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The World Bank

Report No: 31548 - CN

PROJECT DOCUMENT

ON A

PROPOSED GRANT FROM THE

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF USD 18.34 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

PCB MANAGEMENT AND DISPOSAL DEMONSTRATION PROJECT

April 25, 2005

Environment Sector Unit (EASEN)
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective: April 25, 2005)

Currency Unit	=	Chinese Yuan (CNY)
CNY 8.2765	=	US$1
US$ 0.12082	=	CNY 1

FISCAL YEAR

July 1 – June 30

ABBREVIATIONS AND ACRONYMS

AAA	Analytical and Advisory Assistance
BAT	Best Available Techniques
BEP	Best Environmental Practices
CAS	Country Assistance Strategy
CIO	Convention Implementation Office
CNAO	China National Audit Office
COP	Conference of Parties
CQS	Consultants' Qualification Selection
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPB	Environmental Protection Bureau
FECO	Foreign Economic Cooperation Office
FMM	Financial Management Manual
FMR	Financial Monitoring Report
GAC	General Administration of Customs
GEF	Global Environment Facility
GM	Geometric
GOC	Government of China
GPN	General Procurement Notice
IC	Individual Consultant
ICB	International Competitive Bidding
IFB	Invitation for Bids
IOMC	Inter-Organization Program on the Sound Management of Chemicals
MOA	Ministry of Agriculture
MBD	Model Bidding Document
MOCom	Ministry of Commerce
MOCon	Ministry of Construction
MOF	Ministry of Finance
MOFA	Ministry of Foreign Affairs
MOH	Ministry of Health
MOST	Ministry of Science and Technology
NCB	National Competitive Bidding
NDRC	National Development & Reform Commission
NIP	National Implementation Plan
NLG	National Leading Group for implementation of the Stockholm Convention
PCB	Polychlorinated biphenyl

PCB3	Trichlorobiphenyl
PCB5	Pentachlorobiphenyl
PCN	Project Concept Note
PIU	Project Implementation Unit
PMO	Project Management Office
PRC	People's Republic of China
QCBS	Quality- and Cost Based Selection
RAP	Resettlement Action Plan
SA	Special Account
SEPA	State Environmental Protection Administration
SERC	State Electricity Regulatory Commission
SOE	Statement of Expenses
SPN	Specific Procurement Notice
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Programme

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CHINA
PCB Management and Disposal Demonstration Project

CONTENTS

CHINA

PCB MANAGEMENT AND DISPOSAL DEMONSTRATION PROJECT

GEF PROJECT DOCUMENT

EAST ASIA AND PACIFIC

EASEN

Date: April 25, 2005	Team Leader: Helen Chan
Country Director: David R. Dollar	Sectors: Other industry (100%)
Sector Manager: Magda Lovei	Themes: Pollution management and environmental health (P)
Project ID: P082993	
Focal Area: Persistent Organic Pollutants (POPs)	Environmental screening category: Full Assessment
Lending Instrument: Specific Investment Loan	Safeguard screening category: Limited impact

Project Financing Data

[ ] Loan [ ] Credit [X] Grant [ ] Guarantee [ ] Other:

For Loans/Credits/Others:
Total Bank financing (US$m.): 0.00
Proposed terms:

Financing Plan (US$m)

Source	Local	Foreign	Total
BORROWER/RECIPIENT	11.73	0.00	11.73
GLOBAL ENVIRONMENT FACILITY	0.00	18.34	18.34
BILATERAL AGENCIES	0.00	2.02	2.02
Total:	11.73	20.36	32.09

Recipient:
Government of China

Responsible Agency:
State Environmental Protection Administration
115 Xizhimennei Nanxiaojie
Beijing 100035
China
yang.xiaoling@sepafeco.org.cn

Estimated disbursements (Bank FY/US$m)

FY	2006	2007	2008	2009	2010	0	0	0	0
Annual	2.904	6.938	4.903	2.865	0.730				
Cumulative	2.904	9.842	14.745	17.61	18.34	0.00	0.00	0.00	0.00

Project implementation period: Start: September 1, 2005 End: August 31, 2009

Expected effectiveness date: August 31, 2005 Expected closing date: August 31, 2009

Does the project depart from the CAS in content or other significant respects? ***Ref. PAD A.3***	[ ]Yes [X] No
Does the project require any exceptions from Bank policies? ***Ref. PAD D.7*** Have these been approved by Bank management? Is approval for any policy exception sought from the Board?	 [ ]Yes [X] No [ ]Yes [X] No [ ]Yes [X] No
Does the project include any critical risks rated "substantial" or "high"? ***Ref. PAD C.5***	[ ]Yes [X] No
Does the project meet the Regional criteria for readiness for implementation? ***Ref. PAD D.7***	[X]Yes [ ] No

Project development objective ***Ref. PAD B.2, Technical Annex 3***

Identify and demonstrate environmentally-sound and cost-effective policies, procedures and techniques for safe management and disposal of China's temporarily-stored polychlorinated biphenyls (PCBs), their associated PCB-contaminated wastes and remaining in-use PCBs equipment.

Global Environment objective ***Ref. PAD B.2, Technical Annex 3***

Help China eliminate PCBs, one of the 12 Persistent Organic Pollutants covered by the Stockholm Convention on POPs, which are harmful to human health and to the environment.

Project description *[one-sentence summary of each component]* ***Ref. PAD B.3.a, Technical Annex 4***

The project has six components: (1) institutional strengthening; (2) development of a policy framework for PCB management and disposal; (3) PCB management in the Zhejiang Province; (4) disposal of highly contaminated PCB wastes in the Liaoning Province; (5) project monitoring and evaluation; and (6) design of a national replication program. The project will be financed with a grant from the GEF (US$ 18.34m), counterpart contributions (US$ 11.73m), and other donors (US$ 2.02m).

Which safeguard policies are triggered, if any? ***Ref. PAD D.6, Technical Annex 10***

Among the ten World Bank Safeguards Policies, three have been identified to be directly applicable to this project: (a) Environmental Assessment (OP/BP/GP4.01), (b) Involuntary Resettlement (OP/BP 4.12), and (c) Information Disclosure (BP17.50). Environmental impacts associated with the project may result from possible PCB discharges (e.g. spills) resulting in contamination at storage/burial sites and during PCB waste excavation, clean-up, containerization, treatment by thermal desorption, temporary storage, transportation, and destruction by incineration. No large-scale, significant and/or irreversible impacts are anticipated as mitigation measures will be taken to prevent, control and countermeasure environmental discharges of PCBs/dioxins/furans. The project environmental impacts are assessed in two full Environmental Assessment Reports and their mitigation is outlined in Environmental Management Plan. Possible social risks may be associated with public exposure to contaminated sites, buildings and water supplies during the site cleanup in Zhejiang and transportation process from Zhejiang to Liaoning. A Resettlement Policy Framework has been prepared to deal with the possible land acquisition and resettlement issue and SEPA has submitted it to the Bank. Site-specific resettlement plans will be prepared during project implementation. Annex 10 discusses more specifically how the project will ensure compliance with the safeguard policies and the World Bank Disclosure Policy.

Significant, non-standard conditions, **if any**, for: none Board presentation: June 28, 2005 Loan/credit effectiveness: expected to be August 31, 2005 Covenants applicable to project implementation: Details in Section C, paragraph 47

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

1. **Background.** Polychlorinated biphenyls (PCBs) are one of the twelve persistent organic pollutants (POPs), which, due to their damage to human health and the environment, were identified for elimination by the Stockholm Convention, which entered into force on May 17, 2004. China has been strongly committed to the development and implementation of the Stockholm Convention. It participated in all preparatory meetings and signed the Convention as soon as it opened for signature on May 23, 2001. China officially ratified the Stockholm Convention on August 13, 2004, and is a Party to the Convention. China has also advanced substantially in meeting the Convention requirement that Parties to the Convention submit a National Implementation Plan (NIP) to the Conference of Parties within two years after the Convention enters into force for that country. China started preparing its NIP in mid-2004 and is expected to complete it by the required date of August 13, 2006.

2. **Country Situation.** Only three PCB producers (in Xi'an, Suzhou, and Shanghai) ever manufactured PCBs in China and only from 1965 to early 1974 (details in Annex 1). They produced approximately 10,000 tons, including 1,000 tons of pentachlorobiphenyl (PCB5) and 9,000 tons of trichlorobiphenyl (PCB3). Some wastes may remain at production facilities, which will be addressed under the national replication program to be developed in this project (component 6, para.25) . PCB5 oils were generally used in a wide variety of open systems, such as in oil paints and exterior dopes. PCB3 was principally used in manufacturing capacitors that were used in the electricity supply industry.

3. During the 1980s, following growing health and environmental concerns, China removed most PCB-containing capacitors from service and placed them in temporary storage facilities (underground "concrete coffins" or in caves) intended to hold them for 3-20 years. Recent surveys and investigations indicate that most PCB-containing equipment remains in these temporary storage facilities, and that many of the facilities -- caves and burial sites -- are leaking PCBs into the environment.

4. **The Main Sector Issues to be Addressed by the Project.** China is a country with a vast territory and a population of over 1.3 billion. Because of its size, the varying stages of economic development and various degree of effectiveness of PCB management and disposal in different regions, China faces many challenges in PCB management and disposal. These include incomplete PCB baseline data, a weak institutional and policy framework for PCB management, lack of PCB disposal technology and facilities, and insufficient public awareness. The project will address these sector issues in one province (Zhejiang) to determine and demonstrate the most

cost-effective practices and technologies for managing and disposing of PCBs in China. This demonstration will help China design and cost its nation-wide PCB program and help other countries design theirs. The main PCB management and disposal issues that the project will address in Zhejiang Province are:

a. **Incomplete PCB baseline data.** The project will complete the identification of PCB wastes (including associated PCB-contaminated soils) in temporary PCB storage sites, over 95% of the wastes are believed to be PCB capacitors and PCB containing oil. An ongoing Sino-Italian PCB project (*Development of PCB Inventory Methodology and Draft PCB Disposal Strategy*) is collecting PCB baseline information in Zhejiang and Liaoning Provinces. This project will support follow-up activities, including identifying the exact locations of the PCB sites, performing PCB concentration tests before their cleanup, and cleaning up of the sites. The Sino-Italian project has also obtained some basic information on transformers in both provinces; however detailed information on PCB transformers and their levels of contamination still need to be confirmed in both provinces. This demonstration project will focus on identifying in-use PCB contaminated transformers installed before 1980 and testing decontamination technology of PCB transformers as well as decontaminating some of those large in-use PCB transformers installed before 1980. The project does not attempt to decontaminate all the PCB contaminated transformers in Zhejiang. This would be a long-term task and would have to be integrated into the normal service and maintenance of transformers.

b. **Weak PCB management and disposal capacity.** This project will support environmentally sound management of PCBs, including recovery, collection, packaging, transportation, safe temporary storage in Zhejiang, and final disposal in Liaoning. There are currently no suitable facilities in China that meet the requirements of the Stockholm Convention for environmentally sound and safe disposal of PCBs. China has started construction of a new incinerator facility to dispose PCBs in 2002. However, design of this new facility does not meet the requirements of the Stockholm Convention on safe disposal of PCBs. China will provide additional funding to complete this incinerator with equipments that are necessary for safe emission control and monitoring of the incineration process. The project will also support capacity building activities for sound PCB management and disposal.

c. **Health and environmental risks from PCB contaminated soils and water.** A toxicity study of DDT and PCB on women and children supported by Canadian Trust Fund is ongoing. Its key objective is to investigate the exposure of DDT and PCBs and their adverse effects with special emphasis on the health of women and children. The initial study result indicates that the tested area in Zhejiang has a high-concentration PCB exposure. PCB geometric concentration levels in

women and children in this area are moderately elevated. They are below those found in Arctic Canada (Nunavut) and above those found in southern Canada.

In the Zhejiang province, several accidental releases of PCBs are known to have occurred (details in Annex 1, Paragraphs 15 –18). Data from the Mei Cheng and Xiaoshan sites in Zhejiang show leakage at both sites and their contamination levels reached 150 – 250 ppm, three to five times the national standard of 50 ppm. The information from Zhejiang Province suggests that the PCB storage sites with confirmed or suspected leakage are located (i) in close proximity, sometimes within the footprint, of residential, office or retail buildings (e.g., in Shangyu Business Street), (ii) in public parks (e.g., Cixi Culture Park), (iii) at upstream of drinking water reservoirs and rivers (e.g., Qian Tang Jang River supplying the City of Hangzhou), (iv) at sites of planned or ongoing infrastructure development (e.g., Qiandao Lake Holiday Valley building and playground in Jianshan), (v) at active cemeteries (e.g., Mei Cheng Township), and (vi) at farms (e.g., in Wenzhou Yueqing). The project, therefore, will address the health and environmental risks by recovering and disposing of the PCBs from all sites in Zhejiang Province to prevent future releases to the environment. The cleanup of PCB sites would be based upon a clear understanding of site-specific risks, feasibility of the technological options and costs.

d. **Imperfect policies, regulations, standards and enforcement.** Enforcement and execution of current polices and regulations are severely constrained by the absence of effective monitoring and evaluation measures. The project will therefore support development and update of the legal and regulatory system for safe PCB management and disposal. Related policies and regulations at the national and local levels governing PCB management and disposal will be formulated and revised as necessary. Monitoring and evaluation measures will be developed to ensure effective enforcement.

e. **Insufficient public awareness and education.** Public awareness is important for smooth cleanup of identified PCB sites in Zhejiang, especially those PCB sites close to residential complexes. The project will support necessary public awareness activities, such as video making, newsletters issuance, TV programs, and other public outreach materials and activities.

5. **Baseline Information in Zhejiang.** Zhejiang Province was selected as the demonstration province for this project. The ongoing Sino-Italian project has estimated that, on the basis of Zhejiang's overall transformer capacity in 1980, the province has about 22,500 PCB capacitors, and a total of about 247.5 tons of PCB oil. The total amount of the PCB capacitors and the highly-PCB contaminated soils (PCB >500ppm) which need disposal is estimated at about 1,980 – 2,475 tons (2,000 tons is used as the project indicator), and the total amount of low-PCB contaminated soils and water

(PCB<=500ppm) which need cleanup is about 19,800 – 24,750 tons (20,000 tons is used as the project indicator).

6. Based on the January 2005 survey on transformers conducted under the Sino-Italian project, the total number of transformers in Zhejiang province has been identified to be around 230,000 transformers in 2003, of which around 2,200 are large transformers at substations (details in Annex 1). There is presently no information on PCB used in transformers or potential contamination with PCB. It is estimated that 78 (still to be confirmed) of large transformers installed before 1980 might still be in service in the Zhejiang province. A conservative estimate would be that they all might contain PCB. Decontamination of some PCB transformers will be one of the focuses in the demonstration project.

2. Rationale for Bank involvement

7. The Bank – as a GEF Implementing Agency – has a responsibility to help its client countries achieve the global environmental objectives that are supported by the GEF. The GEF is the interim financial mechanism of the Stockholm Convention and this PCB Demonstration Project will contribute significantly to achieving the objectives of the corresponding GEF Operational Program for Reducing and Eliminating Releases of Persistent Organic Pollutants (OP14). The proposed project is consistent with the Bank's Environment Strategy and its 2003-2005 Country Assistance Strategy (CAS) for China. The key pillars of the strategy – improving people's quality of life, quality of economic growth, and quality of regional and global commons – are all reflected in the project's objectives and approach. The Bank's technical knowledge on POPs management and its experience in the design and implementation of GEF investment projects give it a comparative advantage among the GEF Implementing Agencies in providing this assistance.

3. Higher level objectives to which the project contributes

8. The project will contribute to both national and global objectives. On the national level, it will support implementation of the China's National Program for Construction of Hazardous and Medical Waste Disposal Facilities issued by the State Council in December 2003**,** and will contribute to China's ongoing efforts to reduce the risks to human health and the environment from industrial pollution. On the global level, the project will help China meet its obligations under the Stockholm Convention and contribute to global efforts to control toxic chemicals in general and to eliminate PCBs in particular. It will also indirectly contribute to the objectives of two other international environmental agreements – the Basel Convention on the Control of Trans-boundary

Movements of Hazardous Wastes and Their Disposal and the Rotterdam Convention on the Prior Informed Consent Procedures for Certain Hazardous Chemicals.

B. PROJECT DESCRIPTION

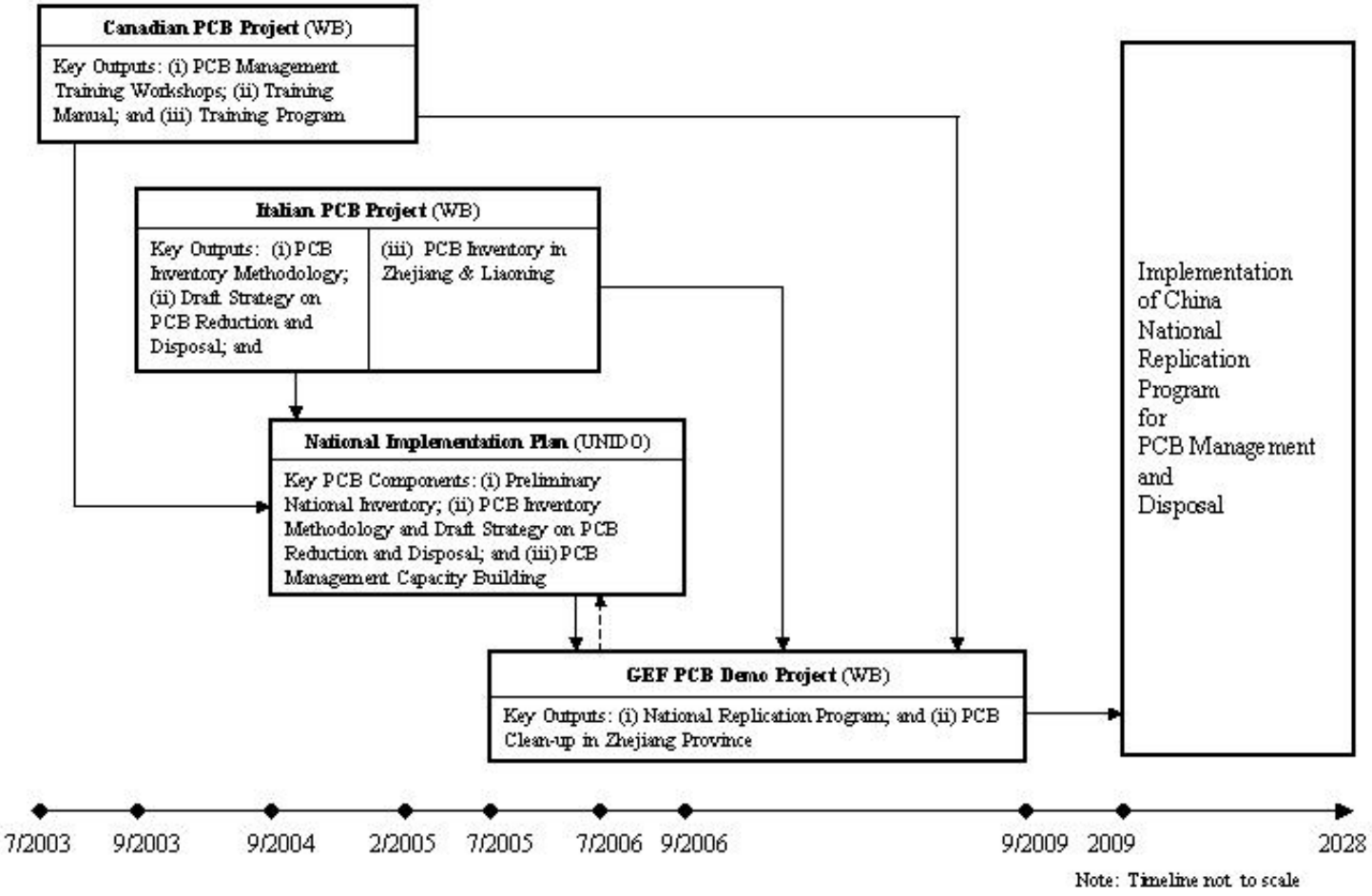
1. Lending instrument

9. The lending instrument is a GEF grant. The grant will be complemented by bilateral and counterpart funding from the Chinese Central and Zhejiang provincial government, the local private sector, and bilateral donors.

2. Program objective and Phases

10. While the project is not a part of a formal, multi-phase program, it is an essential part of a suite of internationally supported interventions aimed at improving China's capacity for PCB management and disposal, and accelerating the achievement of that objective. The project builds upon the work currently under implementation in (a) the preparation of China's National Implementation Plan (NIP) for implementing the Stockholm Convention, (b) the Sino-Italian PCB inventory methodology and draft PCB disposal strategy, and (c) the Sino-Canadian project on training for PCB management. The Sino-Italian and Sino-Canadian projects constitute bilateral co-financing contributions to the NIP preparation. These four projects (including the proposed project) are being implemented simultaneously. Results of the Sino-Italian project and the Sino-Canadian project will be fully integrated into the NIP and the proposed project; and project results from the four projects will lay the ground for developing a National Replication Program for PCB management and disposal in China. These activities are carefully coordinated to avoid any duplication of efforts or inefficient use of resources. The timing and relationship among the proposed project and key complementary initiatives is depicted in the following diagram.

Relationship Among the PCB Projects in China and Their Key Outputs



3. Project development objective (PDO) and key indicators

11. The development objective of the project is to identify and demonstrate environmentally-sound and cost-effective policies, procedures and techniques for safely managing and disposing of China's unique temporarily stored PCBs and associated PCB-contaminated wastes (e.g., PCB-contaminated soils and water). The project will also serve as a demonstration of how this objective can most cost-effectively be achieved throughout China and in other countries that face the same challenge. The criteria for selecting Zhejiang as the demonstration province include its comparatively: (a) longer history of PCB transport, storage, disposal, remediation at different levels of government -- provincial, county, and district; (b) higher level of PCB risks posed to both human health and the environment; (c) better and existing PCB management system at different levels of government to built on; (d) deeper economic development at different levels; and (e) stronger local government support.

12. The Project will implement various cleanup measures in Zhejiang Province to mitigate the impact of PCB threats to human health and the environment, including the global environment. In parallel, the project will strengthen Zhejiang Province's PCB institutional and regulatory system, management practices, and public awareness to prevent a recurrence of PCB pollution in the future. PCB cleanup activities are not expected to adversely affect human health and the environment in the province. The principal outcomes of the project will be that Zhejiang Province has successfully and cost-effectively disposed of its PCBs and PCB wastes, and that China has established a cost effective PCB cleanup framework, which can also be applied to the rest of the world.

13. To track the progress toward the PDO, the project will use five key indicators as summarized below, explained in more detail in Annex 3:

a. Establishment of an institutional and legal framework for PCB management and disposal in Zhejiang Province,
b. Cleanup/removal of PCBs from about 56 PCB storage sites in Zhejiang,
c. Disposal of estimated 2,000 tons of PCB oil, PCB equipment, and high-PCB contaminated soils and water (PCB>500ppm) in Zhejiang,
d. Cleanup of estimated 20,000 tons of PCB-contaminated soils and water (PCB <=500ppm) collected from the 56 PCB storage sites in Zhejiang,
e. Decontamination of 10 large in-use PCB transformers installed before 1980 in Zhejiang and identification of PCB contamination level of 3% of 2,200 large transformers and 50 of small transformers, and
f. A draft national replication program for PCB management and disposal to be applied in the rest of China.

4. **Project components** (Annex 4 for a detailed description and Annex 5 for a detailed cost breakdown).

14. The project has six components: (a) institutional strengthening; (b) development of a policy framework for PCB management and disposal; (c) PCB management in the Zhejiang Province; (d) disposal of highly-contaminated PCB wastes in the Liaoning Province; (e) project monitoring and evaluation; and (f) design of a national replication program. The project will be financed with a grant from the GEF (US$ 18.34m), counterpart contributions (US$ 11.73m), and other donors (US$ 2.02m). GEF funding is 57% of the total project cost. Project components and their cost estimates are listed in Table 1.

Table 1: Summary of Proposed Project Cost and Financing

Component	Cost (US$)	% of Total	GEF Grant (A)	% of A	Counterpart contribution (B)	% of B	Other donors (C)	% of C
1. Institutional Strengthening	1,892,000	5.89	1,230,000	6.71	299,000	2.55	363,000	17.93
2. Development of a Policy Framework for PCB Management and Disposal	812,000	2.53	74,000	0.40	668,000	5.69	70,000	3.46
3. PCB Management in the Zhejiang Province	15,345,000	47.81	10,359,000	56.48	3,849,000	32.80	1,137,000	56.18
4. Disposal of PCB Wastes in Liaoning Province	13,609,000	42.40	6,238,000	34.01	6,917,000	58.96	454,000	22.43
5. Project Monitoring and Evaluation	135,000	0.42	135,000	0.74	0	0	0	0
6. Design of a National Replication Program	304,000	0.95	304,000	1.66	0	0	0	0
Total	**32,097,000**	**100**	**18,340,000**	**100**	**11,733,000**	**100**	**2,024,000**	**100**

Component 1: Institutional Strengthening (US$1,892,000)

15. This component aims to strengthen Chinese institutions for PCB management and disposal in a sustainable manner. It would support: (a) an inception workshop for the project; (b) capacity building at the national level by strengthening the PCB project team and establishment of a national PCB expert group in CIO under SEPA/FECO; (c) establishment of a local project implementation unit (PIU) in the Zhejiang Province; (d) provision of PCB management training to provincial authorities and technical personnel, as well as project management training for both

PIU staff and the PCB project team in CIO; and (e) undertaking public awareness activities.

Component 2: Development of a Policy Framework for PCB Management and Disposal (US$ 812,000)

16. Current policies and regulations on hazardous waste management in China provide some specific requirements on PCB management, although they are insufficient to support the effective implementation of this demonstration project. Therefore, China needs a new policy framework to meet obligations of the Stockholm Convention. This can be achieved through (a) revising the existing national and provincial regulations and/or standards and (b) developing new technical guidelines and measures for implementing the Stockholm Convention. The detailed guidances for establishing the policy and legal framework as well as for technical measures on PCB management and disposal from UNEP, IOMC, Basel Convention, and other resources will be considered during project implementation.

17. This component will develop and improve the legal and regulatory framework for safe management of PCBs in the Zhejiang Province. In addition, relevant policies and regulations at the national and the local levels governing PCB management and disposal will also be reviewed, revised, and supplemented as necessary. This component would cover six key policies:

<u>At the provincial level:</u>

a. A PCB pollution prevention/control regulation for the Zhejiang Province.
b. An emergency response plan for PCB accidents for Zhejiang. This will be an overall response plan for safety, health, environment, and other relevant authorities to effectively manage and cooperate in case of accidents involving PCB.
c. A technical guideline for PCB management and disposal for Zhejiang. This is to develop a technical guideline covering the entire spectrum of activities that together constitute the environmentally sound management and disposal of hazardous wastes containing PCBs.

<u>At national level:</u>

d. A National regulation on PCB management and disposal. The national regulation will (i) define the PCB management and disposal responsibilities of the central government, local government, and PCB equipment owners; (ii) set up the timeline for PCB management and disposal in China; and (iii) require registration and public disclosure of PCB waste storage.

e. National pollution control and environmental quality standards for PCBs. This activity is to develop seven pollution control and environmental quality standards for PCBs to facilitate implementation of the project in the demonstration province and support the environmental regulatory framework in China.
f. Development of a funding mechanism for co-financing PCB management and disposal in China. This regulation will help China to effectively implement the strategy on PCB reduction and disposal now being developed under the Sino-Italian PCB project.

Component 3: PCB Management in the Zhejiang Province (US$ 15,345,000)

18. There are a total of estimated 61 PCB storage sites in Zhejiang, of which five (5) had been cleaned up prior to 2003 and fifty-six (56) sites are to be cleaned up in this project. Of the 56 sites, exact locations of four (4) PCB storage sites have already been confirmed, thirty-four (34) sites have been identified with exact locations still to be confirmed, and eighteen (18) sites are expected to be identified in the inventory investigation under the Sino-Italian project from now to the first-year implementation of the project. Exact locations of where the PCBs are stored in the estimated 52 (34+18) PCB storage sites will be identified, sampled and tested, after which all 56 sites will be cleaned up (details in Annex 4).

19. Highly contaminated PCB wastes with PCB content of over 500ppm will be stored temporarily in Zhejiang until they are transported to Shenyang for final destruction. PCB contaminated soil and other PCB wastes at concentrations from 50 ppm to 500ppm will be treated by a thermal desorption unit in Zhejiang. The cleaned PCB sites will be further monitored and effectively managed until the remediation of the sites brings them within PCB content below 50 ppm at the minimum, which is a standard set by the Chinese Government (China GB13015-91 Standards on Pollution Control of PCB Wastes). However, the cleanup action level for each site will be based on the actual risk at the site and the future use of the cleaned PCB site. The applicable international standards will be used in case of no relevant national standards.

20. The results and lessons learned from each key aspect of PCB management will be fully documented and used to refine national and provincial PCB management regulations and guidelines. They will also be used in the design of the national replication program on PCB elimination.

21. A process for PCB management and disposal described in Paragraph 67 has been drafted for PCB management activities in Zhejiang and PCB disposal in Shenyang. The process will be further detailed with specific procedures and requirements through developing the technical guideline for PCB management and

disposal under Component 2 of this project. The technical guideline will be used, evaluated and improved through project activities in Zhejiang and Shenyang.

22. This component for PCB management in Zhejiang Province would have seven activities:

a. Identification of exact location of PCB sites. Georadar (ground penetrating radar) technology is proposed for locating and obtaining a preliminary quantification of buried PCBs wastes. This technology is based on electromagnetic waves, which are sent to the surfaces to be monitored and received back with a different reflection due to the differing dielectric characteristics of the elements they go through. This technology is effective for locating and determining the depth of claddings, caves, cracks, metallic elements and any other objects with a detectable dielectric contrast. Location of 10 sites will be funded by the Sino-Italian project. The rest of the sites will be financed by this project.

b. Cleanup of PCB storage sites. All identified PCB sites will be cleaned up using the following procedures:

i. Data gathering.
ii. Pre-cleanup field tests -- site environment characterization.
- Mapping of the exact position of buried PCB wastes
- Sampling and analysis
- Mapping of PCB contamination
- Site environment characterization and risk assessment. Based on the location and conditions at the site, proximity to human settlements, water sources, agricultural lands, sensitive habitats, etc., the risks to humans and the environment will be determined using a simple comparative risk assessment approach. The risk assessment will allow ranking of the sites and determining the order of their inclusion in the annual work program.

iii. Site cleanup design. A cleanup plan will be developed for each site based on the data collected from i and ii. The cleanup plan will include details of (a) amount of PCB wastes to be removed, (b) work schedule of the cleanup, (c) standard safety procedures, and (d) measures for preventing further leakage or dispersion of contaminants to the environment during cleanup.
iv. Site preparation prior to cleanup
v. Safety training on personal protection measures
vi. Removal and packaging of PCB contaminated waste and soil
vii. Restoration of the cleanup site
viii. Evaluation of cleanup activities
ix. Site documentation will be collected and archived. The documentation will include the design of the cleanup activities, cleanup work reports, analysis and sampling reports, the post-cleanup report, etc.
x. After the PCB wastes are recovered from the PCB sites, the highly contaminated PCB wastes (>500 ppm) will be transported to the PCB storage facility in Chongxian, near Hangzhou city in Zhejiang for

temporary storage.

xi. After containerization, the highly contaminated PCB wastes will be transported by special trucks from the Chongxian PCB storage facility in Zhejiang to Shenyang, Liaoning for destruction by incineration. A strict transportation protocol will be followed.

c. PCB waste storage facility in Chongxian, Zhejiang. This storage facility will be built and operated according to China's Standard for Pollution Control on Hazardous Waste Regulation (GB18597-2001). An EIA will be prepared for local authorities and the Bank's clearance before its construction. This storage facility will belong to China to be used in the national replication program.

d. Cleanup of low contaminated PCB wastes (between 50ppm to 500 ppm). PCB wastes with concentrations of 50-500 ppm will be treated using a mobile thermal desorption system. Selection of the thermal desorption technology is based on the evaluation of alternative PCB treatment/disposal technologies prepared during project preparation. The expected amount of PCB contaminated wastes, mostly soils, (PCB<=500ppm) is about 20,000 tons, which is planned to be safely cleaned after the highly contaminated PCB wastes are recovered and removed from the temporary PCB storage sites. Given the constraints of traffic, energy supply, and the logistics of re-positioning the facility, a mobile unit able to treat 50 tonnes per day is believed to be the best choice. An EIA for the thermal desorption unit to be used for soil decontamination in the Zhejiang province will be prepared for local authorities and the Bank's clearance before its purchase and application.

e. Supervision of PCB site cleanup and soil decontamination. PCB site cleanup and soil decontamination will be supervised by independent consultants. This is to make sure that PCB site cleanup and soil decontamination follows Chinese regulations and technical standards as well as requirements under this project.

f. Verification and Monitoring of PCBs sites after cleanup. This part will include verification of PCB site decontamination right after site cleanup and monitoring of sites after cleanup for one year. Verification will be conducted by Zhejiang Environment Monitoring Station for each PCB site after cleanup to confirm its site decontamination. The verification results will be endorsed by the Zhejiang provincial EPB. Soil, ground water, surface water and plants around the storage sites will be tested during the verification. After commission of each site by Zhejiang EPB, the project will also support monitoring of selected sites for one year.

g. Testing and Decontamination of in-use PCB transformers. China has confirmed that it never produced PCB containing transformers. However, large transformers containing PCBs were imported to China in 1970s and 1980s, it is possible that some of these PCB transformers are still in use. In addition, transformers might have been contaminated with PCB during servicing and maintenance. The Sino-Italian project attempts to obtain the inventory of all transformers in Zhejiang and Liaoning provinces. So far, this project has

identified 230,000 in-use transformers in Zhejiang in 2003, of which around 2,200 are large transformers (over 110kv), yet their potential contamination with PCB is still to be investigated. And it is estimated that 78 (still to be confirmed) of those older large PCB transformers (over 35kv and about 626 units) installed before 1980 are still in service. As there might be a higher risk that those transformers might be contaminated with PCB, this demonstration project will focus on investigating the potential PCB contamination of them and testing of decontamination technology of PCB transformers and decontamination of some those still in-use large PCB transformers installed before 1980. Due to the large number of transformers and unknow status of potential PCB contamination, the project does not attempt to decontaminate all the PCB contaminated transformers in Zhejiang. This would be a long-term task and would have to be integrated into the normal service and maintenance of transformers. Detailed activities on PCB transformers include:

Activities under the Sino-Italian project:

i. Identification of location of the 2,200 large transformers (already identified under the Sino-Italian project),
ii. Sampling and analysis of 108-144 on-line transformers in Zhejiang to establish the percentage of PCB contaminated transformers and contamination level (will be conducted under the Sino-Italian project in next six months).

Activities under the demonstration project:

iii. Collection of detailed information (such as owner information, age, size, country of origin, PCB analysis records, maintenance records, condition of transformers, etc.) of in-use 78 large transformers installed before 1980. The process and information collected will be based on the PCB inventory methodology developed under the Sino-Italian project,
iv. On site investigation and testing of potential PCB contamination level of the 78 older transformers,
v. Testing of decontamination technology of PCB transformers,
    - Seminars on decontamination technology of PCB transformers,
    - Analysis of the PCB content in transformer oil and selection of the most appropriate technology for decontaminating PCB transformers in service,
    - Rental of decontamination equipment for testing on a limited number of transformers,
    - Test of the PCB oil in decontaminated PCB transformers in service to confirm the level of contamination and the removal of PCBs,

- PCB oil recovered from PCB transformers will first be stored temporarily in Zhejiang and later be transported to Shenyang for final disposal, and
- Evaluation of result. A seminar will be held.

vi. If the PCB-contaminated transformers installed before 1980 are identified, 10 in-use older transformers will be decontaminated based on information collected under iii and iv and technology selected under v. (The number of transformers to be decontaminated would be based on the findings and what might be financially possible within the available funding),

vii. Additional sampling and analysis of PCB contamination level for more transformers (estimated 3% of 2,200 large transformers and 50 of small transformers) if funding available to provide basis for the national replication program.

A strategy for dealing with PCB transformers on both provincial and national level will be developed as part of the Sino-Italian project and be integrated into the national replication program, most likely as a separate component.

Component 4: Disposal of Highly-Contaminated PCB Wastes in Liaoning Province (US$ 13,609,000)

23. This component will provide funding for the final destruction of highly contaminated PCB wastes (with PCB concentration greater than 500 ppm) collected from the storage sites in the Zhejiang Province. The PCBs will be disposed by incineration, utilizing an existing but not fully completed incinerator in Shenyang in the Liaoning Province. Construction of the Shenyang facility was initiated by the Chinese Government in 2002 in an effort to build domestic capacity to comply with the Stockholm Convention. The work has largely been completed on the core equipment, namely the rotary kiln, afterburner, tail gas cleaning system, wastewater treatment system, and workshops, at a cost of $5.8 million. The main activities under this component will be to (a) build a PCB waste storage facility; (b) support a waste characterization and analysis unit at an existing laboratory; (c) complete the rotary kiln incinerator in Shenyang to meet Stockholm Convention requirements, especially with respect to minimizing and monitoring dioxin/furan emissions; (d) dispose the highly contaminated PCB wastes transported from Zhejiang; and (e) provide training to technical personnel in the areas of PCB safe storage, PCB disposal operations, and dioxin/furan monitoring.

Component 5: Project Monitoring and Evaluation (US$ 135,000)

24. This component includes monitoring and evaluating project implementation. Specific activities would include: (a) integration of PCB information gathered from the project into the POPs management information system (POPs-MIS); (b) a workshop on the monitoring system designed for PCB management in Zhejiang Province; and (c) three annual workshops to review project progress.

Component 6: Design of a National Replication Program (US$ 304,000)

25. The objective of this component is to develop a program to disseminate the experiences gained in the Zhejiang Province through implementation of this project to the rest of China and worldwide. This will include (a) a national workshop for review of experience and lessons learned from the demonstration project; (b) development of a national replication program; (c) a national workshop to discuss the draft replication program, after which the replication program will be finalized; and (d) an international workshop for information dissemination.

5. Lessons learned and reflected in the project design

26. The project design draws upon the Bank's considerable experience in working with China on environmental issues, including those related to chemicals. The Bank has been working closely with China on implementation of the Montreal Protocol on ozone depleting substances and has used the experience gained and lessons learned in that program in designing this PCB management project. In addition, both China and the Bank have drawn valuable lessons from preparing and implementing ongoing POPs projects and these lessons have been taken into account in the preparation of this project. Finally, the Bank has drawn on the experience of PCB experts from Italy, Canada, US and UNEP in designing the project. Specifically:

a. **Comprehensiveness.** The project will support development and implementation of a comprehensive program for the identification and environmentally sound management and disposal of PCBs in the Zhejiang Province. This includes supporting the development at both the national and provincial levels of the necessary institutional and legal framework to ensure sustainability after the conclusion of the project.

b. **Country ownership and capability.** Implementation of the Montreal Protocol showed the importance of establishing a Project Management Office (PMO) to provide an anchoring point and a national advocate for each country's ozone layer protection program. Having a capable PMO has proven crucial for the successful implementation of the Montreal Protocol. Consequently, the Bank continues to emphasize helping China improve the capacity of SEPA's Convention Implementation Office (CIO), the office charged with implementing the POPs Convention in China. This has included

providing (through the Bank's Beijing office) extensive and continuing training to the CIO staff on project management, procurement and disbursement procedures, and the Bank's safeguard policies. CIO/SEPA currently has 12 professional and support staff working for 8 ongoing POPs-related projects.

c. **Coordination with related projects.** SEPA has demonstrated a strong commitment to combining all relevant activities under the four POPs-related projects that are currently being implemented. In addition, SPEA has built on its experience, both with ongoing POPs projects and with implementation of the Montreal Protocol, to determine the priorities of project components of this project. Relevant preparatory and base studies on institutional arrangements, policy options, and available disposal and treatment technology choices, as well as training and workshops, will be combined as appropriate for implementation to ensure the effective use of resources and to avoid overlap or duplication.

d. **Involvement of local stakeholders.** China has chosen to conduct demonstration projects at the provincial level to gain practical experience on how the Stockholm Convention can be implemented in a province, and on securing the active participation and support of the provincial stakeholders. China's past experiences with PCB management and disposal regulations have shown how difficult it can be to translate national policies and regulations into practice at the provincial level. The demonstration project will require development or revision of provincial regulations, policies and enforcement modalities, thus requiring active support on such practical aspects as obtaining needed provincial approval to recover PCBs from specific local sites. Consequently, the project design incorporates substantial provincial involvement, including, but not limited to, provincial supervision of the PCB storage sites, oversight of the environmentally sound PCB disposal, and coordination of local training. Furthermore, financial support by the participating provinces will be essential to the success of this project. Finally, but importantly, a provincial coordination group consisting of the main stakeholders will be established for implementing the project.

e. **Timely implementation of safeguard policies.** Some projects have encountered delays in environmental assessment and resettlement operations that affected compensation to affected individuals. To ensure that this does not happen here, the Bank operations team has included the Bank's safeguard policies in project discussions from the beginning of project preparation. The Team has similarly encouraged SEPA and local stakeholders to appoint responsible staff to monitoring preparation of the environment management plan (EMP) and the resettlement action plan (RAP).

6. Alternatives considered and reasons for rejection.

27. Seven alternatives were considered but rejected in favor of the proposed project design:

a **No action**. Consideration was given to leaving the PCBs in caves and buried containments undisturbed, and to allowing any in-use PCB equipment to continue in service without replacement or decontamination. This was rejected because of the threat to human health and the environment – both China's and globally – posed by the likelihood that many such sites are leaking PCBs already, and that the situation could only worsen if left unaddressed. In addition, China's obligations under the Stockholm Convention include identifying and ensuring the environmentally sound management of PCBs remaining in use.

b **Find, but leave in place**. Consideration was given to identifying the cave and burial sites but taking no further action. This was rejected because, as noted above, many sites are known to be leaking and it would be irresponsible to leave such confirmed and potential threats unaddressed.

c **Decontaminate high risk sites only.** Consideration was given to assessing the human and environmental risks at all sites but limiting decontamination to only the sites with high risk levels in the Zhejiang Province. This alternative was rejected for the following reasons:

i. The current condition and potential risks for PCB leakage and contamination can be evaluated only by opening each storage site. Since the level of effort and costs of properly evaluating risks at each site are a significant portion of the overall decontamination effort, it is more cost-effective to complete the site assessment and decontamination in a single operation than to do an assessment first and decontamination later, especially since the PCBs will ultimately have to be recovered from the temporary storage sites at a later stage anyway. In addition, it is important to note that the storage sites were designed for 3-20 year life, but are now approaching 25 years; some sites were not built to specifications (e.g., lacking liners) and are likely to leak in not so distant future, even if they are not leaking now.

ii. It may not be acceptable to the local population to open and inspect the sites without removing the risks for human exposure to PCB.

iii. Opening a storage site may compromise its integrity, making more likely that the site will leak even if it is not currently doing so. Any subsequent leakage and consequent contamination of the surrounding soil and water

will then create a large problem with correspondingly greater risks and cleanup costs beyond the additional costs of remobilization.

d **Recover and store**. Consideration was given to identifying and recovering the PCBs in caves and burial sites, recovering them, and putting them into safe storage. This was rejected because the potential for environmental harm could be exacerbated by collecting the PCBs into one or a few storage locations and leaving them vulnerable to being released by natural disaster, accident, or human failure.

e **Recover and send abroad for disposal**. Consideration was given to identifying and recovering the PCBs and shipping them for disposal in existing facilities overseas. This was rejected due to: (i) transporting considerable amounts of PCB wastes and other highly chlorinated wastes entails unacceptable risks and expenses, and is discouraged under the Basel Convention; (ii) the cost of incineration in European/North American countries ranges from USD 1,000 to USD1,500 per ton, excluding - at least - USD2,000 for transportation; (iii) the China's National Program on the Construction of Hazardous Waste and Medical Waste Disposal Facilities (issued December 2003) has clearly planned and begun the construction of domestic hazardous waste disposal facilities for hazardous waste and PCB; and (iv) the selected alternative will give China invaluable experience in the environmentally sound management and disposal of PCB and other hazardous wastes, including other POPs.

f **Build a new disposal facility in Zhejiang.** This was rejected because it will take time and substantial investment, thus will make the cost of project extremely high and the new incinerator will not be ready in 2 to 3 years.

g **Develop policy, management, and regulatory infrastructure, but no PCB recovery or disposal.** Consideration was given to focusing only on policy and regulation rather than inclusion of cleanup and disposal of all or part of PCB sites and wastes in this project. This was rejected because PCB accidents in Zhejiang have already aroused great concerns from the provincial government and the public. Consequently, failure to address the significant risks posed the already known PCB sites would be unacceptable to many stakeholders.

h **Inclusion of PCBs only in the power sector.** Consideration was given to including only PCBs in the power sector because it is believed that more than 90 percent of PCBs were in that sector. This was rejected because during the early stage of the survey being conducted under the Sino-Italian project, some PCB-containing transformers have already been found outside the power sector in Zhejiang and Liaoning, and it is estimated that there are many more such transformers yet to be identified.

