed feasibility study for final disposal units based on the waste type, destruction efficiency, emissions, residues, energy/material requirements, portability, state of commercialization, and site selection;
- Preparation of detailed request for Proposal from vendors

Outputs

- Feasibility study report of POPs destruction technologies and site selection
- Specifications of the stationary and mobile final disposal unit
- List of potential vendors for technology and equipment
- Request for Proposal (RFP)

Qualifications

Familiar with the current situation of incineration and non-combustion technologies for hazardous waste disposal

Knowledge of the requirement of BAT/BEP under Stockholm Convention

Knowledge of ESM under Basel Convention

2. Language requirement

All reports should be in Chinese and translated to English

3. Estimated budget US$ 30,000

Subcontract 7: Construction, certification, operation, and supervision of stationary and mobile treatment facilities

1. Scope of the contracting services

The objective of this subcontract is to install the stationary and mobile disposal facilities, transport the 10,000 tons of obsolete POPs pesticides from hazardous waste disposal centers (HWDCs) to the corresponding disposal facilities and destruct the wastes in an environmentally friendly manner. A special purpose company will be hired under the PPP mechanism to provide the services required in this TOR.

2. **Activities**

The contractor shall undertake the following activities:

- Environmental Impact Assessment (EIA) for one stationary and one mobile unit
- Invite bids from potential vendors to transport POPs wastes and operate disposal facilities
- Prepare disposal sites for deployment of selected technology, including construction of storage facility and commissioning of equipment
- Installation of the stationary unit at the selected site and mobile unit at selected base stations, the installed facilities should achieve at least the following requirements for applicability, performance and cost-effectiveness:

  a) Applicability

  - suitable for the treatment of POPs stockpile and highly contaminated soil and substances;
  - suitable for the destruction of organic pollutants and stabilization the heavy metals of the dioxin-rich fly ash; and
  - suitable for the safe disposal of contaminated CFCs.

  b) Destruction efficiency

  - Avoid POPs disposal methods which are non-destructive (e.g landfilling, recycling, deep - well injection, etc.).
  - In general, destruction efficiency (DE) higher than 99.99% is thought to be the lowest requirement for POPs waste treatment. According to the Pollution prevention standard of hazardous waste incineration, the DRE should be higher than 99.9999%.

  c) By products

  - Prevent the release of dioxins/furans and other by-product POPs.
  - Not generate any wastes with POPs characteristics.

  d) Completeness and safety

  - Suitable pre- and post- treatment process and facilities
  - Good portability and can be configured as fixed or transportable
  - Good safety for the whole operating process

  e) Cost effectiveness

  - less than USD5300/ton for high strength POPs wastes,
  - less than USD 1000/ton for medium and low concentration POPs wastes.

  f) Monitoring requirements for the disposal facility

  - flue gas: O2, degree of blackness, soot, PM10, CO, CO2, HF, HCl, NO2 at least once a month; heavy metals contents at least once a quarter; dioxin at least twice a year
  - wastewater: pH, CODcr, SS, NH3-N at least once a quarter; POPs pesticides at least once a quarter; heavy metals twice a quarter

- slag and residual: POPs pesticides and LOI twice a month
- noise: sound level(Leq) once a month (24h/d)

g) Monitoring requirements for the disposal plant

- air quality: PM10, NO2, CO, SO2 twice a year (7 days each time)
- soil quality: POPs pesticides twice a year
- surface water: CODcr, SS, NH3-N, PCBs once a year (3 days each time)
- noise: sound level(Leq) once a quarter (24h/d)

- Transportation of POPs waste to the POPs treatment locations in an environmentally sound manner
- Final disposal of POPs pesticide wastes in an environmentally sound way
- Monitoring during facility construction and operation
- Establishment of equipment ownership arrangements

3. Outputs

- Assessment of the environmental impact of the construction of stationary unit for POPs treatment
- Assessment of the environmental impact of installation and operation of mobile unit with four base stations
- Qualified vendors identified and contracted to transport POPs wastes and operate disposal facilities
- Site preparation for disposal facilities
- Storage facility construction and commissioning
- Stationary unit installed at selected site
- Mobile unit commissioned at four base stations.
- 10,000 tons of pesticide wastes safely transported to designated stationary unit or mobile base stations
- 10,000 tons of pesticide wastes disposed of in an environmentally sound manner
- Equipment purchase, infrastructure construction, facility installation, and operation
- Terms of Reference for post-project equipment ownership and operation
- Transfer of equipment title

4. Qualifications

The contractor must:

- Be familiar with the related international and national regulations and requirements for hazardous waste transportation and final disposal;
- Have proven experiences on safe transportation an final disposal of toxic and hazardous wastes;
- Own enough waste treatment facilities and abilities for the safe disposal of 10,000 tons obsolete POPs pesticide in the required timeline;
- Have experience in working with stakeholders in the hazardous waste management sectors, strongly preferred.
- Have proven experiences to work effectively with provincial hazardous waste disposal centers and strong abilities to coordinate the project partners.

