REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title: POPs and Chemical Pollution Solutions through Area-Based- Ecoeffective- Management			
Country(ies):	People's Republic of China	GEF Project ID:[1]	4854
GEF Agency(ies):	UNIDO (select) (select)	GEF Agency Project ID:	150073
Other Executing Partner(s):	Foreign Economic Cooperation Office, Ministry of Environmental Protection (FECO/MEP)	Submission Date:	06/24/2015
GEF Focal Area (s):	Persistent Organic Pollutants	Project Duration(Months)	60
Name of Parent Program (if applicable): ☐ For SFM/REDD+ ☐ ☐ For SGP ☐ ☐ For PPP ☐		Project Agency Fee ($):	570,000

A. FOCAL AREA STRATEGY FRAMEWORK[2]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
(select) CHEM-1	Outcome 1.1 Production and use of controlled POPs chemicals phase out	Output 1.1.1: Countries receiving GEF support to phase out the production or use of controlled POPs (other than new POPs)	GEF TF	1,290,000	5,160,000
(select) CHEM-1	Outcome 1.3: POPs releases to the environment reduced	Output 1.3.1: Action plans addressing unintentionally produced POPs under development and implementation	GEF TF	4,425,000	17,700,000
(select) (select)			(select)		
(select) (select)			(select)		
(select) (select)			(select)		
(select) (select)		Subtotal	(select)	5,715,000	22,860,000
(select) (select)			(select)		
(select) (select)		Project Management Costs	GEF TF	285,000	1,140,000
		Total project costs		6,000,000	24,000,000

B. PROJECT FRAMEWORK

Project Objective: The project will generate and demonstrate an area based chemical management replicable methodology based on an eco-effective management approach to systematically eliminate POPs and SAICM concerned chemical wastes from the total life cycles of products and industrial production systems.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount ($)	Confirmed Cofinancing ($)
1. Introduction and incorporation of area	TA	Incorporation of Eco-Effectiveness	1.1 Establish an enabling environment	GEF TF	900,000	3,600,000

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the Focal Area Results Framework and LDCF/SCCF Framework when completing Table A.

based eco-effective approach as a component of the Yiyang and Tianjin Local Government upcoming 5 Year Economic and Social Development Plan		principles into local government green initiatives, plans, programmes; and enhancement of environmental management decision making	through awareness raising and strategy integration to incorporate eco effective management principles into national and local government chemical management policy			
2. Creation of an institutional model to facilitate knowledge and promote investment relevant to eco-effective management and to ensure related capacity building	TA	Establishment of institutional framework incorporating local government and local enterprises supported by an Eco-Effective Knowledge Center	2.1 Strengthen the national and local institutional capacity and promote the research for public private partnerships [PPPs] investment to implement eco-effective management as it applies to POPs and SAICM concerned chemicals	GEF TF	1,000,000	3,000,000
3. Pilot demonstrations at enterprises in the selected value chains to showcase eco-effective management application to encourage wider investment in eco-effective solutions and access to appropriate technologies	Inv	Selection of at least 3 processes in each demonstration area and the pilot application of eco-effective methodology to design out toxic chemicals from total life cycles of the materials and the production systems employed.	3.1 POPs and SAICM chemicals focused eco effective diagnostic and technological management strategies/methodologies applied to target industrial value chains in the demonstration areas	GEF TF	2,715,000	13,060,000
4. Quantitative measurement of results of eco-effective chemical management measures expressed in materials, financial and commercial terms in pilot enterprises within selected value chains including monitoring and assessment of changes in impact on receiving ecosystems	TA	Documentation of results of the applied eco effective approach to chemical management including case studies of the process with reference to changed procedures, new and alternative materials, technology innovations and energy. Financial and commercial aspects of applied eco-effective management as well as the environmental	4.1 Eco-Effective monitoring parameters established, inventory data recorded and updated and local government institutional capacity strengthened to capture and interpret data built	GEF TF	600,000	1,800,000

		monitoring and results.				
5. Dissemination Plan	TA	Planning and implementation of a dissemination strategy that will communicate to a wider audience. Eco-effective approach methodology documented and made available to wider audience	5.1 Dissemination programme planned, developed and delivered to national and local audience	GEF TF	200,000	800,000
6. Project monitoring and evaluation	TA	Assessment of the impact of project activities including lessons learned	6.1 Project impact indicators designed, applied and project implementation evaluated	GEF TF	300,000	600,000
	(select)			(select)		
	(select)			(select)		
			Subtotal		5,715,000	22,860,000
			Project management Cost (PMC)[3]	(select)	285,000	1,140,000
			Total project costs		6,000,000	24,000,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
GEF Agency	UNIDO	Cash	100,000
National Government	MEP	Cash	500,000
National Government	MEP	In-kind	1,300,000
Local Government	Municipalities of Yiyang and Tianjin	Cash	1,730,000
Local Government	Municipalities of Yiyang and Tianjin	In-kind	1,570,000
Private Sector	Project Pilot Enterprises in Yiyang and Tianjin	In-kind	8,880,000
Private Sector	Project Pilot Enterprises in Yiyang and Tianjin	Cash	9,920,000
(select)		(select)	
(select)		(select)	
Total Co-financing			24,000,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in $)		
				Grant Amount (a)	Agency Fee (b)[2]	Total c=a+b

[3] PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
Total Grant Resources				0	0	0

[1] In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

[2] Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount ($)	Cofinancing ($)	Project Total ($)
International Consultants	440,000	60,000	500,000
National/Local Consultants	299,000	625,000	924,000

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[4]

The information presented in this document builds on that provided in the PIF. The project framework is essentially the same. As part of the PPG interactions with the project stakeholders the outputs were reviewed and summarized to present a single output for every outcome to clarify the project logic and to strengthen the document. The essence has not changed from the PIF.
The original PIF contained 21 Outputs focusing to a large extend on the actvity level of the project framework. In order to improve the project structure the Outputs have been brought up to the corresponding framework level and streamlined to 6 with a corresponding number of 6 Outcomes.
The PIF indicated that mercury, together with POPs and SAICM chemicals would be the focus of eco effectiveness managememt demonstrations. On closer examination during the PPG phase it became clear that mercury emission was primarily related to the combustion of coal in power generation and as such was considered to be beyond the scope of this project.
During the PPG phase the need to build the project management capability became obvious and accordingly Central Government requested that the PMC be recalculated to 5% of the sub-total. In addition at this stage, field visits were conducted in the demonstration areas including with the local authorities of Tianjin Municipality and Yiyang city and the participating enterprises where co-financing commitments were made.

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

1. The project is consistent with the strategy of the PR China National Implementation Plan (NIP) of the Stockholm Convention, where the Executive Summary states that "by combining actions for [Stockholm] Convention implementation with the objectives of promoting the optimization and upgrading of industrial structure and constructing a resource-saving and environment-friendly society".
2. The 12th Five-Year Plan for National Economic and Social Development (hereinafter referred to as the national 12th Five-Year Plan), specifically the goals "To focus on energy conservation, improve the incentive and restraint mechanisms and accelerate the construction of resource-saving and environment-friendly society" and "building a resource-saving and environment-friendly society, adjust product and industrial structures, promote cleaner production, develop a cyclic economy, boost effective utilization of resources, create new economic growth openings and increase employment opportunities, improve the environment awareness of the whole society and the level of public participation, and ultimately promote sustainable development."
3. The 12th Five-Year Plan for National Environmental Protection prioritized POPs Pollution prevention as one of the most important areas of China's environmental protection Strategy.
4. The Ministry of Environmental Protection supports this project as being consistent with meeting the obligations of PR China NIP and the commitment that the Government will improve the policies and regulations designed to fulfill the objectives of Convention implementation, strengthen institutional capacity building, adopt relevant strategies and actions, and carry out Convention implementation activities in stages and by region and by industry. The project innovates the first area-based project for the implementation of China's obligations under the Convention through area-based eco-effectivness and economic-environmental rebalancing measures by focusing on POPs and hazardous chemicals elimination in the local socio-economic and development plans.
5. The Regulations on Safe Management of Hazardous Chemicals in China issued by the State Council, China's Cabinet promotes the environmental managemnt of hazarous chemicals, which regulates for the total process of management, including production, storage, import, use, sales and transporting of hazardous chemicals to

[4] For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter "NA" after the respective question.

prevent their envrionmental risk, especially SAICM concerned toxic chemicals.