C. IMPLEMENTATION

1. Partnership arrangements

28. **Financial partnerships**: The Global Environment Facility (GEF), as the interim financial mechanism for the Stockholm Convention, will provide most of the funding for the demonstration project. In addition, Bilateral Cooperation Parties (BCP), such as foreign governments, will be the financiers of the project, as will the Central Government of China and the provincial governments of Zhejiang and Liaoning Provinces.

29. **Coordination among international IAs, EAs and donors.** SEPA is the core agency to coordinate all POP activities in China. Relevant international IAs and EAs, as well as bilateral financiers will be invited to participate in periodical POP coordination meetings and be informed about the project implementation status, invited to advise on its design, and briefed on its implementation progress and impacts through a coordination mechanism. These measures will ensure adequate and continuing information exchange among IAs, EAs, donors, and domestic stakeholders in China.

30. **A technical coordination group** will meet formally twice a year to review project progress. The Group will be chaired by FECO/SEPA, and will also include the World Bank, UNIDO, UNDP, the Governments of Italy, Canada, and other interested bilateral development partners. It will also include UNEP, WHO and FAO, which, although not directly involved, are recognized as having important experience on POPs activities. SEPA will provide regular progress reports on all ongoing POPs activities and on proposed new activities to all the agencies. SEPA has already initiated such a consultative process in the context of China's National Implementation Plan, which is currently under development. The Bank will also keep the other agencies and bilateral partners informed of the ongoing work through regular updates. Figure 1 shows a general view of the partnership arrangement.

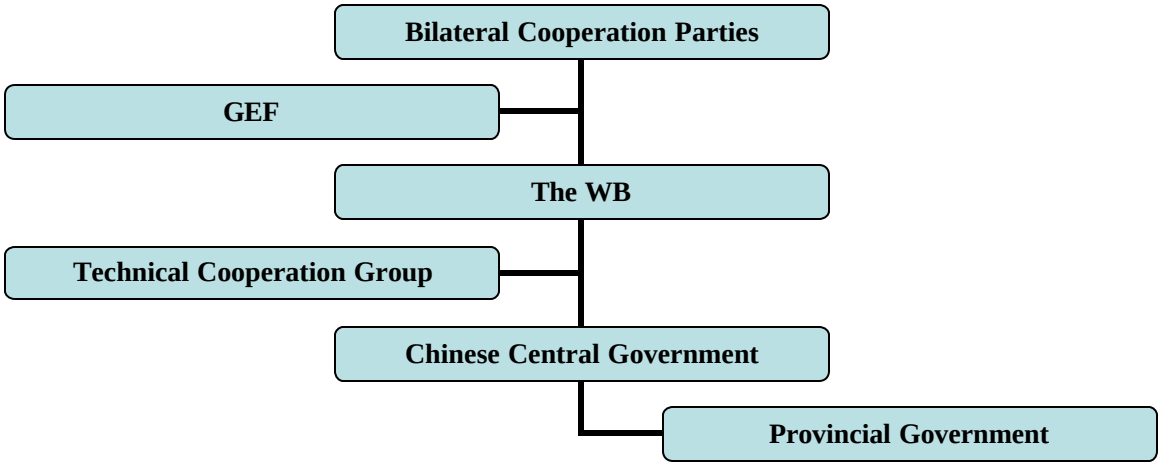


Figure 1. General view of the partnership arrangement

2. Institutional and implementation arrangements

31. **National implementation arrangements.** SEPA has been designated as the national lead implementing agency for all POPs activities and for implementation of the POPs Convention. All major national and local government, scientific institutions, and private sectors that are concerned with the elimination of PCBs in China will be involved in project implementation, and many have already been involved in its initial preparation. The stakeholders and their roles are:

a. **National Leading Group (NLG) for implementation of the Stockholm Convention.** China established the National NIP Development Leading Group in September 2003, with SEPA as the Lead Agency. The NLG provided overall guidance and coordination for the NIP development process at its Project Concept and Project Brief stages. This Group has become the National Leading Group for Implementation of the POP Convention after China ratified the Convention on August 13, 2004. It will provide (i) overall guidance to development of the NIP, (ii) review of significant policies related to POPs, and (iii) guidance to implementation of all POP activities. It consists of the following 11 agencies:

i. State Environmental Protection Administration (SEPA)
ii. National Development and Reform Commission (SDRC)
iii. Ministry of Foreign Affairs (MOFA)
iv. Ministry of Finance (MOF). MOF 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 Construction (MOCon)

x. General Administration of Customs (GAC)
xi. State Electricity Regulatory Commission (SERC)

b. **Convention Implementation Office (CIO)**. The CIO is part of Foreign Economic Cooperation Office (FECO) of SEPA. FECO is in charge of all bilateral and multilateral cooperation projects on environmental protection in SEPA. CIO is responsible for day-to-day compliance with the Stockholm Convention and its responsibilities for this project include (i) providing technical support to international negotiations and policy studies on the Stockholm Convention, (ii) providing support to the development and implementation of corresponding policy and regulations, as well as coordinating with key governmental stakeholders, (iii) screening, preparing and implementing Convention activities, (iv) raising co-financing (bilateral and domestic) for international collaborative programs, (v) preparing and submitting funding withdrawal applications to the Bank, and (vi) collecting data and information, preparing reports and organizing training, education, and information dissemination activities. As CIO is not an independent entity, FECO will represent SEPA to sign MOUs (see legal covenants under Section 6) with Zhejiang DADI and Shenyang Center respectively as well as other contracts for activities in the project.

c. **PCB Project Team in CIO.** The PCB project team will be in charge of the management and implementation of the proposed PCB project under the guidance of the CIO. Its responsibilities include (i) preparing TORs for activities under the project, (ii) reviewing project progress reports submitted by the local PIU (see below), (iii) managing project procurement and financial resources according to the Bank's procedures, (iv) organizing and convening project coordination meetings among stakeholders, and (v) reviewing project outputs. The PCB project team will seek technical support from various experts (a national expert group, including the chief technical advisor [CTA], national technical advisor [NTA] and other consultants) as necessary.

d. **National Expert Group.** This group includes the Chief Technical Advisor (an international consultant), the National Technical Advisor, technical/policy experts and experts on transformers, as described in the Annex 4. This National Expert Group will, in general, be responsible for:

i. Introduction of successful experience gained from this demonstration project to other countries;
ii. Assisting CIO in overall technical management and coordination of all project activities;
iii. Technical support to institutional strengthening, policy framework, PCB management and disposal, project monitoring and evaluation, and replication program development;

iv. Providing comments on project implementation progress at different stages;
v. Revision and improvement of the training material developed by the Canadian project on Capacity Building on PCB Management; and
vi. Providing consultation on transformer decontamination activities.

e. **Local Project Implementation Unit in Zhejiang (local PIU).** Zhejiang will establish a project implementation unit (PIU) to conduct day-to-day project management and coordination at the local level. The PIU's location, size and specific functions will be clearly defined in a TOR prepared by CIO/SEPA. The PIU will consist of staff from the Zhejiang EPB (two key centers: Zhejiang Environmental Monitoring Center and Zhejiang Solid Waste Management Center) and the Zhejiang Power Company. Its responsibilities will include (i) coordinating/organizing local training and seminars; (ii) overseeing operation of PCB management in Zhejiang; (iii) monitoring PCB sites after their cleanup and the PCB storage facility to be built in Chongxian for temporary storage of highly contaminated PCB wastes; (vi) participating in public awareness activities in Zhejiang and engaging in policy dialogue with agencies in the province; and (v) collecting information and preparing progress reports.

f. **Shenyang Hazardous Waste Disposal Technical Center.** The Shenyang Institute of Environment Science has cleaned up three PCB sites in Zhejiang in the past few years. It owns the rotary kiln incinerator which will be completed in 2005-2006 to dispose PCB wastes under the project. The rotary kiln incinerator is the designated PCB incinerator in China and is located in a waste management facility in Xinmin, Liaoning. In January 2005, the Shenyang Hazardous Waste Disposal Technical Center was established by Shenyang Institute based on the requirements of the National Plan on Construction of Technical Centers for Environmental Protection. All assets, including the rotary kiln PCB incinerator in the waste management facility in Xinmin, have been transferred to this Center by the Shenyang Institute. The Shenyang Center is an independent and state-owned company and it will obtain an official license from SEPA for PCB management and disposal. The official license will be issue according to the newly issued Regulation for the License of Hazardous Waste Management -- State Council Order #408 once the incinerator is formally commissioned by SEPA. Commissioning will include confirmation that dixion and furan emission meets the Stockholm Convention emission standards. SEPA has confirmed that this Center will have the only PCB incinerator in China in the foreseeable future. For this reason, it will be the contractor for PCB disposal in the project. Whether China will build a second PCB incinerator in the future will solely depend on experiences gained

in this demonstration project and the estimated total amount of PCB wastes that need to be disposed in China. The Shenyang Center will receive the highly contaminated PCB wastes (>500ppm) collected in Zhejiang and dispose of them according to Stockholm Convention requirements. It will also house, maintain and operate the PCB storage facility and the waste characterization unit. Howeve, these two units will not belong to the Shenyang Center at project completion, but to the Central Government and these two units will be used in the follow up National Replication Program.

g. **Hangzhou Dadi Environmental Protection Co. Ltd (DADI)**. Hangzhou Dadi Environmental Protection Co. Ltd. is the second waste management company in China which had experience in cleaning up PCB sites. The other one is the Shenyang Institute. DADI is also the 2nd designated PCB waste management center in the National Program for Construction of Hazardous and Medical Waste Disposal Facilities issued by the State Council in December 2003. Over the past ten years, Dadi has received continuous technical support from GTZ of Germany. It has in-house German technical staff helping it on all technical matters on waste management. SEPA has confirmed that Dadi will be the 2nd waste management company in China which will be granted an official license in handling PCB wastes, excluding final disposal as it does not have a PCB incinerator. For this reason, Hangzhou Dadi will be the contractor in this project to (i) recover PCB wastes from burial sites, remove, package, transport, temporarily store PCBs (including PCBs recovered from PCB transformers still in use) and PCB-containing equipment, (ii) treat contaminated soils (between 50 ppm and 500ppm), and (iii) decontaminate PCB contaminated transformers under the project. The PCB storage facility will be built within the Dadi facility and Dadi will operate and maintain this facility. The thermal desorption unit to be procured will also be operated and maintained by Dadi. However, these two units do not belong to Dadi at project completion, but belong to the Central Government as these two units will be used in the follow-up National Replication Program.

32. Figure 2 shows the framework of the institutional arrangements for the proposed project.

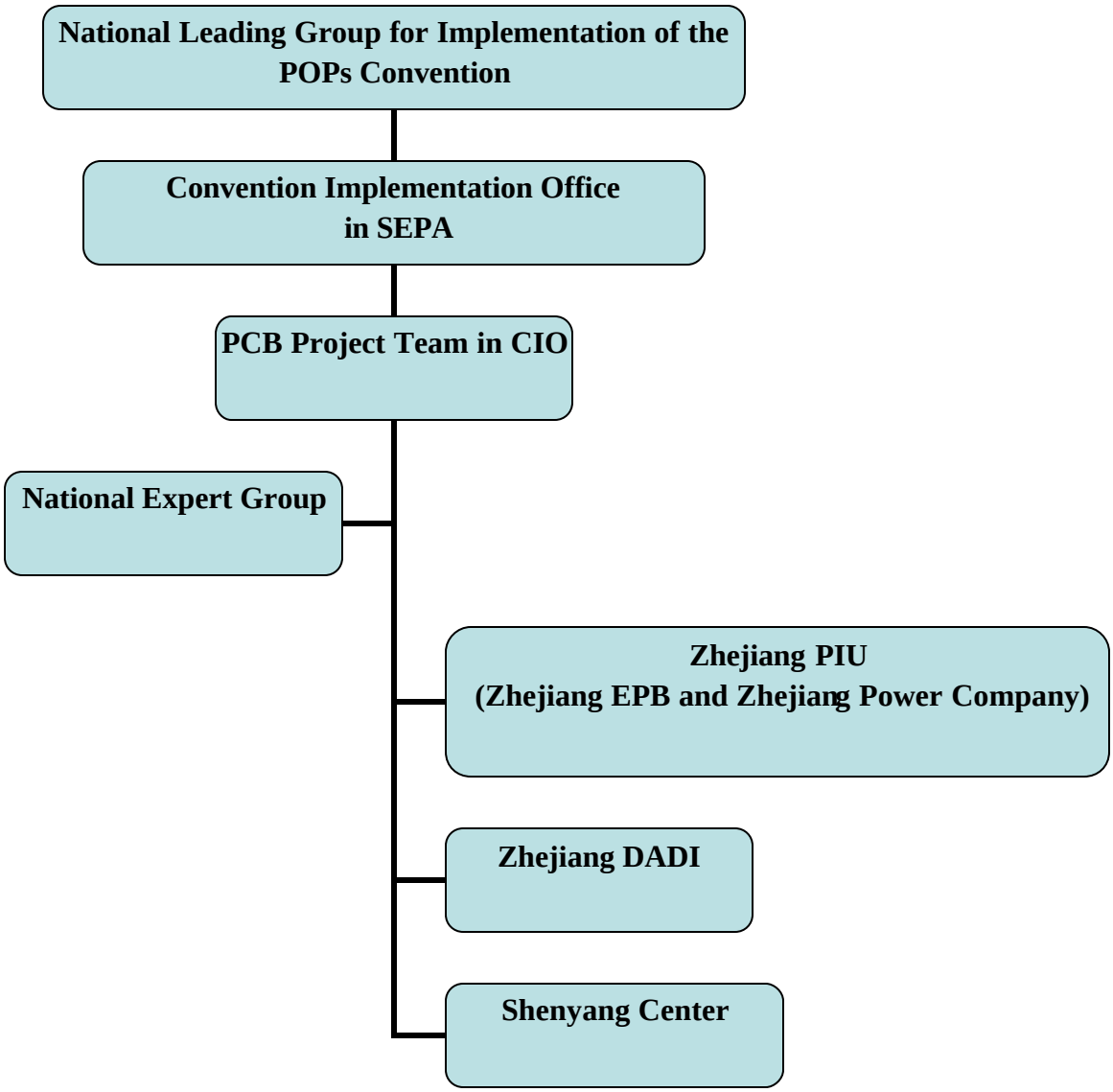


Figure 2. Framework of the institutional arrangements for the proposed project.

33. **Contractors for Consulting Services.** Private companies or government institutes, when necessary, will be selected through a competitive process to (a) prepare environmental impact assessment needed for the project, (b) monitor PCB sites after cleanup, and (c) undertake consultant services under the project.

34. **Involvement of Other Stakeholders.**

a. Enterprises that still have PCBs in service will be involved in implementing the project activity of decontamination of PCB transformers from the beginning.

b. The public at large will be involved in the project through education and public

awareness activities.

i. *PCB disposal in Shenyang.* This project will complete the rotary kiln incinerator under construction in the Shenyang Center, which would not require any relocation or additional land acquisition. When the facility started construction in 2002, its information was shared with local communities. Public acceptance of the site was assessed through a survey and a final agreement was signed.

ii. *PCB sites cleanup in Zhejiang Province.* The PCB site treatment in Zhejiang would require temporary land and tree acquisition as well as relocation of structures and tombs in some cases. The Zhejiang Province has developed a Resettlement Policy Framework to deal with the potential social risks (land acquisition and resettlement issue) to the public. The framework involves local governments, the affected villages, institutions and the affected households in the inventory of impacts and development of the compensatory packages. Site-specific resettlement plans will be prepared during project implementation.

iii. *Workshops and Training.* Institutional capacity building is a major component of the project which includes series of workshops and training. These training programs will be directed to key stakeholders in Zhejiang, including PCB management institutions (PIU, EPB, power companies), Hangzhou Dadi, environmental monitoring staff, and PCBs disposal operators in Shenyang.

c. Relevant international organizations and possible bilateral donors will be informed about project progress and invited to advise on its implementation.

3. Monitoring and evaluation of outcomes/results

35. Monitoring of project activities and evaluation of their results in the project will serve a dual function. First, it will facilitate tracking progress toward project objectives. Second, it will facilitate learning and generation of knowledge necessary for the preparation of the national replication program.

36. The monitoring indicators, developed specifically for the project and described in section B2 and Annex 3, reflect the project's focus on the environmentally sound management and disposal of PCBs, on reducing risks from PCBs wastes and PCB-contaminated sites, and on associated capacity building. The data for determining the value of the indicators will come from two main sources. First, they will come from PCB management and disposal operations using standardized project-wide technical guidelines and methodologies for data collection and quality assurance. The detail PCB inventory completed in the first year of project implementation will be a crucial

source of new data. The responsibility for data collection at this level will rest with the local PIU, with guidance and assistance from the PCB project team in the CIO/SEPA. Second, data will come from standardized monitoring and reporting designed by the PCB project team in the CIO/SEPA providing support services. The Zhejiang PIU will collect data from all contractors carrying out project activities (Annex 4) and report to the PCB project team in CIO/SEPA. Project managers, including PCB project team in CIO/SEPA and the Zhejiang PIU, will regularly review consolidated indicators to assess effectiveness of the project.

37. The World Bank is responsible for supervising the implementation of the project to ensure that financing is used only for the purposes intended, with due regard to project objectives, expected outcome, efficiency and economy. Bank missions will visit China at least twice a year for this purpose.

38. An annual meeting will be held to review project implementation with representatives from all project stakeholders. Progress reports will be distributed beforehand for review at the meeting.

4. Sustainability and Replicability

39. As a Party to the Stockholm Convention, China is obligated to identify, manage, and dispose of PCBs in an environmentally sound manner, and to eliminate its PCBs by 2028. The institutional and legal framework and technical capabilities put in place in Zhejiang through this demonstration will thus be needed throughout the country. The sustainability will be ensured by (a) involving all key stakeholders, including local participation from the beginning and throughout its implementation; (b) demonstrating the effectiveness of environmentally sound PCB management and disposal technologies and facilities; (c) supporting provincial and national capacity building; and (d) putting in place and demonstrating the mechanisms for effective enforcement of PCB management and disposal policies and regulations.

40. With ratification of the Stockholm Convention on August 13, 2004, China has officially made its commitment to take on the obligations of the Convention. Among those obligations is Part II of Annex A, under which China must take measures to manage and dispose of PCBs and PCB-containing materials according to the requirements of the Convention, thus ensuring that the products of this demonstration will be used nationally in the remaining provinces.

41. China is committed to begin the demonstration of environmentally sound PCB management and disposal in the selected province as soon as the necessary technical and financial support from the international community is provided in accordance with Articles 12 and 13 of the Convention.

42. This demonstration project will build upon other related and ongoing PCB projects. These include (a) development of a National Implementation Plan for the Stockholm Convention, being conducted by SEPA/CIO with the assistance of UNIDO and the GEF, (b) the ongoing Sino-Italian project titled "PCB Inventory Methodology and Draft Strategy on PCB Reduction and Disposal in China", and (c) a PCB management capacity building project financed by a Canadian Trust Fund. These activities have already provided useful information which has been used in the development of the demonstration project for Zhejiang Province.

43. China is committed to provide the counterpart funding for the GEF grant. As the national implementing agency of the preparation project, CIO/SEPA has obtained (1) a firm commitment of RMB 20 million counterpart funding from the local government of Zhejiang Province, and RMB 13 million from the Zhejiang power company (of total RMB 33 million, RMB 31.8 million is for the demonstration project, RMB 1.2 million is for the Sino-Italian project) and (2) a firm commitment of RMB 9.2 million counterpart funding from the Shenyang Center (not include in-kind contribution). The Central Government has also committed to provide RMB 8 million as counterpart funding for this project. Also Italy and Japan Government as well as USA EPA have provided written commitment letters in co-financing the demonstration project. The total bilateral donor contribution is USD 2.024m.

44. The National Leading Group for Implementation of the Stockholm Convention would play a crucial role in the sustainability and replicability of the project by providing overall guidance and oversight. A strong and effective Convention Implementation Office would ensure success of the project. Good cooperation between the central government and the local government and stakeholders will be at least as important. Institutional arrangements have been described above.

45. The project has been designed, and will be implemented, in the expectation that the experience gained in the Zhejiang Province will create a model for China's other provinces and that will be adopted at the national level. The approach makes this more likely by incorporating the active participation of national government, provincial government, local government, the private sector, and other stakeholders throughout its development and implementation.

46. The project further seeks to ensure replicability by including a specific component (Component 6) on promoting and disseminating projects results and lessons to the rest of China. As described earlier, Component 6 includes activities to encourage and facilitate technology transfer and information dissemination through programs of public participation, stakeholder involvement, and professional and community-based education and outreach. National, provincial and local governmental organizations, institutes and companies involved in this project will also

help ensure the dissemination of relevant information. Finally, the project's internet website will make its results widely available, as well as giving access to new information on PCB management and disposal issues.

5. Critical risks and possible controversial aspects

Risk	Rating	Risk Mitigation Measure
(a) Local governments may not continue to consider the problem of PCB wastes to be an important environmental challenge and therefore give lower priority to resolving problems during implementation.	M	(a) The SEPA/CIO will continue to make major efforts to raise awareness in the Zhejiang Province. Its active supervision and the full continuing involvement of Zhejiang stakeholders will mitigate this risk.
(b) Poor coordination among all national and international stakeholders, such as Chinese government, academia, industry and the public, as well as donors, GEF and the World Bank.	M	(b) China established CIO to harmonize interests and standpoints of different agencies. FECO has over ten years of experience in the management of projects and national programs. It also has wide experience in collaborating effectively with numerous Intergovernmental Organizations, bilateral donors and enterprises.
(c) Disposal technology not meeting performance requirements, resulting in unacceptably high emissions of dioxin/furan and other toxic chemicals.	M	(c) Selection of proven technology and equipment from recognized suppliers, provision of adequate training, and active supervision of the operation of disposal facilities will mitigate this risk.
(d) Public opposition to the disposal project.	M	(d) Public awareness raising and inclusion of all stakeholders in both project preparation and implementation will minimize the likelihood of this occurring.
(e) Failure to properly identify and find all PCB sites and equipment.	M	(e) Detailed inventories will be complemented by awareness campaigns to encourage the stakeholders and the public to disclose locations of PCB sites and equipment.
(f) PCB waste may accidentally leak during transport or during other stages, e.g., containment, packaging, temporary storage, etc.	H	(f) PCB transport or other operations will follow a strict, internationally acceptable protocol enforced as a part of regular project supervision. Key elements of the protocol, such as emergency response procedures and operator training are

Risk	Rating	Risk Mitigation Measure
		outlined in the environmental assessment and environmental management plan documentation and under description of Component 3 (Annex 4 of the Project Brief).
(g) The PCB site treatment in Zhejiang would require temporary land and tree acquisition as well as relocation of structures and tombs in some cases. There are potential social risks raised from PCB site cleanup.	M	(g) A site-specific resettlement plan will be developed during project implementation to address potential social risks to the public. The plan would involve local governments, affected villages, institutions and affected households in the inventory of impacts and development of the compensatory packages.

6. Loan/credit conditions and covenants

47. The following financial and environment covenants have been incorporated into the Grant Agreement:

a. Financial covenants –
   i. No withdrawals shall be made until the Bank have received:
      - A Memorandum of Understanding, satisfactory to the Bank, entered between SEPA and the Zhejiang provincial government indicating provincial commitment to support and provide necessary coordination and cooperation of all activities related to PCB cleanup under the project;
      - A Memorandum of Understanding, satisfactory to the Bank, entered between SEPA/FECO and Dadi for the supervision and monitoring of the implementation of the PCB storage facility and the thermo desorption unit; and
      - A Memorandum of Understanding, satisfactory to the Bank, entered between SEPA/FECO and Shenyang Center for the supervision and monitoring of the implementation of the PCB storage facility and the waste characterization unit.
   ii. No withdrawals shall be made on any expenditures on PCB cleanup activities until the Bank receives an official license authorizing DADI to handle PCB wastes.
   iii. No withdrawals shall be made on any expenditures on PCB disposal activities until the PCB incineration facility has been commissioned by

SEPA and SEPA has issued an official license authorizing the Shenyang Center to use the PCB Incineration Facility for PCB disposal.

b. Environment covenants - The emission of dixion and furan from the PCB incineration facility shall not exceed 0.1ngTEG/Nm^3 from the PCB incinerator of the Shenyang Center at all time.

48. The following are conditions for Grant effectiveness.

a. A Project Implementation Manual, cleared with the Bank, has been adopted by SEPA; and
b. A financing management manual for the project, cleared with the Bank, has adopted by SEPA.

49. Dated covenants and conditions applicable to project implementation are:

a. By April 30, 2006, Dadi through SEPA/CIO shall send a plan to the Bank on the operation and maintenance of (a) the PCB storage facility in Chongxian, and (b) the thermal desorption system to be used for the treatment of low contaminated PCB soils.
b. By April 30, 2006, Shenyang Center through SEPA/CIO shall send a plan to the Bank for the operations and maintenance of (a) the PCB storage facility, and (b) the waste characterization unit.
c. By April 30, 2006, SEPA/CIO will send to the Bank a plan, prepared in accordance with the agreed TOR, for the safe transportation of PCB wastes: (i) from the PCB storage sites to the PCB storage facility in Chongxian, Zhejiang province, and (ii) from the Chongxian PCB storage facility to Shenyang Center in Xinmin, Liaoning province.
d. By February 15 and August 15 of each year, starting on August 15, 2005, CIO will send a semi-annual progress report to the Bank with detail project implementation status based on agreed format with the Bank, and a financial management report on uses and sources of funds for the project.

D. APPRAISAL SUMMARY

1. Economic and financial analyses

50. The demonstration project is essentially contributing to local and global public good by reducing the risk of contaminating the environment through releases of PCBs, a persistent organic pollutant. Typical economic or financial analysis is thus difficult and problematic at best. While it may be theoretically possible to apply cost-benefit analysis to the process, the lack of reliable base data and the controversial aspects related to the valuation of human life make such an analysis impractical. It is

nonetheless clear that the benefits from reducing damage to the environment and to human health from releases of PCBs will substantially exceed the costs associated with implementing this project. In addition, the project will seek maximum cost-effectiveness in all of its interventions, and it will use risk reduction as the criterion to prioritize among the PCB sites being addressed.

2. Technical

51. Estimates of PCB wastes for the Zhejiang province are to cover all PCB capacitors and transformers buried in temporary PCB storage sites. The PCB inventory identified under the Sino-Italian project includes 43 confirmed PCB sites (Table 4, Annex 1), with an additional 18 suspected. The total estimated sites in Zhejiang are 61 sites. The overall estimated amount of 22,500 PCBs capacitors, 2,000 tonnes of highly contaminated wastes, 20,000 tonnes of less contaminated wastes (mostly soil), and about 78 (still to be confirmed) of older in-use large PCB transformers are likely underestimates of actual totals. This estimation does not include transformers installed after 1980 and still in use that may be contaminated with PCBs; or those out of service PCB transformers which are stored at backyards or warehouses of their owners.

52. In China, PCB wastes are mainly PCB contaminated soils. The amount of contaminated wastes requiring removal has been estimated using a concentration threshold of 50 ppm (in soil) as a maximum level above which cleanup is necessary. This threshold is based on the Chinese GB13015-91 Standard on Pollution Control of PCB Wastes. It also corresponds with the definition used by the Basel Convention, which defines as "hazardous wastes" those "wastes, substances and articles" which contain PCBs "at concentration level of 50 mg/kg. Similarly, the Stockholm Convention identifies three levels of concentration at which PCBs are a concern, the lowest of which is 0.005 percent. Both of these thresholds convert to 50 ppm. However, the cleanup action level for each site will be based on the actual risks at the site and the future use of the cleaned PCB sites. The applicable international standards will be used in case of no relevant national standards.

53. **PCB destruction technologies**. The analysis of the technologies to be utilized for the destruction of PCBs for the project included: (a) considerations of the availability of a PCB incinerator under construction in Shenyang and China's domestic PCB disposal experience; (b) a review of available PCB destruction technologies; (c) China's National Program for Construction of Hazardous and Medical Waste Disposal Facilities; and (d) the PCB situation in China and in the demonstration province.

54. The analysis of international experience and technical literature shows that high temperature incineration continues to be the most widespread, accepted, and proven technology for the destruction of high concentration PCBs wastes, capable of achieving a destruction and removal efficiency (DRE) greater than 99.9999%, and limiting dioxin and furan concentrations in the flue gases to well below 0.1ng TEQ/Nm^3. Achieving these standards requires continuous monitoring of environmental and process parameters, careful management, and suitable supplementary methodology for the final disposal of ashes that, in some cases, may contain organic or inorganic pollutants. This expertise in operating rotary kiln incinerators is well established in China.

55. Considering the large amount of PCB wastes expected to be found in the Northern provinces, it makes economic sense to complete and use the new incinerator in Shenyang rather than establishing a new PCB disposal facility in Zhejiang, deploying an alternative technology in China or shipping to and using existing incinerators in European or North American countries. Based on cost information from other project, it is understood that the cost of incineration in European/North American countries ranges from USD 1,000 to USD1,500 per ton, excluding transportation which costs up to USD2,000/ton for PCB. Any trans-boundary shipments of PCB would be in the context of the Basel and Rotterdam Conventions. Shipping hazardous wastes across national borders and oceans would add additional risk to the project. Looking over the timeframe of the entire PCB program in China, it cannot be guaranteed that such trans-boundary and transoceanic shipment would be allowed.

56. Construction by the Shenyang Hazardous Waste Disposal Technical Center of a new state of the art rotary kiln incinerator with a capacity of 15 tonnes per day for PCB wastes is nearing completion in Xinmin near Shenyang. The plant has been designed to meet all applicable Chinese regulations and standards. The project will use it to dispose PCB wastes transported from Zhejiang. The Stockholm Convention, however, requires capabilities not included in the plant's current design, particularly with respect of minimizing emissions of dioxins and furans. These features include (a) a pre-treatment system for PCBs wastes or flue gas cleaning system for fulfilling the PCDD/PCDF values for BAT, generally lower than 0.1ngTEQ/Nm^3, (b) a central control unit, (c) an online monitoring unit, and (d) a dioxin emission monitoring unit.

57. As noted above, an undetermined number of PCB-contaminated transformers are likely to be identified through China's ongoing PCB inventory process. The potential cost and disruption involved in replacing such transformers argues for decontaminating them and continuing using them through their normal expected lifetimes. Consequently, the demonstration project includes testing a suitable

technology for decontaminating PCB transformers and decontaminating some large PCB transformers installed before 1980 in Zhejiang.

58. On the basis of the above, the proposed technologies for the project are:

a. Shenyang rotary kiln incinerator. The incinerator will be completed to allow for the treatment of highly contaminated PCB wastes (>500 ppm) to meet Stockholm Convention standards. Pretreatment for the incinerator will be designed to allow separation of the high concentration PCB stream (principally PCB oil) and a low concentration PCB stream (principally shredded material contaminated by PCB). The other four key technical units (waste pretreatment and crusher unit, central control unit, online monitoring unit, and dioxin emission monitoring unit) will be added. Upon completion, the incinerator would attain a DRE for PCBs of 99.9999%; and dioxin concentration in the exhaust gas of <0.1TEQng/Nm^3.
b. Decontaminate PCB-contaminated transformers through dehalogenation, regeneration and recovery of the contaminated oil. A small-scale mobile plant for evaluating the selected technology will be rented in order to gather data on its environmental performance and operating costs. The recovered PCB contaminated oil will first be shipped to the PCB storage facility in Zhejiang and later to the disposal facility in Shenyang.

59. The project refers to disposal standards for PCB and dioxin/furan emissions set by the Stockholm Convention. However, it is noted that these standards are not yet fully established, i.e. the outcome of the BAT/BEP group as well as the Basel Convention Group on POPs Disposal will be discussed in May 2005 at POPs/COP1. The outcome of the discussion and guidance given by COP1 (e.g. on maximum levels and BAT/BEP) will be fully taken into account during project implementation, especially when developing the national replication program for PCB management and disposal in China.

60. **POPs disposal centers.** Based on the National Plan on Hazardous Waste and Medical Waste Management issued in December 2003 by the State Council, China intends to have a hazardous waste disposal facility in each province. The Plan specifies, however, that POPs may go only to the hazardous waste disposal centers in either Shenyang and Hangzhou (Zhejiang), with the Shenyang Center covering the northern provinces, and the Hangzhou Center covering the southern provinces. Hangzhou does not currently have the capacity to dispose POPs, and can only handle PCB wastes from identification and recovery to shipment for final disposal.

61. After completion of the PCB incinerator in Shenyang Hazardous Waste Disposal Technical Center, it is expected to handle all PCBs from the northern provinces. Shenyang incinerator is not only for disposal of PCB wastes from Zhejiang but also for those from other provinces in the country. In the longer term, it will be

less cost effective to send abroad. If warranted by the results of the national inventory and experience from this demonstration project, China may consider establishment of a PCB disposal facility in Hangzhou.

62. **Mobile thermal desorption unit.** With respect to contaminated soils, thermal extraction is believed to be the only on-site process allowing at least a limited preservation of the original properties of soils, thus allowing subsequent return of the de-contaminated soils to its original location. The same process can be used to treat also soils contaminated by hydrocarbons, by other chlorinated compounds and by pesticides.

63. Thermal desorption is a mature technology commercially used in developed countries for decontaminating soil from hazardous wastes, including PCBs. The thermal desorption unit to be procured under this project for the treatment of PCB contaminated soils in Zhejiang will include the appropriate design and operating conditions to ensure compliance with standards. The thermal desorption unit will be equipped with the treatment systems for the treatment of the flue gas and wastewaters resulting from condensed gases.

64. A mobile thermal unit is intended to decontaminate the soil around the sites in the project. In the first year of project implementation, a feasibility study will be conducted after site characterization to evaluate different decontamination technologies, including whether a fixed or mobile thermal desorption unit would be the most cost effective solution for the project, taking into account the national replication program. If the feasibility study concluded that a fixed unit is more cost effective and practical for the project, a fixed unit will be selected. After the selection is made, and prior to procurement, an EA will be prepared for approval by Chinese authorities and clearance by the Bank.

65. The thermal desorption technology to be supported by GEF could also be for PCB disposal in other provinces in the national replication program. While it is possible that a few more mobile units (if that is the conclusion of the feasibility study) could be needed for the full replication program, such a determination can be made only after completion of the PCB inventory and after China has gained sufficient experience from this demonstration project.

66. **Process for PCB management and disposal.** China has developed a process on PCB management and disposal to provide technical guidance on PCB management in Zhejiang and PCB disposal in Shenyang. Component 2 of the Project will further develop specific procedures and requirements through developing the technical guideline for PCB management and disposal. The process for PCB management and disposal includes the following steps:

a. *Environment characterization and risk assessment of each PCB site.* This entails investigating each site in detail to determine the extent of site contamination, potential leakage, potential health and environmental impact based on surrounding areas, e.g., risk of contamination of farm land, housing areas, ground water, rivers, reservoirs, etc. This is referred to in the project as site characterization and will be used in the risk assessment to determine priority for PCB recovery and site cleanup.

b. *Infrastructure construction for PCB management and disposal.* This includes (i) establishment of a storage facility in Zhejiang for temporary storage of PCB wastes before transportation to the Shenyang disposal facility, (ii) establishment of a storage facility in Shenyang for storage of PCB contaminates to be shipped from Zhejiang, (iii) completion of the PCB disposal incinerator to meet the minimum standard for PCB disposal under the Stockholm Convention, and (iv) training of personnel for handling excavation, transportation and site and storage management.

c. *Implementation of PCB cleanup.*

   i. Once the decision has been made to include given sites in the annual work plan, data from those sites will form the basis for contracts for PCB recovery and site cleanup,
   ii. Contractors will recover PCBs and PCB contaminants from the sites, and based on level of PCB contamination, decide whether the contaminants can be cleaned up by the mobile unit or have to be sent to Shenyang for final disposal, and
   iii. Transportation of PCB contaminants within Zhejiang and from Zhejiang to Shenyang.

d. *Evaluation of PCB cleanup results.* After finalizing the PCB recovery at the sites, independent verification will be conducted verifying that the sites have met required environmental standards. The sites will be monitored for one year after PCB site cleanup to ensure that the sites do not constitute a future risk.

e. *Decontamination of PCB transformers.* Recover of PCB containing oil from remaining PCB transformers in the province and decontaminate these transformers. The recovered PCB contaminated oil will first be shipped to the PCB storage facility in Zhejiang and later to the disposal facility in Shenyang.

f. *Disposal of PCB wastes in Shenyang.* Dispose all highly contaminated PCB wastes at the Shenyang disposal facility.

g. *Supportive capacity building and policy framework establishment.* Conduct capacity building activities and establish effective policy framework.

3. Fiduciary

67. The assessment of the China's fiduciary capacity consists of the following: (a) country self-assessment of the financial management and procurement practices following the Bank guidelines; (b) assessment by a Bank-accredited Financial Management Specialist and Procurement Specialist from the Bank; and (c) synthesis of the two assessments at appraisal and agreement on any necessary financial management and procurement capacity strengthening.

68. A procurement capacity assessment of the implementing agencies was carried out in October 2004 and updated in December 2004. The assessment has concluded that the overall risk of the procurement process is average. The agencies involved have allocated adequate resources including experienced staff to implement the project. Needs for strengthening the procurement capacity of the agencies have been identified, and accordingly an action plan has been discussed and agreed during the assessment. This includes training workshops, and preparation and dissemination of sample procurement documents, staffing plan for project implementation, etc. A procurement plan for the whole project period has been discussed and agreed with Bank team.

4. Social

69. The project is expected to have significant social benefits by reducing public health risks associated with the release of PCBs. This benefit will materialize in the Zhejiang Province with the planned cleaning of PCB sites and disposal of PCB as well as contaminated materials in the project. The planned design of a national replication program based on this demonstration experience in Zhejiang will further extend this benefit to the other provinces in China.

70. Possible social risks may be associated with public exposure to contaminated sites, buildings and water supplies during the site cleanup in Zhejiang and transportation process, as well as the site location of the disposal facility in Shenyang. The social impacts of the Zhejiang and Shenyang components are assessed separately. The Shenyang PCB Waste Disposal Facility is built at a developed site on a state forest farm. This site was selected and established in 2002. Its selection followed a consultative process with various stakeholders, including local governments, related institutions and local communities. The facility information was shared with local communities. Public acceptance of the site was assessed through a survey and a final agreement was signed. The site required about three hectares of forest land. The acquisition process and all payment were completed in early 2002. The PCB incineration would not require any relocation or additional land acquisition. The

Shenyang Municipality has conducted a review of the land acquisition process and submitted to the Bank.

71. The PCB site treatment in Zhejiang would require temporary land acquisition as well relocation of structures and tombs. The general locations of the PCB burial sites have been identified and the exact locations will only be known after further field work. Impacts related to the site treatment will only be known when the treatment design is completed. Therefore, the Zhejiang Province has developed a Resettlement Policy Framework to deal with the possible land acquisition and resettlement issue and has submitted it to the Bank. Site-specific resettlement planning will be prepared during project implementation. The planning would involve local governments, the affected villages, institutions and the affected households in the inventory of impacts and development of the compensatory packages.

72. These risks are minor compared to the overall expected benefits. They have been carefully considered through compliance with high technical standards, effective communication with the local residents, and involvement of all stakeholders in the potentially controversial aspects of the project. The participatory mode used for project preparation, and full involvement of local stakeholders, will continue during project implementation.

5. Environment

73. The project is essentially an extensive cleanup of PCB sites and equipment which will bring substantial environmental benefits, both locally and globally by eliminating currently uncontrolled PCB releases to the environment. The project does, however, carry some inherent environmental risks, specifically as related to possible PCB leakage resulting in contamination at storage/burial sites, the recovery of stored PCB capacitors from excavated sites, transporting highly contaminated PCB wastes from Zhejiang to Shenyang, and from the excavated sites to temporary storage in Zhejiang. These risks are mitigated by the improved PCB management system (from identification to final disposal) which the project is designed to demonstrate.

74. Environmental Management Plan (EMP) have been developed as part of the EA preparation which specified detailed mitigation measures (remediation of PCBs sites, transportation, temporary storage and treatment/destruction of PCBs waste, as well as emergency response measures), environmental monitoring plan during implementation of PCBs management and disposal process, institutional coordination and capacity building, implementation schedule and cost estimates. A series of PCB management workshops for government authorities and for waste management companies have been built into the project and will be conducted prior to PCB recovery to ensure that PCBs wastes are handled properly. The project will strengthen

the current environmental policy and regulatory framework on handling PCB wastes. All risks have been carefully reviewed during project preparation.

75. In addition to the two EAs that were prepared during project preparation (Zhejiang EA and Shenyang EA), three other EAs will need to be prepared during project implementation. These additional EAs are as follows:

a. *EA for the PCB storage facility to be constructed in Zhejiang.* When the site for building the PCB storage facility is selected, an EA needs to be prepared for the Chinese authorities and the Bank's clearance before its construction.
b. *EA for the PCB storage facility to be constructed in Shenyang.* When the site for building the PCB storage facility is selected, an EA needs to be prepared for the Chinese authorities and the Bank's clearance before its construction.
c. *EA for the thermal desorption unit to be used for soil decontamination in Zhejiang.* An EA will need to be prepared for the selected thermal desorption unit, after the PCB site characterization efforts in Zhejiang have been concluded. The relative weights of fixed versus mobile thermal desorption unit should be analysed in the EA to select the lower cost option. The EA will need the Chinese authorities and the Bank's clearance before its purchase and application.

6. Safeguard policies

76. The project triggers Operational Policy 4.01 on Environmental Assessment (EA) and Operation Policy 4.12 on Involuntary Resettlement. The key safeguard issues are associated with potential environmental and social impacts from dealing with highly toxic chemicals and remediation of contaminated sites. The project's environmental impacts are assessed in an Environmental Assessment (one for Zhejiang and one for Shenyang) and their mitigation is outlined in an Environmental Management Plan. The project's social impacts are assessed and their mitigation is outlined in a Social Management Framework. Annex 10 discusses more specifically how the project will ensure compliance with the safeguard policies and the World Bank Disclosure Policy.

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[X]	[ ]
Involuntary Resettlement (OP/BP 4.12)	[X]	[ ]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[ ]	[X]

Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[X]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[X]

7. Policy Exceptions and Readiness

77. The PCB Demonstration Project does not require any policy exceptions. The project is ready for implementation.

* *By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*

Annex 1: Country and Sector or Program Background

CHINA: PCB Management and Disposal Demonstration Project

PCBs in China

1. Polychlorinated Biphenyls (PCBs) are one of the twelve persistent organic pollutants (POPs) to be eliminated under the 2001 Stockholm Convention. PCBs' harmful effects on human health and the environment are well documented, and include developmental and behavioral disorders in children and disruption in the endocrine and immune systems. Recently, PCBs were deemed to be carcinogen, and potential cancer growth accelerator. Research has also linked PCBs to reproductive failure and suppression of the immune system in various wild animals, such as seals and mink. Finally, PCBs are toxic to fish, killing them at higher doses and causing spawning failures at lower doses.

2. **PCB production.** China began to produce PCBs in 1965 and stopped in early 1974, using them mainly in electrical equipment and as an additive in paint. The total production amounted to about 10,000 tons, including 9,000 tons of trichlorobiphenyl (PCB3) and 1,000 tons of pentachlorobiphenyl (PCB5). Figure 1 below summarizes the general information on the production, use, import and export of PCBs in China.