5. Language requirement

All reports should be in Chinese and translated to English

6. Estimated budget US$ 3,432,800

Subcontract 8: Demonstration non-landfill technologies for safe disposal of Dioxin rich fly ash

1. Scope of the contracting services

The objective of this subcontract is to implement a pilot demonstration for safe disposal 1000 tons of dioxin rich fly ash by non-landfill options in the target province

2. Activities

The contractor shall undertake the following activities:

- Target province selected for non-landfill pilot disposal of dioxin rich fly ash
- Development of operating manual for non-landfill disposal of dioxin rich fly ash
- Staff training for safe disposal of dioxin rich fly ash in the selected province
- Implementation of pilot for safe disposal of dioxin rich fly ash by non-landfill options

3. Outputs

- Report on target province selection
- Operating manual
- Number of staff trained in selected province
- Training materials developed
- Capacity created for disposal of at least 300 tons per year of dioxin rich fly ash safely by non-landfill technology

4. Qualifications

The contractor:

- Must be familiar with the related international and national regulations and requirements for hazardous waste disposal;
- Must have proven experiences on safe final disposal of hazardous wastes;
- Must own enough waste treatment facilities and abilities for the safe disposal of 1,000 tons dioxin-rich fly ash in the required timeline;
- Experience of working with stakeholders in the hazardous waste management sectors in the target province is strongly preferred.

5. Language requirement

All reports should be in Chinese and translated to English

6. Estimated budget US$ 229,400

Subcontract 9: Prioritized inventories of contaminated sites

1. General background information

China has urgent need of an on the ground program for managing stockpiles of obsolete POPs pesticides and associated contaminated wastes in an environment sound way. China's large agricultural industry and heavy dependence on agro-chemicals resulted in about 574,000 tons of POPs pesticides production through the end of 2004. Although POPs pesticides production has been prohibited by domestic regulations, lack of a targeted national program providing capacity building and technical assistance to manage these chemicals has resulted in significant stockpiling of obsolete POPs pesticides.

Based on the research and surveys conducted in conjunction with preparation of this project, obsolete POPs pesticide and associated wastes have been identified in 44 POPs pesticide manufacturing plants and a number of distribution and end user sites. In the past, plant owners and end users have been responsible for managing their own POPs pesticides, which have resulted in stockpiles of obsolete pesticides and associated wastes, the distribution and scope of which has been unknown to central and local environmental protection agencies.

With the clean-up and removal of these POPs wastes, the contaminated sites should be inventoried with risks to human health and the environment ranked to determine the priority for future remediation.

2. Aim of the project

The objective is to establish a prioritized inventory of contaminated sites associated with obsolete POPs pesticides

3. Activities

- Review existing national and international best practice guidelines for human health and ecological risk assessment
- Develop a project-fit methodology, including QA/QC procedures for quantitative environmental risk assessment (QERA)
- Train staff in provincial solid waste management centers
- Carry out on-site surveys following removal activities, focusing on identification of exposure scenarios
- Qualitatively predict POPs concentrations in identified exposure scenario and characterize risks by comparing target POPs risk factors
- Analyze information needs for quantitative environmental risk assessment

4. Outputs

- Report of international experience and applicability to QERA of POPs contaminated sites in China
- Copy of project-fit methodology for QERA
- Training agenda, course materials, trainer list, trainee list, list of qualification certificates
- Filled out questionnaires
- Report of qualitative description of exposures to POPs via environmental medias
- Prioritized site inventory
- Report of information needs for quantitative environmental risk assessment system

5. Qualifications

- Necessary equipment for personal safety protection
- Able to organize a team with multidisciplinary background in environmental risk assessment

6. Language requirement

All reports should be in Chinese and translated to English

7. Estimated budget US$ 57,000

Subcontract 10: Establishment and maintenance of an Internet-based information processing, display and dissemination system

1. General background information

China has urgent need of an on the ground program for managing stockpiles of obsolete POPs pesticides and associated contaminated wastes in an environment sound way. China's large agricultural industry and heavy dependence on agro-chemicals resulted in about 574,000 tons of POPs pesticides production through the end of 2004. Although POPs pesticides production has been prohibited by domestic regulations, lack of a targeted national program providing capacity building and technical assistance to manage these chemicals has resulted in significant stockpiling of obsolete POPs pesticides.

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With the clean-up and removal of these POPs wastes, the contaminated sites should be inventoried with risks to human health and the environment ranked to determine the priority for future remediation. All the data and information from the above processes should be input into an information system which can be accessed by various stakeholders to facilitate the future remediation actions.

2. Aim of the project

The objective is to establish and maintain an Internet-based information processing, display and dissemination system based on data from environmental risk assessment

3. Activities

- Design Internet-based system to process and display QERA results and facilitate modeling of environmental risks and remediation decision-making
- Purchase, install, and test system, maximizing use of existing hardware, software, and topographic data from the current POPs MIS
- Input data and operate, maintain and update system
- Conduct internet-based training and software dissemination

4. Outputs

- Design report
- Specifications and TORs for system installation and testing
- System test report
- TOR for system operation and maintenance
- System specifications and user instructions
- Web pages

5. Qualifications

- Be able to organize a team with expertise in cartography, GIS, and hardware and software configuration.
- Having experience in establishing and maintaining environmental information systems.
- Having necessary hardware and software for system test.

6. Language requirement

All reports should be in Chinese and translated to English

7. Estimated budget US$ 35,400

Subcontract 11: Establish a project management information system (MIS), including a project website to disseminate information to stakeholders

1. General background information

A Project Management Information System will be established to support the Project Manager and the project management team to ensure that all the project activities be completed on time, in quality and within budget. The MIS will keep baseline records of Annual Work Plans and contracts with consultants and subcontracts with performance indicators, result reports, responsibilities and budgets, and compare them with the progresses of the activities. A project website will be established to disseminate project information to the primary stakeholders and the general public.