6. The eco-effective strategy underpinning the project is consistent with the Chinese Government "Circular Economy Promotion Law" of 2009 and the 'Eco-Civilization Programme'. The 'Eco-Civilization' programme objective is the sustainable balanced integration of human activity with the natural ecosystem incorporating a spatially based approach.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

7. The Project focal area is Persistent Organic Pollutants [POPs] and specifically GEF 5 CHEM – Objective No 1, outcomes

   □ 1.1 Production and use of controlled POPs chemicals phase out;

   □ 1.3 POPs releases to the environment reduced;

8. It is submitted that the application of an eco-effective methodology to chemical management [specifically POPs and SAICM concerned chemicals] is consistent with GEF CHEM 5.

9. This aproach is advocated by the authors of 'Cradle to Cradle: Remaking the way we make things' define the first step in an eco-effectiveness strategy as a 'design filter' to remove bio-accumulative chemicals from production and consumption cycles to include POPs, PVC, Cadmium, Lead and Mercury. [William McDonough & Michael Braungart 2002.]

10. The Strategic Approach to International Chemicals Management endorses the eco-effectiveness management approach as follows: "Establish and implement national action plans with respect to waste minimization and waste disposal, taking into consideration relevant international agreements and by using the cradle-to-cradle and cradle-to-grave approaches throughout the total life cycle of products and production systems. [SAICM Dec 2005 para 69]

A.3 The GEF Agency's comparative advantage:

11. UNIDO is the specialized United Nations agency for global industrial development focusing its activities on poverty reduction, inclusive globalization and environmental sustainability. UNIDO aspires to reduce poverty through Inclusive and Sustainable Industrial Development (ISID) and ensure every country to have the opportunity to grow a flourishing productive sector, to increase their participation in international trade and to safeguard their environment. In carrying out the core requirements of its mandate and mission, UNIDO has more than doubled its technical cooperation delivery over the past ten years. At the same time, it has also substantially increased its mobilization of financial resources, testifying to the growing international recognition of the Organization as an effective provider of inclusive and sustainable industrial development services.

12. In line with ISID, UNIDO has developed a Green Industry Initiative to mainstream social and environmental considerations into the operations of enterprises in all countries and regions through the more efficient use of energy and raw materials, innovative practices and applications of new green technologies since 2009. UNIDO is implementing the Initiative through a global, high-level, multi-stakeholder action partnership, known as the Green Industry Platform, which provides a forum for catalyzing, mobilizing and mainstreaming action on Green Industry around the world. It offers a framework to bring together governmental, business and civil society leaders to secure concrete commitments and mobilize action in support of the Green Industry agenda, i.e. greening the manufacturing process and creating green industries for production of goods and services for domestic use or export.

13. UNIDO, as one of GEF agencies, has a strong comparative advantage in the industrial sector in GEF projects in the following areas: industrial energy efficiency, renewable energy services, water management, chemicals management (including POP, Merucry and ODS), and biotechnology. UNIDO has a unique advantage in piloting BAT/BEP in small-medium enterprises (SMEs) in developing countries and countries with economies in transition. UNIDO, as a member of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), has been actively engaged in SAICM issues. UNIDO capitalized on its existing institutional network such as National Cleaner Production Centers (NCPC), Field Offices, Stockholm and Basel Convention Regional Centers and local UNIDO desks to ensure the delivery of its programmes.

14. The Stockholm Convention Unit (SCU) of UNIDO has an in-depth understanding and expertise for management of chemicals, especially in industrial processes in close relationship with the governments and private sector to help customize solutions, secure GEF funding and mobilize the required co-financing. The unit has a large experience on promoting technology transfer and supporting convening role of UNIDO by establishing forum with the participation of governments, the private sector, civil society and other partners to exchange and disseminate knowledge and information, strengthen partnerships for discussing about common questions on policies, legal, institutional and regulatory issues, capacity building and facilitating the replication of good experiences and lessons.

15. UNIDO plays a leading role in the implementation of the Stockholm Convention on POPs. Since the Convention opened for signature in 2001, UNIDO, as one of the principal agencies, assists developing and economies in transition countries to meet their obligations under the Convention. POPs related projects and activities mainly in the folowing areas: Policies for POPs Management (also NIPs and NIP Review and Updates); Promote and demonstrate Best Available Techniques and Best Environmental Practice (BAT/BEP) to reduce Unintentinonal-POPs releases; PCBs management and technology transfer of non-combustions technologies; Production of POPs alternatives; and Management of recycling chains with potential for POPs recycling or formation. UNIDO is currently implementing 82 Stockholm Convention Implementing projects in over 55 counties. In the PR of China UNIDO is currently implementing several UNIDO-GEF projects covering the before menioned five main activities in the focal area of POPs.

A.4. The baseline project and the problem that it seeks to address:

A. 4.1 Context / Background information

16. At the heart of the eco-effective approach to value chain management is a mindset change that stimulates innovation and rethinking. The approach aims for a massive change in material flows resulting in a 'no waste' society and redesigns the current, one way industrial systems into a circular system. The application of the eco-effectiveness approach to POPs and SAICM concerned chemicals is guided by operational tools such as the Eco-Effectiveness Life Cycle Analysis Framework (further background explanation for the eco-effectivness approach is also attached to Annex E).

17. The fundamental challenge addressed by this project is to gain the eco-effective approach accepted as a complementary and finally alternative strategy to 'the current, make, waste' approach. The current waste and chemical management policy in PR China supports a a 'take, make, waste' industrial model and in response the 'Circular Economy' policy in China tries to addresses the unsustainable waste volumes through the promotion of 'reduce, reuse, recycle' measures, developing a 'waste economy' and finding better ways to use and dispose of the waste. The 'take, make, waste' industrial model is globally dominant. Significantly in China the un-sustainability of this model is increasingly realized and that the 'circular economy' response is simply not enough. Welcome as these programs are, they aim to improve, but not change, the current industrial economic model and the associated mindset by typically targeting resource savings and waste reduction. These programs are inherently self-limiting because there comes a point when all the refining and improvements are made and still there are environmental inefficiencies which can also be quantified economically and financially.

18. The 'problem', which this project seeks to address, is the dominant assumption and mindset that waste is inevitable, that waste is the 'problem' and therefore has to be 'managed'.

19. One such example of the urgent need to find a 'win–win' solution to this dilema is the area of the South Dongting lake incorporating the municipality of Yiyang in the Yantze River basin. Yiyang is a prefecture-level city on the Zi river, a tributary to the South Dongting wetlands and the Yantze River, in Hunan Province.

20. A second example of the apparent incompatability of the so called 'extensive GDP driven economic model' to sustainably balance the needs of industry with the overarching necessity to ensure a living healthy ecosystem is the area of Tianjin City. Facing Bohai Sea, Tianjin is the third largest city in China. As an important industrial centre in north China, Tianjin has been ranking as the highest top three growth rate of GDP in China in recent

years, which is an example of the apparent incompatibility of the so called 'extensive GDP driven economic model' to sustainably balance the needs of industry with a living healthy ecosystem.