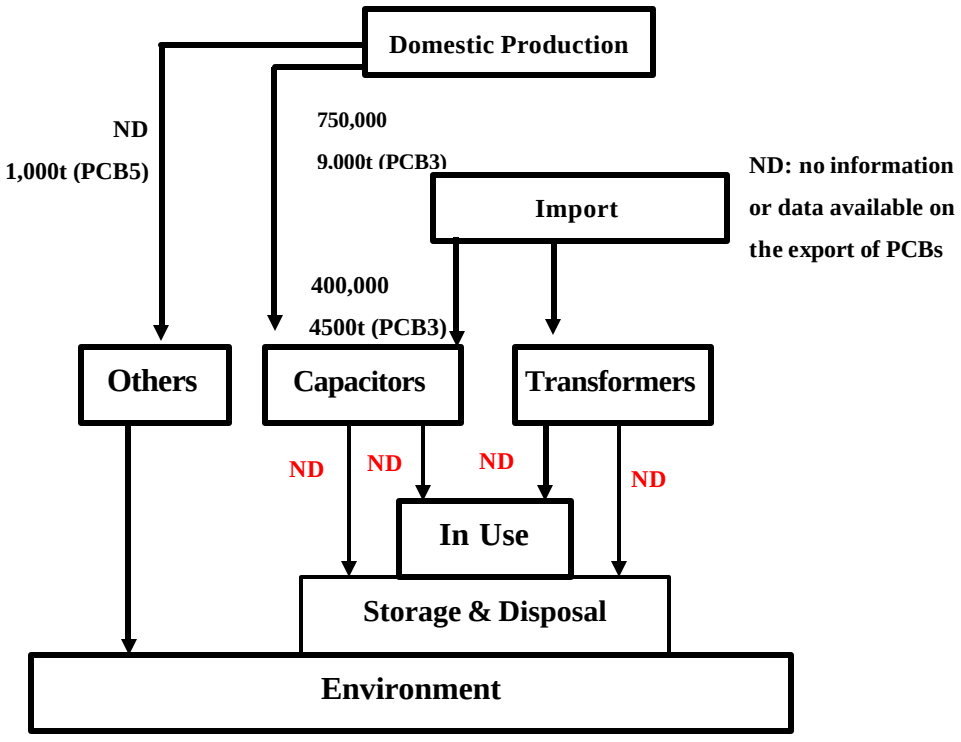


Figure 1: The Production, Use, Import, Export and Storage of PCBs in China

3. **PCB producers.** Historically, there were only three PCB producers in China. Detailed information on PCB production is not available due to staff departure and missing records. A brief overview of the three PCB producers is given below:

a. Xi'an Chemical Plant. This is a medium size chlor-alkali plant producing caustic soda, chlorine, HCl, Calcium carbide and VCM/PVC etc. In the 1950s, the most important Chinese manufacturer of electric power capacitors, designed by USSR engineers, was located in Xi'an. PCB oil was supplied from USSR. However, in the 1960s, due to political reasons, import of the PCB oil from USSR was not allowed. The Xi'an Chemical Plant started production of PCBs from 1965 to meet demands of capacitor producers in Xi'an. On March 9, 1974, the former Ministry of Machine of China issued a Ban of Production of PCB Containing Electric power Capacitors [(74) Yi-Ji- Dian No 226]. Xi'an Chemical Plant then stopped production of PCB oil. As of today, this plant still exists and produces other chlor-alkali products.

b. Jiangsu Suzhou Solvent Plant. Up to the 1990s, this enterprise was the only chemical plant producing diphenyl (biphenyl). Biphenyl is mainly used as a high-temperature heat transfer medium, which is commonly used in production of many chemicals. It is also the raw material for the production of PCB. This enterprise was in a good position to produce PCB to satisfy the demand in the eastern area of China, including the demand from a manufacturer of electric-power capacitors in Jiangsu Wuxi. The time of the start and end of the PCB production may be similar to Xi'an Chemical Plant. The enterprise produced many types of solvents and plasticizer of phthalate series. The enterprise has been merged to Jiangsu Chemical Pesticide Group Company.

c. Shanghai Electro-chemical Plant. This enterprise was the first chlor-alkali plant in China. Originally, the enterprise was named Tianyuan Electro-chemical Plant. Now, it is called Shanghai Chlor-alkali Co. Ltd. and belongs to Tianyuan Group Company. It produces CFC-12, CR and CTC.

4. **PCB use.** PCB5 oils were mostly used in a wide variety of open systems, such as in oil paints and exterior dopes. While some wastes may remain at production or formulation facilities, it is reasonable to assume that most of this material has been released into the environment.

5. PCB3 was principally used in manufacturing capacitors that were used in the electric power supply industry. An estimated 11 kg of PCB3 was used in each capacitor and, based on a production of 9,000 tones, it is estimated that about 750,000 PCB-containing capacitors were produced in China. Production of PCB containing capacitor in China stopped in 1975. Estimates based on the installed transmission capacity in China in 1975 indicate that 1.15 million capacitors would have been

required, suggesting that as many as 400,000 PCB-containing capacitors were imported into China. If this estimate were correct, then an estimated 4,000-4,500 tones of PCB3 oils would have been imported with this equipment so that a total of 13,000-13,500 tones of PCB3 would have been introduced into China as a result of the manufacture and import of capacitors. Figure 2 shows the distribution of PCBs used in China.

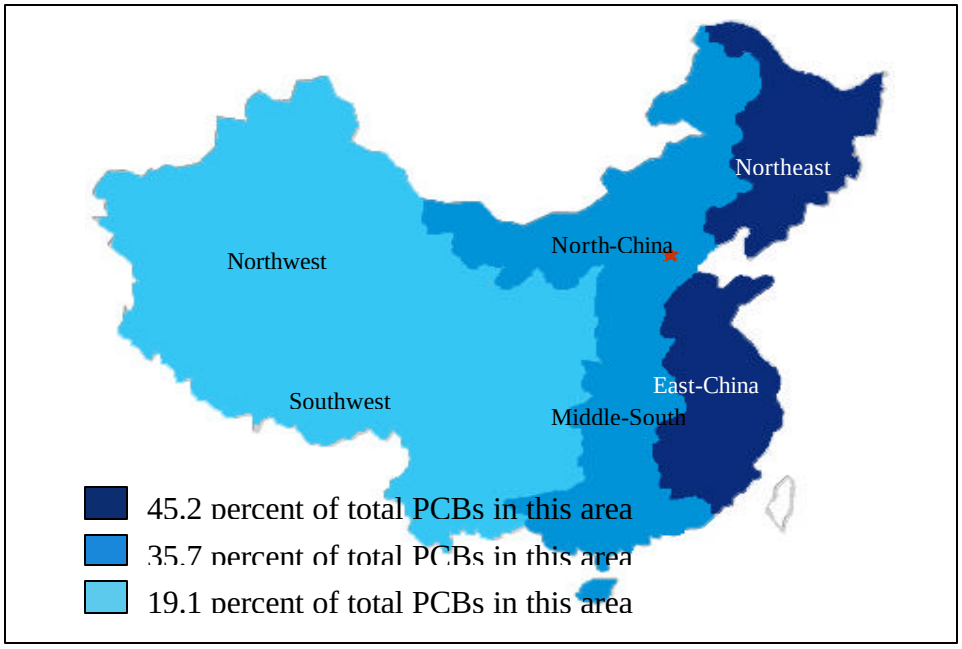


Figure 2: Distribution of PCBs Used in China

6. While China never produced transformers containing PCB oils, an unknown number were imported. Thirty PCB-containing transformers have so far been found and disposed of, but there is no basis on which to estimate how many PCB-containing transformers may remain in China, either in service or in storage for disposal.

7. Since the lifetime of capacitors made in China is estimated to be 15 years, it follows that most of the 1.15 million PCB-containing capacitors have now been retired from service. Some specialized transformers were imported into China in the 1970s and 1980s and their lifetime is expected to be 25-40 years. Therefore approximately 1 million capacitors and an unknown number of transformers are in storage and disposal sites throughout China.

8. During the 1980s, pieces of electrical equipment taken out of service were collected at temporary storage sites prior to disposal in accordance with the

requirements imposed by relevant Ministries. A maximum storage time of 3-20 years was set, after which obsolete equipment was to be placed in caves or dedicated concrete-lined landfill facilities.

9. Surveys and investigations conducted in recent years indicate that discarded PCB-containing equipment remains in some temporary storage facilities. Few of the sites were recorded on files and many of those for which file details have been found are no longer marked on the ground. Identification of these sites will, therefore, be a time-consuming and costly task.

10. In addition, many disposal sites have exceeded or are approaching their design lifetime of 20 years. Investigations at some of these sites indicate that they are leaking PCBs into the surrounding environment. Thus, measures to address such problems must be taken as soon as possible.

11. China signed the Stockholm Convention on May 23, 2001, and ratified it on August 13, 2004. As a Party to the Convention, China's obligations include eliminating the use of PCBs in equipment by 2025 and pursuing "the environmentally sound waste management of" of PCBs and of equipment containing PCBs "as soon as possible, but no later than 2028."

12. The Chinese government has attached great importance to POPs issues and made substantial efforts toward their reduction and elimination. These efforts include:

a. The Convention Implementation Office (CIO) in China was set up on April 15, 2003, in Foreign Economic Cooperation Office (FECO) of State Environmental Protection Administration. The Office has integrated the POPs-related work of several departments of SEPA, namely the International Cooperation Department, Pollution Control Department, Science and Technology Department, Programming Department, and the Foreign Economic Cooperation Office, and is responsible for organizing and coordinating all POPs measures and activities in the country. Under CIO, a Special Joint Working Group on PCBs, with members mainly from SEPA and SERC, was established to coordinate and organize all activities on PCBs;
b. In November 2003, China established the Leading Group for China NIP Development (LG) with SEPA as focal point and with membership from 11 administrations and ministries of the State Council: SEPA, National Development and Reform Commission, Ministry of Foreign Affairs, Ministry of Finance, Ministry of Commerce, Ministry of Science and Technology, Ministry of Agriculture, Ministry of Health, Ministry of Construction, General Administration of Customs and State Electricity Regulatory Commission. The Convention Implementation Office in FECO/SEPA is in charge of the day-to-day management of all POP activities in China.

c. CIO has set up the POPs Expert Panel, with noted experts from scientific research institutions, universities, and colleges, to provide advice on the formulation of strategy and its follow-up implementation activities;
d. With the support of Italian government, CIO has organized the expertise needed for development of a PCB inventory methodology and a national strategy on PCB reduction and disposal;
e. Canadian government has also supported: (i) a series of 6 workshops in public awareness activity, (ii) a PCB management workshop and manual development, (iii) a toxicity study, and (iv) a termite study.

PCB Management in China from 1974 into the future

13. Prior to the PCB pollution accident in Zhejiang in the late 1980s, China's PCB management efforts focused principally on PCB-containing electrical equipment remaining in service and on the sealing up of retired PCB-containing equipment. The Administration of Power of China was the main administration agency. China's institutional reform included disbanding the Administration of Power and PCB management was taken over by SEPA after 1990.

14. PCB management in China has the following stages.

a. **Stage I (1974-1990): Production ended and PCB equipment stored**. China stopped production of electrical equipment containing PCBs and prohibited the import of such equipment in 1974. In 1980s, China decided to take some PCB equipments out of service and stored them temporarily underground, in caves or at sites of users.
b. **Stage II (1990-1998): Initial Regulation of PCB electric equipment and wastes**. These include --
    i. Severe PCBs contamination events in Zhejiang in the late 1980s helped prompt China to issue clear regulations on collection, storage, transportation, treatment, disposal, and import of PCBs and PCB-containing electrical equipment, starting with "*Circular on Strengthening Administration on Abandoned Polychlorinated Biphenyl Power Capacitors* [Huanguan (1990) 004]," and "*Regulations on Prevention of Environmental Pollution of Electrical Equipment Containing Polychlorinated Biphenyl and its Wastes* [Huanguan (1991) 050]." These regulations continue to be China's main laws and standards on PCBs.
    ii. During this stage, China also carried out a preliminary investigation on PCB electrical equipment throughout the country and built a pilot hazardous waste incineration facility with a capacity of 1 ton/day in Sujiatun, Shenyang, in 1995. Total investment was about 4,800,000 RMB. As of April 2003, this pilot facility has disposed about 1000 tons

of PCB wastes collected from Shenyang and other provinces. After November 2003, this facility was no longer in use because of its poor emission control of environment pollutants raised from wastes incineration. China will dismantle it in 2005.

c. **Stage III (1998-2004): Control of PCBs as hazardous wastes and different activities related to the Stockholm Convention.** These include --

i PCBs wastes were listed formally as hazardous wastes in 1998. The management and disposal of PCB wastes is governed by national permit and transportation manifest control systems, and disposal must meet technical standards.

ii China has started a construction of a new PCB incineration facility since 2002 to address the Stockholm Convention. It is still under construction and will be completed in 2005.

iii The SARS outbreak in early 2003 generated great concern from the central government over hazardous waste and medical waste management, leading to the issuance in December 2003 of **China's National Program for Construction of Hazardous Waste and Medical Waste Disposal Facilities.** The program directs the construction in every province of central disposal facilities for hazardous wastes, as well as the establishment of a comprehensive management mechanism to ensure the facilities' viability and sustainability. The construction of the disposal facilities in the various provinces will be phased, with the construction of some given higher priority than others. The national plan further identified rotary kiln incineration as the preferred disposal technology, supplemented by plasma torch technology.

iv With support from the Canadian Government, China held 5 workshops in 2002 among stakeholders at national and provincial level to raise public awareness on the Stockholm Convention and PCB management and disposal in China.

v Under the Sino-Canadian project, a PCB management training will be conducted in late 2004, and training modules developed by mid-2005.

vi Under the Sino-Italian project, PCB inventory methodology and PCB inventory investigation will be tested in Zhejiang and Liaoning provinces. This project will also develop the draft strategy of PCB disposal technology and destruction. This project will be completed in 2006.

vii With the support of GEF, China is developing a national implementation plan (NIP) for the POPs Stockholm Convention and will be completed in September 2006.

d. **Stage IV (2005 - 2009): Demonstration of PCB management and disposal.** This stage will focus on developing and demonstrating in Zhejiang Province a cost effective, environmentally sound and financially feasible program to

safely manage and dispose PCBs. A national replication program will be developed in 2008/2009 based on the experience and lessons learned from the demonstration of PCB management and disposal in Zhejiang.

e. **Stage V (2010-2028): PCB management and Disposal in China.** China will replicate the comprehensive PCB management and disposal program demonstrated in Zhejiang to all of China's other provinces.

PCB in Zhejiang Province

15. **Accidental Releases of PCBs in Zhejiang Province.** Several accidental releases of PCBs are known to have occurred in the Zhejiang Province, including in Luqiao and Taizhou in 1989, in the Southern part of Shaoxing City (year not reported), and in Yueqing and Wenzhou in 1990. The main causes for these accidents were illegal dismantling and subsequent sale of PCB-containing capacitors or their improper disposal.

16. The 1989 release in Luqiao, caused by leakage from disassembled PCB capacitors, was treated in time by the Zhejiang Environmental Protection Bureau, under supervision of SEPA and the China Academy of Science (Toxic Chemical Office and Ecological Environmental Center). Highly contaminated soil and capacitors were incinerated. The incident resulted in the issuance by Zhejiang of regulations prohibiting the dismantling or sale of retired PCB-containing capacitors.

17. In the south of Shaoxing City, several PCB capacitors were landfilled improperly without any anti-leakage measures. PCB oils subsequently leaked because of water infiltration and severe corrosion of the capacitors. The capacitors were removed from the site, but the contaminated soil and leachate remain at the original location.

18. In 1990, at Yueqing and Wenzhou, in the first of two incidents, the local government and the Police Bureau found 273 obsolete PCB capacitors and 900 kilograms of PCB oil. Both the capacitors and the PCB oils were recovered and sealed in a cave. Improper sealing, however, allowed subsequent PCB leakage from the cave. In the second Yueqing incident, an illegal capacitor dismantling site was discovered in 1991. Residents of the village in which the site had been found were reported to have experienced symptoms of having been exposed to toxics, and chickens and ducks were reported to have died.

19. **Baseline Information on PCBs in Zhejiang.** According to the preliminary investigation on PCBs conducted by SEPA and the Ministry of Energy in 1996, PCB problems in China mainly exist in the electric power system and some large-scale enterprises of other industrial sectors. The PCB situation in Zhejiang basically reflects

that of China as a whole. The ongoing inventory investigation being conducted under the Sino-Italian "Development of PCB Inventory Methodology and Draft Strategy for PCB Disposal Project" also cover other sectors which have, or may have, PCBs, including the military, railway, and hospital sectors. Data from those sectors are not yet available.

20. The theoretical calculation for the amount of the PCB electrical equipment (mostly capacitors) is based on the transformer capacity in MVA in 1980. Table 1 shows the transformer numbers and total capacity (MVA) in the various transformer substations in 1980.

Table 1: Number of transformers and their capacity in Zhejiang transformer substations in 1980

Region	Transformer Substations	Large Transformers[1]	Transformer Capacity (MVA)
Jinhua	52	100	465.3
Jiaxing	25	73	644.46
Wenzhou	44	88	372.6
Taizhou	18	36	390.835
Lishui	8	15	77.61
Hangzhou	36	67	795
Ningbo	33	63	551.71
Shaozing	37	64	920.43
Huzhou[2]	20	40	300
Zhoushan[2]	20	40	300
Quzhou[2]	20	40	300
Total	**313**	**626**	**5117.945**

1. Transformers with capacity more than 35KV

2. No electric power records in these districts; average value of the capacity of those districts is shown

21. **Transformers in Zhejiang:** China banned import of PCB equipments in 1980. As Table 1 shows, the total number of large transformers at substations in Zhejiang in 1980 is about 626 units, and the transformer capacity is 5,120 MVA. On average, considering the overall transformer capacity, the capacity of each large transformer is expected to be on the order of few MVA (the size of a large distribution transformer). No data are available on the number or sizes of the small transformers.

22. According to a 2005 January investigation conducted by the Zhejiang Solid Waste Management Center and the Zhejiang Electric Power Company on all on-line transformers in the electricity power sector (production and distribution of electricity) for the province, the total number of online transformers is 230,733, and overall

capacity is 127,794 MVA. Information is provided in Table 2. More detailed information on transformer in Zhejiang province is summarized in Table 3.

Table 2: On-line Transformers and Overall Capacity in 2003

Transf. Class(kV)	Transf. Number	Overall Capacity (MVA)
500kv	24	18,500
220kv	187	28,160
110kv	787	29,069
35(63)kv	1256	10,938
35/0.4kv	387	1,930
3-10/0.4kv	228092	39,197
Total	**230733**	**127,794**

Table 3: Transformer substation, on-line transformer, power plant, and overall capacity in 2003 in Zhejiang Province

city	Distribution Substations	Voltage rank	Number of substation				Number of transformer	Capacity of transformer (MVA)	Number of power plants in service	Power plants dismantled or no more in use
			total	Operating before 1980	Operating between 1980 and 1995	Operating after 1995				
Hangzhou	primary substation	500kv	3	0	1	2	7	5500	8	3
		220kv	20	2	4	14	39	5880		
		110kv	85	8	20	57	159	6295		
	secondary substation	35(63)kv	81	/[1]	/	/	127	1338		
	switch transformer	35/0.4kv	/	/	/	/	85	620		
		3-10/0.4kv	/	/	/	/	28861	6481		
Huzhou	primary substation	500kv	0	0	0	0	0	0	4	2
		220kv	7	1	2	4	12	1650		
		110kv	30	2	10	18	52	1905		
	secondary substation	35(63)kv	50	/	/	/	94	740		
	switch transformer	35/0.4kv	/	/	/	/	61	861		
		3-10/0.4kv	/	/	/	/	19162	2195		
Jiaxing	primary substation	500kv	1	0	0	1	2	1500	4	0
		220kv	10	1	5	4	18	2580		
		110kv	49	5	12	32	73	2588		
	secondary substation	35(63)kv	48	/	/	/	94	1068		
	switch transformer	35/0.4kv	/	/	/	/	53	192		
		3-10/0.4kv	/	/	/	/	19044	3828		
Ningbo	primary substation	500kv	2	0	0	2	5	3750	11	1

city	Distribution Substations	Voltage rank	Number of substation				Number of transformer	Capacity of transformer (MVA)	Number of power plants in service	Power plants dismantled or no more in use
			total	Operating before 1980	Operating between 1980 and 1995	Operating after 1995				
		220kv	15	2	5	8	28	4080		
		110kv	75	3	20	52	130	4858		
	secondary substation	35(63)kv	108	/	/	/	187	1648		
	switch transformer	35/0.4kv	/	/	/	/	39	40		
		3-10/0.4kv	/	/	/	/	41103	7096		
Jinhua	primary substation	500kv	1	0	0	1	3	2250	6	0
		220kv	9	0	5	4	17	2490		
		110kv	50	6	12	32	77	2822		
	secondary substation	35(63)kv	74	/	/	/	139	805		
	switch transformer	35/0.4kv	/	/	/	/	60	9		
		3-10/0.4kv	/	/	/	/	27303	6043		
Lishui	primary substation	500kv	0	0	0	0	0	0	4	0
		220kv	2	0	1	1	3	420		
		110kv	14	0	7	7	24	767		
	secondary substation	35(63)kv	65	/	/	/	105	544		
	switch transformer	35/0.4kv	/	/	/	/	18	84		
		3-10/0.4kv	/	/	/	/	11455	1203		
Quzhou	primary substation	500kv	0	0	0	0	0	0	6	0
		220kv	6	2	1	3	8	1970		
		110kv	20	0	7	13	27	903		

city	Distribution Substations	Voltage rank	Number of substation				Number of transformer	Capacity of transformer (MVA)	Number of power plants in service	Power plants dismantled or no more in use
			total	Operating before 1980	Operating between 1980 and 1995	Operating after 1995				
	secondary substation	35(63)kv	34	/	/	/	58	336		
	switch transformer	35/0.4kv	/	/	/	/				
		3-10/0.4kv	/	/	/	/	7757	905		
Shaoxing	primary substation	500kv	2	0	1	1	5	3750	12	0
		220kv	12	0	4	8	24	3510		
		110kv	53	3	17	33	102	3783		
	secondary substation	35(63)kv	63	/	/	/	121	1120		
	switch transformer	35/0.4kv	/	/	/	/	10	21		
		3-10/0.4kv	/	/	/	/	12901	1905		
Taizhou	primary substation	500kv	0	0	0	0	0	0	6	0
		220kv	8	0	3	5	15	2130		
		110kv	34	0	12	22	47	1663		
	secondary substation	35(63)kv	86	/	/	/	145	1271		
	switch transformer	35/0.4kv	/	/	/	/	22	32		
		3-10/0.4kv	/	/	/	/	31873	4330		
Wenzhou	primary substation	500kv	1	0	0	1	2	1750	9	2
		220kv	11	0	4	7	23	3450		
		110kv	56	2	11	43	96	3475		
	secondary substation	35(63)kv	85	/	/	/	140	1747		
	switch transformer	35/0.4kv	/	/	/	/	21	35		

city	Distribution Substations	Voltage rank	Number of substation				Number of transformer	Capacity of transformer (MVA)	Number of power plants in service	Power plants dismantled or no more in use
			total	Operating before 1980	Operating between 1980 and 1995	Operating after 1995				
		3-10/0.4kv	/	/	/	/	21651	4309		
Zhoushan	primary substation	500kv	/	/	/	/	0	0	4	0
		220kv	/	/	/	/	0	0		
		110kv	/	/	/	/	0	0		
	secondary substation	35(63)kv	30	/	/	/	46	321		
	switch transformer	35/0.4kv	/	/	/	/	18	36		
		3-10/0.4kv	/	/	/	/	6982	902		
Total of Province			**1300**	**37**	**164**	**375**	**230733**	**127784**	**74**	**8**
				only related to primary substation						

1. Not available yet. Further investigation will be carried out under the Sino-Italian project.

23. **Capacitors in Zhejiang:** On the basis of the overall transformer capacity, the total number of capacitors has been estimated to be about 20,500 units. Another 2,000 should be added to this estimate to account for capacitors estimated to have been brought into Zhejiang illegally, making the total for the province approximately 22,500 units. No information is available on the amount of PCB equipment and wastes after 1980, although more data will become available when the PCB inventory investigation is completed in the first year of the project implementation. The current PCB baseline data in Zhejiang are nevertheless likely to prove an underestimate.

24. The average quantity of PCB oil in each capacitor is assumed to be 11 kg [1]. Using the estimated total of 22,500 PCB capacitors in Zhejiang, there would thus be about 247.5 tons of PCB oil. Using a fill ratio of 20 - 25% as weight basis, a weight of 990 - 1240 t for only the PCBs capacitors can be estimated. Assuming a ratio of 2 times the weight of the capacitor for highly contaminated soil and waste (including the weight of the capacitor itself) and of 20 times for less contaminated soil, Zhejiang would have about 1,980—2,475 tonnes and 19,800—24,750 tonnes, respectively, of highly contaminated wastes (> 500 ppm) and less contaminated soil (between 50 to 500 ppm). 2,000 tons of highly-contaminated and 20, 000 tons of lower contaminated wastes are used for calculation of project cost and determination of indicators. These quantities can be confirmed, however, only after site sampling and analysis.

25. It should be noted that these estimates do not include information on small capacitors and transformers. The estimates are consequently likely to be an underestimation of the total amount of PCB-contaminated equipment in the province.

26. **Identified PCB sites in Zhejiang Province (2003).** The recent rapid development of Zhejiang's economy has put great pressure on land uses, and an unknown number of PCB sites were almost certainly used for the development. PCB leakage has been confirmed at some such sites. The Zhejiang Power Company, cooperated with the Zhejiang EPB, conducted some PCB preliminary investigations and monitoring some PCB sites since 1995. Together with the recent investigations under the Sino-Italian Project, 43 PCB sites in Zhejiang have been identified (see Table 4). Findings thus far include:

a. Three storage sites (numbers 01, 03, and 11) in Zhejiang Province were fully cleaned up and the PCBs wastes were incinerated.
b. Two storage sites (numbers 23 and 38) were fully cleaned up, but PCB wastes have been stored temporarily awaiting disposal.
c. Two storage sites (numbers 10 and 15) have undergone basic cleanup and some

[1] data comes from *Building the Capacity of the People´s Republic of China to Implement the Stockholm Convention POPs and Develop a National Implementation Program, Primary Assessment Report on PCBs in China, Appendix 2, para. 1.2, UNIDO 2003*

PCB wastes were incinerated. Further cleanup will be needed.

d. Another two sites (numbers 2 and 12) have been located. In summary, total 9 sites have been exactly located. The sino-Italian project will fund exact location of another 10 sites. The other 42 sites will be exactly located through funding of the demonstration project.
e. Historical data from the Mei Cheng and Xiaoshan sites (number 26 and 21) in Zhejiang show leakage at both sites and their contamination levels reaching 150 – 250 ppm, or three to five times the allowable levels. This is not surprising, given that the storage sites were designed for a 3-20 year life and many are now approaching 25 years. In addition, some sites were not built to the required specifications even at the start, so that some lack entirely the liners meant to prevent PCBs from leaking into the environment.
f. Data on PCB concentration in the ground are limited. At several PCB sites, PCB wastes and contaminated soil were removed without confirmatory testing afterwards. Further testing of the soil and water at these sites will be required to ascertain the existence and extent of any remaining contamination.
g. In most cases, records concerning the existence of a PCB storage site were found showing only the site's general location, leaving the exact location of the PCB wastes unknown. Further investigation will be required to identify the exact location of these PCB sites.
h. Several PCB sites are located in very close proximity to (sometimes within the footprint of) buildings, road, and other barriers (see examples below). Addressing such sites will be possible only with substantial stakeholder consultation and involvement.
    i. Number 4: in Shangyu Business Street, close to residential, office or retail buildings
    ii. Number 18: in Cixi Culture Park
    iii. Number 28: at sites of planned or ongoing infrastructure development (e.g., Qiandao Lake Holiday Valley building)
    iv. Number: 26: at upstream of Qian Tang Jang River and close to active cemeteries,
    v. Number 10: in the farms.
i. Site-specific data on PCB leakage are not available for most sites. Such data can only be collected during site investigation and pre-clean up field tests planned under the Component 3.

Table 4: Basic information on the 43 identified PCB storage sites

The district city name	Site code	Name	Disposal condition	Remark
Shaoxing	01	Eastern part of Shaoxing city	Cleaned up completely. The capacitors in this site have been sent to Shenyang and incinerated.	Fully cleaned up
	02	Southern part of Shaoxing city	The capacitors in this site have been disposed in Shenyang. But the site soils need to be cleaned up.	Located
	03	Former Electric Power Bureau	Cleaned up completely. The capacitors in this site have been sent to Shenyang and incinerated.	Fully cleaned up
	04	Shangyu,Shaoxing	Still sealed	
	05	Dianrong,Shaoxing	Still sealed	Non-Electric Power
	06	Shengzhou,Shaoxing	Still sealed	
	07	Xinchang,Shaoxing	Still sealed	
	08	Zhuji,Shaoxing	Still sealed	
	40	Shaoxing Steel Corporation Group	Still sealed	Non-Electric Power
Wenzhou	09	Pingyang,Whenzhou	The capacitors in this site have been purchased by some people and the local people don't know where these capacitors are. Local people said the capacitors leaked when they were removed. So the soil in this site need be further treated.	
	10	Yueqing,Wenzhou	The capacitors and oil in this site have been sent to Shenyang and incinerated. The contaminated soils still remain in the site. So the soil in this site need be further treated.	Located
Jiaxing	11	Wangdian,Jiaxing	Cleaned up completely. The capacitors in this site have been sent to Shenyang and incinerated.	Fully cleaned up
	12	Haining, Jiaxing	The capacitors have been removed and the soils need further treatment.	Located
	13	Tongxiang, Jiaxing	Still sealed	
Taizhou	15	Luqiao, Taizhou	Capacitors in this site have been dismantled. Soils need further treatment.	Located
	37	Sanmen, Taizhou	In this site, there are lots of chemical residues containing PCBs depositing in the open air.	Non-Electric Power
Ningbo	14	Xiangshan, Ningbo	The capacitors were stolen, the sealed up site and soil need further treatment	
	16	Cixi, Ningbo	The capacitors were stolen and the sealed up site and soil need further treatment	
	17	Yuyao, Ningbo	Still sealed	

The district city name	Site code	Name	Disposal condition	Remark
	18	Meishan, Cixi	Still sealed	
	19	Chemical fertilizer, Ningbo	Still sealed	Non-Electric Power
	20	Tian'an,Nngbo	Still sealed	Non-Electric Power
Hangzhou	21	Xiaoshan,Hangzhou	Still sealed	
	22	Yuhang,Hangzhou	Still sealed	
	24	Xin'an jiang transformer substation	Still sealed	
	27	Wenchang,Chunan	Still sealed	
	28	Chunan transformer Substation	Still sealed	
	38	Hangzhou Steel Corporation Steel Group	The capacitors have been removed and the site cleaned up. The capacitors still have been stored in the warehouse now.	Fully cleaned up
	42	Exact location unknow	The capacitors still be stored in the warehouse.	
Jinhua	23	Yiwu,Jinhua	The capacitors have been removed and the site cleaned up. The capacitors still have been stored in the warehouse now.	Fully cleaned up
	25	Laoshusheicheng,Jinhua	Still sealed	
	26	Meicheng,Jinhua	Still sealed	
	29	Pujiang,Jinhua	The capacitors have been removed and the local people don't know where these capacitors are. Local people said the capacitors leaked when they were removed. And the soil needed further treatment.	
	30	Xiaoshun,Jinhua	The capacitors have been removed and the local people don't know where these capacitors are. Local people said the capacitors leaked at that time. So the soil need be further treated.	
	31	Shangshan,Jinhua	Still sealed	
	33	Lanxi,Jinhua	Still sealed	Non-Electric Power
Quzhou*	32	Shizikou,Quzhou	Still sealed	
	34	Diangong,Shejiang	Still sealed	Non-Electric Power
	41	Quhua,Quzhou	Still sealed	Non-Electric Power
Lishui	35	Qingtian,Lishui	Still sealed	
Huzhou	36	Nanpu,Huzhou	Still sealed	
	39	Changxing,Huzhou	Still sealed	Non-Electric Power
	43	Exact location unknow	Still sealed	

27. **PCB management in Zhejiang.** Zhejiang currently has a provincial EPB, 11 city-level EPBs and 83 county-level EPBs in Zhejiang Province, who are responsible for PCB management. In addition, the province established the Zhejiang Solid Waste Management Center in 1999 to assist the provincial EPB with the management of solid waste (including PCB waste). The cities of Hangzhou, Ningbo, Wenzhou, Jinhua have also established their own solid waste management centers.

28. The Zhejiang Power Company is composed of 11 city-level power subsidiary companies, and every city-level power subsidiary company composed of several county-level power subsidiary companies. It and most of its component and subsidiary companies at all levels (county, city and provincial) have security departments responsible for environmental protection compliance and these will take some role in the demonstration project.

29. Although Zhejiang Province is one of the stronger provinces for PCBs management in China, Zhejiang has not yet established either a sufficient PCB management coordinating and cooperating mechanism or the management infrastructure and procedures necessary to ensure the environmentally sound management and disposal of PCBs.

The Main Sector Issues to be Addressed by the Demonstration Project

30. China is a country with a vast territory and a population of over 1.3 billion. Because of its size and varying stages of economic development and different effectiveness of PCB management and disposal in different regions, China faces many challenges for PCB management and disposal, such as incomplete PCB baseline data, weak institution and policy framework for PCB management, lack of PCB disposal technology and facilities, and insufficient public awareness. The project will address these sector issues:

a. **Incomplete PCB baseline data.** The project will complete the identification of PCB wastes (including associated PCB-contaminated soils) in temporary PCB storage sites, over 95% of the wastes are believed to be PCB capacitors. An ongoing Sino-Italian PCB project (*Development of PCB Inventory Methodology and Draft PCB Disposal Strategy*) is collecting PCB baseline information in Zhejiang and Liaoning Provinces. This project will support follow-up activities, including identifying the exact locations of the PCB sites and performing PCB concentration tests before their cleanup. The Sino-Italian project has also obtained some basic information on transformers in both provinces; however detailed information on PCB transformers and their levels of contamination still need to be confirmed in both provinces. This demonstration project will focus

on identifying in-use large PCB contaminated transformers installed before 1980 and testing decontamination technology of PCB transformers as well as decontaminating some of those large in-use PCB transformers installed before 1980.

b. **Weak PCB management and disposal.** This project will support environmentally sound management of PCBs, including recovery, collection, packaging, transportation, safe temporary storage in Zhejiang, and final disposal in Liaoning. There are currently no suitable facilities in China that meet the requirements of the Stockholm Convention for environmentally sound and safe disposal of PCBs. A new incineration facility for PCB wastes has been under construction since 2002 in Xinmin in Liaoning Province. It has not completed yet. This project will use this facility to dispose collected PCB wastes. However, this facility designed in 2001 could not meet requirements on PCB disposal under the Stockholm Convention, particularly in waste pretreatment, central and online monitoring, and dioxin and furan emission control. The PCB incinerator will be completed by adding four key units (refer to annex 4, Para. 30/c) to ensure that it is capable of safe and effective destruction of PCBs and meets relevant requirements of the Stockholm Convention. Chinese government will provide its own funding and raise bilateral support for completing the PCB incinerator. The project will support capacity building activities for PCB management and disposal.

c. **Health and environmental risks from PCB contaminated soils and water.** The high risks to human health and the environment from exposure to PCBs and soils and water contaminated with PCBs are well known. Several accidental releases of PCBs are known to have occurred in the Zhejaing Province (see paragraph above on PCB identified sites for more details. The project will address the health and environmental risks by recovering and disposing of the PCBs in Zhejiang Province to prevent future releases to the environment. The cleanup of PCB sites would be based upon a clear understanding of site-specific risks, feasibility of the technological options and costs.

d. **Imperfect policy, regulations, standards and their enforcement.** Enforcement and execution of current polices and regulations are severely constrained by the absence of effective monitoring and evaluation measures. The project will support development and update of the legal and regulatory system for safe PCB management and disposal. Related policies and regulations at the national and local levels governing PCB management and disposal will be formulated and revised as necessary. Monitoring and evaluation measures will be developed for their effective enforcement.

e. **Insufficient public awareness and education.** Public awareness is important for smooth cleanup of those identified PCB sties in Zhejiang, especially the PCB sites close to residential complexes. The project will support necessarily public awareness activities, such as video making, newsletters issuance, TV programs,

etc.

Ongoing Activities

31. **Linkage of the Proposed Project to Ongoing Projects.** The Stockholm Convention requires each party to prepare a National Implementation Plan (NIP) within two years from the Convention's entry into force for that country. The NIP provides a framework for the country to develop and implement, in a systematic and participatory way, priority policy and regulatory reform, capacity building, and investment programs. The PDF-B grant phase of the development of China's NIP as a first step to compliance with the Convention was implemented by the Foreign Economic Cooperation Office (FECO) of the State Environmental Protection Administration (SEPA) under a letter of agreement with UNIDO. The GEF Council Meeting approved this full sized project in May 2003.

32. China has also been successful in winning co-financing support from its bilateral development partners for the development of the NIP, including the following activities:

a. Five Workshops (a AAA activity). The workshops' objective was to raise awareness of the Convention among stakeholders at national and provincial level during the PDF-B phase of NIP. The workshops were executed by the World Bank and funded by a Canadian Trust Fund for POPs activities established at the World Bank. The workshops have been completed;
b. Capacity Building in PCB Management (a AAA activity). This small-scale activity is also funded by the Canadian Trust Fund. Its key objective is to begin to develop China's capacity to assess industrial and commercial properties for PCBs (gather inventory information), establish and inspect safe storage sites for PCBs until a PCB destruction technology is established in China, assess PCB destruction technologies, collect environmental samples, and work safely when in contact with equipment and sites that contain, or may contain, PCBs. This is being done by initiating an initial training program which will subsequently form the basis for developing more extensive training programs in China. The project was started in September 2003 and will be completed by mid-2005;
c. Toxicity Study of POPs on Women and Children. This small-scale activity is also funded by the Canadian Trust Fund. Its key objective is to investigate the exposure of DDT and PCBs and their adverse effects with special emphasis on the health of women and children. Biological and environmental samples colleted from an area in Zhejiang province, where there are several large-size disassembly workshops and many single household disassembly centers for imported old and useless electric appliances and metal materials, were tested. Biological samples were collected from women-baby pairs and women-children pairs. Environmental samples were colleted from water, soil, fish, meat, eggs, milk, rice, shells, and vegetables. The initial study result indicates that the selected area is an area with

PCB high-concentration exposure. PCB GM concentration levels in women and children in this area are moderately elevated. They are below those found in Arctic Canada (Nunavut) and above those found in southern Canada.

d. Development of a PCB Inventory Methodology and an Initial Strategy on PCB Reduction and Disposal in China. This project is being executed by the Bank and funded by the Government of Italy. Its key objective is to develop an inventory methodology based on results of pilot projects and a draft strategy on approaches and options for disposal/reduction of PCB. The draft strategy will provide an assessment of current PCB disposal, reduction, management, policy and regulation and identification of approaches and options (or course of actions) that are suitable for China. Both the inventory methodology and the draft strategy will be integrated into the development of a PCB Action Plan in the NIP. The project was started in October 2003 and will be completed by the end of 2005; and,
e. Collection of national information on production, import and use of PCBs and equipment containing PCBs under NIP development. This activity is part of NIP development and funded by GEF grant.

33. The linkages of the proposed project to the above ongoing projects under NIP development include:

a. The completed Sino-Canadian POPs Convention workshops have contributed greatly to the identification of the demonstration project in terms of public awareness, stakeholder participation and identification of experienced and qualified PCB experts.

b. The capacity building project will improve PCB management training at the national level by conducting a pilot training program and developing a national training program proposal, as well as a training manual, by mid-2005.

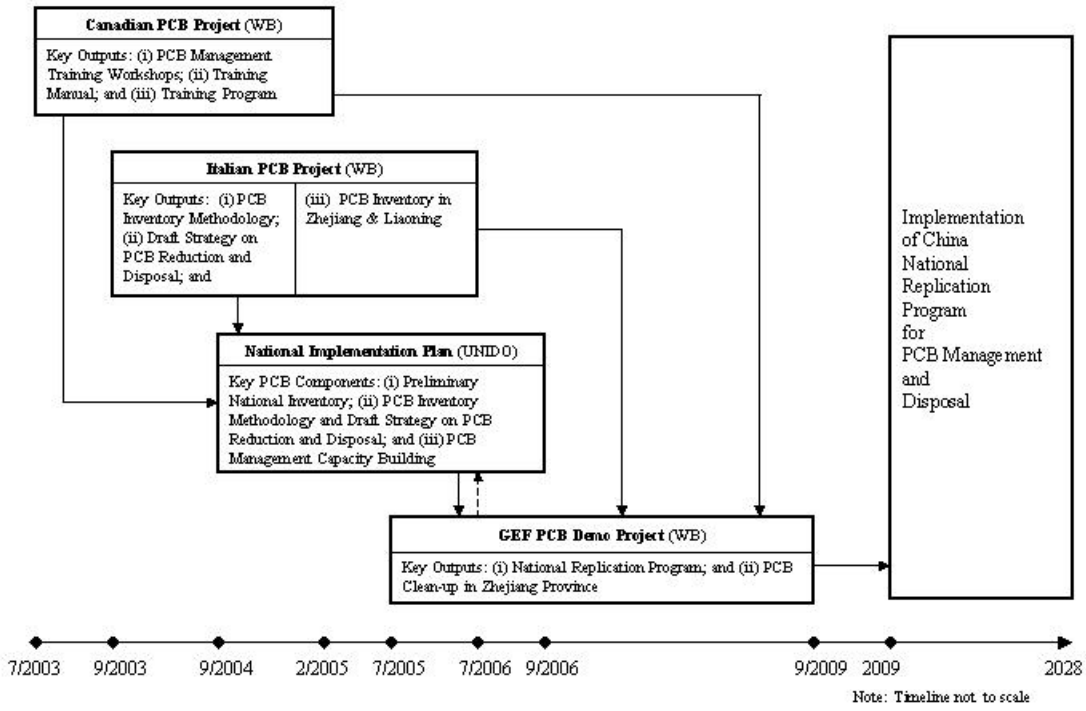
c. The Sino-Italian project will provide an inventory of PCBs and equipment containing PCBs in two provinces – Zhejiang and Liaoning, develop and demonstrate a PCB detailed inventory methodology, and draft a draft strategy on PCB reduction and disposal by mid-2005.

d. National information on PCB import and use, as well as on equipment containing PCBs, will be collected as part of developing the NIP, and will provide basic data for both the draft strategy being developed by the Sino-Italian project and the replication program under this demonstration project.

e. The Sino-Italian and Sino-Canadian projects constitute bilateral co-financing contributions to the NIP preparation. Results of the Sino-Italian project and the Sino-Canadian project will be fully integrated into the NIP and the proposed project; and project results from the (1) Sino-Italian project, (2) Sino-Canadian project, and (3) NIP will lay the ground for developing a National Replication

Program for PCB management and disposal in China under the proposed project. The following diagram shows the linkage of these projects.

Relationship Among the PCB Projects in China and Their Key Outputs



34. These ongoing activities will be closely coordinated with, and will feed into the design of, the proposed demonstration project.

Disposal Technology Selection for the Proposed Project

35. **Summary Conclusions.** As a rotary kiln incinerator is currently under construction in Shenyang, China proposes to use it for incineration of PCB wastes under this project. This option would meet all technical requirements for PCB disposal, as well as being compatible with China's 2003 National Plan for hazardous and medical waste management. . The Shenyang incinerator will have a capacity of 15 tonnes/day, and has been designed to dispose of highly chlorinated wastes (such as chorine-containing organic solvents), including PCBs.

36. **Principles to Select PCB Waste Disposal Technology for China.** According to the requirements of the Stockholm Convection and current PCBs pollution situation in China, the following principles are used for selecting PCBs waste disposal technology demonstrated in China:

a. Meeting the requirement of Stockholm Convention;
b. High treatment effectiveness, safety and reliability;
c. No secondary pollution;
d. With good acceptability, suit to the characteristic of different types of PCBs pollutants in China;
e. Low treatment cost with good economic result;
f. Technology is ripe and reliable;
g. Meeting the schedule of China's PCBs disposal plan.

37. **Currently available PCB disposal technologies.** A number of international agencies concerned with POPs or PCBs have reviewed PCB decontamination technologies in the last ten years. The following documents were examined in order to gather information concerning the available technologies for PCB disposal, as well as for the general strategies followed by the different countries in addressing the problem of PCBs:

a. USEPA produced several relevant reviews, such as "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," and "Technology Alternatives for the Remediation of PCB-Contaminated Soil and Sediment" (1993).
b. More recent reviews include those by of PCB decontamination technologies have been published by UNIDO (M.S.M. Mujeebur Rahuman et al., 2000) on PCB decontamination technologies, and by UNEP on non-incineration technology to be used for pure PCBs stockpiles ("Survey of Non-Incineration PCB Destruction Technologies," August 2000).
c. A training manual for hazardous waste project managers concerning the PCB destruction and decontamination and guidelines concerning PCB decontamination have been written under the Basel Convention by the Auckland University, (2001).
d. The Italian National Committee for Best Available Technologies also prepared recently the Italian "Guidelines for the Selection and Use of the Best Available Technologies for PCB disposal and For the Disposal of PCB-Contaminated Devices" (Italian Ministry of the Environment and Territory, D.LGS 372/99, in Italian).
e. The Scientific and Technical Advisory Panel of the GEF (STAP) recently completed (June 2004) the "Review Of Emerging, Innovative Technologies For The Destruction And Decontamination Of POPs And The Identification Of Promising Technologies For Use In Developing Countries."