2. Aim of the project

The project's overall objective is to implement ESM and disposal of accumulated POPs pesticide wastes and dioxin rich incinerator fly-ash in fulfillment of China's obligations under the Stockholm Convention. This objective will be achieved through a combination of strategies, including legislative and regulatory development, capacity building, public education, technology transfer, training, technical support, and introduction of new advanced environmental risk assessment tools.

3. Activities

The contract or shall undertake the following activities:

- Review preliminary MIS requirements arising from obligations of the Stockholm Convention and from available guidance relevant to multilateral environmental agreements;
- Review likely sources of data in China and prepare a detailed plan for transmission to FECO/MEP,
- Agree technical requirements for MIS with national counterpart and subcontractors
- define user requirements, identify software options and develop hardware specifications compatible with existing IT infrastructure;
- Present, with national counterparts, draft findings and recommendations to MEP and relevant stakeholders
- Procure hard- and software and establish information management systems within existing national IT architectures;
- Install and operate the MIS and build capacity to operate the information management system;
- gather, compile, manipulate, and disseminate potentially sensitive public information; and
- design and develop a user-friendly website providing products from or access to some or all of the data and information in the management system.

4. Outputs

- MIS development documentations and reports generated by properly retrieving data and information from the MIS
- Project website development and maintenance documentation
- Report of short English briefing for the development and operation of the MIS

5. Qualifications

- Familiar with the data and Management information system and reporting requirements of the Stockholm Convention,
- Familiar with the related guidance from multilateral environmental agreements,
- Familiar with the project management requirements of international agencies,
- Previous experiences in project development and implementation are assets.

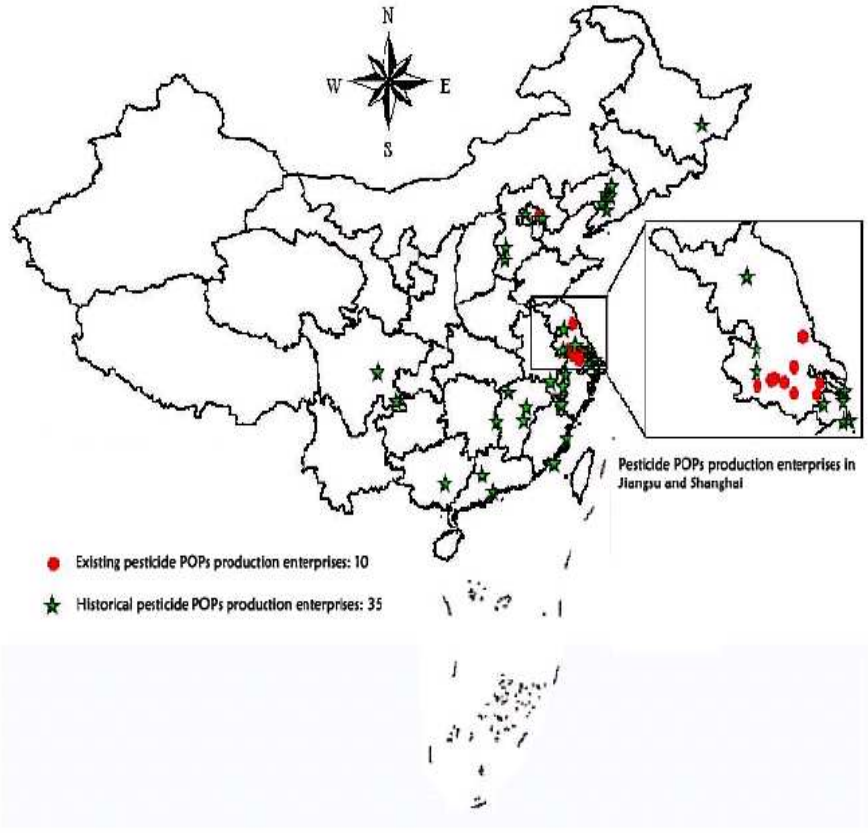
6. Language requirement
All reports should be in Chinese with short briefing translated to English

Estimated budget US$ 58,000

ANNEX 8: BASELINE ANALYSIS FOR POPS PESTICIDES AND FLY ASH

a) Obsolete POPs Pesticide and associated wastes

POPs pesticides in Stockholm Convention Annex A include: aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex and toxaphene. China used to produce toxaphene, hexachlorobenzene, chlordane, heptachlor and mirex. There are 58 enterprises in China that produced the POPs pesticides mentioned in Annex A of the Convention (including primary production and formulation plants), which are located in 18 provinces and municipalities of China. Production and use of toxaphene and heptachlor were stopped in the 1970's, and the production and use of hexachlorobenzene were stopped in 2004. The chlordane and mirex production and use for termite prevention and control will be stopped in the near future following the Demonstration of Alternatives to Chlordane and Mirex in Termite Control Project.



Distribution of historical and existing POPs pesticides production enterprises

By the end of 2004, China has produced a total of 110,000 tons of POPs pesticides mentioned in Annex A of the Convention, of which about 30,000 tons were directly used in fields as agricultural pesticides for pest prevention and control, in termite prevention and control and in disease vector control, and about 80,000 tons of hexachlorobenzene were used as raw materials in the production of pesticides (sodium pentachlorophenate (Na-PCP) and pentachlorophenol (PCP)) and some was exported.