21. Tianjin and Yiyang are representative of similar situations throughout China where the model of industrial progress being pursued is manifestly in conflict with the capacity and survival of the supporting ecosystem. It is acknowleged and increasingly accepted in public policy in China that a new more compatible model of industrial development that sustains the symbiotic inter-reliant nature of successful industrial development with its living ecological hinterland is now self evident and beyond discussion. This clarification coincides with an emerging consensus in Chinese industry to pursue a quality and effecieny prioritised industrial strategy in favor of the historically dominant extensive GDP driven economic model that has characterised Chinese industry until now. This consensus for change is compatible with, and supported by the Chinese Central Government public policy expressed as the 'Circular Economy'. This shift of emphasis to upstream industrial design and quality management is compatible with the before mentioned and internationally accepted concept of 'eco-effectiveness' and 'cradle to cradle'.

A. 4.2 Baseline scenario

a) National level

22. The Ministry for Environmental Protection [MEP], and the China Council for International Co-operation for Environment and Development (CCICED), have directed the attention of the top leaders of China, at both national and local levels, to a hard reality: the development target set by the government will not be achieved unless alternative models of economic development are identified and applied. This ambitious development target is to raise the majority of China's population into "the all-round well-being society". This demands a tremendous increase in production and multiplies pressure on natural resources and the environment. Research by the MEP indicates that China's economy will need to achieve at least a seven-fold increase in efficiency of resource use to achieve the goals set for 2050, while maintaining environmental quality.

23. Central to the Chinese response to this challenge is the Japanese and German inspired Circular Economy approach to resource-use efficiency integrates cleaner production and industrial ecology in a broader system encompassing industrial firms, networks or chains of firms, eco-industrial parks, and regional infrastructure to support resource optimization. As a first reaction, the generation of post-Cultural Revolution laws was revised covering areas such as cleaner production measures, solid waste management and radioactive pollution. In addition, a wide range of local laws in the form of regulations, decisions, orders and quality standards have been issued which deal with the management, supervision and procedures to facilitate the policies and enforcement of national laws. A multi-ministry institutional arrangement through ministerial joint conference, joint law enforcement and information sharing mechanisms on the safety and environmental management of hazardous chemicals has been regulated for in China.

24. The Environmental Protection Law of China came into affect in Jan 2015. Its regulatory measures address water, air, solid waste and noise pollution, and establishes a system for environmental management, monitoring, liability and enforcement. These include general requirements for waste discharge registration systems, for the levying of fees, for environmental impact assessments as well as measures for the control and elimination of pollution supplemented by provisions for legal liability. Article 48 of the law is directly related to POPs and chemical management, which stipulates that "production, storage, transportation, sale and use of poisonous chemicals and goods containing radioactive substances must abide by related national stipulations to prevent environmental pollution". The Environmental Protection Law is part of the legislation package icoperating the civil and criminal code and where extraordinary attention has been given to environmental protection. The law provides the legal fundation for the MEP to issue national environmental standards. The administration is responsible for determining national environmental policies for the protection of air, water, soil and for waste disposal, for issuing national environmental regulations and national standards, for providing guidance to provinces on environmental matters and for supervising and managing environmental protection at national level. Apart from MEP, central government ministries including the Ministries of Agriculture, Energy, Forestry and Water Resources have the power to issue environmental regulations at national level. Local people's congresses and their respective standing committees are

authorized to adopt local regulation provided they are in accordance with superior legislation and regulations. Enforcement lies within the competence of sub-national departments. However, the people's governments of provinces, autonomous regions and municipalities directly under the central government are only empowered to establish local quality standards if no national standard exists, while more stringent discharge standards for pollutants may be established.

25. The National Implementation Plan (NIP) of the Stockholm Convention on Persistent Organic Pollutants (POPs) is the legal and programmatic instrument in which both industry-based and area-based POPs management were set as the strategic priorities to achieve compliance with the articles of the Convention in China. Specifically, the Regulations on Safety Management of Hazardous Chemicals issued by the State Council in April 2002 was also revised in March 2011 to strengthen the safety management of hazardous chemicals and POPs, prevent and reduce the risk of chemical accidents and protect the living and ecological environment. Other policies concerning the environmental management of hazardous chemicals include *Hazardous Chemicals Registration Procedure on Environmental management, Environmental Management Measures on New Chemical Substances and List of hazardous chemicals for environmental management, etc.*

26. As a result of the initial assessments conducted during the project formulation/ preparation stage the following target regions were selected which by their core industrial value chain operations have been identified as main sources for POPs emissions putting ecosystems of global importance in these areas at high risk:

b) Yiyang area

27. Yiyang City is located in the Dongting wetlands and lake on the Yangtze Basin is of acknowledged global significance and listed as a Palearctic Freshwater eco-region by the WWF Global 200 for its rich freshwater biodiversity species matrix. The South Dongting wetland and lake are also listed as globally important wetland nature reserves in the Ramsar Convention on Wetlands. In global terms, the potential loss of this precious natural reserve biodiversity is unconscionable. Dongting wetlands and lake is the second largest fresh water body in the Yangtze River system and pollutants from this area are transported seaward along the length of the Yangtze River and diffused globally in the ocean.

28. The municipality of Yiyang has a population of 4.5 million inhabitants. This area is in the heart of the Chinese fibre and textile production, which has left an unwelcome legacy from intensive pesticide and toxic chemical consumption. In more recent times, Yiyang has embarked on a programme of industrial development including chemical intensive sectors. In Yiyang's eco-sensitive area, with its rich biodiversity resources of global significance, the dioxin concentrations in sediment samples of South Dongting Wetlands are as high as 891 pg/g I-TEQ, which is typically 90 times the POPs values recorded in rivers and bays in developed countries, while the DDT concentration in soil is as high as 745 μg/kg, which is about 15 times higher than the national legal limits for soil quality in eco-sensitive areas . POPs and other toxic chemicals pollution arising from industrial and agricultural practices is evident in residues found in plants, fish, and birds and has caused a marked decline in the biodiversity of this eco-sensitive area. The pollutants are also transported seaward along the length of the Yangtze River and diffused globally in the ocean.

29. As one of the pillar industries in Yiyang, natural ramie fibre [Chinese Flax] cultivation and textile manufacturing rely on the use of POPs and chemicals at several points along the value chain. PCP-Na and DDT use has been an integral element in natural fibre cultivation [ramie, hemp, bamboo] has been a significant local source of pesticide which results in high concentrations of DDT and dioxin contamination in soil and sediment in South Dongting Lake Wetlands. Major POPs pesticides that were produced: chlordane, DDT, hexachlorobenzene, sodium pentachlorophenol, toxaphene and mirex. Obsolete pesticides and associated waste in excess of 16,100kg are stored in Yiyang City at sites in Anhua County, Heshan County and TaoJiang County. Also stored are obsolete toxic chemicals and pesticides in the local forestry sector, such as: chlorpyrifos, buprofezin, phoxim and Bisultap larger. In other chemicals, mainly cyanide cream, deltamethrin, permethrin, Bacillus thuringiensis, imidacloprid, ah one, buprofezin, with a total storage amount of 11,800kg.

30. The ramie degumming process results in further chemical contamination. Currently chemical degumming is the dominant process employed by ramie fibre producers in Yiyang City. Ramie chemical degumming process mainly uses liquid chlorine bleach, a single ton of hemp products to be put in lean material is shown in Table 1. A single ton of degumming product needs 1.06 tons of caustic chemicals, 0.13 tons of acid, 0.09 tons of additive agent,

0.015 tons of liquid chlorine. Annualy 100,000 tons of ramie production will use 53,000 tons of caustic, 6,500 tons of acid and 75 tons of liquid chlorine in the degumming process.