38. Several factors have driven the process of developing technologies for PCB destruction in the last ten years:

a. The (though slowly) increasing number of new patented technologies is partially attributable to the limitations or problems posed by existing technologies, along with a competitive business climate.
b. The strong competitive advantage of incineration versus other technologies, due mainly to the large amount of low cost high temperature incineration capacity in Europe, made it more difficult for non-incineration technologies to enter the market;
c. Increasing awareness of the environmental limits of incineration has nevertheless spurred research and application of new solutions for the treatment of flue gases and for the detoxification of ashes, thus making incineration safer, due to the added costs of the post-treatment processes, but also more costly;
d. The need for decontamination of valuable electrical equipment without destroying it, with the minimum possible interruption to its connection to the electrical grid, and in a way which allows recovery of the expensive dielectric oil, has opened the market to "online" decontamination technologies. Among the most widespread of these are the sodium based and APEG based technologies.

39. **PCBs disposal experiences in China.** The State Environment Protection Administration (SEPA) of China, in the National Eighth Five-Year Plan in 1992, designated a state research topic on the establishment of a set of industrial PCB incineration facilities in China. In response, the Shenyang Institute of Environmental Science developed a pilot-scale incineration facility, whose main performance parameters met applicable national standards. This facility, built for PCB capacitors, included a primary and secondary combustion chamber furnace, in which the first chamber burned solid, liquid, or mixed wastes, while the secondary chamber was dedicated to the post-combustion of the gases. The unit also had high temperature tail gas rapid-cooling equipment and waste water treatment equipment. However, this plant had only limited automated control systems, and lacked online monitoring systems for the off-gas. These two defects are the key problems of PCBs incineration treatment in China. This facility operated for eight years until 2003, is no longer in use and will be dismantled in 2005.

40. The successor demonstration incinerator for hazardous waste is currently under construction in the Xinmin County of the Liaoning Province, and is a national demonstration engineering project designed and constructed by the Shenyang Institute of Environmental Science. The incinerator will be transferred to the Shenyang Hazardous Waste Disposal Technical Center. The new facility has a nominal capacity of 15 ton/day, and is comprised of a rotary kiln pyrolysis furnace, a two-section high temperature tail gas disposal furnace, Venturi scrubber, with NaOH and active carbon absorption as off gas treatment technologies. The plant is also equipped with a water treatment/reuse facility. Roads for accessing the plant has been improved as part of the project.

41. The facility's technology parameters are:

a. Main components: rotary kiln furnace; secondary combustion chamber; Venturi dust gas quench; NaOH spray-pour tower, active carbon absorption tower; baghouse, and water treatment plant.
b. PCBs destruction ratio: 99.9999%
c. Combustion efficiency: 99.9%;
d. HCL destruction ratio: 99.9%
e. Dioxin concentration in the exhaust gas: <0.5TEQng/Nm3

42. The facility does not include detoxification of the ashes, nor does it have automated process control for technical and environmental parameters. As currently being constructed, the facility would not meet Stockholm Convention "best available techniques/best environmental practice (BAT/BEP)" standards for PCDD/PCDF emissions, which would require being below 0.1ngTEQ/Nm^3.

43. **PCB disposal facilities outside China.** UNEP released the first issue of the "Inventory of Worldwide PCB Destruction Capacity" in December 1998. Incineration with rotary kiln plants was the most widely practiced technology to destroy PCBs waste. Cement kiln incineration was also reported to be quite widespread at the time of the inventory. Although UNEP is currently preparing an updated facility inventory, incineration will continue to be the first choice treatment technology for the destruction of PCB. Other available technologies are: solvent or thermal treatment in autoclave for transformers; chemical dehalogenation transformers; and the plasma arc process.

Alternative Schemes for Disposal of Highly-contaminated PCB Wastes

44. There are three alternative schemes of high concentration PCBs disposal: (1) modifying and renovating an existing disposal facility in Zhejiang, and disposing PCBs wastes in Zhejiang; (2) Sending PCBs wastes to Western European countries for disposal; and (3) renovating existing facilities in Shenyang, and disposing Zhejiang PCBs wastes in Shenyang. Comparisons of disposal cost by the three alternatives are showed in Table 5.

Table 5: Comparisons of disposal cost by the three alternatives

Alternative Scheme	1.Disposal in Zhejiang	2.Overseas Disposal	3. Disposal in Shenyang
Total new investment USD	7,700,000 *	—	1,650,000
Disposal expense USD	5,800,000	5,000,000	5,080,000
Transportation cost USD	—	2,000,000	1,512,000

Subtotal, Disposal & Freight USD	13,500,000	7,000,000	6,592,000
Total incremental costs	13,500,000	7,000,000	8,242,000
Inland Transport Risks	No	No	Yes
Overseas transport risks	No	Yes	No
Disposal demo features	Yes	No	Yes
Domestic transport demo features	No	No	Yes
Inland transport expense and risk during project spreading	High	High	Low
Overseas transport expense and risk during project spreading	No	Yes	No
Policy adaptability	Worse	Bad	Good
Comprehensive demo effect	Fine	Worse	Good

* Estimated based on the actual costs of the construction of the Shenyang PCBs incineration facilities.

45. As shown in the Table, the disposal and the transportation costs for Alternative (1) are the highest one, almost 40-50% higher than the rest two options. Therefore, Alternative (1) is not a good option for the implementation of this demonstration project. For the remaining two alternatives, the total incremental costs for Alternative (3) is about 15% more expensive than Alternative (2). However, the disposal and transportation cost for Alternative (3) will be lowered down greatly when the facility receives PCBs wastes from other parts of China. As noted earlier, it will be a time consuming and dreary process for China to get permission to transport and dispose of PCBs wastes in other countries. Moreover, there will be a risk of PCBs exposure to the marine environment in the course of transportation.

46. In addition to dispose of the 2,000 MT PCBs from Zhejiang Province, Alternative (3) will serve the demonstration purpose of PCBs waste transportation and disposal in China and will accept national PCBs wastes after the completion of this demonstration project. Therefore, Alternative (3), disposal of high concentration PCBs wastes in Shenyang, is the best option.

47. The additional investment in the Shenyang incinerator would ensure that it will comply with the national strategy and with applicable standards to meet the Stockholm Convention requirements. The National Plan for Hazardous Wastes and Medical Wastes specifies the building of a 15 tonne/day rotary kiln incinerator in. The applicable standards include GB13015-91 (Standards on Pollution Control of PCB Wastes), which applies to wastes exceeding 50 mg/kg of PCBs. Those standards provide that PCB

wastes exceeding 500mg/kg should be disposed of by high temperature incineration; those contaminated at levels between 50 and 500 mg/kg must be safely landfilled or put through high temperature incineration. PCB waste (with PCBs <50mg/kg) must be collected and temporarily stored under the approval of the EPB if it cannot be incinerated or landfilled.

48. 50 mg/kg (50 ppm) is also the most usual threshold for cleanup among developed countries. The Basel Convention, for example, defines as "hazardous wastes" for those "wastes, substances, and articles" having PCBs "at a concentration level of 50 mg/kg or more." Similarly, the Stockholm Convention identifies three levels of concentration at which PCBs are a concern, the lowest of which is 0.005 percent. Both of these thresholds convert to 50 ppm.

49. The additional investment in the Shenyang incinerator will enable it to reduce its dioxin/furan emission levels to less than 0.1ngTEQ/Nm^3, thereby address the requirement of the Stockholm Convention on the use of best available techniques and best environmental practices: *"When considering proposals to construct new facilities or to significantly modify existing facilities using processes that release chemicals listed in this Annex, priority consideration should be given to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of such chemicals. In cases where such facilities will be constructed or significantly modified, in addition to the prevention measures outlined in section A of Part V the following reduction measures could also be considered in determining best available techniques:*

a. *Use of improved methods for flue-gas cleaning such as thermal or catalytic oxidation, dust precipitation, or adsorption*;
b. *Treatment of residuals, wastewater, wastes and sewage sludge by, for example, thermal treatment or rendering them inert or chemical processes that detoxify them* ;
c. *Process changes that lead to the reduction or elimination of releases, such as moving to closed systems*; (the project includes improving the storage of PCBs and PCB wastes to prevent any releases)
d. Modification of process designs to improve combustion and prevent formation of the chemicals listed in this Annex, through the control of parameters such as incineration temperature or residence time." (the project includes implementing computerized control of all the relevant operational process in order to guarantee technical and environmental parameters).

50. The technology of rotary kiln incinerator is a proven technology with which China has established expertise. The Stockholm Convention, however, requires a further improvement in the environmental and technical performance of this technology. The demonstration project will then bring important follow up for the country.

51. Rotary kiln incinerators are very flexible plants, capable of destroying with high DRE coefficient a wide range of hazardous wastes having differing concentrations of POPs and differing physical-chemical properties. This flexibility allows the project to maximize the benefit/cost ratio of the investment.

Selection of Soil Decontamination Technology

52. Seven technologies for decontaminating PCB contaminated soil (50 ppm-500ppm) were evaluated during project preparation. The seven technologies include (1) incineration, (2) plasma transform technology, (3) In Situ. Verificaiton (ISV), (4) thermal desorption, (5) solvent extraction, (6) solvated electron, and (7) base catalyzed dechlorination. Thermal disorption technology was concluded as the best option with the following advantages for treating PCB low-contaminated soil under the proposed project.

a. **Size**: The throughput size for the proposed thermal desorption unit is on the order of 30 t/day. This size has been estimated on the basis of an estimated amount of 20,000t – 26,000t of contaminated soil in Zhejiang.
b. **Mobility**: Mobile units for the decontamination of PCB-contaminated soil and wastes may be repositioned and reused on different sites once decontamination activities have been completed, thus minimizing investment costs;
c. **Soil Reuse**: Thermal extraction will allow at least a limited preservation of the original properties of soil, making it possible to return the de-contaminated soil to its original location.
d. **Flexibility**: Thermal desorption is also a quite flexible process, capable to treat different kind of contaminated soils: soils contaminated by hydrocarbons, by PCBs, by pesticides.
e. **Scale**: Thermal desorption is especially suitable where for on site/ex-situ situations where large amounts of contaminated soils have to be treated.
f. **Costs**: The economics for the treatment with thermal desorption are quite favorable.
g. **Residue**: The high concentration residues generated by the thermal desorption can be successfully treated by incineration, in which case they would be transported to the Shenyang facility in compliance with applicable standards and requirements.

Conclusion of PCB Management and Disposal Technologies for the Proposed Project

53. Based upon (1) careful analysis of available technologies, (2) the PCB incineration facility in Shenyang, (3) China's strategy on hazardous wastes, and (4) information currently available on PCB situation in China, the following technologies are proposed as demonstration technologies for the proposed project:

a. A new rotary kiln incinerator now nearing completion in Shenyang for the treatment of highly contaminated solid wastes. China will complete construction

of this incinerator to ensure that all Stockholm Convention requirements on PCB disposal are met,

b. Placement of a mobile thermal desorption unit in Hangzhou for the treatment of PCB- contaminated soil at concentrations between 50ppm and 500ppm, and
c. Rental and testing of foreign mobile dehalogenation equipment for the treatment of PCB-contaminated transformers remaining in use.

54. **Technical data for the PCB incinerator in Shenyang.** The technology parameters for the PCB incinerator in Shenyang are:

a. Throughput capacity: 15 t/day
b. Main equipments: rotary kiln furnace; secondary combustion chamber; Venturi dust gas quench; NaOH spray-pour tower, active carbon absorption tower; baghouse; and water treatment plant.
c. PCBs destruction ratio: 99.9999%
d. Residence time in the post-combustion chamber at 1200°C for over 2 seconds
e. Combustion efficiency: 99.9%;
f. HCL destruction ratio: 99.9%
g. Dioxin concentration in the exhaust gas: <0.1ngTEQ/Nm^3

55. **Technical data for the proposed mobile thermal desorber.** The proposed technology parameters for the demonstration PCBs thermal desorber are:

a. Throughput capacity: 30t/day (based on an estimated amount of near 20,000t – 26,000t of contaminated soil in Zhejiang)
b. Thermal desorption unit will use a rotating cylinder to supply indirect heat
c. A pre-treatment (screener) to remove debris and material greater than 2 inches will be adopted
d. Off gases treated using a scrubber, Venturi, and spray tower, followed by a high-efficiency particulate air filter, and a carbon filter unit
e. Blowdown from off-gas treatment - treated using carbon; water from the scrubber, Venturi, and spray tower - treated using a clarifier and filter press
f. Treated soil will be use for backfilling of the contaminated sites

Testing and Dehalogenation of PCB Contaminated Transformers

56. Very little information is available concerning the existence of PCB contaminated transformers in China. Even though China did not produce PCB-containing transformers, it is possible that it imported transformers containing PCBs. Moreover it is also possible that some PCB-free transformers were subsequently contaminated through improper

refilling with PCB-containing oil. Finally, China's 1979 law prohibiting the import of PCB-containing equipment provided that *"In individual exceptional circumstances when import (of PCBs containing devices) is required indeed, the import in such case should be reported to the competent authorities under the State Council."* It is not known whether or how many times this exception was invoked.

57. Approximately 630 large transformers were present in the electricity substation in Zhejiang in 1980, and the overall capacity is 5,120 MVA. No information is available on the current whereabouts of these transformers or on their PCB-contamination status. A preliminary investigation conducted in January 2005 indicates that the total number of online transformers is 230,733, and overall capacity is 127,794 MVA and 230,733 in 2003.

58. The experience of other countries, where the problem of PCB-contaminated transformers is widespread, shows that such a possibility should not be ruled out. It is therefore prudent to identify and assess a suitable technology for use in such circumstances, especially since the completed inventory may include contaminated transformers. The absence of such information, however, makes it advisable to limit that activity to the testing of one technology and by renting of the proper equipment.

59. In selecting the preferred technology for this testing activity, the following points have been considered:

a. China's economy is growing fast, bringing with it corresponding growth in the demand for electricity that is outstripping the country's ability to build new power plants. Thus, management of the electrical system is a very sensitive issue, making it critical that any plan for decontaminating transformers still in service not affect the production or distribution of electricity;
b. A large transformer is a very valuable piece of equipment (nearly USD 250,000 for a 25 MVA transformer); its disposal and replacement with a new PCB-free transformer could be justified only if the transformer is at the end of its operational life; otherwise decontamination and re-use is the preferred solution.
c. The incineration of dielectric oils presents an environmental impact, in term of atmospheric emission of pollutants and micro-pollutants, and in terms of CO2 emission, which should be avoided whenever possible;
d. In addition to environmental considerations, however, dielectric oils are also very valuable and expensive goods, and their recycling and regeneration may present significant economic benefits.

60. **Criteria for the online dehalogenation.** Selection of best technology for the decontamination of the transformer and the dehalogenation, regeneration and recovery of

the contaminated oils will be made in the project's first year. An initial screening has already shown, however, that the best technology must:

a. Be capable to treat the transformer both on site (by means of portable equipment) or ex-situ;
b. Allow the complete regeneration of the oil without affecting negatively its dielectric properties (thus oil should be decontaminated and reused);
c. Due to the fact that must be operated in sensitive settings (manufacturing facilities, electric power generation plants, etc.), the use of high temperature/pressure processes and dangerous chemicals in portable equipment should be avoided as much as possible;
d. Generate the minimum amount of wastes

61. Only chemical dehalogenation processes are capable of fulfilling these criteria. Sodium based processes may present some risk due to the strong reactivity of metallic sodium, although they are very fast; online APEG modified processes (like the CDP® process) are slower, but do not require the use of dangerous chemicals, and may provide better result in term of preservation of dielectric property of oil. Off line dehalogenation like the LTR^2® process (based on the solvent washing of the transformers followed by dehalogenation or incineration of the oil) could also be used, but this type of technology does not allow the recycling of the oil and is therefore more suitable for treatment of transformers.

Annex 2: Major Related Projects Financed by the Bank and other Agencies

CHINA: PCB Management and Disposal Demonstration Project

World Bank Operations

World Bank Projects	Targeted Sector Issues	Performance Ratings
POP Activities in China		
China: "Canadian Grant for Evaluation of Effects of Exposure to Persistent Organic Pollutants and Enhancement of Capacity to Manage Such Pollutants" Funded with CDN$823,800, including a termite study with CDN$343,300 through Canada TF051540 – ongoing	Collect information on the use of mirex and chlordane for termite control, alternatives to said substances and integrated pest management; carry out workshops to review the information collected, raise public awareness of the same and develop a workplan for studies to be carried out in pilot sites; implement trial application of alternatives to mirex and chlordane in pilot sites; and evaluate feasibility of integrated pest management practices for termite control.	Implementation Progress: S Development Objective: S
China: "Italian Grant for the Development of a PCB Inventory Methodology and a draft Strategy on PCB Reduction and Disposal in China" Funded with Euro 1,425,000 Italy TF051188 – ongoing	Assist the Recipient in building its capacity to take concrete measures to reduce or eliminate the release of Polychlorinated Biphenyl (PCBs) into the environment; assist in the implementation of their obligation under the Stockhom Convention and other agreements which pursue similar objectives; and assist in addressing critical domestic, health, environment and sustainable development issues related to PCBs	Implementation Progress: S Development Objective: S
China: "Demonstration of Alternatives to Chlordane and Mirex in Termite Control" Funded with GEF – under development	Eliminate the use of chlordane and mirex for termite control in the demonstration provinces by extensive introduction of IPM and prepare a national replication program for complete phase-out of chlordane and mirex in China by 2014.	
Other Related Operations		
Honduras: "Urgent Tracking and Disposal of Hazardous Materials" Funded with $730,000 through	Inventory and cleanup of 104 tonnes of POPs, obsolete pesticides and other toxic waste, following Hurricane Mitch. Groundwater and	Not rated

World Bank Projects	Targeted Sector Issues	Performance Ratings
Dutch TF021813 April 1999 – August 2000 Closed	breast milk testing in contaminated areas. Also awareness raising, capacity building and public information campaigns	
Mali: "Agricultural Services and Producer Organizations Project" P035630 – ongoing	Building capacity for pesticide management including obsolete pesticide inventories and clean up for $1million.	Implementation Progress: S Development Objective: S
Africa (53 countries): "Africa Stockpiles Program, Strategic Partnership 1" – under development	Find and dispose of stockpiles of obsolete pesticides in all 53 countries on continent, and introduce measures to prevent future such stockpiles, arting with Ethiopia, Mali, Morocco, Nigeria, Tanzania, Tunisia, South Africa.	
Algeria: "Disposal of PCBs and Related Wastes and National Capacity Building on Sound Management of POPs and other Hazardous Wastes" – under development	Manage and dispose of in an environmentally sound manner PCBs stocked and in use in equipment throughout Algeria; as well as to develop a sound legislative and regulatory frame work for POPs and hazardous wastes management and build capacity for its implementation and enforcement. The project builds on work previously undertaken by Algeria, in particular in the framework of a World Bank Industrial Pollution Control project, and takes advantage of the opportunities thus created for country-driveness and efficiency.	
Belarus: Enabling activities related to the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Republic of Belarus – ongoing	Develop a National Implementation Plan (NIP) for POPs issues with the assistance of international organisations so that Belarus effectively addresses the reduction and elimination of persistent organic pollutants consistent with the protection of human health and the environment from the effect thereof, and meet its obligations under the Stockholm Convention.	Implementation Progress: S Development Objective: S
Colombia: Initial Assistance to Colombia to Meet its Obligations Under the	Prepare a National Implementation Plan (NIP); build capacity support for Enabling Activities; and help develop	Implementation Progress: S Development Objective: S

World Bank Projects	Targeted Sector Issues	Performance Ratings
Stockholm Convention on Persistent Organic Pollutants (POPs) – ongoing	indicators for incremental costs through the application and test of techniques for cleaning POPs-contaminated sites. The project will help develop and implement priority policy and regulatory reform, capacity building and investment programs as mandated by the Convention.	
Mexico: Enabling Activities to Help Mexico Comply with the Stockholm Convention on Persistent Organic Pollutants (POPs – ongoing	Develop a National Implementation Plan (NIP) for Persistent Organic Pollutants (POPs), such that Mexico can meet its obligations to the Stockholm Convention.	Implementation Progress: S Development Objective: S
Moldova: Enabling activities related to the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Republic of Moldova – completed	Develop a National Implementation Plan (NIP) and provide supporting capacity strengthening such that the Republic of Moldova can effectively protect human health and the environment from persistent organic pollutants and can fully comply with its obligations under the Stockholm Convention	Not rated
Moldova: Sustainable POPs Stockpiles Management – under development	Assist the GoM in confining stockpiles of pesticides and PCBs in such a way that harm to the environment or human health is prevented, as well as strengthening institutional capacity in Moldova to address POPs-related issues and raising awareness at various levels of society.	

Related Operations

Related cleanup and prevention projects implemented by agencies other than the World Bank.

AGENCY	CLEAN-UP OR DISPOSAL ACTIVITIES	PREVENTION OR CAPACITY-BUILDING AND AWARENESS ACTIVITIES
POP Activities in China		
UNIDO		• Building the Capacity of the People's republic of China to implement the Stockholm Convention on POPs and Develop a National Implementation Plan (NIP)
UNDP		• Strategy and Program on Reduction and Phase-out of POPs Pesticides in China
Other Related Operations		
UNEP Chemicals		• Stockholm Convention Secretariat (interim) • Technical and financial support to 33 countries on PCB inventories • PCB inventory and management support to SADC (14 countries) • Awareness raising workshops; guidance and awareness raising publications on PCBs and other POPs, and on alternatives to POPs pesticides.
Secretariat Basel Convention		• Technical guidelines on environmentally sound management of PCBs and other POPs (drafting stage) • Support for national inventories of PCBs and for development of national PCB management plans in Costa Rica, Côte d'Ivoire, El Salvador, Guatemala, Honduras, Nicaragua, Panama. • Awareness raising, policy making and training workshops. • Technical assistance for the undertaking of the national inventory of obsolete pesticides in Mauritius, Venezuela.
UNIDO	• Demonstration projects on non-combustion destruction technology for PCBs and other POPs in Slovak Republic, Philippines	
Switzerland		• PCB Inventory, strategy, awareness raising in Morocco
Australia	• Technical and financial support to identify and dispose of PCBs and	

	other hazardous wastes in Pacific Island Countries	
FAO	• Manage Ethiopia pesticide disposal project • Initiate/coordinate national inventories of obsolete pesticide stockpiles • Initiate/formulate disposal projects for FAO member countries • Supervise/monitor/follow up disposal and prevention operations in the field • Removal and disposal of obsolete pesticides from Iran, Iraq, Seychelles, Lebanon, Yemen, Zambia. • Engage donors in action to resolve obsolete pesticide problems	• Awareness- raising workshops on obsolete pesticides in affected countries and regions. • Guidelines on prevention and management of obsolete pesticides • Guidance and support for prevention programs and strategies in FAO member countries • Global IPM Facility; International Code of Conduct on the Distribution and Use of Pesticides; Pesticides Management Programme; Joint Secretariat of the Rotterdam Convention on Prior Informed Consent; Advice and support on pesticide regulation; regional programs on pesticides registration (CILSS), IOMC member and co chair of IOMC working group on obsolete pesticides.
GTZ	• Cleanup of over 850 tonnes of POPs-containing and other pesticides in Madagascar, Mozambique, Mauritania, Niger, Zambia	• PCB inventories in Thailand, The Gambia
USAID/USEPA	• Contributed to disposal POPs-containing and other pesticides in Ethiopia, Niger, Senegal	• Awareness raising • Training package for inventory taking
Arctic Monitoring and Assessment Program (AMAP)		• Inventory of obsolete stocks of pesticides in Russia
World Wildlife Fund / WWF for Nature	• Engagement with Governments and NGOs on the implementation of the Stockholm Convention on POPs; Global Toxics Program	• Awareness raising on issue of toxics • Financial and technical assistance

Annex 3: Results Framework and Monitoring

CHINA: PCB Management and Disposal Demonstration Project

RESULTS FRAMEWORK

PDO	OUTCOME INDICATORS	Use of Outcome Information
Identify and demonstrate environmentally-sound and cost-effective policies, procedures and techniques for safely managing and disposing of China's unique temporarily stored PCBs and associated PCB-contaminated wastes.	1 Lessons from Zhejiang Province's demonstration of the most cost-effective, environmentally-safe policies and methods for identifying, excavating and cleaning-up temporary PCB storage sites documented and disseminated nationally and globally. 2 China's national PCB management and program and policy/regulations refined to reflect lessons from Zhejiang's experience.	1. Project management (CIO/SEPA and Zhejiang PIU) will use lessons learned from environmentally-sound PCB management and disposal to design China's national PCB management guidance and program. 2. CIO/SEPA will disseminate best practice in PCB management within China and globally.
Intermediate Results One per Component	**Results Indicators for Each Component**	**Use of Results Monitoring**
Component One: CIO/SEPA and Zhejiang Province's PIU have the trained staff required to (a) implement a provincial PCB management demonstration project successfully; and (b) document and apply to design of China's national PCB management program the lessons learned from it.	**Component One:** **Training completed of:** • Zhejiang PIU staff in project management. • 160 EPB and power company staff in management and disposal. • 60 EPB and power company staff in monitoring. • 20 EPB staff in PCB cleanup. • 40 power company staff in in-use and stored PCB equipment management. • 15 EPB staff soil decontamination. • 30 EPB staff on PCB emergency response.	**Component One:** Annually: Identify improvements in training content, schedule or delivery. Annually: Feedback on the efficacy of the consultants', CIO/SEPA's, and the PIU's services through the progress review meeting. Public awareness: Feedback on the implementation of the project through the internet, hot-line, telephone, letters/mail, etc. Annually: Determine if additional CIO- or PIU- functions are needed.
Component Two: The necessary national and provincial policy frameworks for environmentally-sound management and disposal of PCBs are established.	**Component Two:** New, revised or supplemental national and provincial policies, regulations, guidelines and technical standards issued on: • PCBs in soil and water; • PCB cleanup, containerization, transportation, storage, treatment, and disposal; • A PCB clean-up funding mechanism; • PCB emergency response.	**Component Two:** Annually: Review effectiveness of new regulations and technical standards/guidelines at progress review meetings. Checks on the enforcement of the new regulations and technical standards for PCB management and disposal.

Intermediate Results One per Component	Results Indicators for Each Component	Use of Results Monitoring
Component Three: 1. PCBs, PCB-contaminated equipment, and PCB wastes (including contaminated soil and leachate) temporarily stored in Zhejiang Province identified, recovered and low –contaminated PCB wastes disposed of locally in an environmentally-sound way. 2. If the PCB-contaminated transformers installed before 1980 are identified, 10 PCB transformers de-contaminated and recovered, PCB contaminated oils stored temporarily in Zhejiang, 3. PCB contamination level of more transformers tested.	**Component Three:** 1. Zhejiang Province EPB reports confirm that all (about 56) temporary PCB storage sites in Zhejiang Province have been identified, the PCB-containing equipment and contaminated soil were recovered; low contaminated wastes (about 20,000 tons) were cleaned up; and highly-contaminated wastes were packaged, temporarily stored and safely transported to Shenyang for incineration. 2. Zhejiang Province EPB reports confirm that 10 in-service PCB transformers installed before 1980 were decontaminated and recovered PCB contaminated oil safely stored in temporary storage facility in Zhejiang. 3. 3% of 2,200 large transformers and 50 of small transformers tested.	**Component Three:** Annually: Following completion of detailed PCB inventories, for each PCB site and for Zhejiang as a whole, the PCB database will document progress in PCB management operation so as to (1) inform projections of resource needs and (2) provide practical experience for the national replication program.
Component Four: All highly-contaminated PCB wastes recovered from Zhejiang Province safely disposed of in an completed rotary kiln incinerator in Shenyang.	**Component Four:** Shenyang rotary kiln incinerator completed to Stockholm Convention standards for PCB disposal and staff trained in disposal. Incinerator operational records confirm: (a) Zhejiang Province's approx 22,500 PCB-containing capacitors disposed of in an environmentally sound way. (b) Zhejiang Province's approx 250 tons of PCB oil disposed of in an environmentally sound way.	**Component Four:** Annually: This database will document progress in disposing of the PCBs so as to (1) inform projections of resource needs and (2) provide practical experience for the national replication program.
Component Five: Effective project Monitoring and Evaluation Plan developed and implemented.	**Component Five:** Key project monitoring reports produced, including: a. Zhejiang PCB site inventory report. b. PCB management progress and completion at all sites in Zhejiang. c. PCB disposal in Shenyang; and d. Semi-annual and annual project progress reports.	**Component Five:** Annually or semi-annually: These reports will be reviewed by the PIU and CIO/SEPA to ensure they accurately document progress of the demonstration project so as to allow adjustment of the work plans and make projections of resource needs.
Component Six: Detailed China national replication program for PCB management and disposal developed and adopted.	**Component Six:** (a) National workshop for proposed national replication program for PCB management held. (b) National replication program for PCB	**Component Six:** Towards the completion of the project, it will inform preparation of repeater projects. When the project is in its 4th year,

	management finalized and approved. (c) Global dissemination workshop held.	CIO/SEPA will start preparation of repeater projects based on experiences gained.

ARRANGEMENTS FOR RESULTS MONITORING

Outcome Indicators	Base Line (%)	Target Values (%)				Data Collection and Reporting		
		YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments	Data Collection Responsibility
1. Lessons from Zhejiang Province's demonstration of the most cost-effective, environmentally-safe policies and methods for identifying, excavating and cleaning-up temporary PCB storage sites documented and disseminated nationally and globally.	0	0	20	50	100	Every six months	Tracked using the PCB inventory, management, and disposal information in the management information system (MIS) and the known international and national PCB toxicity standards	Local PIU Consultants: review CIO/SEPA: coordination
2. China's national PCB management and program and policy/regulations refined to reflect lessons from Zhejiang's experience.	0	0	20	50	100	Every six months		
Results Indicators for Each Component								
Component One: **Training completed of:** • Zhejiang PIU staff in project management • 160 EPB and power company staff in management and disposal; • 60 EPB and power company staff in PCB site monitoring • 20 EPB staff in PCB site cleanup • 40 power company staff in management of in-use and stored PCB equipment • 15 EPB staff in soil decontamination • 30 EPB staff on PCB emergency response.	0	50	80	100	100	Every six months	Database will be established as part of the MIS	Local PIU and CIO/SEPA

Outcome Indicators	Base Line (%)	Target Values (%)				Data Collection and Reporting		
		YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments	Data Collection Responsibility
Component Two: New, revised or supplemental national and provincial policies, regulations, guidelines and technical standards issued on: • PCBs in surface water, groundwater, air, and soil; • PCB cleanup, containerization, transportation, storage, treatment, and disposal; • A PCB clean-up funding mechanism; PCB emergency response.	0	20	30	60	100	Every six months	Database will be established as part of the MIS	Local PIU and CIO/SEPA
Component Three: All (estimated 56) temporary PCB storage sites in Zhejiang Province identified, PCB-containing equipment and contaminated soil recovered. Low contaminated wastes packaged, transported, temporarily stored and treated. Severely contaminated wastes safely transported to Shenyang for incineration. 10 In-use large PCB transformers installed before 1980 decontaminated and more transformers tested.	5	5	40	90	100	Every six months	Database will be established as part of the MIS	Local PIU Consultants: review CIO/SEPA: coordination and review
Component Four: Shenyang rotary kiln incinerator completed to Stockholm Convention standards for PCB disposal and staff trained in PCB disposal. Incinerator operational records confirm: (a) Zhejiang Province's approx 22,500 PCB-containing capacitors disposed of in an	0	20	50	90	100	Every six months	Database will be established as part of the MIS	Local PIU Consultants: review CIO/SEPA: coordination and review

Outcome Indicators	Base Line (%)	Target Values (%)				Data Collection and Reporting		
		YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments	Data Collection Responsibility
environmentally sound way. (b) Zhejiang Province's approx 250 tons of PCB oil disposed of in an environmentally sound way. (c) Zhejiang Province's approx 20,000 tons of PCB-contaminated soils disposed of in an environmentally-sound way.								
Component Five: Key project monitoring reports produced, including: a. Zhejiang PCB site inventory report. b. PCB management progress and completion at all sites in Zhejiang. c. PCB disposal in Shenyang; and d. Semi-annual and annual project progress reports.	0	50	80	90	100	Every six months	Progress reports, Progress review meetings (annually)	CIO/SEPA and local PIU Consultants: review
Component Six: (a) National workshop for proposed national PCB management program held. (b) National PCB management program document finalized and approved. (c) Global dissemination workshop held.	0	0	0	10	100	NA	Survey and workshops	Consultants: development CIO/SEPA: coordination and review

Annex 4: Detailed Project Description

CHINA: PCB Management and Disposal Demonstration Project

COMPONENT 1: INSTITUTIONAL STRENGTHENING (US$ 1,892,000)

This component aims to strengthen Chinese institutions for PCB management in a sustainable manner. It includes the following subcomponents:

1. **Inception workshop for the Project.** A three-day Inception Workshop to be held in Zhejiang for about 60 participants from CIO/SEPA, MOF, NDRC, MOST, SERC, Electricity Grid Corporation of China, Zhejiang PIU, Liaoning EPB, Zhejiang Power Company, Liaoning Power Company and other participating agencies. There will be two distinct sessions to this workshop.

   a. The first session (one day) will discuss the following topics: (i) status of PCB management in China and preliminary strategy for reduction and disposal of PCBs; (ii) introduction of the demonstration project; and (iii) coordination mechanisms among project stakeholders.

   b. The second session (two days) will discuss: (i) the operational manual and project implementation plan (including project cycle, project schedule, institutional arrangements, procurement, and financial management); (ii) potential risks and risk mitigation measures during project implementation; and (iii) reporting mechanisms (including formats for progress reports and financial reports).

2. **PCB project team.** This team will be in charge of the management and implementation of the Project under the guidance of CIO. This budget item will cover some necessary equipment and accessories for this overall management.

3. **Establishment of a national expert group.** Fourteen (14) consultants will be engaged for project implementation. These consultants consist of one International Chief Technical Advisor, one National Technical Advisor, six technical/policy experts, and six specialists for PCB transformer decontamination.

   a. The Chief Technical Advisor (CTA, international) will provide overall technical direction and guidance for the project activities. He/she will:
      i Transfer international experience to this project,
      ii Provide technical support for policy development, institutional strengthening, monitoring and evaluation, and development of a follow-on program to share experiences from this project, and
      iii Provide technical input for the PCB management system established in the Zhejiang Province and the disposal center established in Shenyang.
   b. The National Technical Advisor (NTA) will:
      i Assist CIO in the overall technical management of this project,
      ii Coordinate all project activities,

iii Provide technical support to all local consulting firms/consultants and engineering companies, and
iv Provide technical comments on the scheduling and implementation of all project activities.

c. Technical/Policy Experts, consisting of six professionals, will contribute to this project in the areas of: (i) institutional/policy framework on hazardous waste management; (ii) standards on pollution control and technical guidelines; (iii) electricity grid system; (iv) environmental monitoring; (v) PCB treatment and disposal; and (vi) environmental risk assessment. Each expert will be engaged for 150 days during this four-year project to:
i Provide professional consultation for all project activities.
ii Revise and improve the training materials generated by the Canadian Trust Fund study on "PCB Management Capacity Building".

4. **Establishment of a PIU in the Zhejiang Province.** A Project Implementation Unit (PIU) will be established to assist CIO and the PCB team in supervising and monitoring the implementation of demonstration activities in the Zhejiang Province. The local PIU is proposed to be formed by members from the Zhejiang EPB (Environmental Monitoring Center and Solid Waste Management Center) and Power Company of the Zhejiang Province. The key responsibilities of the local PIU – under supervision and guidance of CIO – are to:

a Oversee the implementation of relevant project activities that are under direct contract between CIO and PIU.
b Assist CIO in supervising the project activities conducted by local consulting firms or engineering companies.

5. Capacity building activities for the local PIU will include:

a Procurement of equipment such as computers, printers, copiers, camera, and laptops.
b Development of a database for managing project information.
c Assistance to cover such operating cost items as rent for offices and the meeting room, transportation, and communication.
d Training of PIU staff on project management (see below)

6. **Provincial training.** These training programs will be held in the Zhejiang Province. These training programs will be directed to the key stakeholders in the Zhejiang Province, which include: (i) PCB management institutions; (ii) environmental department of the power companies; (iii) PCB monitoring institutions; and (iv) companies in charge of PCB collection, transportation and treatment. The specific training programs planned for these stakeholders are:

a. Project management training for PIU staff and the project team in CIO. The project will support at least two times project management training for PIU staff and the project team in CIO. The training will include skills on project monitoring, procurement, financial management, as well as the Bank's safeguard policies.
- *Participants:* 10 participants from PIU and CIO.

- *Training materials:* These materials – to be provided by the Bank and SEPA.
- *Training workshops:* Two 2-day workshops.

b. PCB management (to include the entire PCB identification to final disposal process) training for administrative staff :
   - *Participants:* 160 participants from EPB and the power companies at the provincial, city, and county levels.
   - *Training materials:* These materials – to be provided by the Technical/Policy Experts – will cover environmental sound management principles.
   - *Training workshops:* Four 4-day workshops.

c. Training on PCB site monitoring for the monitoring staff:
   - *Participants:* 60 participants from EPB and the power companies at the provincial, city, and county levels. The participants will be in charge of monitoring work at the PCB sites.
   - *Training materials:* These materials – to be provided by the Technical/Policy Experts – will cover sampling, sample preservation, *sample* analysis, data evaluation, and quality assurance/quality control.
   - *Training workshops:* Two 10-day workshops.

d. Training on PCB site cleanup for the PCB cleanup staff:
   - *Participants:* 20 participants from the selected company/companies.
   - *Training materials:* These materials – to be provided by the Technical/Policy Experts – will cover the cleanup technology and personal protection measures.
   - *Training workshop:* One 5-day workshop.

e. Training on in-use/stored PCB equipment management for operational staff:
   - *Participants:* 40 participants from power companies and enterprises having PCB equipment.
   - *Training materials*: These materials – to be provided by the Technical/Policy Experts – will cover sound management practices for PCB equipment that are in use or stored.
   - *Training workshop:* One 2-day workshop.

f. Training on remediation of PCB contaminated sites for decontamination personnel:
   - *Participants:* 15 participants from the company selected for PCB soil decontamination.
   - *Training materials:* These materials – to be provided by the Technical/Policy Experts – will cover remediation of PCB-contaminated sites.
   - *Training workshops:* One 3-day workshop.

g. Training on emergency measures for staff in charge of emergency actions:
   - *Participants:* 30 participants from EPB at the provincial and city levels.
   - *Training materials:* These materials – to be provided by the Technical/Policy Experts – will cover emergency measures to be taken during collection, cleaning and transport of PCB wastes.

- *Training workshops:* One 5-day workshop.

7. **Public awareness.** This sub-component will fund public awareness activities on (1) the risks associated with PCB, (2) cleanup of PCB sites, (3) involvement of PCB equipment owners from the beginning, and (4) assistance to the public to avoid putting PCB equipment into household or industrial wastes. The public awareness to be undertaken will include:

a Video production of about 15-minute duration and broadcasting at CCTV and Zhejiang Province for 10 times.

b Public education and dissemination in 10 national newspaper.

c 20,000 brochures for awareness raising on POPs and PCB.

Component 2: Development of a policy framework for PCB management and disposal (US$ 812,000)

8. Current policies and regulations on hazardous waste management [2] in China provide some specific requirements on PCB management, although they are insufficient to support the effective implementation of this demonstration project which involves a full-spectrum of activities such as monitoring, cleanup, containerization, transport, treatment, and disposal of PCB wastes. Therefore, a new policy framework in China is needed in accordance with the Stockholm Convention. This can be achieved through revision of the existing rules or standards, development of new technical guides and standards to implement the POPs Convention and the National rules, and development of local rules and plans.

9. This component will develop and improve upon the legal and regulatory framework for safe management of PCBs in the Zhejiang Province, as the pilot province for China under this demonstration project. In addition, relevant policies and regulations at the national and the local levels governing PCB management and disposal will also be reviewed, revised, and supplemented as necessary.

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[2] These policies and regulations include:

Environmental Control Law of Solid Wastes Pollution of the People's Republic of China. This is the first law – issued by the People's Congress in 1995 – covering solid waste (including hazardous waste) management in China;
Directory of Hazardous Wastes. This directory – issued by SEPA, the former SETC, the former MFETC and the MPS in 1998 – lists PCBs as the tenth hazardous waste among the 47 hazardous wastes in the list;
Management Method on Hazardous Waste Operation License. This legislation – issued by the State Council in 2004 – stipulates that hazardous wastes containing PCBs be licensed by SEPA for disposal.
Standards on Pollution Control of PCBs Wastes. These standards – issued by the former State Bureau of Technical Supervision and SEPA in 1992 – establish the pollution control value of PCB wastes at 50mg/kg. These standards also require: (i) incineration at high temperature of hazardous wastes with PCB concentrations greater than 500mg/kg; and (ii) incineration at high temperature or secure landfilling of hazardous wastes with PCB concentrations between 50mg/kg and 500mg/kg.
Standard for Pollution Control on Hazardous Waste Incineration. This standard – issued by SEPA in 2001 – specifies the requirements for incineration of PCB wastes as follows: (i) incineration temperature of 1200°C (or greater); (ii) gas retention time of 2.0 seconds (or greater); (iii) combustion efficiency of 99.9% (or greater); (iv) destruction and removal efficiency of 99.9999% (or greater); and (v) calcinations reduction rate of 5% (or less). In addition, the maximum allowable discharge concentration of dioxins should be less than 0.5 TEQ ng/Nm^3.

10. This component consists of six key policies to be revised or developed:

At Provincial Level:

a. **A pollution prevention/control regulation for PCBs for the Zhejiang Province.** The objective of this sub-component is to establish a provincial regulation on pollution prevention/control for PCB-bearing equipment and PCB wastes to ensure a successful implementation of this demonstration project in the Zhejiang Province. The draft provincial regulation will be prepared based on a comprehensive review and evaluation of relevant documents available in China and other countries, and considering the PCB-related experience accumulated for the past years in the Zhejiang Province. The draft guidelines will be presented for discussion at an expert workshop to provide comments and suggestions for revisions. Then the revised guidelines will be applied at specified pilot sites in the Zhejiang Province and further improved, if necessary.

b. **An emergency plan for PCB accidents in Zhejiang.** The objective of this sub-component is to develop an emergency plan that will be implemented in case of PCB accidents that might result in harm to people and the environment. The draft plan will propose measures to address such situations as illegal dismantling of PCB equipment (in particular, stolen PCB equipment); and possible unexpected leakage of PCB oil during collection, cleanup, transport and storage. The draft plan will be prepared based on a comprehensive review and evaluation of similar plans in China and other countries, and considering the specific conditions in the Zhejiang Province. The emergency plan will be reviewed by an expert group to provide comments and suggestions for improvement. The trial implementation of the plan in the Zhejiang Province will provide a more practical experience for further improvement.

c. **A technical guideline for PCB management and disposal.** The objective of this sub-component is to develop the technical guidelines that cover the entire spectrum activities that involve management of hazardous wastes containing PCBs. The draft guidelines will be prepared based on a comprehensive review and evaluation of relevant technical and legal documents available in China and other countries. The draft guidelines are expected to establish detailed rules on cleanup, containerization, transportation, storage, treatment, and disposal of PCB wastes. The draft guidelines will be presented for discussion at an expert workshop to receive comments and suggestions for revisions. Then the revised guidelines will be applied at specified pilot sites and further improved, if necessary.

At National Level:

d. **A national regulation on PCB management and disposal.** The national regulation will (a) define the responsibilities of central government, local government, as well as PCB equipment owners, (b) set up the timeline for PCB

management and disposal in China, (c) require registration and public disclosure of PCB waste storage.

e. **National pollution control and environmental quality standards for PCBs.** The key objective of this sub-component is to develop pollution control and environmental quality standards for PCBs to facilitate implementation of this project at the demonstration sites and support the environmental regulatory framework in China. The proposed standards for development are as follows:

   i. Pollution control standard for PCBs in wastewater discharges
   ii. Pollution control standard for PCBs in gas emissions
   iii. Pollution control standard for PCBs in solid wastes
   iv. Environmental quality standard for PCBs in surface water
   v. Environmental quality standard for PCBs in groundwater
   vi. Environmental quality standard for PCBs in soil
   vii. Environmental quality standard for PCBs in air.