There exist a total of 58 enterprises involved in production of POPs pesticides, including 14 existing units. 20 enterprises have been identified and surveyed, including all existing production enterprises as well as enterprises with larger historical volumes of production. Because the production and use of toxaphene and heptachlor was completely stopped in the 1970's, and large-scale production of dieldrin, endrin and aldrin has never been started, their chemical wastes have not been found in China. At present, the identified POPs pesticide wastes are mainly DDT, chlordane, mirex and HCB

and for the latter, the production was stopped in 2004. POPs pesticide wastes in China are mainly located in Jiangsu, Hunan, Sichuan, Shandong, Tianjin, Shanxi, Hebei and Liaoning provencies, accounting for 70-80% of the total waste quantity. At present, the storage methods of the above wastes are dominantly outdoor storage and simple enclosure.

Insufficient supervision and implementation of pesticides have lead to the complex flow patterns to the users and resulted in serious loss of POPs wastes locations. There is also no systemic sorting or collection, no specific packaging and containers for POPs wastes, and no specially designed POPs wastes transport vehicle. The consequence of that is the simple storage that leads to direct release of POPs wastes in the surrounding areas, which directly affect the environmental safety and public health. Also, many pesticide manufacturers had changed the origin of production areas and production lines for new products and other purposes. At most of the time, the obsolete pesticides and associated wastes are mixed with construction debris and municipal wastes that were simply treated or dumped in uncontrolled landfills.

POPs pesticides contaminated sites, in proximity to the stockpile locations, are also a serious issue, including highly polluted soil found at pesticides manufacturing sites, warehouses and at waste pesticide storage. According to the survey, there are about 44 polluted sites and four of them have been investigated. It was found there were about 18,000 tons of highly polluted soil (DDT>50 ppm) normally concentrated in top layer of soil around a single historic production plant, which is more than 100 times of the original amount of the obsolete pesticides.

Among the pesticide manufactures with obsolete POPs pesticides and contaminated workshops in the production sites, one (Liyang Guanghua Chemical Ltd. Co.) will be covered by the GEF funded Termite Project (WB) and three (Zhanjiakou Greatwall Agricultural Chemical Group, Shangdong Dacheng Pesticides Ltd. Co. and Jianshu Yangnong Chemical Ltd. Co.) by the GEF funded Diocofol Project (UNDP). 10 enterprises with obsolete POPs pesticides remained in production field (enterprises that have only contaminated sites is NOT included), 7 pesticide suppliers in agricultural fields, 5 vector control centres, and 1 hazardous waste temporary storage centre in Chongqing that has about 30 tons of DDT wastes are the main objective and focus of this project. They are located in 14 provinces including: Tianjin, Sanxi, Hebei, Yunnan, Jangsu, Anhui, Shanghai, Congqing, Shan'xi, Nimenggu, Guangdong, Hunan, Guangxi and Jiangxi.

In conjunction with development of this project, MEP initiated a survey program for production, consumption, stockpile, and disposal of POPs pesticides. The program updated initial manufacturer and distributor surveys of conducted during preparation of the NIP, and expanded upon the NIP by inclusion of additional distributor sites. To date, the program has identified 3840~4380 tons of obsolete pesticides in the production field, including about 2400~2800 tons of DDT, 60~70 tons of HCB/PCP-Na and 1380~1510 tons of chlordane and mirex. Distributor surveys and follow-up site visits were conducted nationwide during preparation of China's NIP, identifying 13 POPs pesticide waste sites in 13 provinces. Additional detailed survey work completed during preparation of this project has focused on three target provinces (Chongqing, Jilin, and Jiangsu), identifying 29 additional sites in Chongqing. The 42 sites identified to date have 4219~5713 tons of obsolete pesticides (mostly DDT). Please see the table below for further details regarding sites information collected to date.

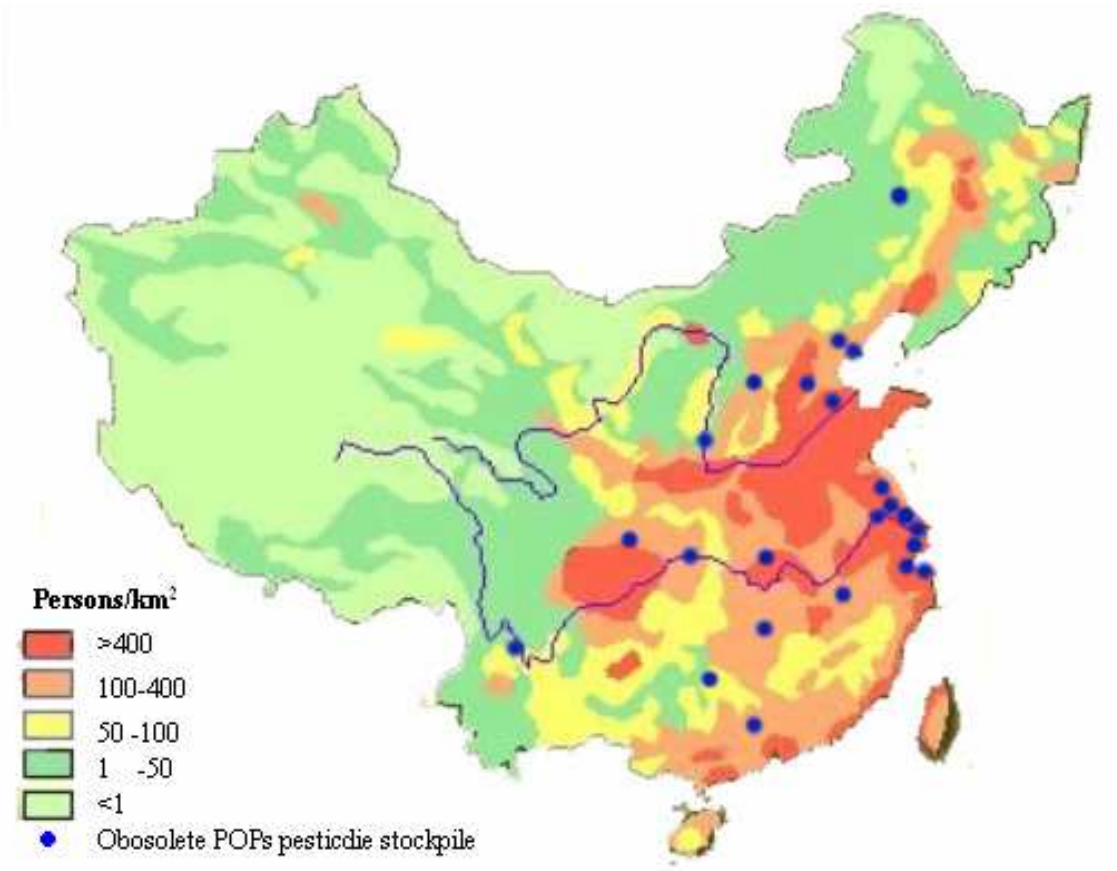
Table 1. Identified Obsolete POPs Pesticides Sites