31. These ramie manufacturers, are mostly located in South Dongting Lake Wetland. Textile industry wastewaters are complex matrices. The use of liquid chlorine can cause a lot of organochlorine compounds in degumming wastewater, with an average concentration of 50 mg/L adsorbable organic halides (AOx). The microorganism is difficult to degrade chlorinated organic substances in the conventional wastewater treatment. Even the chlorine-containing substance is very low concentration. In the photochemical action, formation of dioxins in the UV photolysis of chlorophenols and other organic chlorine compounds is likely to form dioxin pollutants, and remain in the environment for a long time, resulting in significant harm to the environment.

32. The annual industrial wastewater discharge from industrial enterprises located in the vicinity of the south Dongting lake area is more than 20 million tons of organic wastewater at the same time with a COD as high as 4000-6000 mg/L. Wastewater discharging activities and the chemical pollution arising from ramie practices is evident in residues found in plants, fish, and birds and has caused a marked decline in the biodiversity of the Dongting wetlands and lake. According to research studies, the consequent reduction in dilution capacity has amplified the toxic bioaccumulation effects of POPs through the ecosystem and consequently has implication for global effect. Once released to the aquatic environment, POPs will also be transported along the length of the Yangtze River to the sea and beyond while migratory birds are vectors for the aerial distribution of POPs along the migration routes.

Table 1 The Chemical material input in the chemical degumming Process for Ramie Production

No.	Material input	Unit	chemical degumming
1	Ramie	t/t	1.667
2	Steam	t/t	18
3	Water	t/t	800
4	Electricity	kwh/t	672
5	Caustic soda	t/t	1.06
6	Acid	t/t	0.13
7	Additive agent	t/t	0.09
8	Liquid chlorine	t/t	0.015

33. Yiyang City has not yet issued specific management practices and policies for the monitoring and management of toxic chemicals containing POPs. Responding to the requirements of the Stockholm Convention, there is an urgency for Yiyang to analyze and review the national and provincial policies, regulations and standards management of toxic chemicals and issue the local policies and regulations on the management of Yiyang City POPs and toxic chemicals to promote the safe management and risk prevention from POPs and toxic chemicals management.

c) Tianjin area

34. As a coastal industry-intensive area in the northern part of China, the chemical pollutants of Tianjin city are having a serious impact on the wetland ecosystem of the Hai River and marine ecosystem of Bohai Bay, which one of the world's significant international waters. Industrial development in Tianjin exemplies the output driven economic model where industries were clustered to achieve intensity and synergy and where the consequences of past massive resource consumption and toxic chemical waste generation are evident in the legacy of ecological and environmental damage. The overall water quality of the Hai River and Yundingxin river outlets to the sea in Tianjin have not reached the 'fifth level' yet, meaning that levels are 'off-the-scale' and worse than the worst category of water quality in China. The concentrations of DDTs and HCHs were on the ranged of 0.32-31.35 ng/g and 0.35-2.11 ng/g dry wt respectively in the surface soil of agricultural land in Ji County, where the drinking water sources for Tianjin come. The concentrations of POPs and other highly toxic chemicals are high in the waste streams of Tianjin industries including sectors relevant to hazardous waste disposal, painting, building materials for pesticides and others emptying on the ecosystem. HCHs, PCBs and DDTs were in the range of 0.09–150, 0.34–81 and 0.18-4100 ng/g dry wt in sediments sampled from the Hai River and Bohai Bay.

35. The automotive industry has historically been a pillar industry of Tianjin and the city is becoming one of China's largest vehicle manufacturer. The automotive industry based Economy Development Zone was ratified as the first

new national industrialization demonstration base in February 2010. PBDE is the key fire retardent additive in the automotive interior manufacturing sectors, and the total amount of PBDE used is about 30 kg/a. VOC emissions from the automotive paints are one of the major sources of the urban air pollution, and about 400 kg of VOC is released every year.

Table 2 The Chemical material Usage in the production of automotive "back board"

No.	Material Input	Amount kg per ton product
1	Wood powder	344kg
2	Polypropylene powder	573kg
3	Modification additives	32kg
4	PBDE	0.2kg
5	Non-woven	50kg

36. Tianjin issued "Implementing Regulations on the safe protection license on hazardous chemicals in Tianjin" in 2007 to regulate the toxic chemicals production, storage and safety of construction projects. According to the relevant requirements of "Law of Safety production" and "Administrative Licensing Law,". The "Tianjin hazardous chemical management measure" (Decree No. 11 of TianJin Government) was also issued in 2008 to regulate the chemical production, storage, use and risk monitoring.

37. A multi-departmental coordination mechanism has been established in Tianjin to promote the POPs management and implementation of Stockholm Convention and be responsible for making the POPs pollution prevention plans, implementing the relevant chemical management regulations, carrying out the statistical recording work on POPs and distributing the POPs management information. The major government organizations include Environmental Protection Bureau, Public Security Bereau, Water Authority, Economic and Information Technology Commission, Minicipal Commission on Rural Affairs, Health Bureau, Customs, Quality and Technology Supervision Bureau and Administration on Work Safty.

A. 4.3 Baseline project

38. The 13th National Five Year Plan [2016-2020], currently being finalized for approval by the National People Congress, sets out the economic and social framework for the country. The official evaluation of the 2011- 2015 Plan indicates that generally most planning targets were met but significantly energy saving and environmental protection have not been satisfactory. Significantly for this project, corrective action on energy and environmental protection will therefore be priorities in the forthcoming five year plan.

    It is expected that the forthcoming plan will build on and expand the policy measures of the 12th Five Year Plan [2011 -2015], and specifically the environmental subset of the plan, reflected in a significant increase to the 3.4 trillion RMB investment target in the outgoing plan. While a significant portion of this budget will be earmarked for environmental infrastructure, considerable financial resources will be available for industrial development support at local government level and it is these financial resources that this project seeks to mobilize as co-financing for this initiative.

39. Each provincial, municipal, district and county authority is required to generate and implement a local version of the Central Government Five Year Plan and to fund the plan accordingly. The local version of the Plan will have many components including incentives and direct technical support to industry within the local authority area. These supports to industry are channeled through the local authority bureaus of Environmental Protection, Development and Reform, and Science and Technology and will be available to enterprises participating in this project.

40. The preparation phase [PPG] of this project coincided with a major local government initiative in Yiyang to address environmental sustainability. Under the banner of "Green development and ecological Yiyang " the strategic objectives were developed to create an 'Ecological City'. Yiyang is one of the major cites listed in the Dongting Lake Ecological Economic Zone Development Plan (2014-2020), ratified by the State Council in April, 2014. A Yiyang municipal leading group was established to promote the establishment of a national ecological city. Two major plans were prepared and adopted i.e. "The Comprehensive plan on the promotion of the national eco-city construction in Yiyang" and "Implementation plan on the reforming program for the construction of

resource-saving and environment-friendly society". This project was adopted by the local government Planning Group as consistent with and supportive of the objectives of these plans.

It is important to note that while the National Five Year Development sets policy, local government plans have relative autonomy in setting the operational plans to implement these policies. While the forthcoming National Five Year Plan may not explicitly incorporate the eco-effectiveness approach to environmental protection at present, it is feasible for local governments, including Yiyang and Tianjin] to incorporate the eco-effectiveness concept in their 5 years environmental protection plans as a means to fulfill the national policy objecives. The project will build on and benefit from the investment environment , created by local government employing economic incentives and direct financial support to favour eco effective investment. The project will also benefit from the technical input of the local Environmental Protection Bureaus and other local authority technical competences, supported by universities and research institutes. This collaboration will crystalize as the local focal point for the Eco Effective Knowledge Centre.