   The draft standards will be prepared based on a comprehensive review and evaluation of relevant technical and legal documents available in China and other countries. The draft standards will be reviewed by an expert group to provide comments and suggestions for improvement. The revised guidelines will then be applied at specified sites for guiding the demonstration activities under this project.

f. **Development of a funding mechanism for co-financing PCB management and disposal in China.** The objective of this sub-component is to develop a regulation that establishes a funding mechanism for PCB management in China. Development of this regulation will involve: (i) a detailed analysis and estimate of the overall financial needs for PCB management in China given the available baseline information in the country, the requirements of the Stockholm Convention, and the possibilities for international financial assistance; (ii) identification of the possible domestic funding sources for PCB management, considering the financial mechanisms established in such programs as the National Program for the Construction of Hazardous Waste Disposal and Medical Waste Disposal; and (iii) a formulation of a partnership mechanism for all stakeholders to ensure an effective implementation strategy for PCB reduction and disposal in China. The regulation will address in detail requirements for collection, use, management, supervision, and risk minimization of funds for PCB projects. The draft regulation will be prepared based on a comprehensive review and evaluation of relevant technical and legal documents available in China and other countries. The draft guidelines will be presented for discussion at an expert workshop to receive comments and suggestions for revisions.

Component 3: PCB Management in the Zhejiang Province (US$ 15,345,000)

This component, together with Component 4, represents the core of the project. The component consists of the following seven sub-components:

11. PCB sites in Zhejiang:

a. Total estimated PCB sites in Zhejiang: 61
b. Number of PCB sites already cleaned up: 5
c. Number of PCB sites to be cleaned up: 56
   - Number of PCB sites already exactly located: 4
   - Total identified PCB sites in Zhejiang, location still to be found: 34
   - Number of PCB sites to be identified from now to 1st and 2nd years of project implementation: 18
d. Number of PCB sites to be exactly located: 52 (of which, cleanup of 10 sites will be funded by the Sino-Italy project, cleanup of the other 42 sites be funded under the demonstration project)

12. **Identification of exact location of PCB sites.** This sub-component involves determination of specific locations of the PCB storage sites in the Zhejiang Province to initiate environmental sampling[3]. Currently, 43 PCB storage sites (including 5 cleaned up sites) have been identified, although the actual positions are yet to be determined. In addition to these sites, a potential of 18 PCB sites may be present. In some cases, despite records or other information concerning the existence of the PCB storage sites, the exact location of the PCB contaminated waste is still unknown. Very often, the use of a simple probe could not be used and in some cases that methodology could be dangerous. For this reason, use a more sophisticated technique that allows a precise localization of buried capacitors or other PCB contaminated wastes in the Zhejiang Province is recommended.

13. The Georadar (ground penetrating radar) technology is proposed for locating and obtaining a preliminary quantification of buried PCBs wastes. This technology is based on electromagnetic waves, which are sent to the surfaces to be monitored and received back with a different reflection due to the dielectric characteristics of the elements they go through. This technology is effective for locating and determining the depth of claddings, caves, cracks, metallic elements and any other objects with a sensible dielectric contrast. In addition, this technology is used in archaeological surveys, foundations and underground structure surveys, etc. The cost of a complete georadar system is about USD20,000-30,000 depending on the type of antennas and accessories required. It should be operated by a qualified geologist.

14. **Cleanup of the PCB sites.** This project will address only PCB- contaminated water collected immediately inside the storage sites or mixed with PCB contaminated soils (leachate). During identification and cleanup of the PCB sites, PCB contamination of ground water might be detected. Although the PCB-contaminated soil is proposed to be cleaned up with the proposed funding for this project, any PCB-contaminated ground water will be cleaned up by the Chinese, i.e. not under the GEF funding nor included in the counterpart financing of this project.

[3] Environmental sampling would be required to determine the background PCB concentrations associated with the storage sites, the extent of PCB pollution at the storage sites, and the boundary of contaminated soil that require cleanup.

15. If groundwater is found to be contaminated by PCBs, the extent of the groundwater contamination will be assessed (in terms of pollutant concentrations and amount of groundwater to be cleaned up), and a remedial action will be recommended in the context of site-specific environmental investigation. The groundwater clean up will be the responsibility of the Chinese Government, and the cleanup levels will be dictated by the Chinese regulations or – in the absence of these – by international standards (for example, if the contaminated groundwater is used for drinking, the Chinese standard for PCB concentration in drinking water of 0.00002 mg/liter – or 0.02 ppb - will be used).

16. All identified PCB sites in Zhejiang Province will be cleaned up using the following procedures. Activities include:

a. Data gathering. Data gathering is a pre-field preparatory activity which will be conducted for all identified PCB sites. Information concerning geography, topography, land use, soil morphology, hydrogeology (in particular, groundwater depth and flow direction), groundwater use, etc. for each contaminated site will be collected, organized, and stored in a database for easy retrieval.

b. Pre-cleanup field tests (site-specific environmental characterization). Before initiating cleanup at each PCB site, the following activities will be performed:

   i *Mapping of the exact position of the site and position of the buried PCB wastes*. The exact geographic location of each site will be determined using an off-the-shelf global positioning system (GPS). The position of the buried PCB wastes within the site will be determined using a ground penetrating radar or, in simple circumstances, by probing. The use of the GPS and ground penetrating radar will allow preparation of digital maps of sites and of the buried objects for each site.

   ii *Sampling and analysis*. A first set of soil samples at 2 or 3 different depths will be taken. Soil samples will be taken starting from the surrounding of the area where buried objects have been found, and extending in a wider area following a geostatistical criterion. Depending on the type of the site, 66 to 160 samples for each site may be taken for characterization.

   iii *Mapping of PCB contamination*. After the sampling and analysis, a digital map of PCB concentrations will be prepared using a geostatistical software. This map will be overlapped with the map of the buried objects location to design the cleanup activity. Zones with high PCB contamination (>500 ppm) and low PCB contamination (50-500 ppm) will be identified.

   iv *Site characterization and risk assessment*. Based on the location and conditions at the site, proximity to human settlements, water sources, agricultural lands, sensitive habitats, etc., the risks to humans or the environment will be determined using a simple comparative risk assessment approach. The risk assessment will allow ranking of the sites and determining the order of their inclusion in the annual work program. The results of site-specific characterization will be confirmed by the local authorities.

c. Site cleanup design. The site cleanup design will include:

i The amount of wastes to be removed
ii The time schedule of the cleanup work
iii Standard safety procedures
iv Measures for preventing further leakage or dispersion of contaminants to the environment.

The environmental protection administration at the provincial level will review of the site cleanup design. Views and suggestions of the local citizens (including the property owners), representatives from the environmental protection administration, and specialists on the cleanup design will be obtained, and the design will be modified to address these views and suggestions. The Bank will review and clear the first three site-specific environmental characterization reports and detailed site-specific cleanup plan. And the Bank reserves the right to review site environment characterization reports and cleanup plans for other PCB sites during project implementation.

d. Site preparation prior to cleanup. These preparatory activities relate to the need for additional infrastructure at the site, selection of the field equipment, leakage countermeasures, posting of signs, and prevention of soil collapse.

i *Infrastructure*. If necessary, access roads will be constructed and the workplace unruffled (including working area, rest area, tools location and temporary storage area.
ii *Equipment.* The required machinery will be selected on the basis of the area features and landfill type, generally including dredge, electrical generator, electrical kevel, pump, forklift, and transportation trucks.
iii *Leakage countermeasures.* Leakage countermeasures will be implemented.
iv *Site security.* The entire area to be cleaned will be cordoned off, designated with signs, and protected.
v *Prevention of soil collapse.* If the depth of digging is big, steel protective balustrade will be prepared in order to prevent soil collapse. Water will be pumped from the excavated area and stored for analysis and required future treatment.

e. Safety training on personal protection measures. Workers will be trained on personal protection measures including use of suitable protective clothing, gloves, boots, masks; prohibition of smoking, drinking and eating during the work in contaminated areas; and access restriction.

f. Removal and packaging of PCB contaminated waste and soil.

i *Excavation.* Excavation will be performed according to the contaminated site design and procedures established under this project sub-component. The collected contaminants from heavily contaminated zones will be placed separately in an isolated area separated by a 1.2-meter-high cofferdam above the water level. The cofferdam will not be located in area where groundwater is shallow. The floor of the cofferdam will be waterproof. Excavation will be stopped when a cistern or a capacitor is found.

ii *Packaging of PCB-contaminated soil*. Contaminated soils will be packaged and labeled (including the date, identification of the site and the site manager, and types of pollutants).

iii *Removal and packaging of PCB wastes*. PCB capacitors or other wastes will be immediately sealed after their removal from the site and transferred into the barrels. Each barrel will be labeled for future identification.

iv *Removal of liquid PCBs*. Liquid PCBs will be transferred into containers. Each container will be labeled for future identification.

v *Small tools and personal protective equipment.* These tools and equipment will be collected as PCB-contaminated wastes and put into containers and barrels, which will be labeled for future identification.

vi *Protocol of Packaging PCB wastes.* The following protocol will be used for packing the PCB wastes:

- Each capacitor will be packed in one bag made of a heavy-duty plastic membrane. Three to six 6 bags containing capacitors will then be placed in one barrel. The barrels will have a capacity of 200 liters, be made out of metal or plastic lined inside with a thick plastic membrane, and have a sealable cover on the top.
- Heavy polluted wastes (such as broken capacitors and heavy polluted soil) will be put in a barrel with a 200-liter capacity, made out of metal or plastic, and sealed with a double layer thick plastic membrane inside, and have a sealable cover on the top.
- PCB liquids will be stored in 10-liter plastic pots. Separately sealed pots will then be put in a barrel with a 200-liter barrel capacity, made out of metal or plastics, lined with a double layer thick plastic membrane inboard, and have a sealable cover on the top.
- If the moisture content of the lightly polluted soil exceeds 50%, a 200-liter metal barrel with plastic membrane inside or a plastic barrel will be used. However, if the moisture rate is less than 50%, the contaminated soil will be packed in a waterproof bag.

g. Restoration of the cleanup site. The excavated areas will backfilled with clean soil. After the surface is restored, the site will be handed over to the owner.

h. Evaluation of cleanup activities. A report will be prepared for each PCB cleanup site to document and evaluate all activities conducted at the site.

i. Site documentation. Site documentation will be collected and archived. The documentation will include the design of the cleanup activities, cleanup work reports, analysis and sampling reports, the site cleanup report, etc.

j. Transportation of PCBs wastes to the Chongxian storage site in Zhejiang. The highly contaminated PCB wastes (>500 ppm) will be transported from the PCB sites to storage sites in the Zhejiang Province for temporary storage. The following protocol will be used:

i Transportation trucks must contain signs displaying that these are vehicles transporting hazardous chemicals and include name of the transportation company and the emergency numbers.

ii Drivers of these vehicles will go through a special training to receive authorization for transporting PCB wastes. This training will cover such areas as safe driving practices, protective equipment and its use, spill cleanup procedures, emergency response procedures, proper completion of the manifest, etc.

k. Transportation of PCB wastes from the storage site in Zhejiang to Shenyang. After containerization, highly contaminated PCB wastes (>500 ppm) will be transported by special trucks from the temporary storage sites (in the Zhejiang Province) to Shenyang for destruction by incineration. The transportation of PCB highly-contaminated wastes will strictly comply with the terms and requirements stipulated in *Regulation on the Transportation of Hazardous Wastes* in China. The following protocol, explained in details in the Zhejiang EIA, will be used for transporting the PCB wastes:

i Establish the guidelines for safe transportation;
ii Given the characteristics of PCBs, the transportation will be conducted by the special company or institute licensed for hazardous wastes transportation;
iii Management procedure and emergency procedure for transportation should be established in advance. The management procedures should include:
- Contract negotiation and signed;
- Establishment of transportation team and responsibility assigned to individuals;
- Preparation of vehicle and necessary equipment. Trucks transporting PCBs must contain signs displaying that these are vehicles transporting hazardous wastes and include name of the transportation company and the emergency telephone numbers;
- Prior to placement on the trucks, all containers will be inspected to ensure that there are no spills and there is no potential for any spill during transportation.
- Contents of handover of hazardous wastes from cleanup site/warehouse to the transportation team;
- Planning of route and agenda;
- Accommodation and fuel charging;
- Measures for addressing troubles or breakdown of vehicles;
- Contents of handover of hazardous wastes from the transportation team to the warehouse;
- Cleaning of the unloaded vehicles;
- Arrangement of return;
- Check, evaluate the transportation tasks completed;
- Periodical sampling and analysis on the vehicles to determine the necessity of environmental monitoring on sensitive sites along the route of transportation.

iv Transportation trucks must contain signs displaying that these are vehicles transporting hazardous chemicals and include name of the transportation company and the emergency numbers. The workers and staff involved in transportation and drivers of these vehicles will go through a special training to receive authorization for transporting PCB wastes. This training will cover such areas as safe driving practices, protective equipment and its use, spill cleanup procedures, emergency response procedures, proper completion of the manifest, etc.

v There will be three batches of PCB wastes. The first batch will include PCBs wastes from 25 sites from October 2006 to March 2007; the second batch will include PCBs wastes from 15 sites from October 2007 to December 2007; and the third batch will include PCBs wastes from 16 sites from March 2008 to June 2008.

17. Cleanup of the PCBs storage sites will be implemented in four annual programs:

a. 1st and 2nd annual program (July 2005-June 2007) -- infrastructure construction and cleanup of 25 sites.
b. 3rd annual program (July 2007-June 2008) -- cleanup of 31 sites
c. 4th annual program (July 2008-June 2009) – Evaluation of PCB site cleanup and preparation of the national replication program.

18. **PCB waste storage facility in Chongxian, Zhejiang.** The storage facility will be designed and operated according to the Standard for Pollution Control on Hazardous Waste Regulation (GB18597-2001). Up to four 200-liter barrels will be placed on a pallet, all packed together, and marked with a warning label. The PCB contaminated wastes packed in bags will be bond by a binder and marked with a warning label. The height of any PCB-packed container in the storage will not exceed two-floor height. When a certain volume of PCB wastes (>500ppm) are accumulated, these wastes will be transported to the Shenyang PCB Disposal Facility in three batches for final destruction. As for the contaminated soil and other PCB wastes (<=500ppm), these wastes will be treated by the mobile thermal desorption unit.

19. EA preparation for the storage facility for temporary PCB wastes in Zhejiang. When the site for building the PCB storage facility is selected, an EA needs to be prepared for the Chinese authorities and the Bank's clearance before its construction.

20. Cleanup of low contaminated PCB soils (between 50ppm to 500ppm)

a. Mobile thermal desorption system for contaminated soils. Based on current project design, the capacity of the desorption system is about 30-50 ton/day, which can treat about 20,000 ton of low contaminants in two and half years. The budget proposed in Annex 5 is based on 30-50 ton/day, but the project component has not been changed accordingly due to limited time. PCB wastes with concentrations of 50-500 ppm will be treated using a mobile thermal desorption system. Selection of the thermal desorption technology[4] was based on the

[4] In the thermal desorption process, the PCB-contaminated soil is fed to a rotary dryer operating at a temperature of 500-600^{0}C, where PCBs and other organic pollutants are desorbed from soil under a nitrogen blanket. These pollutants in the gas phase are cooled and

evaluation of alternative PCB treatment/disposal technologies. The thermal desorption technology has the advantage of: (i) not producing any dioxins, (ii) leaving behind decontaminated soil than contains about 1-2 ppm PCBs, and (iii) having lower capital and operating costs than incineration. A mobile system allows treatment of the PCB-contaminated soils at the PCB sites, avoiding packing and transportation costs of these wastes. In addition, the environmental risks associated with the transportation of PCB wastes would be minimized.

b. The mobile thermal desorption system consists of ten units: transportation system, feeding system, pre-treatment system, nitrogen generation unit, thermal desorption unit, flue gas treatment unit, wastewater treatment unit, central control, flue gas monitoring and emergency system. The treatment capacity of this system is selected to be 30-50 tpd based on treatment of 20,000 tons of PCB-contaminated soil (50-500 ppm PCBs) in a period of two and half years (from the end of 2006 till Mid 2009) and 200 days/year operation (assuming some downtime for startup, shutdown, and transportation from one site to another). The total investment cost of this system is estimated to be 2 million USD.

c. The operating cost of this mobile thermal desorption system is estimated to be 270 USD/ton, or 5.4 million USD for the 20,000 tons of PCB-contaminated soils to be treated between end of 2006 and mid 2009. This includes the costs for energy, chemicals and supplies, labor, equipment maintenance, safe guarding, rent of land for disposal, cleaning of the rent land, transportation of the equipments, package, testing, waste water treatment, treatment of adsorbate, assurance of engineering, and others. This has been clearly described in the updated Annex 5 revised by CIO recently. The originally proposed budget (150 USD/ton) is too strict and tensional in order to make the budget within a scale of 32.4 million proposed early August.

d. EA preparation. An EA will need to be prepared for use of the mobile thermal desorption system. An analysis will be conducted on mobile vs. fixed thermal desorption, which should be part of EA report. The EA report will need to be cleared by the Chinese authorities and the Bank before its purchase and application.

e. In China, PCB wastes are mainly PCB contaminated soils. 50 ppm is the national standard for cleaning lowly PCB-contaminated wastes in China. The cleanup action level for site cleanup will be based on available international standards and the future use of the cleaned PCB sites.

21. **Supervision of PCB site cleanup and soil decontamination.** Independent consultants will be selected to supervise PCB site cleanup and soil decontamination. This is to make sure that PCB site cleanup and soil decontamination follows Chinese regulations and technical standards as well as requirements under this project.

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washed in a gas cleaning equipment for transfer to the water phase. Wastewater produced during washing is treated with flocculation/precipitation and activated carbon to meet the effluent standards (concentration of PCBs in the effluent is expected to be below 0.5µg/l). The spent carbon, after removing PCBs and other organic pollutants, is sent to for incineration.

22. **Verification and Monitoring of PCBs sites after cleanup.** This part will include verification of PCB site decontamination right after site cleanup and regular post-site-cleanup monitoring for one year. Verification will be conducted by Zhejiang Environment Monitoring Station for each of the PCB sites after its cleanup to confirm its site decontamination. The verification results will be endorsed by the Zhejiang provincial EPB. Soil, ground water, surface water and plants around the storage sites will be tested during the verification. After commission of each site by Zhejiang EPB, the project will also support regular post-site-cleanup monitoring of selected sites for one year.

23. After commission of each site by Zhejiang EPB, the project will support monitoring of selected 30 sites for one year within the project duration. An average of 25 samples per site is expected to be collected and analyzed during the one-year monitoring period. A post-cleanup monitoring plan will be implemented for each selected site. Any subsequent monitoring cost when needed after the project duration will be borne by Zhejiang government.

24. **Testing and Decontamination of in-use PCB transformers.** The sub-component addressing PCB containing transformers still in use has been developed later than have other parts of the project. It was originally the Chinse expectation that there would be no PCB contaminated tranbsformers in China. However, only when the Sino-Italian PCB project identified PCB contaminated transformers as a potentially significant source of PCBs, the problem was realized and transformer became part of the project.

25. China has confirmed that it never produced PCB containing transformers. However, large-size transformers and capacitors containing PCBs were imported to China in 1970s and 1980s, it is possible that some transformers might still be contaminated with PCBs. In addition, transformers might have been contaminated with PCB during servicing and maintenance. With the implementation of the Stockholm Convention, testing of the on-line and off-line transformers and decontamination (or disposal) of PCB-containing equipment would be necessary.

26. The Sino-Italian project attempts to obtain the inventory of all transformers in Zhejiang and Liaoning provinces. So far, this project has identified 230,000 in-use transformers in Zhejiang in 2003, of which around 2,200 are large transformers (over 110kv), yet their potential contamination with PCB is still to be investigated. And it is estimated that 78 (still to be confirmed) of those older large PCB transformers (over 35kv and about 626 units) installed before 1980 are still in service. As there might be a higher risk that those transformers might be contaminated with PCB, this demonstration project will focus on investigating the potential PCB contamination of them and testing of decontamination technology of PCB transformers and decontamination of some those still in-use large PCB transformers installed before 1980. Due to the large number of transformers and unknow status of potential PCB contamination, the project does not attempt to decontaminate all the PCB contaminated transformers in Zhejiang. This would be a long-term task and would have to be integrated into the normal service and maintenance of transformers.

27. The following activities on transformers have been and will be carried out under the Sino-Italian project:

a. Identification of location of the 2,200 large transformers (already identified under the Sino-Italian project),
b. Sampling and analysis of 108-144 on-line transformers in Zhejiang to establish the percentage of PCB contaminated transformers and contamination level (will be conducted under the Sino-Italian project in next six months).

28. Regarding large-size PCB-contaminated transformers, the best available treatment technology involves removal of the PCB oil from the transformers (and decontamination of the transformers), treatment of the PCB oil using a dehalogenation technology, and regeneration and recovery of the oil. For this reason, a suitable technology should:

a Be capable to treat the transformer both on site (by means of portable equipment) or ex-situ
b Allow complete regeneration of the oil without affecting negatively its dielectric properties (so that the oil should be decontaminated and reused)
c Avoid, as much as possible, use of high temperature/pressure or hazardous chemicals to be able to operate at sensitive sites such as industries, electric plants, etc.

29. Only dehalogenation processes are capable to fulfill these criteria. Sodium-based processes have very rapid reaction rates, but may present some risk due to the strong reactivity of metallic sodium. KPEG-modified processes (like the Italian CDP process) do not require use of hazardous chemicals and may provide better result in terms of preservation of the dielectric property of the oil, but have lower reaction rates. Off-line dehalogenation processes (like the LTR2 process), which are based on solvent washing of the transformers followed by dehalogenation or incineration of the oil, are also feasible.

30. The following activities on transformers will be implemented under this project:

a. Collection of detailed information (such as owner information, age, size, country of origin, PCB analysis records, maintenance records, condition of transformers, etc.) of in-use 78 large transformers installed before 1980. The process and information collected will be based on the PCB inventory methodology developed under the Sino-Italian project,
b. On site investigation and testing of potential PCB contamination level of the 78 older transformers installed before 1980,
c. Testing of decontamination technology of PCB transformers,
    i. Seminars on decontamination technology of PCB transformers,
    ii. Analysis of the PCB content in transformer oil and selection of the most appropriate technology for decontaminating PCB transformers in service,
    iii. Rental of decontamination equipment for testing on a limited number of transformers,
    iv. Test of the PCB oil in decontaminated PCB transformers in service to confirm the level of contamination and the removal of PCBs,

v. PCB oil recovered from PCB transformers will first be stored temporarily in Zhejiang and later be transported to Shenyang for final disposal, and

vi. Evaluation of result. A seminar will be held.

d. If the PCB-contaminated transformers installed before 1980 are identified, 10 in-use large PCB transformers in Zhejiang will be decontaminated based on information collected under a) and b) and technology selected under c). (The number of transformers to be decontaminated would be based on the findings and what might be financially possible within the available funding),

e. Additional sampling and analysis of PCB contamination level for more transformers (estimated 3% of 2,200 large transformers and 50 of small transformers) if funding available to provide basis for the national replication program.

31. A strategy for dealing with PCB transformers on both provincial and national level will be developed as part of the Sino Italian project and be integrated into the replication program most likely as a separate component.

32. Seminars on decontamination technology of PCB transformers. This activity is to be supported by Italy. These seminars are necessary prior to the initiation of activities for testing decontamination technology of PCB transformers to involve enterprises who have PCB transformers in service from the beginning. These seminars are also intended to raise their awareness on PCB issues and further obtain their cooperation.

a **Two seminars in Zhejiang and Liaoning.** A 3-day seminar will be held in each of the Zhejiang and Liaoning Provinces for decontamination technology of PCB transformers. The seminar is expected to have about 30 participants from EPB and Power Company (both from the national and provincial levels). Proposed topics for discussion are: (i) production, use, and inventory of PCB transformers in the Zhejiang and Liaoning Provinces; (ii) PCB treatment and disposal technologies; and (iii) main issues related to the decontamination of the on-line transformers from PCBs such as identification of PCB transformers, evaluation of the best management options for transformers (based on age and size), on-line vs. off-line treatment, dielectric oil maintenance, decontamination verification testing, and safety issues related to decontamination activities. In addition, regulations concerning on-site decontamination of PCB transformers will be reviewed, cost-benefit analyses (i.e. assess the cost of PCB decontamination and the cost of replacement of the old one in order to make the comparison) will be discussed, and a one-day field visit will be taken to a PCB site to the training participants.

b **Seminar in Beijing for conclusion of transformer decontamination.** After implementation of project activities on PCB transformers in the Zhejiang Province, a two-day seminar will be held in Beijing – for about 30 participants, consisting of stakeholders at the national and provincial levels – to discuss the following topics: (i) production, use, and inventory of PCB transformers in China; (ii) PCB treatment and disposal technologies; (iii) cost-benefit analysis, and (iv) sharing of lessons learned from the demonstration activities on transformers in Zhejiang.

33. A Sector Expert Team will be established for testing of decontamination technology and decontamination of limited PCB transformers. The Sector Expert Team will consist of one team leader and five engineers with expertise in such areas as technical standards, design, and maintenance of transformers. This Team will be engaged for 100 days to:

a. Collect information about in-service transformers installed before 1980;
b. Provide technical support on (1) PCB contamination level testing of those older transformers, (2) testing of decontamination technology for PCB transformers, and (3) decontamination of PCB transformers;
c. Provide consulting services on regulations concerning equipment transport from other countries, permission of foreign experts to work at sites in China, license to operate equipment at sites, and insurance for equipment and technicians;
d. File documents and forms for obtaining the required permissions;
e. Gather information concerning technical standards on transformer decontamination and analyze the collected information;
f. Develop an implementation plan for decontamination of 10 PCB transformers. This plan should follow the national procedures for the operation and maintenance of transformers; and
g. Evaluate the decontamination program results.

Component 4: Disposal of highly-contaminated PCB wastes in the Liaoning Province (US$ 13,609,000)

34. This component will provide funding for the final destruction of highly-contaminated PCB wastes (with PCB concentrations greater than 500 ppm) collected from the storage sites in the Zhejiang Province. The PCBs will be disposed by incineration, utilizing an existing but not fully completed incinerator in Shenyang in the Liaoning Province. The construction of the Shenyang facility was initiated by the Chinese Government in 2002 in an effort to build domestic capacity to comply with the Stockholm Convention. The work has largely been completed on the core equipment, namely the rotary kiln, afterburner, tail gas cleaning system, wastewater treatment system, and workshops, at the cost of $5.8 million.

35. Under the component, the Government will complete the construction of the incinerator to performance standards required by the Stockholm Convention. In particular, four equipment will be added to the incinerator: (i) waste pretreatment and crushing unit, (ii) central control unit, (iii) online monitoring unit, and (iv) dioxin monitoring unit. The first three units will be financed by China and the last unit to be funded by Japan.

36. In addition, GEF will provide funding to build a PCB storage facility to collect and hold PCB wastes transported from Zhejiang for final disposal, and to buy a waste characterization unit for comprehensive waste characterization.

37. Following the completion of the incineration facility, the PCBs wastes will be transported to the Shenyang incinerator to be identified through analysis, classified, and temporarily stored at the storage facility (to be constructed). PCB capacitors will be

shredded in a closed environment. The PCB wastes will then be introduced into the rotary kiln for incineration. The pollutants in the combustion gases will be completely destroyed in an afterburner. The high temperature gases from the afterburner will be cooled first by a heat exchanger and then by high pressure cooling water system to 100°C to prevent dioxins from secondary generation. After the removal of HCl in a NaOH neutralization tower, the sharply cooled gas will be reheated to over its dew point, treated by the activated carbon to remove the residual dioxin and other contaminants, and further cleaned by the hop-pocket dust catcher to meet the standards. Wastewater from the high pressure cooling water system and shower tower will be reused after appropriate treatment. Online monitoring and control system will ensure that the whole facility will be running safely and effectively.

38. This component has the following five sub-components:

a. **PCB waste storage facility.** This sub-component will support construction of a storage facility for interim safeguarding of PCB wastes removed from PCB contaminated sites in Zhejiang. The facility will be built to internationally accepted standards, and will serve as an accumulation point before the final destruction of PCB wastes. An EA will be prepared for the local authorities and the Bank's clearance before its construction.

b. **Waste characterization unit.** This sub-component will support a waste characterization and analysis unit at an existing laboratory to carry out detailed analytical characterization of the accumulated PCB wastes. The laboratory will carry out tests necessary for safe PCB waste destruction, e.g., calorimetric and flash point tests, tests for determining composition of gas, wastewater and solid wastes, and tests for characterizing PCB, dioxin, heavy metals and non-metal components. The sub-component will be funded by GEF.

c. **Completion of the Shenyang PCB incinerator to meet the Stockholm Convention requirements for safe PCB disposal (financed by China and Japan).** The sub-component will equip the Shenyang facility with the technology necessary to ensure that it is capable of safe and effective destruction of PCBs, and meets relevant requirements of the Stockholm Convention. The sub-component will fund the following four technological units:

i Waste pretreatment and crusher unit. The unit will pretreat PCB wastes to achieve size and consistency necessary for their complete and safe combustion. This unit will contain mechanical crushers or shredders for PCB capacitors and other solid wastes.

ii Central control unit. This unit will provide an integrated central control station of all key technological components of the incinerator facility to ensure safe and complete PCB destruction, and effective control of emissions.

iii Online monitoring unit. This unit will monitor, in real time, the incineration process, especially the emission of tail gases. It will feed the monitoring data to the central control unit to allow optimization of the operating parameters. The data collected by the online monitoring unit will include combustion

temperature as well as concentrations of CO, O_2, CO_2, NO_x, SO_2, HCl, particulates, total hydrocarbons and dioxin.

iv Dioxin emission monitoring unit. This unit will monitor dioxin emissions to ensure that they remain below 0.1ngTEQ/Nm^3. The installation of the unit will include development of an operating guideline and training of the operating staff. This unit will be supported by Japan government.

d. **Disposal of highly contaminated PCB wastes.** This sub-component will fund operating costs of incinerating all highly contaminated PCB wastes (>500ppm). Based on the available data, there will be at least 2,000 tonnes of PCB wastes from the Zhejiang Province shipped for incineration. To prepare for incineration of PCB wastes from other provinces, the project, toward its end, will review the situation in the PCB incineration market in China, and prepare a business plan for the Shenyang facility. The sub-component, funded by the GEF, will pay for the operating costs of incineration.

e. **Training.** This sub-component will support training programs to safely operate the PCB incinerator and related facilities. The training will include:

i Operation of the PCB warehouse;
ii Emergency measures in PCB storage;
iii Regulations and standards;
iv Identification and classification of PCB wastes;
v Operation of the incinerator; and
vi Safeguard issues and emergency measures in PCB incineration.

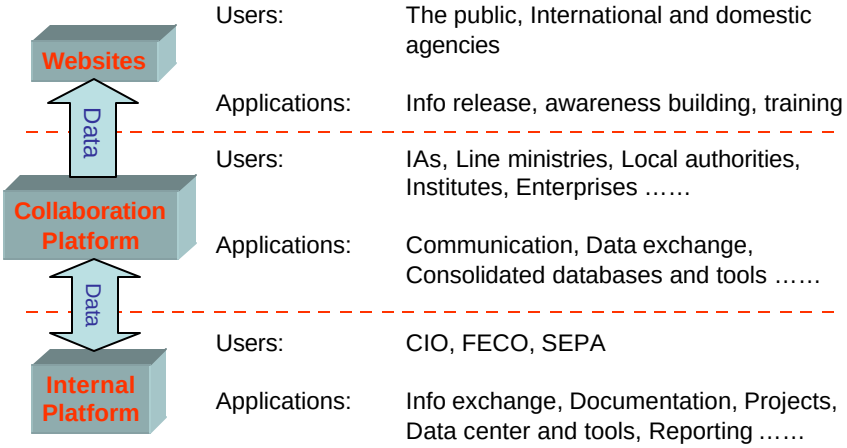
Component 5: Project Monitoring and Evaluation (US$ 135,000)

39. This component aims at monitoring and evaluating project implementation, and disseminating project results. It includes the following sub-components:

40. **PCB-MIS.** All information gathered and developed under this demonstration project will be built into a PCB-MIS which will be integrated into the POP MIS, which is under development funded by other ongoing POP projects, such as the NIP project.

41. The basic framework and major functions of the POPs-MIS are shown in the following diagram. The POPs-MIS consists of an Internal Platform, a Collaboration Platform, and Websites.

POPs Management Information System



a *The Internal Platform*, which is supported mainly by the Italian Pesticide Project, includes Information Exchange, Documentation, Projects, Data Center, and Reporting. This platform will be used for CIO, FECO, and SEPA.

i Information Exchange, which has been already developed, can provide the notifications, working updates, events, and invitations to bidding.
ii Documentations, classifies and manages all related documents for file.
iii Projects, which has already been developed, is used for project management.
iv Data Center stores all information about the production, consumption, alternatives, import and export, and waste inventories.
v Reporting can generate the reports as internal users require.

b *The Collaboration Platform* includes Communication, Data Exchange, Consolidated Databases. The Collaboration Platform will be used by IAs, line ministries, local authorities, institutes, and enterprises.

i Communications includes news and events, statistics, documentation, ad reports.
ii Data exchange uploads data from FECO's data, the local entities, and other information sources
iii Consolidated data center provides query and analysis tools and concerning information on POPs and all other POP related projects.

c *Websites* are intended to release information (on news and events. Statistics, documents, discussions, materials and reports, and bidding), build awareness, and provide online training (on policy, technologies, and best practices). Websites will be accessible by domestic and international agencies as well as the public.

42. The Sino-Italian PCB project is designed to setup PCB database for the Zhejiang and Liaoning provinces within this system and geographical distribution of PCB will be shown in the internal platform. In addition, the Production, Consumption, Alternatives, Import & Export and Stock Pile & Waste supported by Italian Pesticide Project will be updated and maintained on a continuous basis. Similarly, dioxin/furan database will be set up by the NIP project. Collaboration Platform and Websites are planned in the GEF NIP.

43. **A workshop for monitoring indicator system in Zhejiang.** A monitoring indicator system is discussed in detail in Annex 3 to measure the overall implementation progress of project activities on a quantitative basis. A workshop on the monitoring system will be held with participants from SEPA, Zhejiang PIU, and all potential contractors for sub-activities under the project.

44. **Annual progress review meetings.** Annual project implementation review meeting will be held to assess and evaluate all available reports and achievements on all project activities, and discuss the next annual program of the project.

Component 6: Design of a National Replication Program (US$ 304,000)

45. The objective of this component is to develop a program that would help dissemination of the experiences gained in the Zhejiang Province through implementation of this project to the rest of China. It will include the following activities:

46. **National workshop for the project completion.** A national workshop will be organized by the end of this project to summarize the results and evaluate the outcomes of this project. All stakeholders and consultants/companies involved in this project will be invited to this workshop.

47. **Development of a replication program.** A replication program for PCB management and disposal in China will be developed based on experiences gained in this project and the national PCB inventory.

48. **National workshop for the replication program.** This workshop will discuss the draft replication program with participation from all provinces and stakeholders for consultation and to seek their perspectives. After the workshop, the replication program will be finalized.

49. **International workshop for information dissemination.** An international workshop will be organized to share the national experience with representatives from other countries and also learn from their experiences. About 10 international experts from countries with similar PCB problems and efforts, 40 persons from national stakeholders will be invited for this workshop.

Annex 5: Project Costs

CHINA: PCB Management and Disposal Demonstration Project

Project Cost By Component and Sub-activity	GEF (US $)	Local (US $)	Foreign (US $)	Total (US $)
Component One: Institutional Strengthening	**1,230,000**	**299,000**	**363,000**	**1,892,000**
1. Inception workshop for the project	42,000			
2. PCB Project Team	168,000	60,000 (Central Gov.)		
3. Establishment of a National Expert Group		239,000 (Central Gov.)	363,000 (Italy)	
4. Zhejiang Project Implementation Unit (PIU)	459,000			
5. Provincial Training	392,000			
6. Public awareness	169,000			
Component Two: Development of a Policy Framework for PCB Management and Disposal	**74,000**	**668,000**	**70,000**	**812,000**
1. A pollution prevention/control regulation for PCBs in the Zhejiang Province	37,000			
2. An emergency plan for PCB wastes in Zhejiang	37,000			
3. A technical guideline for PCB management and disposal in Zhejiang		130,000 (Central Gov.)	70,000 (USA)	
4. A national regulation for PCB management		97,000 (Central Gov.)		
5. National pollution control and environmental quality standards for PCBs		391,000 (Central Gov.)		
6. Development of a funding mechanism for co-financing PCB management and disposal in China		50,000 (Central Gov.)		
Component Three: PCB Management in the Zhejiang Province	**10,359,000**	**3,849,000**	**1,137,000**	**15,345,000**
1. Identification of exact location of PCB sites (42sites)			152,000 (Italy)	
2. Cleanup of PCB sites (56 sites)	3,059,000	1,520,000 (Zhejiang)		
3. Storage facility for temporary PCB wastes in Zhejiang	1,359,000			
4. Cleanup for low-contaminated soils (50-500 ppm)	5,431,000	1,966,000 (Zhejiang)		
5. Supervision of PCB site cleanup and soil decontamination	200,000			
6. Verification and Monitoring of PCB sites after cleanup	310,000	363,000 (Zhejiang)		
7. Testing and Decontamination of in-use PCB transformers			985,000 (Italy)	
Component Four: Disposal of Highly	**6,238,000**	**6,917,000**	**454,000**	**13,609,000**

Project Cost By Component and Sub-activity	GEF (US $)	Local (US $)	Foreign (US $)	Total (US $)
Contaminated PCB Wastes in Liaoning Province				
1. PCB waste storage facility	1,451,000			
2. Waste characterization and analysis unit	193,000			
3. Completion of the rotary kiln incinerator to meet the Stockholm Convention requirement		6,917,000 (Shenyang)	454,000 (Japan)	
4. Disposal of highly contaminated PCB wastes	4,568,000			
5. Training for PCB storage and disposal	26,000			
Component Five: Project Monitoring and Evaluation	**135,000**	**0**	**0**	**135,000**
1. PCB -MIS (one consultant firm)	24,000			
2. Expert workshop for the project monitoring system	16,000			
3. Progress review meetings	95,000			
Component Six: Design of a National Replication Program	**304,000**	**0**	**0**	**304,000**
1. National workshop for the project completion	59,000			
2. Development of a replication program for PCB management and disposal in China	80,000			
3. National workshop for the replication program	70,000			
4. International workshop for information dissemination	95,000			
Total Baseline Cost				**32,000,000**
Physical Contingencies				64,000
Price Contingencies				33,000
Total Project Costs[1]	**18,340,000**	**11,733,000**	**2,024,000**	**32,097,000**
Total Financing Required	**18,340,000**			

[1]No taxes and duties are included

Annex 6: Implementation Arrangements

CHINA: PCB Management and Disposal Demonstration Project

Institutional Arrangements

1. SEPA has been designated as the national lead implementing agency for all POPs activities and implementation of the POPs Convention. All the major national and local government, scientific institutions, and private sectors that are concerned with the elimination of PCBs in China will be involved in project implementation, and many have already been involved in its initial preparation. The responsibilities of each stakeholder are described as follows.

2. **National Leading Group (NLG) for implementation of the Stockholm Convention.** A National NIP Development Leading Group, with SEPA as the lead agency, was established in September 2003, and provided overall guidance and coordination for NIP development at its Project Concept and Project Brief stages. This Group has become the National Leading Group for implementation of the Stockholm Convention when China becomes a Party of the Stockholm Convention on August 13, 2004. The NLG will provide overall guidance to (1) development of the NIP, (2) review of significant policies related to POPs, and (3) implementation of all POP activities, and will consist of the following 11 agencies.

a. State Environmental Protection Administration (SEPA);
b. National Development and Reform Commission (NDRC);
c. Ministry of Foreign Affairs (MOFA);
d. Ministry of Finance (MOF -- GEF Focal Point in China);
e. Ministry of Commerce (MOCom);
f. Ministry of Science and Technology (MOST);
g. Ministry of Agriculture (MOA);
h. Ministry of Public Health (MOH);
i. Ministry of Construction (MOCon);
j. General Administration of Customs (GAC);
k. State Electricity Regulatory Commission (SERC).

3. **International Implementing Agency.** The World Bank is invited as the international implementing agency for the project. The World Bank will be responsible in supervising implementation of all project activities specified in the project document along the lines of the following:

a. Assisting China in preparation of the Annual Programs (a total of four annual programs) of the project;
b. Supervising overall project progress and associated annual program activities to be completed as indicated in the Annual Program (progress reports to be designed);
c. Carrying out supervision missions;
d. Helping China to set up an operating mechanism to allow effective and transparent implementation of the project;

e. Ensuring that disbursements made to China are based agreed disbursement procedures;
f. Ensuring that procurement are carried out based on agreed procurement procedures;
g. Providing China with the necessary policy, management and technical support; and
h. Reporting to GEF on the project progress.

4. **National Implementing Agency.** SEPA will be the national implementing agency for the project. Its responsibilities will include (1) assignment and supervision of project activities; (2) recruitment of international and national consultants; (3) providing direction to the local PIU; and (4) coordination with stakeholders, including GEF, donors, IAs, and relevant domestic ministries and agencies.

5. **Convention Implementation Office (CIO)**. The CIO is part of Foreign Economic Cooperation Office (FECO) of SEPA. FECO is in charge of all bilateral and multilateral cooperation projects on environmental protection in SEPA. CIO is responsible for day-to-day compliance with the Stockholm Convention and its responsibilities for the project include (1) providing technical support to international negotiations and policy studies on the Stockholm Convention, (2) providing support to the development and implementation of corresponding policy and regulations, as well as coordinating with key governmental stakeholders, (3) screening, preparing and implementing Convention activities, (4) raising co-financing (bilateral and domestic) for international collaborative programs, (5) preparing and submitting funding withdrawal applications to the Bank, and (6) collecting data and information, preparing reports and organizing training, education, and information dissemination activities.

6. **PCB Project Team in CIO.** The PCB project team will be in charge of the management and implementation of the proposed PCB project under the guidance of the CIO. Its responsibilities include (1) preparing TORs for activities under the project, (2) reviewing project progress reports submitted by the local PIU (see below), (3) managing project procurement and financial resources according to the Bank's procedures, (4) organizing and convening project coordination meetings among stakeholders, and (5) reviewing project outputs. The PCB project team will seek technical support from various experts (a national expert group, including the chief technical advisor [CTA], national technical advisor [NTA] and other consultants) as necessary.

7. **National Expert Group.** This group includes the Chief Technical Advisor (an international consultant), National Technical Advisor, technical/policy experts and experts on transformers, as described in the Annex 4. This National Expert Group will, in general, be responsible for:

a. Introduction of successful experience gained from this demonstration project to other countries;
b. Assisting CIO in overall technical management and coordination of all project activities;

c. Technical support to institutional strengthening, policy framework, PCB management and disposal, project monitoring and evaluation, and replication program development;
d. Providing comments on project implementation progress at different stages;
e. Revision and improvement of the training material developed by Canadian Capacity Building on PCB Management; and
f. Providing consultation on transformer decontamination activities.

8. **Local Project Implementation Unit in Zhejiang (local PIU).** Zhejiang will establish a project implementation unit (PIU) to conduct day-to-day project management and coordination at the local level. The PIU's location, size and specific functions will be clearly defined in a TOR prepared by CIO/SEPA. The PIU will be jointly consisted of staff from the Zhejiang EPB (two key centers: Zhejiang Environmental Monitoring Center and Zhejiang Solid Waste Management Center) and Zhejiang Power Company. Its responsibilities will include (1) coordinating/organizing local training and seminars; (2) overseeing operation of PCB management in Zhejiang; (3) monitoring PCB sites before and after their cleanup and the temporary storage site for collected PCB wastes; (4) contributing to advocacy and policy dialogue; and (5) collecting information and preparing progress reports. The PIU's staffing will include the following positions: (1) executive director, (2) project officers, financial officer; (3) management information system specialist; and (4) relevant technical specialists. Detailed responsibilities for these positions will be defined in the PIU's TOR.