Area		DDT	Chlordane/Mirex	HCB	Sub-total
Production	Pesticide manufactures	2400~2800	1380~1510	60~70	3840~4380
Distributors	Agriculture	4164~5640			4164~5640
	Healthcare	55~73	-	-	55~73
	Subtotal	4219~5713			4219~5713
Total		6,619~8,513	1380~1510	60~70	8,059~10,093

The release and transfer of obsolete pesticides and associated waste is potentially a major source of the soil pollution in a wide spread territory because of their semi-volatile properties. It was reported that the concentration is still higher than 1mg/kg in some areas even after 20 years of the prohibition

of DDT and HCH usage in farmlands. In addition, the chemicals may be transferred into the water bodies and finally to the food chain from soil. Many organic chlorine compounds could be detected in the underground water in Beijing, Tianjin, Hebei and Sanxi Provinces. The POPs was also found in the sediments at 5 sites at Eastern Sea coast. The concentration of DDT in the sediment samples of Zhujiang River in southeast China is 0.1~44μg/kg which is distinctively higher than the global average level

Based on the survey of pesticides residues in food stuff, DDT and HCH was detectable in 90.9% of the wheat, corn and rice samples and the concentration of DDT and HCH was about 3~138μg/kg. Those chemicals could be found in eggs, milk and plant oils even after 10 years of the usage prohibition. The concentration of HCH is about 57μg/kg in fish products.



Locations of major POPs pesticide sites and the population distribution in China

At present, the identified POPs wastes storage sites are mostly located in the coastline provinces of eastern China or the areas with high population. The storage methods of these wastes are outdoor storage and simple enclosure from where POPs release poses a great risk to global environment and human health. If these wastes are to be mainly disposed by incineration without appropriate air pollution control devices, according to the common practice, additional large amount of dioxins and furans might be released. The project will identify and adopt cost-effective and environmentally sound alternative technologies to deal with the POPs stockpiles and wastes problem.

b) Fly ash of medical and hazardous waste incineration

According to the national survey on hazardous waste treatment facilities there are 106 centralized treatment facilities and 43 emergency incineration centres constructed for eliminating SARS outbreaks in 2003. There are 85, 33 and 31 facilities located in eastern, central and western parts of China, taking a share of about 56.7%, 22.1% and 21.2% of the total number. As for the disposal

capacity, 52 facilities have a capacity higher than 10 ton/d, 38 facilities have a capacity about 5-10 ton/d and 59 facilities have lower than 5 tons/d. As for the hazardous waste incineration, there are 79 incinerators with a capacity of 5.2×10^5 t/a.

About 8.14×10^5 tons of medical wastes and 2.71 $\times10^5$ tons of hazardous wastes were incinerated in 2004. It is estimated that fly ash containing a high level of dioxin from incineration of hazardous wastes and medical waste amounts to about 11,000 tons per annum, that dioxin release in ash and residue from hazardous and medical incineration of waste is about 748.9g and 186 gTEQ accounting for 19% of the total estimated dioxins release in ash and residue and above 16% of the total releases to air from all sources in China (see table 2). According to the plan of hazardous waste processing facility construction, every province should have at least one centralized hazardous waste treatment centre. So it is expected that without the transfer of alternative technologies, the amount of dioxin fly ash will increase largely in the coming years.

Table 2: Identified Sources of POPs Wastes Containing Dioxins

Type of pollution source	Dioxin release in ash and residue (g-TEQ)
Incineration of waste	1,171.4
Metal smelting	2,167.2
Chemical production and use	68.9
Electricity and heat production	588.1
Outdoor incineration	940
Total	4,911.3

According to current regulations, fly ash should be managed as hazardous waste, i.e., stabilized before disposal at sanitary landfill or irreversibly destroyed and transformed into environmentally harmless substances. Because the safe disposal of fly ash from combustion is a recent issue, there is inadequate research or development in this field in China and consequently relevant technology and equipment is lacking. The high pollutant content in fly ash (shown in table 3) will also increase the requirements of pre-treatment and disposal costs. New and highly effective technologies for destruction of POPs have emerged in recent years and some have been commercialized with competitive price compared with conventional technologies and practices such as safe and controlled landfills. This provides a good opportunity to demonstrate new models of fly ash treatment in China. Despite the fact that landfilling is a common practice in China, there is a need to find out alternatives for disposal because the costs of building well controlled landfills have become expensive and convenient landfill sites are readily not available in many areas, especially the eastern costal areas.