41. The project will build on the initiatives already underway where Yiyang municipal government, in the promotion of the construction of ecological civilization, accelerated the realization of 'Green Yiyang' and "Harmony between man and nature plans. In the local 12th Five Year Plan of Environmental Protection, the total investment of approx. 1.442 billion USD was allocated to 244 infrastructure projects, covering pollution reduction, urban and rural sanitation, watershed management, rural environment and ecological construction and environmental protection capacity building. Tianjin Eco-City Construction Plan was also developed and published by Tianjin Municipality, which promotes clean production and achievement of waste minimization in the industrial processes. The industrial enterprises relevant to hazardous chemicals were required to pass mandatory audits and establish ISO14001 environmental management system.

42. The Tianjin Local Government 12th Five Year Plan addressed environmental sustainability by setting objectives in the waste management area including the promotion of waste minimization, resources recovery and recycling, improvement of the waste management capacity for hazardous and municipal wastes, promotion and development of disposal strategies for historical waste stockpiles and the prevention of pollution from POPs sources.

43. The Environmental Protection Bureaus [EPB] in Yiyang and Tianjin municipalities have committed Industrial Support funds to co-finance this project. Currently there are Circular Economy and Green Industrial Development initiatives being pursued in the two cities and these are embedded in the Local Government Five Year Plan. These initiatives will be ring-fenced in the forthcoming local government plans [2016-2020]. Both municipalities have stated that finance can be allocated to the project through these committed budgets as reflected in Table C.

A. 4.4 Barrier analysis

44. Component 1: Introduction and incorporation of area based eco-effectiveness approach as a component of the Tianjin and Yiyang Local Government forthcoming 5 Year Environmantal Protection Plan.

Existing Barriers to realization

- Institutional resistance to change from end-of-pipe waste mitigation to closed loop zero waste strategies focusing on total process and product design.
- Capacity weakness to design and incorporate eco-effective measures at planning and at policy level
- Limited appreciation of the specifics, capacity and vulnerabilities of the local ecosystem and its symbiotic relationship with local industrial activity

45. Component 2: Creation of public private partnership institutional model to encourage knowledge transfer and investment promotion relevant to eco-effective management and to ensure related capacity building.

Existing Barriers to realization

- The dominant institutional research focus has been to improve, but not change, the current industrial economic model and the associated mind-set by typically targeting resource savings and waste reduction.
- Limited experience in engaging with international knowledge and technology networks.
- Limited capacity for practical interpretation and operational implementation of 'green strategy' slogans

46. Component 3: Pilot demonstrations at enterprises in the selected value chains to showcase eco-effective management application to encourage wider investment in eco-effective solutions and access to appropriate technologies.

Existing Barriers to realization

- Limited capacity for technology management and knowledge acquisition
- Lack of managerial skills and systems
- Lack of skilled and talented workers
- Lack of capital investment funds to implement identified eco effective measures
- Deficit of the necessary scientific, technical, technological knowledge and knowhow by local stakeholders
- The small and medium enterprise [SME] sector lacks the organic capacity and resources for environmental management and is dependent on external technical support and networks.

47. Component 4: Quantitative measurement of results of eco-effective chemical management measures expressed in materials, financial and commercial terms in pilot enterprises within selected value chains including monitoring and assessment of changes in impact on receiving ecosystems.

Existing Barriers to realization

- Lack of area-based chemical management strategy, plan and programme
- Poor or deficient baseline data
- Lack of accurate information on material inflows and outflows in production cycle
- Capacity to move from focus on end of pipe monitoring to front of pipe and in process measurement
- Limited capacity of laboratories to support monitoring and measurement programmes
- Limited technical resource capacity to measure certain impact parameters

48. Component 5: Dissemination Plan

Existing Barriers to realization

- Capacity to describe and communicate the results of the project to a wider audience

A. 4.5 Relevant Data & PPG findings

49. The PPG provided an engagement process to better understand the local economies, the industrial base and the carrying capacity of the supporting ecosystems in the demonstration areas of Tianjin and Yiyang. Furthermore, the

PPG facilitated discussion with local governments and with industries leading to 'buy-in' from stakeholders, 'bottom up' insights and clarifications, all leading to practical and pragmatic project design.

50. POPs inventory and pollution assessment in Tianjin and Yiyang were finished in PPG period, the preliminary inventory of POPs and other chemical releases in the two areas were prepared. Sources of SAICM concerened chemical pollution, as well as the nature, magnitude and geographical dispersion were identfied and defined. Data was generated on current policies and institutional capacity and the requirements and responsibilites for an area based eco-effective approach to chemical management determined.

51. The PPG engagement also confirmed a commitment at local government level, in Tianjin and Yiyang, to implement an area chemical management framework to provide systematic and coherent promotion of eco effective management change to industry and utilities. This commitment to developing a chemical management framework is consistent with local government implementation of central government policy directed towards sustainable industrial development.

52. The PPG phase interacted with central government through the Ministry for Environmental Protection and with the local governments of Tianjin and Yiyang. The project preparation activities included baseline studies, life cycle analysis, cost effectiveness, technology needs and the development of alternative solutions of targeted sectors in Tianjin and Yiyang. Workshops, studies and direct interaction with local government were the instruments used.The outcome of this work is collated in two separate studies attached as ANNEX K covering the baseline situations in Tianjin and Yiyang and including preparatory planning how eco effective management could be introduced and demonstrated.

Sector Selection Process

53. The selection process for the demonstration areas began from a general assessment which suggested that the ecological balance of Dongting Lake and the marine ecosystem of Bohia Bay were out of balance and under threat from unsustainable industrial chemical emissions.This led in turn to collaboration with the local authorities of Yiyang and Tianjin who recognized the problem and requested support to address the problem. The ramie industry in Yiyang and the automotive industry in Tianjin were identfied as the critical target sectors.

54. Ramie is the unique green textile raw material and fiber crops in China and its annual output accounts for more than the 90% of the world's production capacity. Yiyang City, Hunan Province is the main ramie region in the country, and the ramie planted area reaches more than 150000 mu (10000 ha), where the production of ramie fiber reaches 50000 tons / year. Currently, a large spectrum of chemicals are used in the ramie planting, degumming and spinning, dyeing and weaving process including POPs, AOX and other toxic chemical pollution.

55. As an important pillar of the national economy in China, the automobile industry plays a key role in the national economy. Tianjin is one of the major automobile industry bases in China. It is anticipated the vehicle output in Tianjin will exceed 1000000 units in 2017, with an output value exceeding 25 billion Yuan. PBDE and HCFC and other toxic and hazardous chemicals used in the production process of plastic automotive interiors. These toxic substances have a health impact in Tianjin and a longer longer health risks to consumers and society during the total life cycle of each vehicle.