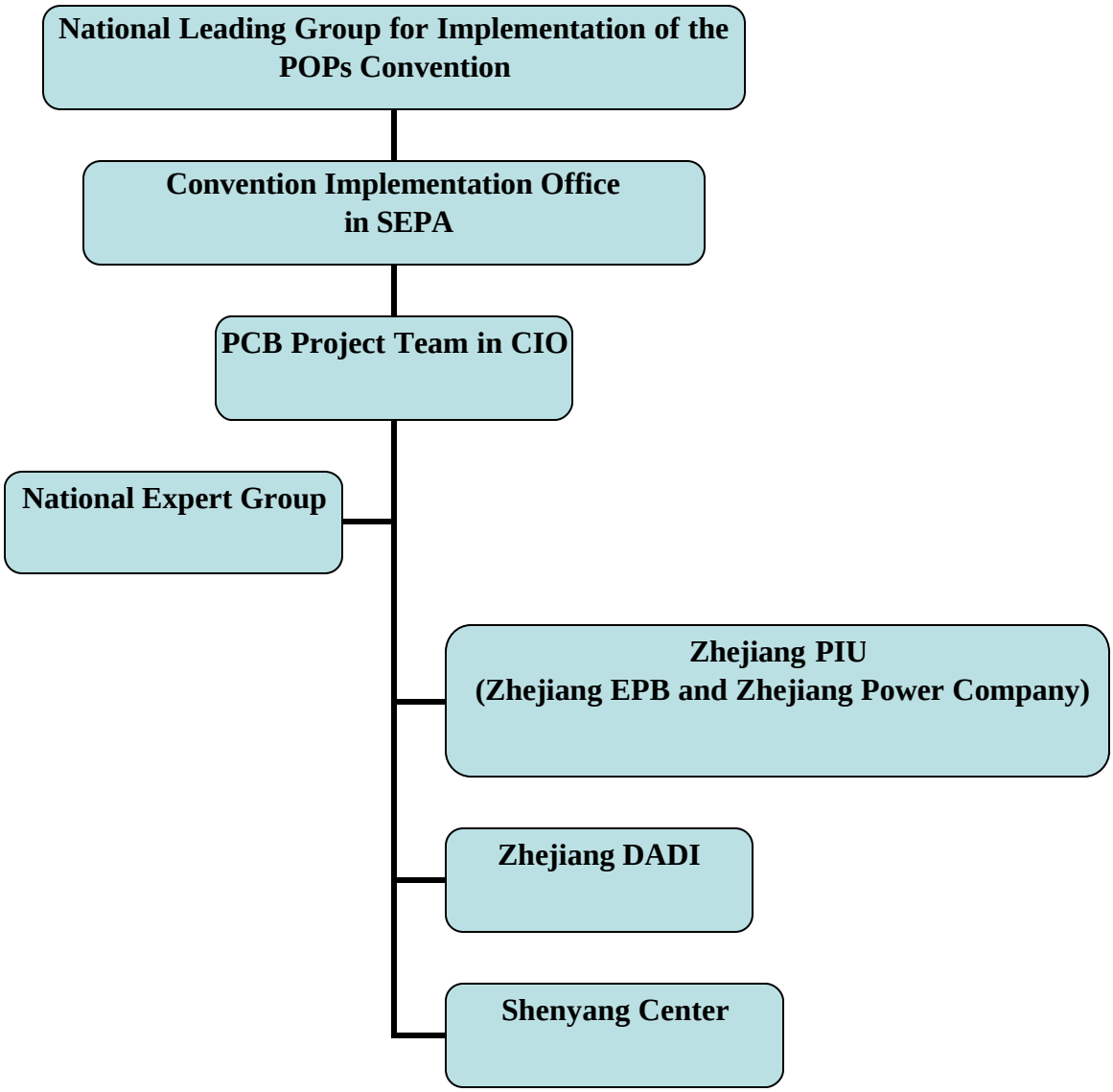
9. **Shenyang Hazardous Waste Disposal Technical Center.** The Shenyang Institute of Environment Science has cleaned up three PCB sites in Zhejiang in the past few years. It owns the rotary kiln incinerator which will be completed in 2005-2006 to dispose PCB wastes under the project. The rotary kiln incinerator is the designated PCB incinerator in China and is located in a waste management facility in Xinmin, Liaoning. In January 2005, the Shenyang Hazardous Waste Disposal Technical Center was established by Shenyang Institute based on the requirements of the National Plan on Construction of Technical Centers for Environmental Protection. All assets, including the rotary kiln PCB incinerator in the waste management facility in Xinmin, have been transferred to this Center by the Shenyang Institute. The Shenyang Center is an independent and state-owned company and it will obtain an official license from SEPA for PCB management and disposal. The official license will be issue according to the newly issued Regulation for the License of Hazardous Waste Management -- State Council Order #408 once the incinerator is formally commissioned by SEPA. Commissioning will include confirmation that dixion and furan emission meets the Stockholm Convention emission standards. SEPA has confirmed that this Center will have the only PCB incinerator in China in the foreseeable future. For this reason, it will be the contractor for PCB disposal in the project. Whether China will build a second PCB incinerator in the future will solely depend on experiences gained in this demonstration project and the estimated total amount of PCB wastes that need to be disposed in China. The Shenyang Center will receive the highly contaminated PCB wastes (>500ppm) collected in Zhejiang and dispose of them according to Stockholm Convention requirements. It will also house, maintain and operate the PCB storage facility and the waste characterization unit. Howeve, these two units will not belong to

the Shenyang Center at project completion, but to the Central Government and these two units will be used in the follow up National Replication Program.

10. **Hangzhou Dadi Environmental Protection Co. Ltd (DADI)**. Hangzhou Dadi Environmental Protection Co. Ltd. is the second waste management company in China which had experience in cleaning up PCB sites. The other one is the Shenyang Institute. DADI is also the 2nd designated PCB waste management center in the National Program for Construction of Hazardous and Medical Waste Disposal Facilities issued by the State Council in December 2003. Over the past ten years, Dadi has received continuous technical support from GTZ of Germany. It has in-house German technical staff helping it on all technical matters on waste management. SEPA has confirmed that Dadi will be the 2nd waste management company in China which will be granted an official license in handling PCB wastes, excluding final disposal as it does not have a PCB incinerator. For this reason, Hangzhou Dadi will be the contractor in this project to (i) recover PCB wastes from burial sites, remove, package, transport, temporarily store PCBs (including PCBs recovered from PCB transformers still in use) and PCB-containing equipment, (ii) treat contaminated soils (between 50 ppm and 500ppm), and (iii) decontaminate PCB contaminated transformers under the project. The PCB storage facility will be built within the Dadi facility and Dadi will operate and maintain this facility. The thermal desorption unit to be procured will also be operated and maintained by Dadi. However, these two units do not belong to Dadi at project completion, but belong to the Central Government as these two units will be used in the follow-up National Replication Program.

11. The chart below shows the framework of the institutional arrangements for the proposed project.

Institutional Arrangements of the PCB Demonstration Project



12. **Consulting Service Contractors.** Private companies or government institute when necessary will be selected through strict competitive process to (1) prepare environmental impact assessment needed for the project, (2) test the environmentally sound decontamination technology for PCB-containing transformers still in service, and (3) undertake consultant services under the project.

13. **Involvement of Other Stakeholders.**

a. Enterprises who still have PCB equipment in service will be involved in implementing the project activity of testing decontamination technology of PCB transformers.

b. The public at large will be involved in the project through education and public awareness activities.

iv. *PCB disposal in Shenyang.* The incinerator in Shenyang has started construction in 2002 and will be completed in 2005. It does not require any relocation or additional land acquisition. The facility information was shared with local communities in 2002. Public acceptance of the site was assessed through a survey and a final agreement was signed.

v. *PCB sites cleanup in Zhejiang Province.* The PCB site treatment in Zhejiang would require temporary land and tree acquisition as well relocation of structures and tombs. The Zhejiang Province has developed a Resettlement Policy Framework to deal with the potential social risks (land acquisition and resettlement issue) to the public. The framework involves local governments, the affected villages, institutions and the affected households in the inventory of impacts and development of the compensatory packages. Site-specific resettlement planning will be prepared during project implementation.

vi. *Workshops and Training.* Institutional capacity building is a major component of the project which includes series of workshops, training and study tours. These training programs will be directed to key stakeholders in Zhejiang, including PCB management institutions (PIU, EPB, power companies), Hangzhou Dadi, environmental monitoring staff, and PCBs disposal staff in Shenyang.

c. Relevant international organizations and possible bilateral donors will be informed about project progress and invited to advise on its implementation.

Coordination among International IAs, EAs and Donors

14. SEPA has been designated to coordinate all POPs-related activities in China. Relevant international IAs, EAs and bilateral donors will be informed about the project, invited to advise on its design, and briefed on its implementation progress and impacts regularly, which will ensure full and continuing information exchange among interested domestic and international stakeholders.

15. A Technical Coordination Group will meet formally twice a year to report and review project progress. The Group will be chaired by CIO/SEPA and will include the World Bank, UNIDO, UNDP, the Governments of Italy, Canada, and other interested bilateral development partners, and agencies such as UNEP, WHO and FAO that are not directly involved but which are recognized as having important expertise on POPs. SEPA will provide regular progress reports on all POPs activities in China. SEPA has already initiated such a consultative process in the context of the NIP which is now under development. The Bank will also keep the other agencies and bilateral partners informed of the ongoing work through regular updates.

Monitoring and Evaluation of Outcomes/Results

16. Monitoring of project activities and evaluation of their results in the project will serve a dual function. First, it will facilitate tracking progress toward the project objectives. Second, it will facilitate learning and generation of knowledge necessary for the preparation of the national replication program.

17. The monitoring indicators, developed specifically for the project and described in section B2 and Annex 3, reflect the project's focus on the environmentally sound management and disposal of PCBs, on reducing risks from PCBs wastes and PCB contaminated sites, and on associated capacity building. The data for determining the value of the indicators will come from two main sources. First, they will come from PCB management and disposal operations using standardized project-wide technical guidelines and methodologies for data collection and quality assurance. The detailed PCB inventories completed in the first year of project implementation will be a crucial source of new data. The responsibility for data collection at this level will rest with the local PIU, with guidance and assistance from the PCB project team in the CIO/SEPA. Second, data will come from standardized monitoring and reporting designed by the PCB project team in the CIO/SEPA providing support services. Zhejiang PIU will collect data from all contractors of project activities (see annex 4) and report to the PCB project team in CIO/SEPA. The project managers including PCB project team in CIO/SEPA and the Zhejiang PIU will regularly review the consolidated indicators to assess the effectiveness of the project.

18. The World Bank is responsible for supervising the implementation of the project to ensure that financing is used only for the purposes intended, with due regard to efficiency and economy. Bank missions will visit China at least twice a year for this purpose.

19. The annual review meeting for project implementation will be held with participants from project stakeholders. Progress reports will be disseminated before the meeting and reviewed at the meeting.

Implementation Arrangements

20. **Linkage of the Proposed Project to Ongoing projects related to PCBs.** The PCB investment demonstration project builds upon the work being done under China's National Implementation Plan development, the Sino-Italian inventory methodology and PCB disposal strategy development, and the Sino-Canadian project on training for PCB management. This project serves as the first step in PCB management and disposal in China and lays the foundation of the national replication program. These four projects were being processed at the same time. Results of the Sino-Italian project and the Sino-Canadian project will be fully integrated into the NIP and the demonstration project. There is no duplication of efforts or resources.

21. The timetable of the proposed project and ongoing projects is shown in the following table.

Project	2002	2003				2004				2005				2006				2007/08	2009
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1-4Q	2Q
NIP development (UNIDO)	Preparation					Implementation													
Canadian Capacity Building on PCB Management (WB)				X	X	X	X	X	X	X	X								
Sino-Italian Strategy Project (WB)				X	X	X	X	X	X	X	X	X	X	X	X				
The PCB demonstration project (WB)					Project Preparation					Project Implementation									

22. **Project Implementation Plan.** The project will be implemented in four successive annual programs (AP) from September 2005 to August 2009. The first year's program is to complete (1) necessary infrastructure of PCB temporary storage and disposal facilities, (2) PCB inventory in Zhejiang, and (3) testing of all PCB sites before their cleanup. The programs for the second and third year are to recover the PCBs, clean up all identified PCB sites, and dispose all PCB wastes. The fourth year's program is to evaluate project results and develop the national replication program.

23. The implementation arrangements of the project are scheduled in the following table.

Project Implementation Plan

Project Components	**AP 1** (July 2005 – June 2006)	**AP 2** (July 2006 – June 2007)	**AP 3** (July 2007 – June 2008)	**AP 4** (July 2008 – June 2009)
Component One: Institutional Strengthening				
1. Inception workshop for the project	**X**			
2. PCB project team in the CIO/SEPA	**X**			
3. Establishment of a national expert group, including	**X**	**X**	**X**	**X**
4. Zhejiang Project Implementation Unit (PIU)	**X**	**X**	**X**	**X**
5. Provincial Training	**X**	**X**	**X**	**X**
6. Public awareness	**X**	**X**	**X**	**X**
Component Two: Development of a Policy Framework for PCB Management and Disposal				
1. A pollution prevention/control regulation for PCBs in the Zhejiang Province	**X**			
2. An emergency plan for PCB wastes in Zhejiang	**X**			
3. A technical guideline for PCB management and disposal	**X**			
4. National pollution control and environmental quality standards for PCBs		**X**	**X**	
5. Development of a funding mechanism for co-financing PCB management and disposal in China			**X**	**X**
6. A national regulation for PCB management and disposal			**X**	**X**
Component Three: PCB Management in the Zhejiang Province				
1. Identification of exact location of PCB sites (42sites)	**X**			
2. Cleanup of PCB sites (56 sites)	**X**	**X**	**X**	**X**
3. Storage facility for temporary PCB wastes in Zhejiang	**X**			
4. Cleanup for low-contaminated soils (50-500 ppm)		**X**	**X**	**X**
5. Supervision of PCB site cleanup and soil decontamination	**X**	**X**	**X**	**X**
6. Verification and Monitoring of PCB sites after cleanup		**X**	**X**	**X**
7. Testing and Decontamination of in-use PCB transformers	**X**	**X**	**X**	**X**
Component Four: Disposal of highly-contaminated PCB wastes in Liaoning Province				
1. PCB waste storage facility	**X**			

Project Components	**AP 1** (July 2005 – June 2006)	**AP 2** (July 2006 – June 2007)	**AP 3** (July 2007 – June 2008)	**AP 4** (July 2008 – June 2009)
2. Waste characterization and analysis unit	**X**			
3. Completion of the rotary kiln incinerator to meet the Stockholm Convention requirement	**X**			
4. Disposal of highly contaminated PCB wastes		**X**	**X**	**X**
5. Training for PCB storage and disposal	**X**	**X**	**X**	**X**
Component Five: Project Monitoring and Evaluation				
1. PCB -MIS (one consultant firm)	**X**	**X**	**X**	**X**
2. Expert workshop for the project monitoring system	**X**			
3. Progress review meetings		**X**	**X**	**X**
Component Six: Design of a National Replication Program				
1. National workshop for the project completion				**X**
2. Development of a replication program for PCB management and disposal in China				**X**
3. National workshop for the replication program				**X**
4. International workshop for information dissemination				**X**

Annex 7: Financial Management and Disbursement Arrangements

CHINA: PCB Management and Disposal Demonstration Project

Summary of the Financial Management Assessment

1. The Financial Management Specialist (FMS) has conducted an assessment of the adequacy of the project financial management system of the GEF – PCB Management and Disposal Demonstration Project. The assessment, based on guidelines issued by the Financial Management Sector Board on October 15, 2003, has concluded that the project meets minimum Bank financial management requirements, as stipulated in BP/OP 10.02. In the FMS' opinion, the project will have in place an adequate project financial management system that can provide, with reasonable assurance, accurate and timely information on the status of the project in the reporting format agreed with the project and as required by the Bank.

2. Funding sources for the project include the GEF grant, bilateral donors and counterpart funds from Chinese Government. The GEF grant will flow from the Bank to the project's special account to be established and managed by the PCB Project Team of Convention Implementation Office (CIO) in the State Environmental Protection Administration (SEPA) to the local project implementation unit in Zhejiang Province (Zhejiang PIU), and finally to contractors or suppliers. In terms of disbursement technique, the project will be disbursing based on the traditional disbursement techniques and will not be using report-based disbursements, in accordance with the agreement between the Bank and MOF. The Chinese counterpart funds will come from central, Zhejiang provincial government and local private sector.

3. No outstanding audits or audit issues exist with the implementing agency involved in the proposed project. The task team however will continue to be attentive to financial management matters and audit covenants during project supervisions.

Risk Analysis

4. ***Strength*** SEPA has extensive experience in the implementation of Bank's project. Several on-going water resources and environmental protection projects are managed and/or implemented by SEPA. No significant financial management weaknesses were identified in previous project implemented by these agencies. Project special accounts will be managed and located in SEPA, which has been competent in processing withdrawal applications and overseeing fund flows, including Bank loan and counterpart funds.

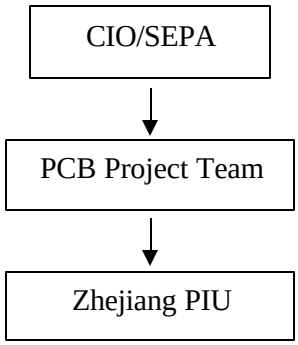
5. ***Weakness*** This project will be centrally managed and controlled by the PCB Project Team in CIO/SEPA and will be locally implemented by Zhejiang PIU. As a result, the coordination of the project management, technology assistance, and delivery of counterpart funds and consolidation of project monitoring reports is vital to the successful implementation of the project. The local PIU in Zhejiang has no prior Bank project experience. Thus, a well-defined and focused training program should be provided by SEPA prior to project effectiveness to their

staff to ascertain that they have a good understanding of Bank operations and requirements. The task team will provide relevant training as and when needed.

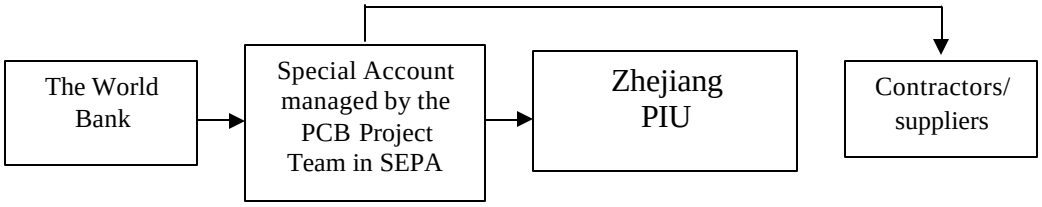
Financial Management and Reporting Arrangements

6. ***Implementing Entity*** The PCB project team will be in charge of the management and implementation of the proposed PCB project under the guidance of the CIO and will be responsible for the day-to-day compliance with the Stockholm Convention. One of the PCB project team's responsibility is managing project procurement and financial resources according to the Bank's procedures.

7. ***Zhejiang*** Province will establish a project implementation unit (Zhejiang PIU) to conduct day-to-day project management and coordination at the local level. The Zhejiang PIU will consist of staff from the Zhejiang Power Company, Zhejiang Environmental Monitoring Center and Zhejiang Solid Waste Management Center. The Zhejiang PIU will have a financial officer in place to handle the project financial management at the local level and report to the PCB project team at the central level.



8. ***Funds Flow*** The GEF grant will flow from the Bank to the special account to be set up at and maintained by the PCB Project Team in SEPA. SEPA will disburse funds to Zhejiang PIU and contractors or suppliers on contract-basis. Bank funds flows are as follows:



9. Counterpart funds will be contributed by the bilateral donors and central government of China, provincial governments of Zhejiang Province and private sectors. The bilateral donors' funds and the counterpart funds from central government will be managed by SEPA/FECO, the counterpart funds from Zhejiang Province will be managed by Zhejiang PIU. The National/Provincial Audit Office will audit the usage of the counterpart funds at the end of the year and end of the project.

10. ***Staffing*** Adequate project accounting staff with relevant educational background and experience is one of the factors critical to the successful implementation of project financial management. Based on discussions, observation and review of educational background and work experience of the staff identified for financial and accounting positions in implementing entities, the task team note that the staff are qualified and appropriate to the work they are expected to assume.

11. To strengthen financial management capacity and achieve consistent quality of accounting work, the task team has recommended that a Project Financial Management Manual (Manual) be prepared. The Manual will provide detailed guidelines on financial management, internal controls, accounting procedures, fund and asset management and withdrawal application procedures. The draft of the Manual will be prepared by the PCB Project team in SEPA and submitted to the Bank. The FMS will review and provide feedback to them and the final version of the Manual will be finalized and distributed to all the relevant financial staff before loan effectiveness.

12. Most of the financial or accounting staff identified for the project in Zhejiang PIU lack direct experience in Bank project. To ensure that staff recruited for the project will have good understanding of Bank's policy and requirements, it has been further agreed that a well-designed and focused training program will be provided by SEPA prior to effectiveness to all relevant staff. The training program will include but not limited to the following:

- Bank's financial management policy and disbursement procedures
- Fund/asset/contract management
- Format and content of project financial statements
- Audit requirement

13. ***Accounting Policies and Procedures***. The administration, accounting and reporting of the project will be set up in accordance with the Circular #13: "Accounting Regulations for World Bank Financed Projects" issued in January 2000 by MOF. The circular provides in-depth instructions of accounting treatment of project activities and covers the following:

- Chart of account
- Detailed accounting instructions for each project account
- Standard set of project financial statements
- Instructions on the preparation of project financial statements

14. The standard set of project financial statements mentioned above has been agreed to between the Bank and MOF and applies to all Bank project appraised after July 1, 1998 and includes the following:

- Balance sheet
- Statement of implementation of grant agreement
- Statement of special account

15. The implementing agencies, Zhejiang PIU and PCB Project Team in CIO, will be managing, monitoring and maintaining respective project accounting records. Original supporting documents for project activities will be retained by them. In addition, Zhejiang PIU will prepare financial statements, which will then be reviewed, approved and consolidated by PCB Project Team in CIO before sending to the Bank for review and comment on a regular basis**.**

16. ***Reporting and Monitoring of Financial Statements.*** In line with the newly issued Financial Monitoring Report (FMR) guidelines, the un-audited project financial statements will be submitted as part of FMR to the Bank on a semi-annual basis (prior to August 15 and February 15 of the subsequent year).

17. ***Information Systems.*** A computerized financial management system "User Friend (Yong You)", a well established accounting software package approved by MOF will be utilized by PCB Project Team for this project. The task team will closely monitor the processing of its accounting work to ensure complete and accurate financial information could be timely provided.

Audit Arrangements

18. ***Internal Audit*** SEPA has its own internal audit department/division and the internal auditors will also verify the financial status and expenditures of the project, but this is not performed on an annual basis. We have not and will not assess the competency of the various internal audit departments due to the cost/benefit of doing such work. As such, reliance will not be placed on work performed by them.

19. ***External Audit.*** In line with other Bank financed project in China, the project will be audited in accordance with the Government Auditing Standards of the People's Republic of China. The Foreign Funds Application Audit Department of the China National Audit Office (CNAO) has been identified as the auditor for the project. The annual audit reports of project financial statements will be submitted to the Bank by PCB Project Team within 6 months of the end of each calendar year.

Impact of Procurement Arrangements

20. Threshold set for procurement post-review will be consistent with that set for SOE for disbursement purpose. To have maximum effectiveness and efficiency, financial management specialist and procurement staff should jointly participate in supervision missions to ensure the following:

- Contracts awarded are in line with the Bank's procurement guidelines;
- Contract payments made are in accordance with the terms of the contract and well supported.

Disbursement Arrangements

21. The project will be disbursing on the traditional disbursement techniques and will not be using report-based disbursements, in accordance with the agreement between the Bank and MOF.

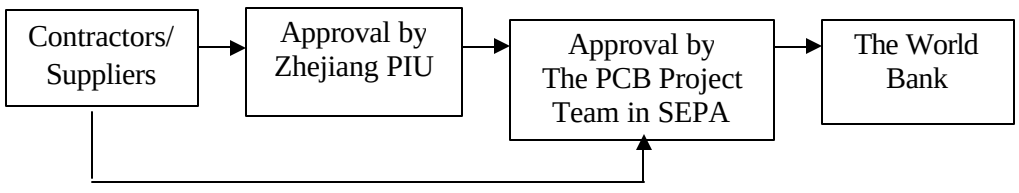
22. Bank loan proceeds would be disbursed against eligible expenditures as follows (i) Civil works – 100% of expenditures, (ii) Goods – 100% of expenditures, (iii) Service for the clean-up of PCB sites, cleanup of low contaminated soils, and decontamination of transformers in Zhejiang - 100% of expenditures, (iv) Service for disposal of PCB highly-contaminated wastes in Shenyang - 100% of expenditures, (v) Consultant services- 100% of expenditures, (vi) Workshops/Training – 100% of expenditures, and (vii) Incremental Operating Cost - 100% of expenditures.

23. Disbursement methods, such as replenishment, reimbursement, direct payment and special commitment, will be available to the project. The SOE limits will be set up in line with procurement post-review threshold, as follows:

- Works under contracts each costing less than US$ 200,000 or equivalent;
- Goods under contracts each costing less than US$ 200,000 or equivalent;
- Services described in paragraph 22 (iii) and (iv) under contracts each costing less than US$200,000 or equivalent;
- Consulting services under contracts awarded to consulting firms each costing less than US$100,000 or equivalent;
- Consulting services under contracts awarded to individual consultants each costing less than US$50,000 or equivalent;
- All trainings, workshop and incremental operating costs.

24. One special account (SA) will be established at and maintained by SEPA for this project. The SA for the project will be in US dollar, with an authorized allocation at US$ 1.60 million equivalent to about 4 months of eligible expenses reimbursable via special account. The initial authorized allocation from the Bank would be US$1.2 million until the aggregate withdrawals and outstanding Special Commitments will be equal to or exceed US$5.0 million equivalent. From the SAs, the Bank funds would be disbursed to project implementing entities and/or supplier and contractors.

25. The PCB Project Team in SEPA will be directly responsible for the management, monitoring, maintenance and reconciliation of the SA activities of the project. Supporting documents required for Bank disbursements will be prepared and submitted by Zhejiang PIU to the PCB Project Team for final verification and consolidation before sending to the Bank for further disbursement processing. The flow of the withdrawal application is as follows:



Action Plan

26. The following proposed time-bound actions that have no major impact on project preparation or Board presentation, but should be adequately addressed by the project:

Action	Responsibility	Target Date
Finalize and issue the Financial Management Manual to relevant staff	SEPA	Prior to effectiveness

Financial Covenants

27. In addition to the standard financial covenants (e.g. maintaining project accounts in accordance with sound accounting practices, audit requirement and SOE), as described in the legal document, further specific financial covenants (if any) applicable to the project will be detailed in section C of the PAD.

Supervision Plan

28. A detailed supervision plan for this project will be included as part of the China Audit Strategy document which is currently in process. This document will take into consideration of the size of project and the risks identified.

Annex 8: Procurement Arrangements

CHINA: PCB Management and Disposal Demonstration Project

A. General

1. Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Loan/Credit, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

2. **Procurement of Works:** A total of about $2.73 million of civil works would be procured for construction of facilities for temporary storage of PCB wastes in Hangzhou and in Shenyang. The procurement will be carried out following NCB procedures and the Chinese Model Bidding Document (MBD) for Bank-financed NCB Works will be adopted, which was issued by Ministry of Finance in May 1997 in agreement with the Bank. To address the differences between the Bank Guidelines and the Tendering and Bidding Law of China, waivers for Bank-financed NCB procurement shall be included in the Legal Agreement of the project in accordance with recommendations as provided in the Bank's Operational Procurement Review of China dated February 17, 2003.

3. **Procurement of Goods:** A total of about $3 million of goods would be procured under this project, including: (1) computers and other office equipment; (2) waste characterization and analysis unit; (3) thermal desorption unit; and (4) printing of promotion brochures. Contracts estimated to cost less than $100,000 per contract would be awarded following shopping procedures. Contracts estimated to cost between $100,000 and $500,000 would be awarded following NCB procedures, using the Chinese Model Bidding Document (MBD) for Bank-financed NCB Goods, which was issued by Ministry of Finance in May 1997 in agreement with the Bank. Contracts estimated to cost $500,000 or more would be awarded following ICB procedures and the Bank's latest Standard Bidding Documents for ICB procurement of goods will be used.

4. **Procurement of Non-Consulting Services:** A total of about $13.81 million would be required under the project for services for cleanup of PCB sites and PCB low-contaminated soils, final disposal of highly contaminated PCB wastes. Services for: (1) cleanup of PCB sites (56 sites in total), and (2) cleanup of low-contaminated PCB soils in Zhejiang Province would be directly contracted to Hangzhou Dadi Environment Co. since it is the only firm in China who has the required facilities and been licensed (already on interim basis and in process for licensing be on long term basis) by the State Environment Protection Administration (SEPA) under relevant regulations for cleanup of

PCB sites and low-contaminated PCB soils, and Bank team was advised by SEPA that it is not going to license more firms for PCB cleanup. Services for the final disposal of PCB highly contaminated wastes (>500ppm) taken from Zhejiang Province would be directly contracted to Shenyang Hazardous Waste Disposal Technical Center, which has been established as a legally separate entity under Shenyang Academy of Environmental Sciences in Liaoning Province. SEPA confirmed that the Center possesses the facility for final disposal of PCB wastes, which would be the only facility of this kind available in China in the foreseeable future. Therefore, SEPA would solely designate it for final PCB disposal following relevant Chinese regulations. All these contracts on direct-contracting basis would be awarded with the Bank's prior agreement on the prices and terms of contract.

5. **Selection of Consultants:** A total of about $1.35 million of consulting services would be required under the project for (1) institutional strengthening activities, (2) development of a policy framework for PCB management and disposal, (3) project monitoring and evaluation activities, and (4) development of the national replication program for PCB management and disposal. Contracts for consulting services, each estimated to cost US$100,000 equivalent or more, would be awarded following the procedure of Quality and Cost Based Selection (QCBS); The procedure of Quality-Based Selection (QBS) would be followed for assignments which meet Para. 3.2 of the Consultant Guidelines. For consulting services estimated to cost less than US$100,000 equivalent per contract under this project, contracts would awarded following the procedures of Selection Based on Consultants' Qualifications (CQS). Procedures of Selection of Individual Consultants(IC) would be followed for assignments which meet the requirement of Para. 5.1 and 5.3 of the Consultant Guidelines. For some of the services, government-owned universities or research institutes may be hired because of their unique and exceptional roles in the sector and their participation would be very critical to the project implementation. In China, consultants from the private sector have not much involved in policy formulation, national program planning etc in the field of PCB management and disposal.

6. **Training Workshops, Seminars and Promotion Activities:** A total of about $0.82 million would be required for training workshops, seminars and services for public education and dissemination on national TV channels and newspapers. These activities would be disbursed against reasonable actual costs.

7. **Incremental Operating Costs (IOC):** A total of about $0.53 million would be required for the incremental operating costs for the implementing agencies: Convention Implementing Office (CIO) of SEPA and the Zhejiang PIU. Out of this total amount, about $ 228,000 would be required for the CIO and $300,000 for the PIU to cover their project management costs including expenditures for office consumables and operation of office equipment, vehicle operation and maintenance, transportation costs and travel allowances, etc. which the project implementing agencies would not have been incurred absent the project. The incremental operating costs would be disbursed following procedures acceptable to the Bank.

B. Assessment of the agency's capacity to implement procurement

8. Procurement activities will be carried out by the CIO, established within the Foreign Economic Cooperation Office (FECO) of SEPA, and the Project Implementation Unit (PIU) established in the Zhejiang Province. The CIO is staffed by four highly qualified professionals on full-time basis and three on part-time basis, while the PIU is staffed by five professionals on full-time basis for the project implementation. The procurement functions are staffed by one experienced procurement officer in the CIO and one procurement officer in the PIU.

9. An assessment of the capacity of the Implementing Agency to implement procurement actions for the project has been carried out by Li Xiaoping, Procurement Specialist of World Bank Office in Beijing in October 2004. The assessment reviewed the organizational structure for implementing the project and the interaction between the project's staff responsible for procurement Officer and the SEPA's relevant central units for administration and finance.

10. The FECO has been familiar with Bank procurement procedures by implementing several previous Bank-financed projects and established necessary internal administrative and technical control systems. The Zhejiang PIU is new to the Bank procurement procedures, and therefore training workshops on Bank-financed procurement will be provided to the PIU staff and some of the CIO new staff before the project implementation.

11. The overall project risk for procurement is average.

C. Procurement Plan

12. The Borrower, at appraisal, developed a procurement plan for project implementation which provides the basis for the procurement methods. This plan has been agreed between the Borrower and the Project Team on March 21, 2005 and is available at Convention Implementation Office, Foreign Economic Cooperation Office of the State Environment Protection Administration, 115 Nanxiaojie Xizhimennei, Xicheng District, Beijing, China. It will also be available in the project's database and in the Bank's external website. The Procurement Plan will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

D. Frequency of Procurement Supervision

13. In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agency has recommended a launch workshop and one supervision mission to visit the field to carry out post review of procurement actions for every six to eight months.

E. Details of the Procurement Arrangements

Procurement Method		Threshold	Prior Review Threshold	Comments
Goods	ICB	≥US$ 500,000	All contracts for goods above US$500,000, all NCB contracts for works, and the first contract of NCB for goods and the first contract of shopping for works and goods	Contracts for supply of waste pre-treatment/crushing unit, thermal adsorption unit
	NCB	US$100,000-500,000		Contracts for supply of waste characterization unit
	Shopping	<$100,000		Contracts for supply of small items of lab instruments, etc.
Works	NCB	≥US$200,000		Contracts for building storage facilities
	Shopping	<US$200,000		
Direct contracting		Contracts for services for cleanup of PCB sites, PCB low-contaminated soils, and final disposal of highly contaminated PCB wastes	All contracts	See justifications provided in above clause 4.
Consulting services [1/]	QCBS	≥US$100,000	US$100,000 for firm and US$50,000 for individual	Assignments for development of standards and technical guidelines for PCB management and disposal, etc.
	QBS	Assignments which meet para. 3.2 of the Consultant Guidelines.		
	CQS	<US$100,000		
	IC	Assignments meeting the requirement of Para. 5.1 and 5.3 of the Consultant Guidelines		

Notes: 1) Short lists composed entirely of national consultants: Short lists of consultants for services estimated to cost less than US$300,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

F. Details of the Procurement Arrangements Involving International Competition

1. Goods, Works, and Non Consulting Services

(a) List of contract packages to be procured following ICB and direct contracting:

1	2	3	4	5	6	7	8
Contract No.	**Contract (Description)**	**Estimated Cost(US$)**	**Procurement Method**	**Prequalification (yes/no)**	**Domestic Preference (yes/no)**	**Expected Bid-Opening Date**	**Comments**
G-1	Equipment for Zhejiang PIU (including equipment for database)	98,000	Shopping	No	No	3Q 2005	multiple contracts may be awarded
G-2	Waste characterization and analysis unit	193,000	NCB	No	No	3Q 2005	
G-3	Thermal Desorption Unit	2,700,000	ICB	No	No	3Q 2005	
G-4	Printing services of 20,000 brochures	12,000	Shopping	No	No	4Q 2006	
W-1	Construction of storage facility for temporary PCB wastes in Zhejiang	1,319,000	NCB	No	No	3Q 2005	USD 40,000 is allocated for EIA preparation
W-2	Construction of PCB wastes storage facilities in Shenyang	1,411,000	NCB	No	No	3Q 2005	USD 40,000 is allocated for EIA preparation
NCS-1	Service for cleanup of PCB sites (56 sites), including site characterization	4,579,000	Direct Contracting[1]	No	No	2Q 2006	multiple contracts may be awarded GEF: 3,059,000 Zhejiang: 1,520,000
NCS-2	Service for cleanup of low-contaminated PCB soils and decontamination of transformers	4,667,000	Direct Contracting[1]	No	No	3Q 2006	multiple contracts may be awarded GEF: 2,731,000 (2,700,000 is allocated for thermal desorptiop unit) Zhejiang: 1,936,000 (USD 30,000 from local funding is allocated for EA preparation for the thermal desorption)
NCS-3	Service for disposal of highly contaminated PCB wastes	4,568,000	Direct Contracting[2]	No	No	3Q 2006	multiple contracts may be awarded

1	2	3	4	5	6	7	8
Contract No.	**Contract (Description)**	**Estimated Cost(US$)**	**Procurement Method**	**Prequalification (yes/no)**	**Domestic Preference (yes/no)**	**Expected Bid-Opening Date**	**Comments**
	Sub-total	19,547,000					**GEF: 16,091,000 Counterpart: 3,456,000**

Notes:

1) Hangzhou Dadi Environment Co. would be directly contracted to carry out the services since it is the only firm in China who has the required facilities and been licensed (already on interim basis and in process for licensing be on long term basis) by the State Environment Protection Administration (SEPA) under relevant regulations for cleanup of PCB sites and low-contaminated PCB soils, and Bank team was advised by SEPA that it is not going to license more firms for PCB cleanup.
2) Shenyang Hazardous Waste Disposal Technical Center would be directly contracted to carry out the services since it possesses the facility for final disposal of PCB wastes, which would be the only facility of this kind available in China in the foreseeable future and solely licensed by SEPA for final PCB disposal.

2. Consulting Services

1	2	3	4	5	6
Ref. No.	**Description of Assignment**	**Estimated Cost (US$)**	**Selection Method**	**Expected Proposals Submission Date**	**Comments**
	Workshops	**377,000**			
1.	Inception workshop	42,000	To be disbursed against reasonable actual costs	3Q 2005	
2.	Expert workshop for the project monitoring system	16,000		3Q 2005	
3.	Progress review meetings (Three meetings, one meeting in each of year 2006, 2007, and 2008)	95,000		3Q 2006 3Q 2007 3Q 2008	
4.	National workshop for the project completion	59,000		2Q 2009	
5.	National workshop for the replication program	70,000		2Q 2009	
6.	International workshop for information dissemination	95,000		2Q 2009	
	Training	**444,000**			
7.	Provincial training on PCB management and disposal	292,000	To be disbursed against reasonable actual costs	4Q 2005-2Q 2006	
8.	Project management training of PIU	19,000		4Q 2005	
9.	Training for PCB storage and disposal in Shenyang	26,000		4Q 2005	
10.	Public education and dissemination on national TV channels and 10 national newspaper	107,000		4Q 2005	Multiple contracts may be awarded.
	Consulting Firms	**1,053,000**			**GEF: 660,000** **Local: 393,010**
11.	Development of a pollution prevention/control regulation for PCBs in the Zhejiang Province	37,000	CQS	4Q 2005	
12.	Development of an emergency plan for PCB wastes in Zhejiang	37,000	CQS	4Q 2005	
13.	PCB-MIS integration	24,000	CQS	2Q 2006	
14.	Zhejiang database development	42,000	CQS	2Q 2006	

1	2	3	4	5	6
Ref. No.	**Description of Assignment**	**Estimated Cost (US$)**	**Selection Method**	**Expected Proposals Submission Date**	**Comments**
15.	Development of a replication program for PCB management and disposal in China	80,000	CQS	2Q 2008	
16.	Monitoring of PCB sites after cleanup	673,000	QBS	3Q 2006	GEF: 310,000 Zhejiang: 363,000 Multiple contracts will be awarded.
17.	EA preparation for storage facility for temporary PCB wastes in Zhejiang	40,000	CQS	3Q 2005	
18.	EA preparation for Shenyang PCB waste storage facility	40,000	CQS	3Q 2005	
19.	EA for use of the mobile thermal desorption unit	30,000 (Zhejiang)	CQS	3Q 2005	Financing by Zhejiang : 30,000
20.	Preparation of Video programs for TV show	50,000	CQS	4Q 2006	Multiple contracts will be awarded.
	Individual Consultants	**300,000**			
21.	International consultants participating the training workshops (including consultant fee and travel cost)	100,000	IC	3Q 2005	Multiple contracts will be awarded.
22.	Supervision of PCB site cleanup and soil cleanup	200,000	IC	3Q 2005	Multiple contracts will be awarded.
	Others	**528,000**			**GEF: 468,000** **Local: 60,000**
23.	Operating cost of PIU	300,000	To be disbursed following procedures acceptable	N/A	
24.	Operating cost of the project team in CIO/SEPA	228,000		N/A	GEF: 168,000 Central: 60,000

1	2	3	4	5	6
Ref. No.	**Description of Assignment**	**Estimated Cost (US$)**	**Selection Method**	**Expected Proposals Submission Date**	**Comments**
			to the Bank		
	Total	**2,702,000**			**GEF: 2,249,000 Counterpart: 453,000**

Annex 9: Economic and Financial Analysis

CHINA: PCB Management and Disposal Demonstration Project

1. The demonstration project is essentially contributing to local and global public good by reducing the risk of contaminating the environment through releases of PCBs, a persistent organic pollutant. Typical economic or financial analysis is thus difficult and problematic at best. While it may be theoretically possible to apply cost-benefit analysis to the process, the lack of reliable base data and the controversial aspects related to the valuation of human life make such an analysis impractical. It is nonetheless clear that the benefits from reducing damage to the environment and to human health from releases of PCBs will substantially exceed the costs associated with implementing this project. In addition, the project will seek maximum cost-effectiveness in all of its interventions, and it will use risk reduction as the criterion to prioritize among the PCB sites being addressed.

2. Please refer to Annex 15 for Incremental Cost Analysis.

Annex 10: Safeguard Policy Issues

CHINA: PCB Management and Disposal Demonstration Project

Environment

A. Project Background

1. Between 1965 and 1974, China produced about 10,000 tons of PCBs, which were used in capacitors and other applications such as oil paints. In addition, some PCB-containing transformers were imported to China. In the 1980s, with the growing health and environmental concerns, China removed from service all PCB-containing capacitors and stored them temporarily in caves and burial sites. As a signatory of the Convention, China is committed to the destruction of PCBs.

2. The proposed PCB Management and Disposal Demonstration Project aims at identifying and demonstrating environmentally sound and cost-effective policies, procedures and techniques for safely managing and disposing of temporarily stored polychlorinated biphenyls (PCBs) in China , the associated PCB-contaminated wastes, and the remaining in-use PCBs. It consists of the following components: (1) institutional strengthening; (2) development of a policy framework for PCB management and disposal; (3) PCB management in the Zhejiang province which include PCB identification, collection, packaging, transportation, temporary storage, final disposal, and evaluation of the process in the demonstration area; (4) disposal of highly contaminated PCB wastes in Liaoning Province; (5) project monitoring and evaluation, and (6) design of a national replication program.

3. The project has selected: (i) the Zhejiang Province to demonstrate identification and recovery of PCB capacitors, transformers, oils and associated wastes, and treatment of the low-concentration PCB-contaminated soil (less than 500 ppm PCB concentration); and (ii) the Shenyang incineration facility to demonstrate destruction of high-PCB-contaminated wastes (over 500 ppm PCB concentration). The project is classified as Category A for environmental assessment. Without any mitigation measures, the project activities that would likely have environmental and social impacts include remediation of highly toxic chemicals at contaminated sites and handling, storage, transportation, treatment and destruction of these wastes. SEPA has retained the Zhejiang Provincial Environmental Science Institute to prepare the EA for PCB management in the Zhejiang Province. The EA for the PCB incineration facility at Shenyang was prepared by the China Coal Mining Industry Corp. International Engineering Group (Shenyang Design & Research Institute) and Shenyang Academy of Environmental Science in 2002, and approved by Provincial EPB. Construction of this incineration facility is near completion, but the facility would need additional equipment to meet the performance standards required by the Stockholm Convention. The EA has been revised to reflect these additions. Since October 2004, the Bank has reviewed and commented on various versions of these two EAs, and found them to be satisfactory in February 2005.

4. The PCB management activities in the Zhejiang Province will include identification of PCB sites (about 43 PCB sites have been identified and about 18 more sites are expected to be identified in the next two years), remediation of each of these PCB sites, transportation and temporary storage of PCB wastes, soil decontamination of low concentration PCB wastes, and transportation to Shenyang of high concentration PCB wastes for final destruction. The PCB disposal facility in Shenyang will require additional equipment to meet the Stockholm Convention. This incinerator will have a 15 ton per day capacity.

B. EA Legal Framework

5. China has regulatory, policy and administrative requirements for managing PCBs and other hazardous wastes. The EAs have identified 22 PCB related and many more hazardous waste related state laws, regulations, and standards. Major state laws, regulations and standards related to PCB management referred in the project EAs include:

a. PCB Wastes Control Standard (GB13015-1991)
b. SEPA's hazardous waste lists (47 waste types of 1998)
c. Hazardous Waste Storage Standard (GB18597-2001)
d. Pollution Control Standard for Hazardous Waste Incineration (GB18484-2001)
e. Hazardous Waste Landfilling (GB18598-2001)
f. Regulation on Road Transportation of Hazardous Material)
g. Guidelines on Vehicle Transportation of Hazardous Material (JT 3130)
h. Regulations on Manifest Management for Hazardous Waste Transportation, and Labels of Vehicles for Hazardous Material Transportation (GB 13392).

In addition, the legal requirements for PCB management in the Zhejiang and Liaoning Provinces have been identified. The EAs have followed the requirements of Chinese legal requirements at the state and provincial levels.

6. As this is a GEF-financed project, requirements of the Stockholm Convention on Persistent Organic Pollutants (POPs) have also been taken into consideration in the EA preparation. Among the ten World Bank Safeguards Policies, three have been identified to be directly applicable to this project: (a) Environmental Assessment (OP/BP/GP4.01), (b) Involuntary Resettlement (OP/BP 4.12), and (c) Information Disclosure (BP17.50).

C. Inventory of PCB Wastes and Baseline Environment

7. In May 2004, the Zhejiang Province was selected as a demonstration province for PCBs inventory survey and management. The Zhejiang Province is located in southeast China and covers an area of 100,180 km^2. The province has a population of 46 million and includes 11 cities (90 counties and districts).