Table 3: Heavy metal and leachate concentration of incineration ash

ash	amount	Cu	Pb	Zn	Cd	Cr	Ni	Hg	As
FA1	Concentration ($mg\cdot kg^{-1}$)	898.5	1147.1	10761.2	47.1	110.3	1427.5	7.7	18.4
	Leachate concentration ($mg\cdot L^{-1}$)	1.06	6.50	377.93	2.96	0.09	1.11	-	0.01
FA2	Concentration ($mg\cdot kg^{-1}$)	253.3	14.9	4519.0	3.7	59.0	1009.5	-	-
	Leachate concentration ($mg\cdot L^{-1}$)	0.05	0.02	0.33	0.00	0.25	0.00	-	-
BA	Concentration ($mg\cdot kg^{-1}$)	788.7	40.0	2788.3	14.9	174.7	1176.5	0.6	2.8
	Leachate concentration ($mg\cdot L^{-1}$)	0.02	0.03	0.20	0.02	0.07	0.04	-	-
Leachate toxicity evaluation standard value ($mg\cdot L^{-1}$)		50	3	50	0.3	10	10	0.05	1.5
Hazardous waste allowed to go to landfill ($mg\cdot L^{-1}$)		75	5	75	0.5	12	15	0.25	1.5

The fly ash dioxin content of different types of waste incinerators is shown in Table 3 and 4.

Table 4 Dioxin concentration of fly ash from Rotary-fluidized bed incinerator of medical waste

	[PCDDs] ng/g	[PCDFs] ng/g	[PCDF]/[PCDD]	TEQ-Conc. ng-ITEQ/g
HFA-1	155.3	870.5	5.16	13.5
HFA-2	440.	1652.1	3.65	25.5
HFA-3	561.4	1635.0	2.93	25.5
HFA-4	372.6	1265.4	3.36	17.5
HFA-5	71.8	368.3	4.89	6.9
HFA-6	993.1	2806.5	2.89	44.7
HFA-7	452.2.	1935.4	4.28	67.3
HFA-8	141.8	723.8	5.5	13.1

Samples HFA-1~8 were taken at the outlet of Bag filter during operation including start up, stable condition and shut down, but the specific operating conditions of the numbered samples were not available.

Table 5 Dioxin concentration of fly ash of number of typical waste incinerators in China

No.	Type of Incinerator	Capacity	Type of Waste	Flue gas cleaning system	Dioxin (ng-ITEQ/g)
HFA-1	Rotary kiln- fluidized bed incinerator	10T/d	MW (oil)	Semi-dry+ACI+BF	26.8
HFA-2	Incinerator of Simple stoke	10T/d	MW (oil)	Wet scrubber+cyclon	15.6
MFA-1	Circulating fluidized bed incinerator	800T/d	MSW Coal(20/80)	Semi-dry+ BF	0.37
MFA-2	Martin stoke incinerator	1100T/d	MSW (oil)	Semi-dry+ ESP in filtering way	0.65
MFA-3	Reciprocal mechanical stoke incinerator	900T/d	MSW (oil)	Semi-dry+BF	0.75

H: Hospital M: Municipal MW: medical waste MSW: Municipal Solid Waste ACI: Activated Carbon Injection ESP: Electro-static precipitator BF: Bag filter
Source: Unpublished research data.

Table 6. POPs Pesticide waste Site Status[2]

Site #	Chemical	Obsolete pesticides (tons)	Site size	Status
PM-1	Toxaphene	none	Workshop: 250m^2	Historical enterprise
PM-2	Chlordane/Mirex	Chlordane Residue: 2t Mirex Residue: 8t	Workshop: 300 m^2; The site of stocking wastes: 100 m^2	Historical enterprise
PM-3	Chlordane	Waste water: 1600t, Sediment: 1000t	1500m^2	Historical enterprise
PM-4	Chlordane	50-60	Workshop: 100m^2; The site of stocking	Historical enterprise

[2] For business confidentiality purposes, exact site location and ownership indicators have been replaced with identification numbers, e.g. PM-1 = Pesticide manufacturer #1, AD-2 = Agricultural distributor # 2, HD-3 = Healthcare distributor # 3. Additional identification or location information can be made available upon request.