a) Yiang area

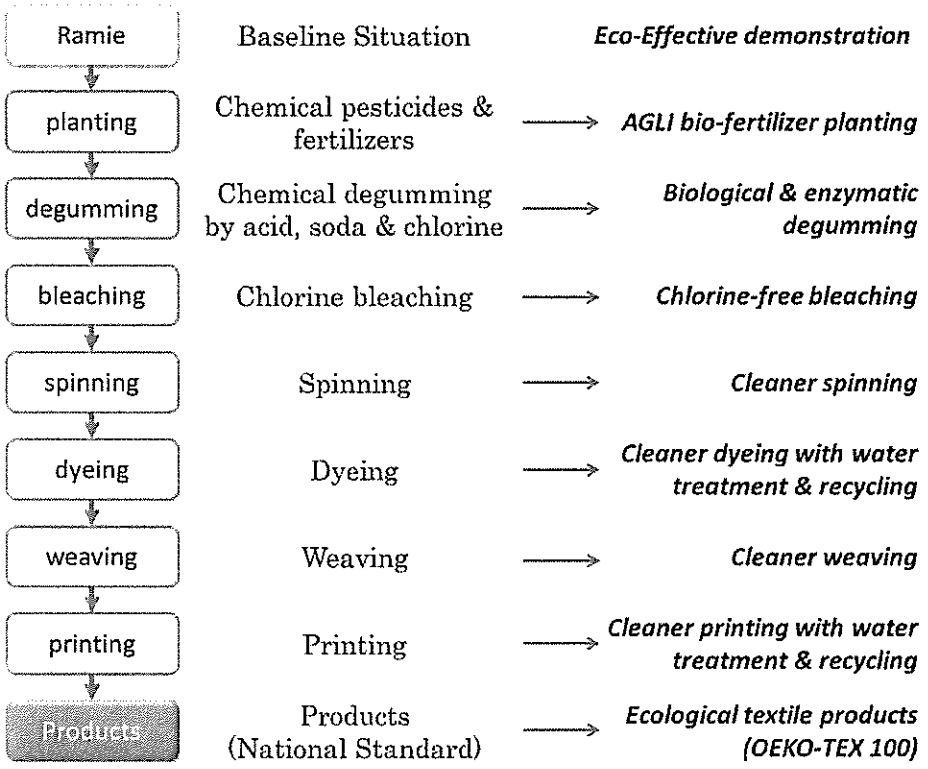
56. In the case of Yiyang the local government, in response to central government policy, has developed a local strategic plan to create an 'Ecological City', a central part of which is the pursuit of Green Industry. Although the strategic plan may be aspirational it is nevertheless remarkably frank on the challenges facing 'Yiyang to realize a comprehensive, coordinated and sustainable development of economy and society' and is evidence of an official appetite to embrace change towards inclusive and sustainable industrial development. [Ref: Ecological City Construction Plan for Yiyang City, Hunan Province; Municipal Government of Yiyang; 2014]

57. Currently, Yiyang lacks of an overall chemcial management strategy, systematic planning and action programms. The development of area-based chemical action plan and management measures are necessary to achieve the environmental sound management of POPs and other toxic chemicals and reduce their negative impacts on the local ecosystem. According to the 12th five year plan of persistent organic pollutants in Hunan Province, Yiyang

will set up the local database of persistent organic pollutants and other toxic chemicals, assess the regional ecological environmental risks of POPs and other toxic chemicalsin the key industries and provide professional trainings for the local environment managementerial staff and raise their awareness and understanding on the knowledge of persistent organic pollutants and toxic chemicals.

58. Natural fibre cultivation and textile sector in Yiyang have been identified as one of the project target value chains. As a pillar industry of the Yiyang area economy the sector accounts for 80% of Chinese linen production, with the planting area of 200,000 mu (1 hectare = 15 mu) and fiber production capacity of 50,000 tons / year. The sector is associated with the widespread POPs and other pesticide contamination of land and watercourses apart from extensive chemical use in fibre degumming, fabric dying and in other direct and indirect value chain processes. Natural fibre cultivation and textile sectors represent an area based value chain from primary production to increasingly sophisticated processing stages to market ready garments. The flow diagram of the ramie processing includes planting, degumming, bleaching, spinning, dyeing, weaving, printing and wastewater treatment (as showed in Fig.1). This value chain presents an opportunity to apply eco effective management at several points in that value chain and will be an excellent example to demonstrate and promulgate eco effective management across product and process life cycles. Planting, degumming and bleaching are of special concern because of the vast volumes of toxic chemical consumed and hazardous pollutants discharged by these processes. The GEF fund will support eco effective chemical management in these processes while the technical optimization and cleaner production in the ramie spinning , dyeing , weaving, printing and wastewater treatment processes will be assigned to co-financing support.

FIG 1. ECOEFFECTIVE DEMONSTRATION FOR POPS AND TOXIC CHEMICAL MINIMIZATION IN THE LIFE-CYCLE OF RAMIE PRODUCTION IN YIYANG CITY



59. Ramie planting in Yiyang City currently consums large amounts of fertilizer and pesticides, and the current consumptions is 120kg of fertilizer and 3kg of pesticides per mu. AGRI biological fertilizer can potentially prevent

the use of chemical fertilizers, pesticides and herbicides and increase the textile output and generate significant economic benefits, so the demonstration for ramie planting has a very high value. The adoption of AGRI biological fertilizer in the area of 5,000 mu will reduce the annual consumption of fertilizers and pesticides for 600 and 15 tons, respectively. It is also expected replication of 150,000 mu AGRI biological ramie planting in Yiyang City could decrease fertilizer use by 18,000 tons anually and pesticide consumption by 450 tons anually.

60. Degumming process is utilized to removing polymeric impurities surrounded the ramie fibers, such as the pectin substances, hemicellulose and lignin and other ingredients, to separate and loosen the fibers and make ramie fibers spinnable. Chemical degumming technologies adopted currently in Yiyang Cicy are based on bolling-off at high temperature (128-134 oC) and high pressure(147-196 KPa), which not only use large amount of caustic alkali, strong acid, liquid chlorine and other chemical additives, but also generate a large number of chemical wastes. A 5000-ton enzyme-based bio-degumming ramie production system will be setup through the technical demonstration through the modification of existing chemical degumming plant production line, mainly increasing the mechanical rubbing machine, biological inoculation equipment, biological enzyme fermentation and biocidal device. Bio-degumming ramie production system can reduce at least 58% of caustic, 100% of acid, 100% of chlorine and 89% of chemical additives (silicate of soda, sodium sulphite and surface active agents) in terms of per unit ramie production

61. Chlorine bleaching process makes ramie fibers whiter or lighter in color by chemical removal of their colors and sodium hypochlorite is the major bleaching agent used in alkaline and neutral conditions. Chlorine bleaching wastewater contains residual chlorine and high content of AOx, of which about 1% of non-polar organic solvent extraction halide EOx (extractable organically-bound halogen) is fat insoluble, containing bio-accumulate in the organic chloride, about 0.1% of which are highly lipophilic nature and bio-accumulate in toxic substances, namely dioxins. The conventional activated sludge process can only remove 15% to 50% of the AOx, resulting that the discharging wastewater has a AOx content of up to about 50mg/L and has a significant negative impact on the local environment. To minimize the AOx from the source, chlorine-free bleaching technology through the hydrogen peroxide based continuous steaming or bleaching or cold pad bleaching will be demonstrated and the wastewater discharge is supposed to be lower than the national emission limit of 12mg/L.

62. Cleaner production and Environmental Management Systems (ISO14000) will be implemented in the ramie spinning, dyeing, weaving and printing industrial processes and a 4000m3/d advanced wastewater treatment system will be updated in the project to clean, recycle and resue the ramie degumming, bleaching and dyeing wastewater on the basis of advanced biochemical oxidation wastewater treatment technology, increasing the photocatalytic oxidation, such as ozone and ultraviolet light combined with homogeneous degradation to minimize the chemical pollutant discharge from the ramie production. The designed ramie textile product is supposed to pass the OEKO-TEX® Standard 100 testing and certification system for textile raw materials, intermediate and end products at all stages of production.

b) Tianjin

63. A similar appetite for change towards sustainable industrial development is evident in Tianjin where there are innovative sustainable policies being adopted including a drastic increase in fines [July 2014] based on the amount of pollution discharged thereby encouraging companies to upgrade their facilities and production systems rather than continue to pay environmental infringement fines that are no longer economically tenable. Another example of initiatives for change is the China Council for International Cooperation and Development [CCICED] Pilot Project on Green Supply Chain Management.