8. The PCBs inventory methodology has been developed and the PCB survey has been initiated with Italian funding support as preparation activities for this project. The initial results have shown that the main source of PCB wastes in the Zhejiang Province is the retired capacitors from the power sector and some large enterprises. However, as the survey of PCB transformers is only in its early stage, information about PCB-containing

and PCB contaminated transformers, if any, is yet to be developed. Early data collected suggested that there are PCB transformers in the province. To-date, 43 PCB storage sites have been identified from the survey, and about 18 more sites are expected to be discovered in the next two years. The buried PCB sites have been found to be scattered throughout the province in a variety of locations such as wastelands or backyards of previous power stations (now under roads and buildings). There are also PCBs wastes placed some years ago in caves at remote mountainous areas. Because of personnel changes resulting from power sector reform and poor recordkeeping practices (no records in most cases), the specific numbers of capacitors at most storage sites are unknown. As the exact locations for some PCB sites are also uncertain, these need to be determined during project implementation. Among the 43 PCB sites, six sites have their stored capacitors removed and disposed, and five sites have been totally cleaned up in compliance with the Chinese environmental standards. The limited cleanup experience and monitoring data have indicated that PCB contamination of soil at burial sites is not uncommon.

9. A site in Chongxian (near Hangzhou City) was selected for the construction of a facility for temporary storage of PCB wastes in the Zhejiang Province. The topography at the site is hilly with a slope ranging from 10-40 degrees. The yearly average temperature is 16.5^{o}C and the yearly average precipitation is 1,011 mm. The predominant wind is from south-southwest direction. There are no rare or endangered species of flora or fauna around the site. The site is not in an earthquake zone of magnitude greater than 7. The distance from the nearest residential house from this site is more than 2 km, and from the nearest surface water is more than 1.5 km. There are no storage facilities of flammable or explosive hazardous substances or wastes, or high voltage electricity lines within 1 km of the site. This area is used for sound disposal of waste. The industrial waste incinerator and the medical waste incinerator owned by Zhejiang DADI Environment Protection Company are the main engineering of this area, which are about 100 meters from the proposed site for the PCB storage facility to be built. No surface water, school, hospital, and critical natural habitat within 1 km of the proposed site.

10. The project envisions incineration of highly-contaminated PCB wastes (over 500 ppm PCB concentration) from the Zhejiang Province at a PCB incinerator constructed at the Shenyang Hazardous Waste Disposal Technical Center located in Xinmin county, about 70 km west of Shenyang (the capital of the Liaoning Province in northeast China). The Center is linked to a national trunk road (G102, Shenyang-Beijing) with a 1km dedicated access road. The area around this Center has a relatively flat landscape and is partly an alluvial sandy plain. The Center covers an area of 3 ha and is surrounded by a state-owned forest plantation (total area of 52,000 ha) to the north and east. The nearest villages to the Center are Zhaojiawopu (2.1 km to the north, with a total population of 26,700), Xiaozhutun (2.3 km to the south, with a total population of 28,800), and Guajia (3.2 km to the northwest, with a total population of 14,300). The nearest surface water to the Center is the Liuhe River (about 3 km to the east), which is a seasonal tributary of the Liaohe River. However, the Center has no relation with this surface water. There is also a drainage ditch, 1 km to the west, which is normally dry, but carries rainwater during the

wet summer season. This ditch has a length of 12 km before merging the Caotun Ditch, which runs about 30 km before merging the Raoyang River. The depth of ground water ranges from 3.4 meters to 4.7 meters. The climate is continental with hot and rainy summers, and cold and dry winters. The temperatures range from –31.9^{o}C to 37.7^{o}C, with an annual average of 8.1^{o}C. The annual precipitation ranges from 378 mm to 1,013 mm, with an average of 620 mm. The average wind speed is 3.3 m/s. There are no culturally sensitive areas near the Center.

11. Environmental monitoring conducted at and near the Center indicates generally good ambient quality of noise, soil and air quality, but with some exceptions: ambient PM-10 concentrations exceed the Grade II standard of GB3095-1996 at each of the nearby three villages. The groundwater quality at the project site as well as two other nearby sites exceeds the standard (GB/T14848-93 Grade III) for NH4-N, iron, and manganese; but is free of PCB contamination. Groundwater contamination results from industrial/agricultural discharges and geological conditions.

D. Description of Project Activities

12. The project activities will include characterization of PCB sites, remediation of PCB sites, and decontamination of low concentration PCB soil, storage of PCB wastes, transportation of PCB wastes, and disposal of PCB wastes.

a. Characterization of PCB sites will be conducted to identify the exact location of the buried PCB coffins using Georadar, then to determine the extent of soil contamination, if any, through soil sampling and analysis. The main pollutant of concern is PCBs. Soil characterization will be conducted through specific procedures to be specified under this project. Through the characterization effort, the contours and quantities of contaminated soil –distinguished as low (below 500 ppm) and high (over 500 ppm) PCB concentration soils– if any, will be determined.

b. Remediation at buried PCB sites will be conducted according to the remediation plan to be prepared for each contaminated site and by people fully trained in remediation and industrial hygiene techniques. The plan involves site preparation (including construction of access roads, if necessary; assuring site security; equipment mobilization; prevention of soil collapse; water pumping; construction structures for site entry/exit); excavation of soil; removal of PCB capacitors, concrete coffins, and contaminated soil; containerization of PCB wastes that will be shipped; evaluation and restoration of the remediated site. Containerization will involve filling of contaminated PCB wastes in non-chlorinated plastic bags, placing these bags in drums, closing and sealing the lids of the drums, and cleaning the surfaces and labeling of the drums.

c. Decontamination of low concentration PCB soil (less than 500 ppm) will be conducted by thermal desorption. Large lumps in the contaminated soil and clayey soils will be ground to a top size of 5 mm before the feed is introduced in

a horizontal rotary thermal dryer. Feed will be dried, if necessary. To avoid formation of dioxins/furans, an indirectly-fired thermal desorber will be used (such as heat through metal walls or with a medium such as heated gas), where the heat will be conducted to the PCB-contaminated soil to evaporate the PCBs along with water vapor. The gases will be either condensed (with the condensed PCBs adsorbed onto an activated carbon) or combusted in an afterburner (with the combusted gases rapidly cooled, and cleaned from chlorinated gases through scrubbing followed by activated carbon adsorption and baghouse filtration. The scrubber water will be cleaned through neutralization/metals precipitation and recycled). To ensure that dioxins/furans are not emitted to the environment, dioxin/furan sampling in these discharge streams will be conducted. The spent carbon –as a highly-contaminated PCB waste– will be containerized and sent to the Shenyang incineration facility after storage at the temporary storage facility.

d. Highly contaminated soil will be stored at a storage facility before being shipped to the Shenyang incineration facility. In addition, some low-concentration PCB wastes will be temporarily stored before thermal desorption. The design and operation of the temporary storage facility will be according to the requirements of Chinese regulation GB 18597-2001 for hazardous wastes and international standards.

e. Highly contaminated PCB wastes will be incinerated at the Shenyang Hazardous Waste Disposal Technical Center. The design and operation of the PCB incineration facility will be according to the Chinese regulation GB18484-2001 (Pollution Control Standard for Hazardous Waste Incineration) and GB13015-1991 (PCB Wastes Control Standard). Under the project, additional equipment will be procured and installed to ensure that environmental discharges from this incineration facility meet the Stockholm Convention requirements. The PCB incineration facility will include the following operations: PCB storage, shredding, and rotary kiln incineration with an afterburner; heat recovery; flue gas cleanup (using quenching, alkali absorption, carbon adsorption, and baghouse filtration); and environmental discharge of clean flue gases through a stack. The PCB incineration facility will also have a wastewater treatment plant that will recycle all treated wastewaters and the treatment sludge to the incineration facility (so, there will be no wastewater discharge to the environment). The Shenyang Hazardous Waste Disposal Technical Center will also house a medical incineration facility with its dedicated gas cleanup and wastewater treatment systems. In addition, a plasma destruction facility is planned at another building of the Center in the future. The EA for the Shenyang Hazardous Waste Disposal Technical Center covers all operations at the Center.

f. Public consultation for contaminated sites (in each city/town/village where PCB wastes have been identified) will be conducted after site characterization and prior to site remediation.

E. Environmental Impacts and Mitigation Measures

13. Environmental impacts associated with the project may result from possible PCB leakage resulting in contamination at storage/burial sites and during PCB waste excavation, clean-up, containerization, treatment by thermal desorption, temporary storage, transportation, and destruction by incineration.

14. The EA report (covering the activities in the Zhejiang Province) describes the currently identified 43 PCBs sites in Zhejiang (from the Sino- Italian Inventory Project) in terms of baseline information, and assesses potential impact/risks on environment and human health. The project will develop a set of remediation procedures covering the whole cleanup process based on previous experience in the Zhejiang Province on PCBs site cleanup and relevant national regulation/standards and international practice. These mitigation procedures, which will be implemented/improved as demonstration for nationwide replication, include procedures for inventory survey, PCBs site identification, data collection and characterization, preparation prior to excavation (design, training, etc), protection of site security, site cleanup, PCB waste packaging, on-site soil decontamination, transportation, temporary storage, record keeping, interagency coordination, public consultation and information disclosure. For the currently identified 43 PCBs storage sites, prioritization was conducted based on limited data gathered from site visits with consideration of both environmental and social concerns (e.g. way of sealing, distance to local community, possibility of surface/groundwater contamination, pollution status if known, land development status etc) using weighting factors. Based on the results of prioritization, the top 10 sites is planned to be cleaned-up starting from the second year of the project, with the first year focusing on infrastructure construction necessary for the following cleanup (i.e. PCBs waste storage and disposal facility). The detailed site characterization will be conducted during the implementation stage following the procedures developed in the EA.

15. The EA addresses the potential environmental impacts and risks associated with the design/construction and operation of the storage facility for temporary PCB wastes to be shipped to Shenyang, and propose mitigation measures. The location of storage has been carefully selected through evaluation of alternatives, and the design and operation of the storage facility will strictly follow the relevant national standards for hazardous waste storage. Prior to construction of this storage facility, an EA for will be prepared for approval by Chinese authorities and clearance by the Bank.

16. Thermal desorption is a mature technology commercially used in developed countries for decontaminating soil from hazardous wastes, including PCBs. The thermal desorption unit to be constructed under this project will include the appropriate design and operating conditions to ensure compliance with standards. The thermal desorption unit will be equipped with the treatment systems for the treatment of the flue gas and wastewaters resulting from condensed gases. During project implementation, after the contaminated PCB sites have been identified, a study will be carried out to determine whether a fixed or mobile thermal desorption unit will be adopted. Prior to construction

of this thermal desorption unit, an EA will be prepared for approval by Chinese authorities and clearance by the Bank.

17. For the PCBs disposal in Shenyang, the EA report addresses the potential environmental impact of the overall Shenyang Hazardous Waste Disposal Center, including PCBs waste incinerator, medical waste incinerator and plasma incinerator. Air dispersion modeling was used to assess the potential impact from PCBs, HCl, SO_2 and dust. The EA concluded that with the proper technology selected for emission control and mitigation measures, the environmental impacts of gas emission, water discharge, noise and solid waste will be controlled to bring the discharge and ambient pollutant concentrations under compliance with relevant national regulations and standards.

18. The long-distance transportation of PCB wastes from Zhejiang to Shenyang would impose a potential risk to the environment. A set of management procedures and emergency response procedures have been developed in the EA to avoid/minimize the risk (e.g. training of drivers, use of signs on trucks, manifest system, and emergency equipment and procedures).

F. Analyses of Alternatives

19. Alternatives were evaluated for selecting: (i) the location of the storage facility for temporary PCB wastes to be shipped to Shenyang, (ii) the technology of soil decontamination in Zhejiang, (iii) the location of the PCBs incineration facility in Shenyang, and (iv) the technology used for PCB incineration. Final selection was chosen considering environmental, social, technical and financial factors.

20. Two sites at Qiaosi and Chongxian were considered for temporary storage of PCB wastes in the Zhejiang Provinces. The Chongxian site was selected due to its remote location from residential areas and surface waters, proper geological conditions, and proximity to transportation routes.

21. The alternative technologies considered for treatment of low concentration PCB contaminated soil in Zhejiang included: landfilling, incineration, plasma, in situ vitrification, base-catalyzed dechlorination, solvated electron technology, gasification, thermal desorption and biological remediation. The thermal desoption technology was selected given the large amount of PCBs contaminated soil, technology effectiveness, and low costs.

22. For the Shenyang incineration facility, three locations were compared. The current location was decided based on its distance from local villages (more than 2 km), no requirements for resettlement, no requirements for farmland acquisition, convenient access by road transportation, and availability of power and water resources.

23. Rotary kiln incineration was selected for PCBs disposal in Shenyang through comparison of various options, including plasma and non-incineration technologies. The selection was made based on the following factors: treatment efficiency to meet the

national and international discharge requirements (after flue gas cleanup), the extent of waste reduction, maturity of technology worldwide, and successful experience with this technology in China since 1995 (in pilot operations).

G. Environmental Management Plan

24. Each of the two EAs prepared under this project includes an Environmental Management Plan (EMP). Each EMP specifies detailed mitigation measures (remediation of PCBs sites, transportation, temporary storage and treatment/destruction of PCBs waste, as well as emergency response measures), environmental monitoring plan during implementation of PCBs management and disposal process, institutional coordination and capacity building, implementation schedule and cost estimates.

25. The project will be implemented directly by POPs Convention Implementation Office of SEPA with support from its Project team, local PIU in Zhejiang, Hangzhou Dadi, and Shenyang Hazardous Waste Disposal Technical Center. The local PIU will be jointly set up by the Zhejiang EPB and Zhejiang Power Company, and will assist CIO in the supervision and monitoring of all project activities. Mitigation measures and operation procedures developed in the EAs will be integrated into the technical specifications of the contracts with Hangzhou Dadi and the Shenyang Center.

26. Institutional capacity building is a major component of the project which includes series of workshops, training and study tours. These training programs will be directed to key stakeholders in Zhejiang, including PCB management institutions (PIU, EPB, power companies), Hangzhou Dadi, environmental monitoring staff, and PCBs disposal staff in Shenyang.

27. Extensive monitoring is planned for the whole process of PCBs management. This include site monitoring for characterization and clean-up verification, ambient environment monitoring at the storage site for temporary PCB wastes in Zhejiang, emission/ambient environment monitoring of soil decontamination facility in Zhejiang and emission/environmental monitoring for Shenyang incineration facilities. A semi-annual Progress Report including all project activities (PCBs management and monitoring) will be provided to the Bank regularly.

H. Public Consultation and Information Disclosure

28. Public consultation was conducted in Shenyang and Zhejiang respectively, with project affected people specifically in Shenyang and general public in Zhejiang. Given the fact that site characterization and clean-up will be conducted during implementation, it is agreed that detailed public consultation with specific project-affected people will be conducted prior to site cleanup, following the consultation/disclosure procedures developed in the EIA/EMP.

29. In compliance with Bank's Policy on Information Disclosure, the EIA documents have been disclosed to public in Xinmin City Library, relevant village committees for

Shenyang component on December 30, 2004, and the Zhejiang EA has been disclosed to the public on the Zhejiang EPB's external website on February 8, 2005. The Shenyang and Zhejiang EAs were disclosed in the InfoShop on January 14, 2005.

Social

30. The project is expected to have significant social benefits by reducing public health risks associated with the release of PCBs. This benefit will materialize in the Zhejiang Province with the planned cleaning of PCB sites and disposal of PCB as well as contaminated materials under the project. The planned design of a national replication program based on this demonstration experience in Zhejiang will further extend this benefit to the other provinces in China.

31. Possible social risks may be associated with public exposure to contaminated sites, buildings and water supplies during the site cleanup in Zhejiang and transportation process, as well as the site location of the disposal facility in Shenyang. The social impacts of the Zhejiang and Shenyang components are assessed separately. The Shenyang PCB Waste Disposal Facility is built at a developed site on a state forest farm. This site was selected and established in 2002. Its selection followed a consultative process with various stakeholders, including local governments, related institutions and local communities. The facility information was shared with local communities. Public acceptance of the site was assessed through a survey and a final agreement was signed. The site required about three hectares of forest land. The acquisition process and all payment were completed in early 2002. The PCB incineration would not require any relocation or additional land acquisition. The Shenyang Municipality has conducted a review of the land acquisition process and submitted to the Bank.

32. The PCB site treatment in Zhejiang would require temporary land acquisition as well relocation of structures and tombs. The general locations of the PCB burial sites have been identified and the exact locations will only be known after further field work. Impacts related to the site treatment will only be known when the treatment design is completed. Therefore, the Zhejiang Province has developed a Resettlement Policy Framework to deal with the possible land acquisition and resettlement issue and has submitted it to the Bank. Site-specific resettlement planning will be prepared during project implementation. The planning would involve local governments, the affected villages, institutions and the affected households in the inventory of impacts and development of the compensatory packages.

33. These risks are minor compared to the overall expected benefits. They have been carefully considered through compliance with high technical standards, effective communication with the local residents, and involvement of all stakeholders in the potentially controversial aspects of the project. The participatory mode used for project preparation, and full involvement of local stakeholders, will continue during project implementation.

Annex 11: Project Preparation and Supervision

CHINA: PCB Management and Disposal Demonstration Project

	Planned	Actual
PCN review	08/15/2003	09/04/2003
Initial PID to PIC	09/09/2003	09/09/2003
Initial ISDS to PIC		
Appraisal	02/21/2005	02/21/2005
Negotiations	05/09/2005	
Board/RVP approval	06/28/2005	
Planned date of effectiveness	08/31/2005	
Planned date of mid-term review	N/A	
Planned closing date	08/31/2009	

Key institutions responsible for preparation of the project:

China State Environmental Protection Administration (SEPA), the Zhejiang Environmental Protection Bureau, and the Shenyang Environmental Protection Bureau.

Bank staff and consultants who worked on the project included:

Name	Title	Unit
Helen Chan	Sr. Operations Officer	EASEN
Erik Pedersen	Sr. Environmental Engineer	ENVMP
Robin Broadfield	Sr. GEF Regional Coordinator	EASEN
Bekir Onursal	Sr. Environmental Specialist	EASEN
Chaohua Zhang	Sr. Social Sector Specialist	EASSD
Qing Wang	Environmental Specialist	EASEN
Martin Fodor	Environmental Specialist	EASEN
Feng Ji	Operations Officer	EASEN
Murray Newton	Consultant/PCB Specialist	ENVMP
A. Samson Kaber	Program Assistant	EASEN

Bank funds expended to date on project preparation:

1. Bank resources: TBD
2. Trust funds: TBD
3. Total: TBD

Estimated Approval and Supervision costs:

1. Remaining costs to approval: TBD
2. Estimated annual supervision cost: TBD

Annex 12: Documents in the Project File

CHINA: PCB Management and Disposal Demonstration Project

The Bank

PCN
PID at the PCN stage
ISDS at the PCN stage
Minutes of ISDS review at the PCN stage
Minutes of PCN review meeting

PAD
PID at the PAD stage
ISDS at the PAD stage
Minutes of ISDS review at the PAD stage
Minutes of PAD review meeting

GEF

GEF PCN (finally submitted)
GEF review sheets for Pipeline Entry
Comments from other IAs
The Bank's response memo
PDF-B output reports:

a. Report on selection of demonstration area,
b. Report on PCB transport, storage, disposal, remediation in demonstration area,
c. Preliminary assessment on existing institutional/policy capacity building in demonstration area,
d. Identification report on PCB disposal technology and technical standards,
e. Preparation of a financing plan for the proposed project,
f. Preparation of an action plan of the project implementation, and
g. Draft operation manual, including the M&E plan.

GEF Project Brief (finally submitted)
GEF review sheets for Work Program Entry

Annex 13: Statement of Loans and Credits

CHINA: PCB Management and Disposal Demonstration Project

			Original Amount in US$ Millions						Difference between expected and actual disbursements	
Project ID	FY	Purpose	IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig.	Frm. Rev'd
P075602	2004	CN-2nd National Railways (Zhe-Gan Line)	200.00	0.00	0.00	0.00	0.00	200.00	0.00	0.00
P073002	2004	CN-Basic Education in Western Areas	100.00	0.00	0.00	0.00	0.00	99.34	-0.66	0.00
P065463	2004	CN - Jiangxi Integrated Agric. Modern.	100.00	0.00	0.00	0.00	0.00	99.00	3.49	0.00
P066955	2004	CN-ZHEJIANG URBAN ENVMT	133.00	0.00	0.00	0.00	0.00	133.00	0.00	0.00
P069852	2004	CN-Wuhan Urban Transport	200.00	0.00	0.00	0.00	0.00	200.00	106.60	0.00
P081749	2004	CN-Hubei Shiman Highway	200.00	0.00	0.00	0.00	0.00	200.00	0.00	0.00
P077615	2004	CN-GEF-Gansu & Xinjiang Pastoral Develop	0.00	0.00	0.00	10.50	0.00	10.50	1.20	0.00
P077137	2004	CN-4th Inland Waterways	91.00	0.00	0.00	0.00	0.00	91.00	0.00	0.00
P065035	2004	CN-Gansu & Xinjiang Pastoral Development	66.27	0.00	0.00	0.00	0.00	65.61	7.13	0.00
P075728	2004	CN-Guangdong/PRD UR ENVMT	128.00	0.00	0.00	0.00	0.00	128.00	0.00	0.00
P068058	2003	CN-Yixing Pumped Storage Project	145.00	0.00	0.00	0.00	0.00	133.05	-3.10	0.00
P040599	2003	CN-TIANJIN URB DEV II	150.00	0.00	0.00	0.00	0.00	143.82	4.22	0.00
P067337	2003	CN-2nd GEF Energy Conservation	0.00	0.00	0.00	26.00	0.00	14.60	18.90	0.00
P076714	2003	CN-2nd Anhui Hwy	250.00	0.00	0.00	0.00	0.00	247.50	20.50	0.00
P058847	2003	CN-3rd Xinjiang Hwy Project	150.00	0.00	0.00	0.00	0.00	99.33	14.33	0.00
P070191	2003	CN-SHANGHAI URB ENVMT APL1	200.00	0.00	0.00	0.00	0.00	190.00	10.00	0.00
P070441	2003	CN-Hubei Xiaogan Xiangfan Hwy	250.00	0.00	0.00	0.00	0.00	144.33	-15.67	0.00
P064729	2002	CN-SUSTAINABLE FORESTRY DEV. PROJECT	93.90	0.00	0.00	0.00	0.00	76.07	10.91	0.00
P058846	2002	CN-Natl Railway Project	160.00	0.00	0.00	0.00	0.00	31.60	6.60	0.00
P060029	2002	CN-Sustain. Forestry Dev(Natural Forest)	0.00	0.00	0.00	16.00	0.00	14.11	4.60	0.00
P071147	2002	CN-Tuberculosis Control Project	104.00	0.00	0.00	0.00	0.00	82.74	-21.26	0.00
P070459	2002	CN-Inner Mongolia Hwy Project	100.00	0.00	0.00	0.00	0.00	85.63	8.63	0.00
P068049	2002	CN-Hubei Hydropower Dev in Poor Areas	105.00	0.00	0.00	0.00	0.00	84.02	18.52	0.00
P045915	2001	CN-Urumqi Urban Transport	100.00	0.00	0.00	0.00	0.00	49.78	49.78	0.00
P047345	2001	CN-HUAI RIVER POLLUTION CONTROL	105.50	0.00	0.00	0.00	0.00	81.08	-24.42	0.00
P056596	2001	CN-Shijiazhuang Urban Transport	100.00	0.00	0.00	0.00	0.00	85.41	58.61	0.00
P056199	2001	CN-3rd Inland Waterways	100.00	0.00	0.00	0.00	0.00	74.99	8.49	0.00
P051859	2001	CN-LIAO RIVER BASIN	100.00	0.00	0.00	0.00	0.00	60.26	26.76	0.00
P058845	2001	Jiangxi II Hwy	200.00	0.00	0.00	0.00	54.77	63.13	8.90	0.00
P056516	2001	CN - WATER CONSERVATION	74.00	0.00	0.00	0.00	0.00	33.37	8.07	0.00
P058843	2000	Guangxi Highway	200.00	0.00	0.00	0.00	0.00	87.29	43.29	0.00
P049436	2000	CN-CHONGQING URBAN ENVMT	200.00	0.00	0.00	0.00	3.70	148.51	74.91	0.00
P056424	2000	CN-TONGBAI PUMPED STORA	320.00	0.00	0.00	0.00	100.00	146.04	113.24	0.00
P058844	2000	3rd Henan Prov Hwy	150.00	0.00	0.00	0.00	0.00	49.58	28.58	0.00
P042109	2000	CN-BEIJING ENVIRONMENT II	349.00	0.00	0.00	25.00	0.00	282.76	195.51	0.00
P045264	2000	CN-SMALLHLDR CATTLE DEV	93.50	0.00	0.00	0.00	0.00	9.89	5.19	0.00

P064924	2000	CH-GEF-BEIJING ENVMT II	0.00	0.00	0.00	25.00	0.00	23.32	20.51	5.51
P064730	2000	CN - Yangtze Dike Strengthening Project	210.00	0.00	0.00	0.00	0.00	105.27	105.27	0.00
P045910	2000	CN-HEBEI URBAN ENVIRONMENT	150.00	0.00	0.00	0.00	0.00	113.96	50.96	0.00
P041268	1999	CN-Nat Hwy4/Hubei-Hunan	350.00	0.00	0.00	0.00	0.00	50.33	40.33	0.00
P056216	1999	CN - LOESS PLATEAU II	100.00	50.00	0.00	0.00	0.00	16.79	18.92	-2.91
P038121	1999	CN-GEF-RENEWABLE ENERGY DEVELOPMENT	0.00	0.00	0.00	35.00	0.00	21.96	29.90	11.38
P060270	1999	CN-ENTERPRISE REFORM LN	0.00	5.00	0.00	0.00	0.00	2.25	3.75	3.53
P057352	1999	CN-RURAL WATER IV	16.00	30.00	0.00	0.00	0.00	18.66	15.23	10.41
P058308	1999	CN-PENSION REFORM PJT	0.00	5.00	0.00	0.00	0.00	1.17	1.17	0.00
P042299	1999	TEC COOP CREDIT IV	10.00	35.00	0.00	0.00	0.00	34.23	-12.39	0.00
P046829	1999	RENEWABLE ENERGY DEVELOPMENT	100.00	0.00	0.00	0.00	0.00	12.87	99.87	10.00
P046564	1999	CN - Gansu & Inner Mongolia Poverty Red.	60.00	100.00	0.00	0.00	13.30	33.46	29.39	-8.83
P046051	1999	CN-HIGHER EDUC. REFORM	20.00	50.00	0.00	0.00	0.00	5.69	7.31	0.00
P003653	1999	CN-Container Transport	71.00	0.00	0.00	0.00	18.61	3.01	21.62	0.70
P043933	1999	CN-SICHUAN URBAN ENVMT	150.00	2.00	0.00	0.00	0.00	84.94	82.56	26.76
P049665	1999	CN-ANNING VALLEY AG.DEV	90.00	30.00	0.00	0.00	0.00	17.31	12.48	0.00
P051856	1999	ACCOUNTING REFORM & DEVELOPMENT	27.40	5.60	0.00	0.00	0.00	17.60	17.51	0.00
P036953	1999	CN-HEALTH IX	10.00	50.00	0.00	0.00	0.00	33.31	23.58	-0.01
P051888	1999	CN - GUANZHONG IRRIGATION	80.00	20.00	0.00	0.00	0.00	23.25	19.84	0.00
P051705	1999	Fujian II Highway	200.00	0.00	0.00	0.00	0.00	51.00	51.00	0.00
P050036	1999	Anhui Provincial Hwy	200.00	0.00	0.00	0.00	9.60	32.99	42.59	0.00
P041890	1999	CN-Liaoning Urban Transport	150.00	0.00	0.00	0.00	0.00	26.78	26.78	0.00
P036414	1998	CN-GUANGXI URBAN ENVMT	72.00	20.00	0.00	0.00	10.19	58.34	66.26	31.27
P036949	1998	CN-Nat Hwy3-Hubei	250.00	0.00	0.00	0.00	0.00	21.15	21.15	0.00
P003539	1998	CN - SUSTAINABLE COASTAL RESOURCES DEV.	100.00	0.00	0.00	0.00	2.06	45.61	47.68	0.47
P003566	1998	CN-BASIC HEALTH (HLTH8)	0.00	85.00	0.00	0.00	0.00	35.87	24.51	0.00
P003606	1998	ENERGY CONSERVATION	63.00	0.00	0.00	22.00	0.00	31.67	18.37	0.00
P003614	1998	CN-Guangzhou City Transport	200.00	0.00	0.00	0.00	20.00	100.31	120.31	100.31
P003619	1998	CN-2nd Inland Waterways	123.00	0.00	0.00	0.00	37.00	15.35	52.35	1.49
P035698	1998	HUNAN POWER DEVELOP.	300.00	0.00	0.00	0.00	145.00	21.52	166.52	-12.39
P045788	1998	Tri-Provincial Hwy	230.00	0.00	0.00	0.00	0.00	15.58	15.58	0.00
P046563	1998	CN - TARIM BASIN II	90.00	60.00	0.00	0.00	2.67	7.14	10.44	0.00
P046952	1998	CN - FOREST. DEV. POOR AR	100.00	100.00	0.00	0.00	0.00	29.62	-69.61	17.19
P049700	1998	CN - IAIL-2	300.00	0.00	0.00	0.00	0.00	1.65	1.65	0.75
P051736	1998	E. CHINA/JIANGSU PWR	250.00	0.00	0.00	0.00	86.00	40.56	126.56	13.47
P037859	1998	CN-GEF Energy Conservation	0.00	0.00	0.00	22.00	0.00	0.71	22.06	0.00
P040185	1998	CN-SHANDONG ENVIRONMENT	95.00	0.00	0.00	0.00	1.40	20.07	21.47	10.27
P003590	1997	CN - QINBA MOUNTAINS POVERTY REDUCTION	30.00	150.00	0.00	0.00	0.00	3.20	6.55	-1.41
P036405	1997	CN - WANJIAZHAI WATER TRA	400.00	0.00	0.00	0.00	75.00	13.07	88.07	0.00
P044485	1997	SHANGHAI WAIGAOQIAO	400.00	0.00	0.00	0.00	0.00	71.86	48.66	51.41
P003637	1997	CN-NAT'L RURAL WATER 3	0.00	70.00	0.00	0.00	0.00	0.56	3.77	3.35
P003650	1997	TUOKETUO POWER/INNER	400.00	0.00	0.00	0.00	102.50	29.55	132.05	29.55
P040513	1996	2nd Henan Prov Hwy	210.00	0.00	0.00	0.00	19.00	12.88	31.88	23.88
P003599	1996	CN-YUNNAN ENVMT	125.00	25.00	0.00	0.00	19.48	35.68	56.92	17.43

P003602	1996	CN-HUBEI URBAN ENVIRONMENT	125.00	25.00	0.00	0.00	47.32	17.07	66.43	4.10
P003594	1996	CN - GANSU HEXI CORRIDOR	60.00	90.00	0.00	0.00	0.00	71.13	60.31	0.00
P034618	1996	CN-LABOR MARKET DEV.	10.00	20.00	0.00	0.00	0.00	5.56	7.67	0.00
P003571	1995	CN-7th Railways	400.00	0.00	0.00	0.00	119.00	10.28	129.28	10.28
P003596	1995	CN-Yangtze Basin Water Resources Project	100.00	110.00	0.00	0.00	1.92	0.21	4.60	4.60
P003603	1995	CN-ENT HOUSING & SSR	275.00	75.00	0.00	0.00	57.46	37.16	92.53	7.19
P003639	1995	CN-SOUTHWEST POVERTY REDUCTION PROJECT	47.50	200.00	0.00	0.00	0.01	1.21	25.36	25.36
P003540	1994	CN-LOESS PLATEAU	0.00	150.00	0.00	0.00	0.00	0.93	0.27	0.00
P003632	1993	CN-ENVIRONMENT TECH ASS	0.00	50.00	0.00	0.00	0.00	0.86	1.44	1.12
		Total:	11,768.07	1,612.60	0.00	181.50	945.99	5,231.85	2,901.12	396.23

CHINA
STATEMENT OF IFC's
Held and Disbursed Portfolio (In Millions of US Dollars)

		Committed				Disbursed			
		IFC				IFC			
FY Approval	Company	Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2002	ASIMCO	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00
2003	Anjia	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00
2004	Antai	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	BCIB	0.00	0.00	11.60	0.00	0.00	0.00	0.00	0.00
1999/00/02	Bank of Shanghai	0.00	24.67	0.00	0.00	0.00	24.67	0.00	0.00
2002	CDH China Fund	0.00	14.96	0.00	0.00	0.00	3.97	0.00	0.00
2003	CSMC	0.00	12.00	0.00	0.00	0.00	9.60	0.00	0.00
2004	CUNA Mutual	0.00	12.00	0.00	0.00	0.00	1.47	0.00	0.00
1998	Chengdu Huarong	5.61	3.20	0.00	6.25	5.61	3.20	0.00	6.25
1998	Chengxin-IBCA	0.00	0.25	0.00	0.00	0.00	0.25	0.00	0.00
1992	China Bicycles	4.50	0.00	0.00	0.00	4.50	0.00	0.00	0.00
2004	China Green Ener	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	China II	28.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	China Re Life	0.00	15.41	0.00	0.00	0.00	15.41	0.00	0.00
1994	China Walden Mgt	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
2004	Colony Capital	0.00	17.31	0.00	0.00	0.00	0.00	0.00	0.00
2004	Colony China	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00
2002	Darong	10.00	1.50	0.00	8.00	0.00	0.00	0.00	0.00
1995	Dupont Suzhou	6.23	0.00	0.00	0.00	6.23	0.00	0.00	0.00
1994	Dynamic Fund	0.00	7.91	0.00	0.00	0.00	6.25	0.00	0.00
2004	Fenglin	19.00	6.00	0.00	18.00	0.00	0.00	0.00	0.00
2003	Great Infotech	0.00	3.50	0.00	0.00	0.00	2.80	0.00	0.00
2002	Huarong AMC	9.00	2.51	0.00	0.00	9.00	0.01	0.00	0.00
2004	IB	0.00	52.18	0.00	0.00	0.00	52.18	0.00	0.00
2002	IEC	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	Jiangxi Chenming	0.00	12.90	0.00	0.00	0.00	0.00	0.00	0.00
1998	Leshan Scana	3.61	1.35	0.00	0.00	3.61	1.35	0.00	0.00
2001	Maanshan Carbon	8.25	2.00	0.00	0.00	8.25	2.00	0.00	0.00
2001	Minsheng Bank	0.00	23.50	0.00	0.00	0.00	23.50	0.00	0.00

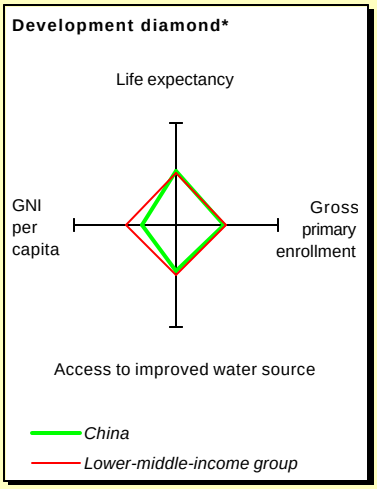
2001	NCCB	0.00	26.58	0.00	0.00	0.00	26.46	0.00	0.00
1996/04	Nanjing Kumho	34.00	2.23	0.00	0.00	0.00	0.00	0.00	0.00
2001	New China Life	0.00	30.70	0.00	0.00	0.00	23.32	0.00	0.00
1995	Newbridge Inv.	0.00	1.95	0.00	0.00	0.00	1.95	0.00	0.00
1997	Orient Finance	5.71	0.00	0.00	7.14	5.71	0.00	0.00	7.14
2003	PSAM	0.00	1.93	0.00	0.00	0.00	0.00	0.00	0.00
1997/00	PTP Holdings	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00
2001	Peak Pacific	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
2003	SAIC	12.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
2004	SBTS	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00
2000	SSIF	0.00	4.50	0.00	0.00	0.00	1.02	0.00	0.00
1998	Shanghai Krupp	26.25	0.00	0.00	57.74	26.25	0.00	0.00	57.74
	Shanghai Midway	0.00	16.02	0.00	0.00	0.00	16.02	0.00	0.00
1999	Shanxi	15.36	0.00	0.00	0.00	12.81	0.00	0.00	0.00
1993	Shenzhen PCCP	3.76	0.00	0.00	0.00	3.76	0.00	0.00	0.00
2002	Sino Gold	0.00	4.00	0.00	0.00	0.00	4.00	0.00	0.00
2001	Sino-Forest	21.67	0.00	0.00	0.00	16.67	0.00	0.00	0.00
1995	Suzhou PVC	0.00	2.48	0.00	0.00	0.00	2.48	0.00	0.00
2000	Wanjie Hospital	13.64	0.00	0.00	0.00	13.64	0.00	0.00	0.00
1996	Weihai Weidongri	0.71	0.00	0.00	0.00	0.71	0.00	0.00	0.00
2004	Wumart	0.00	6.48	0.00	0.00	0.00	6.48	0.00	0.00
2003	XACB	0.00	19.94	0.00	0.00	0.00	0.00	0.00	0.00
2004	Xinao Gas	25.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00
1993	Yantai Cement	4.73	0.00	0.00	0.00	4.73	0.00	0.00	0.00
2003	Zhengye-ADC	15.00	0.00	0.00	7.00	6.14	0.00	0.00	2.86
2002	Zhong Chen	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total portfilio:	352.03	358.04	36.60	104.13	132.62	250.43	0.00	73.99

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic.
2002	ASIMCO	0.00	0.00	0.01	0.00
2004	Antai	0.00	0.00	0.00	0.04
2004	CCB-MS NPL	0.00	0.00	0.00	0.00
2003	Cellon	0.00	0.01	0.00	0.00
2004	Chenming LWC	0.06	0.00	0.00	0.16
2004	China Green	0.00	0.00	0.01	0.00
2002	Huarong AMC	0.02	0.00	0.00	0.00
2002	IEC	0.00	0.00	0.01	0.00
2002	KHIT	0.00	0.00	0.00	0.00
2004	NCFL	0.00	0.02	0.00	0.00
2003	Peak Pacific 2	0.00	0.01	0.00	0.00
2004	SIBFI	0.00	0.00	0.00	0.00
2002	SML	0.00	0.00	0.00	0.00
2002	Sino Mining	0.01	0.00	0.00	0.01
2002	Zhong Chen	0.00	0.00	0.00	0.03
	Total pending commitment:	0.09	0.04	0.03	0.24

Annex 14: Country at a Glance

CHINA: PCB Management and Disposal Demonstration Project

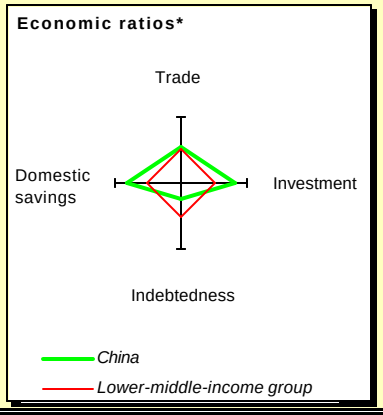
POVERTY and SOCIAL	China	East Asia & Pacific	Lower-middle-income
2002			
Population, mid-year *(millions)*	1,281.0	1,838	2,411
GNI per capita *(Atlas method, US$)*	950	950	1,390
GNI *(Atlas method, US$ billions)*	1,219.1	1,740	3,352
Average annual growth, 1996-02			
Population *(%)*	0.8	1.0	1.0
Labor force *(%)*	0.9	1.2	1.2
Most recent estimate (latest year available, 1996-02)			
Poverty *(% of population below national poverty line)*	5	..	..
Urban population *(% of total population)*	38	38	49
Life expectancy at birth *(years)*	71	69	69
Infant mortality *(per 1,000 live births)*	30	33	30
Child malnutrition *(% of children under 5)*	10	15	11
Access to an improved water source *(% of population)*	75	76	81
Illiteracy *(% of population age 15+)*	14	13	13
Gross primary enrollment *(% of school-age population)*	106	106	111
Male	105	105	111
Female	108	106	110



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

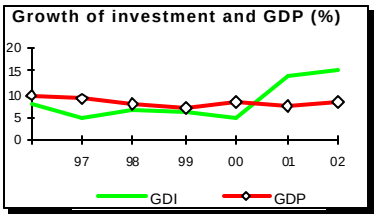
	1982	1992	2001	2002
GDP *(US$ billions)*	221.5	454.6	1,167.1	1,232.7
Gross domestic investment/GDP	33.2	36.2	38.5	41.0
Exports of goods and services/GDP	8.9	19.5	25.5	29.5
Gross domestic savings/GDP	34.8	37.7	40.9	44.0
Gross national savings/GDP	35.1	38.0	40.0	43.8
Current account balance/GDP	2.4	1.9	1.5	2.9
Interest payments/GDP	0.2	0.6	0.5	0.5
Total debt/GDP	3.8	15.9	14.6	12.6
Total debt service/exports	8.0	8.6	7.7	6.1
Present value of debt/GDP	..	..	14.1	..
Present value of debt/exports	..	..	51.8	..

	1982-92	1992-02	2001	2002	2002-06
(average annual growth)					
GDP	9.7	9.0	7.5	8.0	7.5
GDP per capita	8.1	8.0	6.7	7.2	6.6



STRUCTURE of the ECONOMY

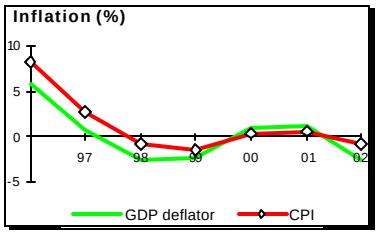
	1982	1992	2001	2002
(% of GDP)				
Agriculture	33.3	21.8	15.8	14.5
Industry	45.0	43.9	50.1	51.7
Manufacturing	37.3	33.1	34.2	44.5
Services	21.7	34.3	34.1	33.7
Private consumption	50.7	49.2	45.7	42.5
General government consumption	14.5	13.1	13.4	13.5
Imports of goods and services	7.3	18.0	23.1	26.5



	1982-92	1992-02	2001	2002
(average annual growth)				
Agriculture	4.6	3.7	2.8	2.9
Industry	11.6	11.3	8.4	9.9
Manufacturing	11.2	10.4	9.0	8.1
Services	11.7	8.4	8.4	7.3
Private consumption	11.4	8.1	2.8	1.9
General government consumption	9.9	8.4	10.5	7.0
Gross domestic investment	9.5	9.7	13.9	14.9
Imports of goods and services	9.7	12.8	10.8	27.5

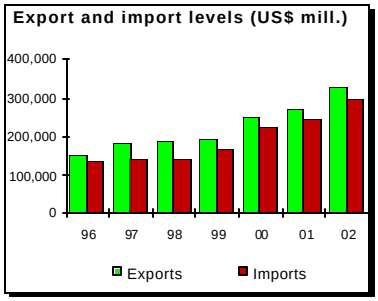
PRICES and GOVERNMENT FINANCE

	1982	1992	2001	2002
Domestic prices				
(% change)				
Consumer prices	6.0	6.4	0.7	-0.8
Implicit GDP deflator	-0.2	7.9	1.2	-2.6
Government finance				
(% of GDP, includes current grants)				
Current revenue	22.9	14.7	17.1	17.9
Current budget balance	..	2.0	1.1	0.0
Overall surplus/deficit	-0.3	-1.0	-4.7	-3.0



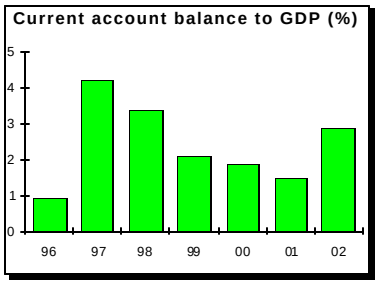
TRADE

	1982	1992	2001	2002
(US$ millions)				
Total exports (fob)	22,321	84,940	266,155	325,565
Food	2,908	8,309	12,780	14,623
Fuel	5,314	4,693	8,420	8,372
Manufactures	12,271	67,936	239,802	297,085
Total imports (cif)	19,285	80,585	243,610	295,203
Food	4,201	3,146	4,980	5,237
Fuel and energy	183	3,570	17,495	19,285
Capital goods	3,204	31,312	107,040	137,030
Export price index *(1995=100)*	41	85	83	78
Import price index *(1995=100)*	71	95	91	86
Terms of trade *(1995=100)*	58	89	91	90



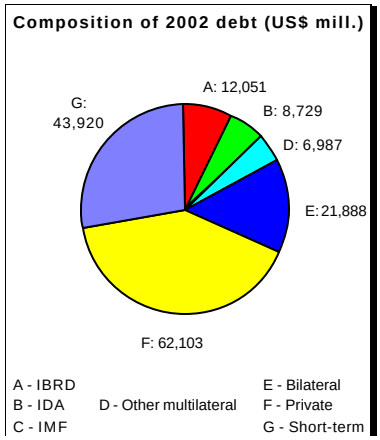
BALANCE of PAYMENTS

	1982	1992	2001	2002
(US$ millions)				
Exports of goods and services	24,906	94,198	299,409	365,395
Imports of goods and services	20,555	86,752	271,325	328,013
Resource balance	4,350	7,446	28,084	37,383
Net income	376	249	-19,174	-14,945
Net current transfers	486	1,155	8,492	12,984
Current account balance	5,212	8,850	17,401	35,422
Financing items (net)	-995	-10,952	30,046	40,085
Changes in net reserves	-4,217	2,102	-47,447	-75,507
Memo:				
Reserves including gold *(US$ millions)*	..	24,842	220,051	297,721
Conversion rate *(DEC, local/US$)*	2.4	5.9	8.3	8.3



EXTERNAL DEBT and RESOURCE FLOWS

	1982	1992	2001	2002
(US$ millions)				
Total debt outstanding and disbursed	8,358	72,428	170,110	155,678
IBRD	0	3,752	11,550	12,051
IDA	1	4,287	8,654	8,729
Total debt service	2,125	8,618	24,297	23,688
IBRD	0	460	1,550	1,631
IDA	0	30	151	175
Composition of net resource flows				
Official grants	47	327	240	..
Official creditors	657	2,343	2,156	-839
Private creditors	-122	8,949	-4,017	-13,593
Foreign direct investment	430	11,156	44,241	49,308
Portfolio equity	0	1,243	3,015	2,286
World Bank program				
Commitments	330	1,865	782	563
Disbursements	1	1,331	1,791	1,733
Principal repayments	0	197	904	1,157



Annex 15: Incremental Cost Analysis

CHINA: PCB Management and Disposal Demonstration Project

Overview

1. Consistent with the objectives of the GEF's Operational Program #14 for helping its member countries implement the Stockholm Convention on Persistent Organic Pollutants (POPs), this project will help China to accelerate the elimination PCBs, one of the 12 POPs covered by the Convention. The project will achieve this objective by demonstrating in one Chinese province on (1) how to safely and cost-effectively recover PCBs from China's many unsafe temporary PCB storage sites, (2) how to collect the remaining PCBs still in service, and (3) how to safely transport them for environmentally sound disposal and destruction, using appropriate technologies. It will also promote national and international replication of the lessons learned.