Site #	Chemical	Obsolete pesticides (tons)	Site size	Status
			wastes: 60m^2	
PM-5	DDT/Dicofol	none	Workshop:1000m^2	Existing enterprise
PM-6	DDT reagent	none	Workshop:32m^2	Historical enterprise
PM-7	Chlordane/Mirex	none	Workshop:13000m^2	Existing enterprise
PM-8	Chlordane/Mirex	none	Workshop: 5300m^2	Existing enterprise
PM-9	DDT/Dicofol	none	Workshop:12000m^2	
PM-10	Chlordane/Mirex	Chlordane none	Workshop: 80 m^2	Existing enterprise
PM-11	HCB/PCP-Na	none	Workshop: 2500m^2	Historical enterprise
PM-12	Chlordane	none	Workshop: 400 m^2	Historical enterprise
PM-13	DDT/HCB/PCP-Na	30-50	Workshop:6466m^2; Contaminated site:10000 m^2	Historical enterprise
PM-14	Chlordane/Mirex	100-150	Workshop: 3000m^2; The site of stocking wastes: 200m2	Existing enterprise
PM-15	Chlordane	Emulsion:2t; Raw material:2t; Residue: 3t	Workshop: 1000-1500m^2	Historical enterprise
PM-16	DDT	500-600	4km^2	Has produced DDT for many years and is the only plant producing DDT in China now.
PM-17	HCB/PCP-Na	50-100	area of stocking contaminated soil:3000 m2, Workshop:75000m2	Has produce HCB for many years and the only plant producing HCB until 2003 in China
PM-18	DDT reagent	60-100	2km^2	Existing enterprise
PM-19	DDT/Dicofol	10; raffinate 400 m3	15000m^2	Historical enterprise
PM-20	Toxaphene	none	Workshop: 250m^2	Historical enterprise
PM-21	DDT			
PM-22	Chlordane, Mirex, Heptachlor and Dieldrin			
PM-23	PCP-Na			
PM-24	DDT			
PM-25	Toxaphene			
PM-26	Toxaphene/Mirex			
PM-27	HCB/ PCP-Na			
PM-28	Toxaphene			
PM-29	Toxaphene			
PM-30	DDT			
PM-31	Toxaphene			
PM-32	Toxaphene			
PM-33	DDT			
PM-34	Chlordane			
PM-35	Chlordane			
PM-36	HCB			
PM-37	HCB			

Site #	Chemical	Obsolete pesticides (tons)	Site size	Status
PM-38	DDT			
PM-39	Toxaphene			
PM-40	Toxaphene			
PM-41	Toxaphene			
PM-42	Toxaphene			
PM-43	Toxaphene			
PM-44	Toxaphene			
Total Pesticides manufacturers	**Mixed**	**3840~4380**		
AD-1	DDT	12		Simple landfilling, deeply buried under the storehouse, with the Depth 4m. The ground covered by cement
AD-2	DDT		300 m^2	Storing in storehouse where no measure to defend leakage
AD-3	DDT	0.002		Storing special site
AD-4	DDT	0.3		During 1972-1976 there were 300kg DDT in stock and buried as wastes since then.
AD-5	DDT/HCB	2		It is stored in special storehouse and waited to be disposed.
AD-6	Dicofol			
AD-7	Dicofol	2		It has a large amount from a questionnaire and need to be verified on site
AD-8	Chlordane/Mirex			Storing in storehouse where no measure to defend leakage
AD-9	DDT			
AD-10	DDT			
AD-11	DDT			
AD-12	DDT			
AD-13	PCP			
AD-14	Toxaphene			
AD-15	HCB			
AD-16	Chlordane			
AD-17	Mirex			
AD-18	Mirex			
AD-19	Mixed			
AD-20	Mixed			
AD-21	Mixed			
AD-22	Mixed			
AD-23	Mixed			
AD-24	Mixed			
AD-25	Mixed			
AD-26	Mixed			
AD-27	Mixed			

Site #	Chemical	Obsolete pesticides (tons)	Site size	Status
AD-28	Mixed			
AD-29	Mixed			
AD-30	Mixed			
AD-31	Mixed			
AD-32	Mixed			
AD-33	Mixed			
AD-34	Mixed			
AD-35	Mixed			
AD-36	Mixed			
AD-37	Mixed			
Total Agricultural distributors	**Mixed**	**4164~5640**		
HD-1	DDT	9.6		It is put into plastic bottle, sealed by wooden box, and stored in special storehouse where have cement ground.
HD-2	DDT	0.2		There are 20 boxes of waste pesticide approximated to 200kg.It is stored in sealed storehouse where have cement ground, no aeration and light. 14 of them are sealed up, others are stored dispersedly.
HD-3	DDT			The plant plans to consume until it is used up
HD-4	DDT, Chlordane/Mirex			The company has a strict stock management and plans to use until it's exhausted.
HD-5	Mirex			The company has a strict stock management and plans to use until it's exhausted.
Healthcare distributors	**Mixed**	**55~73**		
Subtotal distributors	**Mixed**	**4219~5713**		
Total	**Mixed**	**8059~10093**		

Note: PM = Pesticide manufacturer, AD = Agricultural distributor, HD = Healthcare distributor.

Table 7. Current Laws, Regulations, and Standards Related to POPs Pesticides

Law/Regulation/Standard	Description
Law on the Prevention and Control of Environmental Pollution from Solid Waste	Umbrella law stipulating general pollution control requirements, including production, collection, storage, and transport of hazardous wastes
National Catalogue of Hazardous Wastes	Listing of regulated hazardous wastes and waste categories (POPs pesticides listed in Category 4)