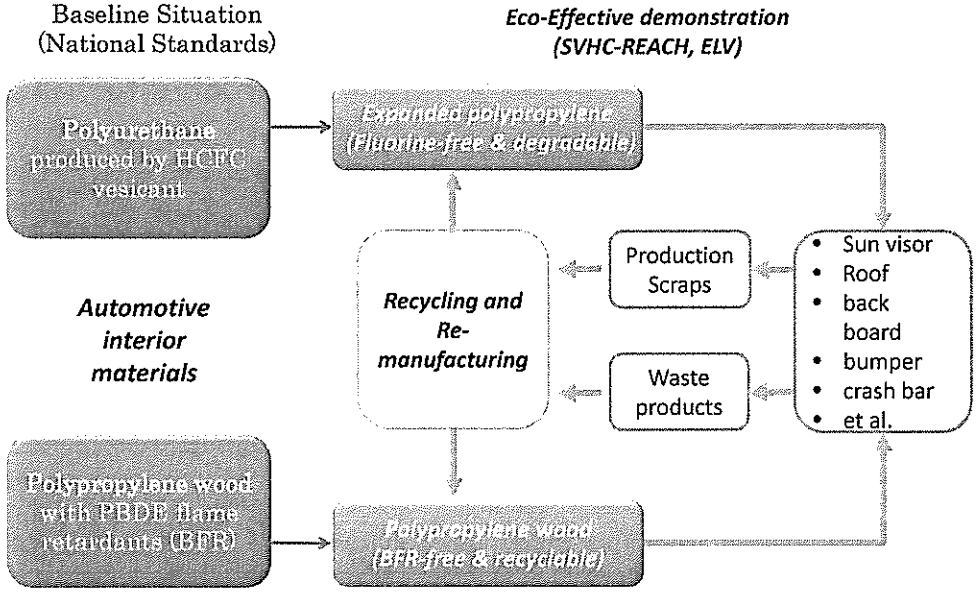
64. In the case of Tianjin, it has only a preliminary chemicals management framework, but still lacks specific measures, including regulatory and related systems to support its actual chemicals management, such as cleaner production audits on POPs emissions to promote enterprise owners carrying their effective chemical management. The institutional capacity for chemical management should be further improved and the risk assessment of chemicals and risk management system should be constructed in Tianjin. At the same time, the managementerial and technical staff should be trained through a professional training system to improve their knowledge and skill to meet the technical requirements of the environmental management of POPs and SAICM chemicals.

65. The project target value chain is the Automotive interior material manufacturing where PBDE and toxic chemicals are inputs into the products and production systems. This value chain is exposed to global market pressures as Tianjin is exporting almost all of its output to EU markets. The inclusion of these technically challenging value chains in this project will provide valuable demonstration to other sophisticated industries in the Tianjin area and beyond. It is expected that the automotive interior material production and the toxic heavy metals and organic pollutants in the designated product meet the European Union's restriction on Substances of Very High Concern of the Registration, Evaluation, Authorization and Restriction of Chemicals (SVHC-REACH) and the End of Life of Vehicle (ELV), especially for the limitation of Lead(Pb), Cadmium(Cd), Hexavalent Chromium (Cr6+), Mercury(Hg), Polybrominated Biphenyls (PBB) and Polybrominated Diphenyl Ethers (PBDE).

66. The automotive industry has historically been the key industry of Tianjin City and with the development of Bohai Economic Rim, Tianjin City is one of the largest automobile production areas in China. In addition, Tianjin City is the northern economic center hosting a major port which channels imports and exports of automobiles and automotive components. The automotive industry in the region of Tianjin City has had very unique development opportunities. With the construction of Binhai New Area and the renewing of Bohai Economic Rim, Tianjin City is improving its investment environment to encourage multinational automotive and national automotive groups to set up production-, R & D-, and procurement centers. This developments will further promote the automotive industry in Tianjin City to consolidate its status as central industry and will accelerate the economic development of Tianjin City.

67. Plastic material is one of the major substances for automotive interior manufacturing, accounting for 70 kg per car and including polyurethane(PU), polyvinyl chloride(PVC), acrylonitrile butadiene styrene copolymers(ABS), polypropylene (PP) and polycarbonate (PC) plastics. This project will support the demonstration of two emerging green plastics, expanded polypropylene (EPP) and polypropylene (PP) with mineral powders as flame retardants, as the alternatives of the PU produced by HCFC blowing agent and BFR-free PP for the production of dashboard, door panels, steering wheel housing, seats, headliner, back panels, sun visors and other components(as showed in Fig.2).

FIG 2: ECOEFFECTIVE DEMONSTRATION FOR POPS AND TOXIC CHEMICAL MINIMIZATION IN THE LIFE-CYCLE OF AUTOMOTIVE INTERIOR PRODUCTION IN TIANJIN CITY



68. In the current production of polyurethane materials in Tianjin, hydrochlorofluorocarbons (HCFCs) were commonly used as blowing agent at a concentration of 0.2%, such substances have the greenhouse effect. A new production line of PU foam for steering wheel components manufacturing using water instead of fluoride as blowing agent with a capacity of 240 t/year and a new production line of EPP for sun visor manufacturing with a capacity of 36 t/year are expected to eliminate the 672 kg/ year of HCFCs use completely compared to current fluoride-foaming PU production lines with annual capacity of 240 t and 96 t respectively. Toxic chemical contents will comply with the requirements of SVHC-REACH and ELV. Scrap and waste of plastics, such as the defective products and surface treatment scrap generated during the production will be recycled to re-enter into the EPP production process at the level of 85%.

69. In the current production of polypropylene wood, polybrominated diphenyl ethers(PBDE) were commonly used as addition into the wood-plastics composites to improve the flame retardant properties of the product. Traditionally, 0.2 kg of PBDE are needed for one ton of wood-plastics composites. A new polypropylene cast board production line with a capacity of 480 t/year using stone powder as the alternative of PBDE for manufacturing of back board, bumper and crash bar components. The heavy metal and toxic chemical contents should meet the requirements of SVHC-REACH and ELV. Moreover, the specified facilities will be built to recycle the waste wood-plastics products, therefore 70 kg of PBDE use could be eliminated each year, based on a capacity of 350 t/ year of current production line. It is expected a 85% of recycling rate could be achieved for the production scraps and the waste products collected to meet the ELV standards.

70. PPG engagement with local enterprises in Yiyang and Tianjing showed a growing understanding at enterprise level of the relationship between commercial success and resource management and a desire to move to a new level of commercial certainty and sustainability. The PPG process approved the need for new technologies and alternative sustainable solutions at material and production level. Technology needs identified, feasibility assessed and recommendations for alternative solutions provided in these two city.

A. 5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

A. 5.1 Project Components

The project components comprise the following:

Component 1: Introduction and incorporation of area based eco-effectiveness approach as a component of the Yiyang and Tianjin Local Government upcoming 5 Year Economic and Social Development Plan

71. This component will mainstream the eco-effective management approach to chemical management at both national and local government level, building on the existing national chemical management policy and the cluster based chemical management practices evident in the industrial park in Tianjin and the eco-sensitive area in Yiyang. This component also builds on the investment commitment of the Tianjin municipality and Yiyang city to implement national environmental policy through municipal plans and funding and will therefore incorporate the eco-effective management approach to POPs and SAICM concerned chemicals in the Environmental Protection element of the Tianjin and Yiyang local government 13th Five Year Plans. It is stressed that the investment commitment may straddle several municipal 'bureaus' [i.e. departments] beyond the Environmental Protection Bureau [EPB] to include the Municipal Development and Reform Commission, Science and Technology Bureau and the Bureau of Industrial Development.

The ownership of this component will be vested at Central Government with the Ministry for Environmental Protection and at local government level with the Environmental Protection Bureaus [EPB] of the Municipalities of Tianjin and Yiyang.The EPBs, incorporating local technical resources and supported by the National Eco Effective Knowledge Centre will become the focal point for continuous support to industry to implement Eco Effective management after the lifetime of the project. Project sustainability will also be assured as the eco effective policy is embedded in longer term local government sustainable economic and social planning.

The activities under this component will be directed by the Project Steering Committee with project management provided by the Project Management Team, with technical support from the National Eco Effective Knowledge Centre and operationally implemented at local level by the Project Management Offices of Tianjin and Yiyang.