2. The project has six components: (1) institutional strengthening; (2) development of a policy framework for PCB management and disposal; (3) PCB management in the Zhejiang Province; (4) disposal of highly-contaminated PCB wastes in the Zhejiang Province; (5) project monitoring and evaluation; and (6) design of a national replication program. The project will be co-financed by a grant from the GEF (US$ 18.34m), government counterpart contributions (US$ 11.41m), and other donors (US$ 1.76m).

Broad Development Goals

3. China produced and imported a total of about 13,000-13,500 tons of PCB3 for use in transformers and capacitors and an unknown amount of PCB5 for use in paints and dopes during the 1960s and 1970s. It also imported up to 400,000 PCB-containing capacitors. China stopped production of PCBs in 1974, and production and import of PCB-containing capacitors in 1995. Since the lifetime of Chinese-made capacitors is about 15 years, most of the 1.15 million Chinese-made PCB-containing capacitors have now been retired from service. In addition, China imported some PCB-containing transformers in the 1970s and 1980s, with expected lifetimes of 25-40 years. In total, it is estimated that approximately 1 million capacitors and an unknown number of transformers are now in temporary storage sites throughout China; plus an unknown number of transformers (either PCB transformers or transformers contaminated with PCBs) are still in service. This constitutes a serious threat to the global environment and human health.

4. Due to weak management and the lack of effective policies, regulations and standards, several serious PCB pollution accidents have occurred in the cities/towns of Taizhou, Shaoxing, and Wenzhou in the Zheziang Province in the past 15 years.

5. China's central and local governments have taken several initiatives to address the PCB management challenge. These include issuing a regulation on "Prevention of Environmental Pollution of Electrical Equipment Containing Polychlorinated Biphenyl and its Wastes" in 1990, carrying out a preliminary nationwide investigation on PCB-containing electrical equipment in 1995, and setting up a pilot-scale PCB incineration facility in Shenyang in 1995. Nevertheless, China continues to lack effective laws and

resources to deal with PCBs, nor does it yet have a comprehensive program for managing the problem or the capacity to do it. As a result, actions have been limited to responding to a few PCB accidents and serious leakages.

6. China ratified the Stockholm POPs Convention on August 13, 2004. As a Party to the Convention, China's obligations include eliminating the use of PCBs in equipment by 2025 and pursuing "the environmentally sound waste management" of PCBs and of equipment containing PCBs "as soon as possible, but no later than 2028." To meet these obligations, China will implement their demonstration project and develop the national replication program.

Baseline Scenario

7. Under the baseline scenario, China would apply its existing regulations, policies and management approach to PCBs at both the national and provincial levels. These regulations and policies include:

a. *Circular on Changing Impregnant of Power Capacitors* [Jidian 226 (1974)], issued by former National No.1 Ministry of Machine-Building Industry in March 1974, which stipulated an end to using trichlorinated biphenyl to manufacture power capacitors.

b. *Circular on Preventing Pollution Problems of Polychlorinated Biphenyl Harmful Substance* [Jingji (1979) 225], issued by former State Economic Commission and Environment Protection Committee under the State Council in August 1979, which addressed the control of pollution from polychlorinated biphenyls and stopped the import of electrical equipment with polychlorinated biphenyl as the medium, with the exception of essential imports as approved by the competent authorities under the State Council.

c. *Circular on Strengthening Management on Abandoned Polychlorinated Biphenyl Power Capacitors* [Huguan 004 (1990)] issued by the former National Environmental Protection Agency (Now SEPA) in 1990, which strictly prohibited dealings in waste PCB capacitors, dismantling waste PCB capacitors and capacitors not displaying a distinct model number, and which required the Environmental Protection Department and Electricity Department to carry out surveys on PCB-containing capacitor inventories, (whether stored, idle, or still in service).

d. *Regulations on Prevention of Environmental Pollution of Electrical Equipment Containing Polychlorinated Biphenyl and its Wastes* [Huguan (91) 050] jointly issued by the former the National Environmental Protection Agency (now SEPA) and the State Ministry of Energy in March 1991 to prevent and control pollution from the use of PCB electrical equipment. The regulation addressed the collection, storage, transport, treatment and disposal of PCBs wastes, as well as strengthening governmental supervision and management of PCBs.

e. *Circular on Reporting Countrywide Polychlorinated Biphenyl Electrical Installation and Its Wastes* jointly issued by SEPA and the former Ministry of

Power Industry in December 1995, which ordered relevant units to coordinate a nationwide investigation on the use, storage, and status of PCB electrical equipment. The Shenyang Institute of Environmental Sciences conducted preliminary investigation of PCBs electrical equipment and its wastes in selected provinces in 1995-1996, according to the requirements of the circular.

f. *Standard of pollution control from PCB containing waste* (GB13015-91).

8. **The pilot hazardous waste incineration facility built in 1995.** In China's Eighth Five-Year Plan in 1992, the State Environment Protection Administration (SEPA) of China, was designated to carry out a state research topic the establishment of a set of industrial PCBs incineration facilities in China. In response, the Shenyang Institute of Environment developed a pilot-scale incineration facility in Sujiatun, Shenyang in 1995, whose main performance parameters met applicable national standards. This facility had a capacity of 1 ton/day and the total investment was about 4,800,000 RMB. This facility, built for incineration of PCB capacitors, included a primary and secondary combustion chamber furnace, in which the first chamber burned solid, liquid, or mixed wastes, while the secondary chamber was dedicated to the post-combustion of the gases. The unit also had high temperature tail gas rapid-cooling equipment and waste water treatment equipment. This facility, however, operated for eight years until 2003, is no longer in service. As of April 2003, this pilot facility has disposed about 1,000 tons of PCB wastes collected from Shenyang and other provinces. The plant had only limited automated control systems, and lacked online monitoring systems for the off-gas. These two defects are the key problems of PCBs incineration treatment in China. China will dismantle it in 2005.

9. While the initial PCB management actions taken in the 1970s and early 1980s were focused on the dismantling and temporary storage of PCB-containing equipment, focus in the 1990s shifted to finding and monitoring temporary storage sites. Recovery of the PCBs was done only where there was serious leakage or accidents, or when the site was needed for other uses. Under the Baseline Scenario, China would basically continue that management practice.

10. Under the Baseline Scenario, China will also, with GEF support, prepare and submit to the Conference of the Parties to the Stockholm Convention a National Implementation Plan (NIP) by August 13, 2006. The NIP will describe China's POPs situation, priorities, and intended management activities. China will also implement an ongoing Italian-funded PCB technical assistance project (*Development of PCB inventory methodology and draft PCB disposal strategy*) that will collect PCB baseline information in Zhejiang and Liaoning Provinces, and a Canadian-funded project on training for PCB management.

11. Under the Baseline Scenario and absent this project, China would continue to respond to only the most serious identified leakages and to other accidental releases of PCBs, and to do so on a case-by-case basis. In addition, the existing old disposal facility in Shenyang (now is planning to be dismantled) would have continue to operate even though it would not comply the Stockholm Convention. Neither Zhejiang Province nor the Central Government would develop a comprehensive management and policy

framework for ensuring the environmentally sound management and eventual elimination of all PCBs. This would likely result in approximately 5% of the PCB storage sites being cleaned-up, and these are the sites that have serious identified leakages. The experiences from past clean up revealed that the clean up undertaken thus far pose additional hazards, such as, contaminated soils remain in place without proper identification and barriers, and some clean up were partially completed.

GEF Alternative

12. Under the GEF Alternative Scenario, the project will comprehensively identify and demonstrate in one province how all PCBs can be safely and most cost-effectively recovered from their temporary storage sites, how those sites can be remediated, how the PCBs still in service can be collected, and how the recovered PCBs can be safely transported, managed, and disposed of in an environmentally sound manner, complying with the Stockholm Convention. In so doing, the project will give China the practical experience in PCB management and help develop the capacity it needs to achieve complete disposal of all PCBs by 2028, as specified in the Stockholm Convention. Specifically, the project will:

a. Identify all PCB storage sites and PCB transformers still in use in the demonstration province (Zhejiang);

b. Recover all PCB equipment and PCB wastes from temporary storage sites and PCBs from transformers still in use in the province, and transport them to a safe temporary storage facility before final disposal. After removal of PCBs, PCB wastes and PCB-containing equipment from the sites, the sites will be brought back to their original condition (i.e., before the PCBs were stored at the location) consistent with international environmental practice;

c. Dispose of the PCBs in an environmentally-sound manner at China's designated national center for PCB disposal in Shenyang, which will be completed for that purpose by December 2005; and

d. Develop China's capacity and practical experience in managing PCB elimination at the national level and use that capacity and experience to prepare a detailed national PCB management plan.

13. The project is key to helping China gain practical experience with the unique and complex environmental protection problems posed by its thousands of temporary, unsafe PCB storage sites. These problems include safe recovery of the PCBs from these temporary storage sites and the treatment of chlorinated organic wastes, including the technical difficulties entailed in minimizing secondary pollution from dioxins in the disposal process.

14. The following specific activities will be undertaken by the GEF Alternative Project:

a. Institutional strengthening and capacity building at Zhejiang Province and national levels.

b. Development of an adequate PCB policy and regulatory framework.

c. Recovery of all PCB-containing equipment and cleanup of all PCB storage sites in Zhejiang Province (the remaining 95% of all storage sites), including:

- Transportation, treatment and disposal of the wastes from the PCB storage sites (95% of the costs for dealing with highly contaminated PCB waste and 100% of the costs of low concentration PCBs wastes will be covered by the project),
- Recovery, temporary storage, transportation, treatment and disposal of wastes from the PCB storage sites, and
- Maintenance, monitoring, management and decontamination of all on-line PCB transformers in Zhejiang Province.

d. Disposal of PCB highly-contaminated wastes in an environmentally-sound and cost-effective way that will

- Provide safe storage and characterization unit of highly-contaminated PCB wastes before incineration;
- Complete the Shenyang PCB incinerator to have (1) a dedicated shredder and feed mechanism for PCB-contaminated capacitors; (2) a central control unit, (3) a online monitoring system, and (4) a dioxin emission monitoring unit to ensure that PCB disposal meets the Stockholm Convention requirements. China will finance the first three units with its own funds and Japan will finance the fourth unit;
- Dispose of highly-contaminated PCB wastes; and
- Provide technical support to operate and manage a PCB disposal facility.
- Cleanup of PCB contamination incidental to the recovery of PCBs at temporary storage sites.

e. Monitoring and evaluation of project implementation; and

f. Design and development of a national PCB management replication program.

15. The incremental activities and costs of the GEF Alternative include the following:

a. Recovery of PCBs and PCB-contaminated equipment from the storage sites including excavation to reveal incidental contamination of the surrounding soil, presence of contaminated leachate infiltration of water into the underground PCB storage coffins. As it will not be possible to put the contaminated soil back without cleaning it up, the incidental contaminated soil and leachate will have to be cleaned up and would thus be considered part of the incremental PCB recovery costs.

b. The capital costs of the mobile soil decontamination unit. The design of this sub-component is based on an assessment of the alternative costs to transport contaminated soil from each site to a disposal facility and the costs of clean replacement soil to backfill the excavated site, as compared to the investment and operating costs of a mobile unit which could serve one or more sites in the local area.

c. Construction of a PCB storage facility for interim safeguarding of PCB wastes before final disposal.

d. Procurement of a waste characterization unit to carry out detailed analytical characterization of the accumulated PCB wastes before final disposal.

e. Completion and operation of an environmentally-sound PCB incineration facility at Shenyang in Liaoning Province at China's own cost and some bilateral assistance from Japan. The alternative to this incremental investment would be to transport China's heavily-contaminated PCB wastes to a PCB disposal facility in Europe or north America. The evaluation of these two options was based on the total quantities of PCB waste, estimated to over 20,000 tons, to be disposed of over the course of China's entire PCB program, rather than just the quantities to be disposed of during the demonstration project, since all of China's PCBs eventually will have to be eliminated in order to meet the requirements of the Stockholm Convention. The analysis showed that completing a Chinese facility under construction in Shenyang is clearly the least cost option. The auxiliary improvements to a waste management incinerator to handle PCB wastes include safe temporary storage of large amounts of PCB-contaminated equipment and wastes and a special feed system to handle the large number of PCB-containing capacitors to be disposed at the facility. Finally, as a result of the more stringent environmental requirements for the facility, better monitoring and control of the operation is required.

Incremental Costs

16. As provided by the Stockholm Convention, the incremental costs to developing countries of implementing the Convention will be covered by its financial mechanism, the GEF. Because the Parties to the Convention have not yet established guidelines on identifying and calculating what constitute incremental costs under the Convention, the project's incremental cost calculation is based on the general guidelines in GEF/C.7/Inf.5 on Incremental Cost. Articles 1, 2, 5, 8, 10, 11-13, and 15-17 of that document address the definition and principle underlying incremental cost calculation, describing "incremental cost" as "a measure of the future economic burden on the country that would result from its choosing the GEF Alternative in preference to the course of action would have been sufficient in the national interest."[5]

17. As summarized in Table 1 the total cost of the Alternative is about US$ 32.5 million and its agreed incremental cost is US$ 31.5 million. As a contribution to the task of meeting the global POPs management challenge, and in recognition of the fact that it

[5] GEF/C.7/Inf 5, Paragraph 2.1.

will realize some modest national benefits from these incremental expenditures, China has offered to co-finance US$11.34million of the incremental costs and raised US$ 1.84 million from Italy, Japan, and the United States. It requests financial assistance from the GEF to support US$18.34 million balance of the incremental costs.

Table 1. Global and Domestic Benefits/Risks with Baseline and GEF Alternative

	Global Environmental benefits/risks	Domestic Benefits/risk	Total Costs (US$)
Baseline	1. Scattered ad hoc in-country operations contribute little to global or regional objectives 2. Risk of release of large quantities of PCB to the global environment	1. Some support to PCB sites with most serious identified leakages and to other accidental releases of PCBs, 2. Very limited general awareness of PCB and its environmental and heath impact, 3. Limited institutional capacity to manage PCB, 4. Responding to emergency situations like PCB accidents in case of serious leakages from temporary storage, and 5. No capacity to recover, collect, store and dispose PCBs safely.	1 million (including the spent investment of the old pilot hazardous waste incineration facility and actions for enforcement of current policies)
Alternative	1. A demonstrated and replicated PCB management and disposal program designed to address global goals as well as regional and local needs 2. Overall reduction of the risk in the release of PCB to the environment, 3. Environmentally sound disposal of PCBs under control conditions, 4. Developing a long term plan for complete collection and disposal of PCB, 5. Assisting China in meeting its obligations under the Stockholm Convention	1. Building institutional capacity to mange PCBs in an environmentally sound manner, 2. Raising public awareness of PCBs' risk to the environment and human health, 3. Eliminating the risks of further releases of PCBs from leaking storage sites in general and will ensure safe recovery, transportation, storage and disposal of PCB in the future.	33.0 million
Incremental Cost (GEF/non-GEF)			32.0 million (18.3/13.7)

Table 2: Matrix of Scenarios Comparing Baseline and GEF Alternatives

Components	Baseline	GEF Alternative	Increment
1. Institutional Strengthening—Strengthening capacity of management institutions and stakeholders	Institutional capacity for the management of PCBs would increase modestly through GEF support to the POPs NIP exercise and small-scale bilateral PCB technical assistance activities in the context of the Stockholm Convention. Continued limited capacity would constrain PCB management and disposal at national, provincial and local levels. The focus would continue to on PCB accidents and leakages.	Adequate institutional capacity for managing PCBs will be created at the national level and in Zhejiang Province through intensive staff training programs and technical seminars. Specifically - (a) a core national PCB Management Group at SEPA and a national roster of technical and policy experts will be established. (b) Over 300 staff of the Zhejiang Provincial authorities and institutions responsible for PCB management (the provincial and local environmental agencies and power companies) will be trained in all aspects of PCB management. (c) PCB public awareness activities will be undertaken at the national and provincial levels, the outputs of and lessons from which will guide other provinces. (d) As a large number of contracts and activities have to be managed over the four-year project, a Provincial Project Implementation Unit (PIU) will	The cost of the GEF Alternative (US$ 1,892,000) is incremental because these activities are above and beyond the PCB management actions that China would take in its national interest and will be undertaken in order to meet the requirements of the Stockholm Convention. The incremental GEF Alternative capacity is essential for refining and implementing the national PCB management program and will significantly reduce its costs. Elements such as establishment of the core PCB Group in SEPA and the roster of PCB experts are key up-front investments in China's overall PCB phase-out program.

Components	Baseline	GEF Alternative	Increment
		also be established.	
2. Development of a policy framework for PCB management and disposal	PCB management polices and regulation would remain weak and enforcement would be ineffective, due to lack of resources and limited public awareness.	Existing policies, regulations and standards regarding PCB management would be critically reviewed. Based on this review, it is expected that the existing policies and regulations would have to be revised, replaced, or supplemented by new and more effective polices. In accordance with Chinese procedures, such policies would be developed at the central government level first and then adopted and adjusted to the special conditions in provinces. A total of seven (7) national standards for the various aspects of PCB management will be developed.	The costs of this component (US$ 812,000) are all incremental because these activities are above and beyond what China would do in its national interest. The development of the national policies is a one-time activity which will not have to be repeated in the replication program, although the policies will need to be reviewed on a continuous basis to incorporate the experience of this demonstration project and of the other provinces selected to be in the next phase of cleanup. The lessons from the demonstration project on how to adapt and adjust the national regulation to a province and the necessary training of local authorities will provide useful input to the replication program.
3. PCB management in the Zhejiang Province –PCB site cleanup from PCB identification, PCB recovery,	Zhejiang Provincial and local authorities respond only to PCB storage accidents and serious leakages because they lack the resources, capabilities and techniques for safe PCB site	All PCBs are recovered from the approximately 56 temporary PCB storage sites in Zhejiang Province and the sites remediated. Highly contaminated wastes are moved to a safe provincial storage site and	Costs total US$ 15,345,000 and are incremental because the GEF Alternative activities are being undertaken because China ratified the Stockholm Convention and was able to receive GEF support.

Components	Baseline	GEF Alternative	Increment
packaging, safe storage to transportation to final disposal	cleanup and disposal and for PCB recovery from in-use equipment. China has very little hard experience of how to clean-up its hundreds of temporary PCB storage sites and therefore is unable to plan or undertake a large-scale national PCB management program.	transported to a PCB incineration facility. PCBs are safely recovered from in-use transformers and disposed of. From the Zhejiang Province demonstration, China learns how to most cost-effectively remediate its hundreds of temporary PCB storage sites.	
4. Disposal of highly contaminated PCB wastes in Liaoning Province – including completion of incineration facility to meet the Stockholm Convention requirements.	Small quantities of recovered PCBs would be incinerated at the existing old incinerator that does not meet the requirements of the Stockholm Convention for safe disposal of PCBs. The result would be unacceptably high emissions of dioxins and furans, thus creating additional environmental problems. Some recovered PCBs would remain in unsafe temporary storage facilities and the result would create unacceptable level of environmental hazard.	A new hazardous waste disposal facility in Shenyang is expanded to safely manage and dispose of PCBs. The additional investments are in (i) a warehouse for PCB wastes, (ii) a waste characteristics identification & analysis unit, (iii) a waste pre-treatment /crushing unit (a shredder and feeding system for PCB oil and PCB capacitors), (iv) a central control unit, (v) an online monitoring system, and (vi) a dioxin monitoring unit. The expanded unit is capable of disposing of all China's seriously contaminated PCB wastes. Hence this investment is the most cost effective means of achieving this objective. About 2,000 tons of heavily contaminated PCB	The component total cost of US$ 13,6099,000 is incremental because this cost is incurred as a result of ratifying the Stockholm Convention. China would not have invested in the new incineration facility, had it not been for obligations under the Stockholm Convention.

Components	Baseline	GEF Alternative	Increment
		equipment, PCB oil and other PCB wastes from Zhejiang Province are safely disposed of at the facility. The facility would continue to be used in the national replication program.	
5. Project monitoring and evaluation – including integration of PCB data into a POP MIS and workshops to discuss progress and monitoring	Because of limited PCB awareness, resources, regulations and standards, there would be no monitoring or evaluation of PCBs either stored or in use in Zhejiang Province.	All PCB data from the provincial demonstration is integrated into the POPs MIS and the system expanded to accommodate this information. A project monitoring and evaluation system is designed and review meeting and a start up workshop are held for all participating stakeholders to review the monitoring program.	Estimated costs of US$135,000 incremental because the monitoring activity would not occur without the GEF project.
6. Design of a national replication program	China's provinces do not have regulations and requirements in place for managing PCB wastes. Hence there is not sufficient incentive to develop and implement a national PCB management program. Local governments only respond to PCB emergencies, such as serious leakages, excavations of sites for building or construction work, or illegal excavations of sites.	Based on the project outcomes, experience and lessons learned, Chinese PCB experts prepare a proposed national PCB management program. It is presented and reviewed at a national workshop and endorsed by the national government. Lessons learned from the project are also disseminated internationally.	The costs of US$ 304,000 are incremental because, had it not accepted the obligations of the Stockholm Convention, China would not have had sufficient incentive to develop a national PCB phase-out program.

Annex 16: STAP Roster Review

CHINA: PCB Management and Disposal Demonstration Project

STAP Roster Reviewer Comments

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Background

PCBs are the archetype legacy persistent organic pollutant (POP) because they are ubiquitous in the global environment and have been in use for over 50 years. The properties which made them so useful in electrical industry applications: low water solubility (high lipid solubility) and resistance to thermal degradation, photolysis, oxidation and biodegradation, also guaranteed that they would persistent in the environment and bioaccumulate in food webs. It is precisely these criteria which were used to define a POP in the Stockholm Convention.

Vapor pressures and aqueous solubilities of PCBs (as a class average of the most common commercial mixtures) are lower than a number of other organohalogen compounds such as the hexachlorocyclohexanes (HCHs) and chlorobenzenes, therefore PCBs are not usually the major POP found in air or water. However, PCBs are among largest single group of organohalogen compounds by concentration in soil, sediment and biota in remote environments along with DDT-, chlordane-, toxaphene- and chlorobenzene-related compounds, at least in the more industrialized northern hemisphere. PCBs are almost invariably the major organohalogen contaminant in environments near urban and industrial areas, a reflection of their broad application in the electrical power industry, primarily in capacitors and transformers, but also their historical open uses in paints, oils and plastics in some countries.

In addition to being ubiquitous and having a tendency to biomagnify, PCBs and their metabolites in higher organisms have a broad spectrum of toxic effects. For example, in many environments, minor members (congeners) of the PCB family of compounds carry the majority of the dioxin-like activity. Considering their persistence, ubiquity, relatively high concentration and wide range of effects I believe PCBs to be the POP compound class of most concern globally.

Long-term biomonitoring studies have shown that local environmental levels of PCBs responded rather quickly to reduced production and cessation of open uses in industrialized countries in the 1970s. For example, order of magnitude declines in PCB concentrations were observed in fish and fish-eating birds in the North American Great Lakes and the Baltic Sea between 1970 and 1990. However, the response in remote environments was more subdued, and peak concentrations tended to be later. Temporal trends in PCB concentrations in biota in both highly contaminated and remote

environments tended to level off in the mid 1980s, and have declined slowly or not at all thereafter. Thus, there was no significant change in PCB concentrations in polar bears in the Canadian Arctic between 1991 and 1999, and concentrations were similar to those observed in the late 1960s. This suggests that input and removal processes are presently near steady state in the global mass balance of PCBs in the biosphere. Removal of PCBs from the environment certainly occurs, primarily by burial in ocean sediments and reaction with OH radicals in the troposphere. It is therefore probable that input to the environment (air and/or water) from various sources has continued despite attempts made to mitigate PCB environmental loading. It is quite possible that emissions from soils and electrical equipment surfaces contaminated by leaking transformers and capacitors, spills during handling and refilling, improper disposal of electrical equipment and fluids, emissions from waste dumps, and PCB-containing paints, oils and plastics are responsible for the lack of a decreasing temporal trend in PCB concentrations globally. .

Scope and Objective of the Work

Based on the assessment of the global problem of PCBs given above, this project addresses a small part of a large environmental concern. It is useful to put the scale of this project into the global context. One estimate has world production of PCBs at 1.3 million tons (Watanabe et al., PCB Symposium 2003 in Malaysia). About 35 % of this production was the USA, 30% was Western Europe, and 15% was Russia and Japan. "Others" accounted for 20%. According this Project Brief, China produced 0.01 million tons of PCBs between 1965 and 1974, or ca. 1% of world production.

Therefore, based on production alone, destroying all the PCBs in China would not make much of a dent in the global inventory. On this basis, some of the statements in the brief are perhaps too optimistic (e.g., Appraisal Summary, Item 54, pg. 32, which talks about this project "eliminating further PCB emitted into the environment"). Of course, this begs the question as to whether the PCBs that were manufactured in China were used and disposed of in a manner more likely to allow them to escape to the environment than in other countries. Based on the description in this Project Brief of accidents in Zhejiang Province involving illegal dismantling and subsequent sale of PCB-containing capacitors, it would seem that the potential for the Chinese manufactured PCBs to escape to the environment is significantly higher than in the major production areas of USA and western Europe. At the same time, the ability to redress this will depend on the degree of dispersal. It is one thing to clean up soils in the neighborhood of a capacitor dumpsite, and quite another if activities resulting in PCB spills occurred in a broad range of small industry or even private venues scattered over a large area.

Another factor in PCB emission to the environment which cannot be controlled is past general use of electrical equipment, e.g., ballasts in fluorescent lighting fixtures and capacitors in small motors. Furthermore, the use of PCB 5 in open uses like paint is much more likely to be a problem for emission to the environment than buried capacitors. This is acknowledged briefly in Item 3, pg. 36 and Item 25, pg. 42.

It is therefore unclear in advance of the project whether cleanup of the known PCB-containing capacitors in storage is likely to have a significant impact on PCB loading in China or the global environment. This in itself is sufficient reason to carry out a demonstration project in my view. Carefully designed before/after monitoring of environmental concentrations, particularly in air, should be undertaken to determine the efficacy of the project. It may very well turn out that irretrievable PCB inventory in China and atmospheric input from other countries, particularly Russia and Japan, are more important to human exposure in China than capacitor dumpsites. Of course, that does not mean that destruction of retrievable inventory should not be done. However, it may be useful to de-emphasize to stakeholders the influence that destruction of this inventory will have on PCB concentration in food, for example. PCBs are a global problem, just as much in China as elsewhere. It is clear from PCB concentrations in open ocean biota in the northern hemisphere, where prevailing atmospheric circulation is from west to east, that the influence of Asia (North Pacific Ocean) in global PCB emissions is much less than North America and Europe (North Atlantic Ocean), as would be predicted from the production figures.

A factor in addressing destruction of PCB inventory in China is the unknown number of imported transformers which may contain PCBs. The brief states that there were 630 transformers in substations in Zhejiang, and that their whereabouts is unknown. This problem is adequately recognized, and appropriate measures to gather the information appear to be built into the project. However, there is a risk the issue could become large than anticipated. If it turns out that many transformers are PCB-containing, the amount of PCBs to be destroyed could be a similar order of magnitude as those in capacitors. In the USA, PCB use in transformers was about half that in capacitors. Although it was stated in the Project Brief that it was highly likely China imported transformers containing PCBs, nothing was said about the potential source(s). Would this have most likely to have been the USSR? It would seem to be prudent to spend a significant effort tracking down information on potential origin of the transformers, the probability that they contain PCBs and their ultimate disposition. Otherwise, it becomes a massive analytical exercise to analyze the contents of a highly representative number of transformers for PCBs to determine the scope of the problem if it is extended to the whole of China. The decision to choose a mobile technology which can be rented to deal with this problem is a good one because the scope is unknown.

It is clear that the major technical challenge in this project is identifying the wastes and packaging them safely for transport, not the destruction. This is adequately reflected in the budget, nearly half of which is dedicated to Component 3: PCB Management in the Zhejiang Province. In Item 34.c, pg. 45, it is stated that the Sino-Italian project, "will provide an inventory of PCBs and equipment containing PCBs in two provinces – Zhejiang and Liaoning." This statement appears to indicate an overlap with the present project.

The last three criteria for choosing Zhejiang Province for the demonstration project (pg. 12, item 10) give me some concern. They are: (3) better PCB management system at different levels of government, (4) deeper economic development at different levels, and

(5) stronger local government support. While choosing a province which meets these criteria might enhance the success of the project, is it a good idea to choose the best-case scenario to demonstrate PCB management and disposal? What implications does this have for provinces with poor PCB management, shallower economic development and weak local government support? Has enough attention been paid, resources devoted, to Component 1 (Institutional strengthening) and Component 2 (regulations and standards) to provide a model which can be implemented/replicated in the worst case scenarios which might be encountered in other provinces?

I am concerned about the lack of description of the pre- and particularly post-cleanup chemical monitoring. In fact, the post-cleanup chemical monitoring part of the proposal (Item 18, pg. 70) is not developed adequately to assess what is being proposed. It is stated that data on PCB concentration in soil and water derived from soil sampling and analysis of soil and water are limited in China. It may be that a environmental monitoring outside of known sites should be done in order to catch sources which were not identified. However, this would be a large task to implement. Is there any formal, comprehensive monitoring program for PCBs in either the physical or biotic environment that could provide useful additional information? There is no indication of this in the project or annexes.

While there is a brief description of pre-cleanup monitoring to scope the sites (Item 14.b.ii, pg. 67), there is no item in budget that I could identify for this activity. According the Annex 5, $516,660 will be devoted to monitoring sites *after* cleanup. Item 18.e, pg. 17 indicates that soil, ground water, surface water and plants around the storage sites will be tested during the monitoring. Plants would be of little use – perhaps pine needles or barks, but not annual vegetation. It would be better to sample local wildlife (mice, rats, rabbits) and worms than plants.

It is also unclear which agency(s) will undertake the monitoring, or what kind of a quality assurance program is contemplated. Analysis of PCBs in high-level wastes is not particularly difficult, but still requires reasonably expensive and sophisticated equipment, and a laboratory with experience in these analyses. Analysis of ambient air and water is highly exacting. There is also the question as to how the results are calculated and reported. PCBs are complex mixtures, particularly the commercial formulations. There are several methods that could be used to separate and quantitate PCB concentrations. It should be a priority to put in place analytical protocols which are capable of congener-specific determination, and not to allow a variety of different methods of calculation. This is especially true if biota water and air are to be monitored. Because of differences in volatility, water solubility and bioaccumulation potential among PCB congeners, the source patterns in capacitors and soils are unlikely to be maintained in these media.

In the discussion on Critical Risks and Risk Mitigation Measures, it is suggested that using best available technology will mitigate the risk of unacceptably high emissions of dioxin/furan and other toxic chemicals from the incinerator in Liaoning Province. It is not clear what monitoring of emissions is being proposed to ensure compliance. Without

monitoring, compliance is likely to not be achieved, since there is always a tendency to cut corners if there are no consequences.

I am unfamiliar with PCB 3 and 5. What are the Aroclor (Phenochlor, Kanechlor) equivalents of these two mixtures manufactured in China? This has considerable implications for both analysis and toxic potential. If PCB 3 is primarily trichlorobiphenyls, then the composition is likely close to Aroclor 1016, but may also be similar to Aroclor 1242 (more toxic), which was a major-use PCB mixture in the USA. PCB 5 is probably similar in composition to Aroclor 1254, but may be closer to Aroclor 1248 (more toxic).

It was mentioned above that there are some doubts that this project will indeed result in significant changes to the PCB loading in the environment in Zhejiang Province, especially food. One way of addressing this is to investigate whether the profile of PCBs found in media and food outside of contaminated areas matches that of the PCBs in capacitors and transformers, or looks different from those profiles.

Key issues

a. *Scientific and technical soundness of the project*

The project has been well thought out, and is technically sound. All of the proposed technology has been proven elsewhere.

Application of state of the art sub-surface detection equipment (Georadar) should greatly lessen the chance of missing some of the stored capacitors. Training of staff in retrieving and safely packaging and transporting the material has been identified as a priority and adequate measures proposed to implement this training.

Upgrading of the incinerator in Liaoning Province to meet Stockholm Convention standards of minimal dioxin formation and high degree of PCB destruction has been properly addressed. It is important that computerized control of the operational process based on real time measurement of incinerator conditions be implemented in order to meet these standards.

A good analysis was made of alternate technologies for destruction of PCBs in transformer fluids. The use of mobile dehalogenation equipment in order to retain the transformer fluids for reuse is efficient and economically sound. As pointed out, incineration of the fluids adds unnecessary carbon dioxide to the environment. Note that the plasma torch process does not produce carbon dioxide, although it is a destructive method. It is not clear why a final choice of technology has not been made. The discussion, Items 57-59, pg. 53, indicate that this choice will be made in the first year of the project.

b. Identification of the global environmental benefits and/or drawbacks of the project

The project in itself may not result in a large decrease in environmental burden of PCBs in the Province or China as a whole. As discussed under Scope and Objective of the Work, China manufactured a relatively small proportion (ca. 1%) of the world production of PCBs, and is therefore likely to be minor contributor to the global PCB burden. Because of the lack of environmental monitoring data, it is unclear as to what proportion of the PCB burden in the Chinese environment is due to local input and the proportion from long-range transport. It is also unclear what fraction of the environmental burden is from large capacitor and transformer use and disposal versus the contribution from open uses and minor electrical uses (motor capacitors, fluorescent lighting fixture ballasts). Nevertheless, it is important that the existing inventory of PCBs be identified and destroyed if possible, since development of sites contaminated with PCBs may very well enhance their loss to the environment.

c. How the project fits within the context of the goals of GEF, as well as its operational strategies, programme priorities, GEF Council guidance and the provisions of the relevant conventions

The project is a good match to OP10 of GEF. It builds capacity to deal with PCB disposal in China. It provides a demonstration of how to overcome barriers to adoption of best practices, waste minimization and pollution prevention measures of this global contaminant in one of the world's major economies. The project takes advantage of an existing waste incinerator, upgrading it to international standards. Stakeholder involvement and participation has been carefully built into the project. The project is also an excellent fit to the goals of OP14: Reducing and Eliminating Releases of Persistent Organic Pollutants into the Environment.

d. Regional context

Demonstration of success in coordination of the various levels of government in achieving the goals of this project may provide considerable encouragement to other countries in the region to undertake similar PCB management and disposal projects.

e. Replicability of the project (added value for the global environment beyond the project itself)

This project will hopefully provide a model for PCB management and disposal which can be extended to the whole of China. There is some risk that the difficulty in doing this has been underestimated by choosing a 'best case' province to undertake the project.

f. Sustainability of the project

The short-term goal of the project is to find, collect and destroy the retrievable PCB inventory in Zhejiang Province. If successful, this goal of the project would be realized, and no further work required. Capacity building (training of personnel, regulations, site scoping procedures and destruction technology) developed in this project will be

sustainable beyond the end of the project through expansion to management and disposal of PCB inventory in all of China. It is not clear where the resources would come from to support this expansion.

g. In the case of target research project, it will be necessary to address the issue of the extent to which the project will contribute to the improved definition and implementation of GEF's strategies and policies, thus paving the way for more effective international, technical cooperation, assistance and investment projects.

N/A

Secondary issues

a. Linkages to other focal areas

No specific comment.

b. Linkages to other programmes and action plans at regional or sub-regional levels

The project Brief identifies two projects that are linked: the Sino-Italian project on inventory methodology and inventory investigation, and the Sino-Canadian project on training for PCB management. Both of these projects are intended to be first steps in the strategy behind the PCB management and disposal demonstration project, and will significantly improve the likelihood of its success.

c. Other beneficial or damaging environmental effects

No specific comment.

d. Degree of involvement of stakeholders in the project

Every effort appears to have been expended to identify and include all possible stakeholders. This is critical to the success of the project, since the Brief identifies the lack of an institutional, legal and political framework for the PCB management and disposal issue in China. It will require that all levels of government, affected industries (especially the power industry) and the public buy into the necessity of this project, and work together to develop the appropriate regulations, trained personnel and infrastructure to carry it out. The success of the project is much more tied up with this aspect than it is with technical feasibility.

e. Capacity-building aspects

The project is primarily about capacity-building. As noted in the previous section, success will result in development of regulations, trained personnel and infrastructure which will be applicable to management and disposal of PCBs in the whole of China.

f. Innovativeness of the project

The project is not especially technically innovative, since various aspects have all been demonstrated elsewhere. It is innovative in that it attempts to deal with the whole range of political, legal, regulatory and technical aspects involved in management of a POP.

Response to STAP Roster Reviewer Comments

Responses to Prof. Norstrom's comments are presented in the following table, in the order of the sections where the issues were raised.

Comments from STAP Reviewer	Task Team Response
Scope and Objective of the Work	
Low global significance of Chinese PCB inventory. According this Project Brief, China produced only about 1% of world production of PCBs, so destroying all the PCBs in China would not make much of a dent in the world inventory . . . The project is perhaps too optimistic in stating that it will "eliminate further PCB emitted into the environment."	As noted by the reviewer, the key factor is not the overall production of PCB in China, but the risk of their release to the environment. The project is intended to recover and destroy PCBs that are leaking into the environment. As he also notes, the current potential for Chinese PCBs to escape into the environment is "significantly higher" than is the case in Europe or the US. The project is primarily focused on these currently uncontrolled releases.
Influence of foreign atmospheric input on Chinese exposure levels and related stakeholder concerns. It may well turn out that irretrievable PCB inventory in China and atmospheric input from other countries, particularly Russia and Japan, are more important to human exposure in China than capacitor dumpsites. Of course, that does not mean that destruction of retrievable inventory should not be done. However, it may be useful to de-emphasize to stakeholders the influence that destruction of this inventory will have on PCB concentration in food, for example.	We agree with this observation and will reflect the suggestion during implementation. Nonetheless, we wish to note that the principal driver behind the project is the commitment of the Chinese Government to meet its obligations under the Stockholm Convention, not the stakeholders' concerns about PCB concentration in food.
Transformer sources. Although it was highly likely China imported transformers containing PCBs, nothing was said about the potential source(s). . . The project should spend significant effort tracking down their potential origins, the probability that they contain	We agree and intend during the project appraisal stage to track down information on China's imports of transformers.

Comments from STAP Reviewer	Task Team Response
PCBs and their ultimate disposition.	
Overlap with Sino-Italian project. The Sino-Italian project will provide an inventory of PCBs and equipment containing PCBs in Zhejiang and Liaoning, thus indicating an overlap with the present project.	The proposed project has been designed to be complementary with the Sino-Italian work by building on the more general information it is producing. Specifically, the Sino-Italian project will identify approximate locations of PCB burial sites and locations of in-service transformers. The proposed demonstration project will then use this information for the detailed investigation needed to identify the exact locations of the buried or stored capacitors, and to characterize the sites.
No budget for monitoring. There is a brief description of pre-cleanup monitoring to scope the sites but there does not appear to a budget item for the work.	The budget for the pre-cleanup monitoring is included in the budget for the second sub-component of component 3.
Monitoring. The project devotes $516,660 to monitoring sites after cleanup, including testing soil, ground water, surface water and plants. Testing plants would be of little use -- the project should instead sample local wildlife (mice, rats, rabbits) and worms.	The monitoring will be limited to soil testing before and after cleanup to assess effectiveness of clean-up. Biota, water and air monitoring to assess impact of the cleanup on the overall PCB exposure are beyond the scope and objectives of the proposed project, although it would undoubtedly produce useful data.
Monitoring agency. It is also unclear which agency(-ies) will undertake the monitoring, or what kind of a quality assurance program is contemplated.	Monitoring will be undertaking by the Zhejiang Monitoring Station under the auspices of the Zhejiang Environmental Protection Bureau, and will follow standard Chinese quality assurance protocols.
Compliance monitoring. Monitoring dioxin emissions is important, but it is not clear what monitoring is planned.	We agree on the importance of emission monitoring. Component 4 provides for systematic on-line monitoring and control of dioxin emissions from the Shenyang facility.
Key Issues	
a. Scientific and technical soundness of the project It is important that computerized control of the operational process based on real time measurement of incinerator conditions be implemented in order to meet these standards.	We agree. The upgrade of the Shenyang incinerator will include a central control unit and online monitoring which will give real time measurements of incinerator conditions to ensure it meets applicable standards.
It is not clear why a final choice of a dehalogenation technology for transformers remaining in use has not been made.	The project has proposed making this choice during the first year's activities in order to allow the testing and review of one or more candidate technologies. That decision process will draw on the results of the ongoing technology assessment under the Sino-Italian project and the seminars

Comments from STAP Reviewer	Task Team Response
	transformer decontamination proposed under Component 1 of this project. The process is intended to allow a careful review of how the selected technology actually performs in Zhejiang before committing to using it more widely.
b. Identification of the global environmental benefits and/or drawbacks of the project It is unclear what proportion of the PCB burden in China's environment is due to local input rather than from long-range transport. It is also unclear what fraction is from large capacitor and transformer use and disposal versus the contribution from open uses and minor electrical uses (motor capacitors, fluorescent lighting fixture ballasts).	China has estimated that 90% of the PCBs it produced were used in transformers and capacitors. While data are not available on the relative contributions of various domestic and foreign sources to China's PCB burden, it is clear that China's storage sites are increasingly releasing PCBs to the environment. Finding and recovering China's stored PCBs will thus remove a known, continuing, and controllable source of PCB releases into both China's and the globe's environment.
e. Replicability of the project (added value for the global environment beyond the project itself) This project will hopefully provide a model for PCB management and disposal which can be extended to the whole of China. There is some risk that the difficulty in doing this has been underestimated by choosing a 'best case' province to undertake the project.	We recognize that there might be some risks in choosing the Zhejiang Province, which is better positioned to address PCB contamination than are some other provinces. Similar risks would exist, however, regardless of which province were selected. We believe that lessons learned from successful development and implementation of the various project components will provide a model that will be broadly applicable in China, and, through the replication program, will be adjusted to reflect different economic and institutional conditions in other provinces.
f. Sustainability of the project The short-term goal of the project is to find, collect and destroy the retrievable PCB inventory in Zhejiang Province. If successful, this goal of the project would be realized, and no further work required. Capacity building (training of personnel, regulations, site scoping procedures and destruction technology) developed in this project will be sustainable beyond the end of the project through expansion to management and disposal of PCB inventory in all of China. It is not clear where the resources would come from to support this expansion.	We expect that the expansion of PCB disposal throughout China will be funded from a combination of local, GEF and bilateral sources.

Annex 17: Map

CHINA: PCB Management and Disposal Demonstration Project

Map No. IBRD 33583.