Law/Regulation/Standard	Description
Administration of Report and Registration of Pollutants Discharge	Requirement that producers of solid wastes register and regularly report releases
Measures for the Administration of Operating License for Hazardous Wastes	Requires that those engaged in collection, storage, and/or treatment of hazardous wastes obtain a hazardous waste operating license
Measures on the Management of Duplicated Form for Transfer of Hazardous Wastes	Generators of hazardous wastes must submit duplicate hazardous waste transfer plans for approval by regional authorities at source and destination
Measures for the Prevention and Control of Environment Pollution by Discarded Hazardous Chemicals	Regulates process for remediation of contaminated sites
Principles for the Environmental Impact Assessment Technology on Hazardous Waste Treatment Facility Construction Projects	Regulations regarding location, treatment technologies, environmental impact, environment protection measures, public disclosure, and other issues
Standard on Identification of Hazardous Wastes	Standards for analysis of POPs containing hazardous wastes
Pollution Control Standards for Hazardous Waste Incineration (GB18484-2001)	Incineration standards
Standard for Control of Hazardous Waste Secure Landfill (GB18598-2001)	Landfill standards
Standard for Pollution Control of Hazardous Waste Storage (GB18597-2001)	Waste storage standards
General Appellation of Pesticides (GB4839-1998)	HCB, chlordane, mirex, aldrin, dieldrin, endrin, and heptachlor listed as controlled substances
Name List of Hazardous Goods (GB12268-2005)	Listing of hazardous POPs (item 1 toxic goods in category 6)
Regulation on Management of Import of Chemicals for the First Time and Import and Export of Poisonous Chemicals	Pesticides POPs listed in Annex I (Poisonous Chemicals Banned or Strictly Restricted, Group 1)
Guiding Catalogue of Industrial Structure Regulation (2005)	HCB, chlordane, and mirex in “elimination category” as obsolete products
Regulation on Safe Use of Pesticides (1982)	Classifies toxaphene and chlordane as medium toxicity pesticides, prohibiting use on fruit trees, vegetables, tea plants, traditional Chinese medicine, tobacco, coffee, pepper and citronella; chlordane allowed only for cereal feedstuff, and to prevent and control underground pests
Ministry of Agriculture Public Notice No. 199	bans toxaphene, aldrin, and endrin
Regulation on Termite Prevention and Control in Urban Houses (amended 2004)	regulates prevention and control of termites in urban houses
Pesticide Varieties Banned and Strictly Restricted from Use in China	Regulation regarding banned or restricted pesticides, including POPs pesticides
Notification of the General Administration of Customs on Issues Related to Exemption of the Value Added Tax in Import of Pesticides (2001)	Regulates import and export of pesticides

Law/Regulation/Standard	Description
Ministry of Environmental Protection (MEP) Notifications No. 29 and No. 65	Regulates import and export of pesticides
Classification and Indication of Hazardous Chemicals in Common Use (GB13690-92)	Dieldrin listed as category 6 poisonous good
Guideline on Construction of Diseases Prevention and Control Center Laboratories at the Province, Prefecture and County Levels	lists heptachlor as a pesticide monitoring item
Maximum Pesticide Residue Limit in Foods (GB2763-2005	stipulates residual limits of aldrin, dieldrin, and heptachlor in grains, vegetables, meat and eggs.
Measures for the Administration of Operating Licenses for Hazardous Chemicals (SETC 2002)	Management of business licenses related to POPs
Implementation Measures for Safety Production License of Hazardous Chemical Production Enterprises, State Administration of Work Safety and State Administration of Coal Mine Safety 2004	Management of the qualifications of enterprises engaged in POPs production
Management Measures on Production of Packages and Containers for Hazardous Chemicals in Designated Enterprises (SETC 2002)	Management of designated manufacturers of packaging and containers for hazardous chemicals
Measures for Management on Registration of Hazardous Chemicals (SETC 2002)	POPs registration management
Detailed Rules for Registration of Hazardous Chemicals (Trial) (SETC 2000)	POPs registration management
Implementation Measures for Safety License of Hazardous Chemicals Construction Projects (State Administration of Work Safety, State Administration of Coal Mine Safety 2006)	Safety check of POPs production and storage enterprises
Regulations on Environmental Management of the First Import of Chemicals and the Import and Export of Toxic Chemicals (MEP, General Administration of Customs, Ministry of Foreign Trade and Economic Cooperation, 1994)	Import and export management related to POPs
Provisions on Safe Use of Chemicals in Workplaces (Ministry of Labor, Ministry of Chemical Industry 1996)	Safety management related to POPs production sites
Measures for Management on Production license of Industrial Products (State Bureau of Quality Supervision and Inspection 2002)	Production license management related to POPs
Regulations for the Safe Use of Pesticides (Ministry of Agriculture, Animal Husbandry and Fishery, Ministry of Health, 1982)	Management related to the use of POPs
Regulations on Prevention of Termites in Urban Housing (Ministry of Housing and Urban-Rural Development 1999)	Management related to the use of POPs
Management Regulations on Railway Transportation of Hazardous Goods (Ministry of Railways 1996)	Management related to the transportation of POPs

Law/Regulation/Standard	Description
Regulations on Waterway Transportation of Hazardous Goods (Ministry of Communications 1996)	Management related to the transportation of POPs
Regulations on Road Transport of Hazardous Goods (Ministry of Communications 1993)	Management related to the transportation of POPs
List of Chemicals with Severe Toxicity (2002)	Includes POPs
List of Hazardous Chemicals (State Administration of Work Safety 2003)	Includes POPs
Reference No. of Dangerous Goods and Classification GB6944-2005 (MEP 2005)	Includes POPs
List of Dangerous Goods GB 12268-90 (MEP, the State Standardization Commission 2005)	Includes POPs
Environmental Quality Standard for Soils (GB15618-1995)	Applicable to POPs contaminated sites
Environmental Quality Risk Assessment Benchmark for Soils at Industrial Facilities (HJ/T25-1999)	Applicable to POPs contaminated sites
Identification Standard for Hazardous Waste - Identification for Extraction Toxicity GB 5085.3-1996	Applicable to POPs contaminated sites
Technological Specifications of Environmental Monitoring of soils (HJ/T164-2004)	Applicable to POPs contaminated sites
Measures for Manifest Management on Transfer of Hazardous Wastes	Includes POPs hazardous wastes

Annex 9: International and national experts consulted during Project Document development

Name	Position and Specialty
International Experts	
Dr. Csizer, Zoltan	UNIDO Consultant for Environmental projects and programs development, environmental management and policy
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