Output / Activity
Output 1 Establish an enabling environment through awareness raising and strategy integration to incorporate eco effective management principles into national and local government chemical management policy.
Activity 1.1.1: Incorporate the eco effectiveness approach at national chemical management policy level to include technical research, guidelines and directive, management system and contingency planning. The systematic incorporation of this approach will provide a long term framework to build chemical sustainability.
Activity 1.1.2: Conduct awareness raising campaign to strengthen stakeholder engagement through direct and indirect communication strategies; to explain and deepen the understanding eco-effective principles and to generate public ownership of the project by demonstrating eco effective management and positive outcomes.
Activity 1.1.3: Revise and adapt the existing cluster based chemical management practices in industrial park or eco-sensitive area consistent with the eco-effective management approach in Tianjin and Yiyang
Activity 1.1.4: Develop a technical guideline for the application and evaluation of eco-effective management at industrial value chain and eco system levels with core emphasis on POPs and SAICM concerned chemicals in Tianjin and Yiyang
Activity 1.1.5: Reflecting national policy as expressed in the 13th National 5 Year Plan, incorporate the eco effective management approach into the forth coming Local Government 5-year Plans in Tianjin and Yiyang as a strategy to achieve local environmental protection objectives and specifically in the area of POPs and Hazardous Chemicals

Component 2: Creation of an institutional model to facilitate knowledge and promote investment relevant to eco-effective management and to ensure related capacity building.

72. This component establishes a national knowledge centre to strengthen national and local capacity to implement eco- effective management policy and practice as applied to POPS and SAICM concerned chemicals. The Eco Effective Knowledge Centre will act as a hub that acquires and transfers knowledge on all aspects of eco-effective management but with particular emphasis on POPS and SAICM concerned chemical management in industrial value chains. The establishment of the knowledge centre will be supported by international technical expertise in eco- effective management and by an international network with specific expertise to address technical and scientific challenges that will arise.

During the PPG stage potentially suitable technical institutions were identified to host the National Eco Effective Knowledge Centre including the Technology Transfer Centre of POPs Convention based in Tsinghua University, UNIDO's Technology Exchange Centre in China based in Beijing Normal University and environmental management institutes of the Chinese Academy of Science. The hosting institution for the National Eco Effective Knowledge Centre will be finally selected during the early project implementation stage with a priority to assure international and national knowledge sharing and long time operational support.

0utput / Activity
2.1 Strengthen the national and local institutional capacity and promote the research for public private partnerships [PPPs] investment to implement eco-effective management as it applies to POPs and SAICM concerned chemicals
Activity 2.1.1: Create a national knowledge center as a repository for research, international best practice of institutional learning for eco effective management and access to appropriate technologies and systems to support sustainable industrial value chains
Activity 2.1.2: Establish a task group in local government to promote communication, coordination and ultimate adoption of eco-effective management inspired practices and technologies into action plans in Tianjin and Yiyang. The membership of this task group will draw on the local technical and scientific talent pools available from the technical bureaus of local government supported by local academic and research institutions.
Activity 2.1.3: Research to generate partnership investment models reflecting both public and private resources to integrate eco effective management capacity and application at administrative and enterprise level to assure value added and sustainability across the total value chain. Research will be conducted by national and academic institutions specializing in closed loop production systems.
Activity 2.1.4: Develop training materials and conduct eco-effectiveness management trainings for management and technical personnel in Tianjin and Yiyang
Activity 2.1.5: Develop the area based eco effective management database integrate the procedures and processes for training of personnel,

summarizing, and reporting environmental information to local Environmental Protection Bureaus in Tianjin and Yiyang
Activity 2.1.6: Establish the chemical contingency planning capacity building in Tianjin and Yiyang

Component 3: Pilot demonstrations at enterprises in the selected value chains to showcase eco-effective management application to encourage wider investment in eco-effective solutions and access to appropriate technologies.

73. Using dedicated expertise drawn from the stakeholders, including the international network of academic and technical institutions, this component will comprehensively audit the selected enterprises product and production life cycles with a view to devising solutions and strategies consistent with eco-effective management principles to eliminate POPs and toxic chemicals throughout the life cycle chains.

In the case of Yiyang selected enterprises will reflect all production stages of the ramin value chain incorporating up to 10 production facilities and enterprises. The project focus will be on three enterprises to showcase the application of eco effective management to include the piloting of alternative technologies. With regard to the automotive value chain in Tianjin up to 10 production units will be involved in the project with dedicated project concentration on two demonstration enterprises where eco effective technologies will be piloted and demonstrated. Project scale up and replication is addressed as part of the dissemination strategy reflected in Component 5.

The eco effective design protocol calls for materials to be defined as technical or biological nutrients that are safe and healthy for humans and the environment. Working with the product manufacturer and suppliers, each product formulation is mapped out and broken down into its chemical constituents. The toxicity of every material that goes into a product is examined and a path to help manufacturers improve product and process design is developed.

Output / Activity
Output 3.1: POPs and SAICM chemicals focused eco effective diagnostic and technological management strategies/methodologies applied to target industrial value chains in the demonstration areas.
Activity 3.1.1: Conduct detailed Environmental Risk Assessment [ERA] of all POPs and SAICM concerned chemicals in demonstration areas
Activity 3.1.2: Conduct Materials Assessment Protocol [MAP] of total life cycle of POPs and SAICM concerned chemicals in target industrial value chains
Activity 3.1.3: Identify specific eco effective solutions in consultation with the international network of universities and technical institutions
Activity 3.1.4: Select the 3 demonstration technologies and associated public launching events in Tianjin and Yiyang
Activity 3.1.5: Develop appropriate eco effective chemical solutions and implement identified eco effective design changes in the automotive interior sector at Tianjin in consultation with expertise

from the international network
Activity 3.1.6: Develop and implement appropriate eco effective chemical solutions in the natural fiber textile sector (primary cultivation of natural fiber, fiber degumming, chlorine-free bleaching, weaving processes and textile dyeing) at Yiyang in consultation with expertise from the international network
Activity 3.1.7: Integrated approaches for chemical management in Tianjin and Yiyang

Component 4: Quantitative measurement of results of eco-effective chemical management measures expressed in materials, financial and commercial terms in pilot enterprises within selected value chains including monitoring and assessment of changes in impact on receiving ecosystems.

74. This component will link the effectiveness of eco-effective applied strategies at the pilot enterprise level to financial and commercial benefit and measure the changes of impact on supporting ecosystems through the monitoring of specified environmental parameters. The financial and commercial is reflected in the international experience and characterized by reduced material costs, generating innovating thinking, addressing many industry level strategic challenges and building resilience as a result. Eco effective principles open opportunities for enterprises to add new downstream businesses. These will profit from the dual benefits of extracting additional value from the cascaded material as input while avoiding waste costs. It also assure market access and durability.

0utput / Activity
Output 4.1. Eco-Effective monitoring parameters established, inventory data recorded and updated and local government institutional capacity strengthened to capture and interpret data built
Activity 4.1.1: Design and finalize a monitoring framework including eco effective monitoring parameters for demonstration sites and participating enterprises
Activity 4.1.2: Record and update the inventory data of target sites (e.g. material flows, energy consumption, emission data etc.)
Activity 4.1.3: Enhance local monitoring capacity by the procurement of equipment and tools to gather and analyze information data

Component 5: Dissemination Plan

75. This component will plan and implement a dissemination strategy that will introduce the Eco-Effective approach to chemical management to a wider audience beyond the confines of the demonstration municipalities. The wider audience would include government administration, the international academic and research community, the national and international business community and the general public. The dissemination plan describes and defines a clear strategy of dissemination activities to be performed and how they are to be delivered in terms of responsibility, timing, dissemination tools and dissemination channels. The dissemination plan will underpin the take up a replicability of eco effective thinking and solution implementation generally.

Output / Activity
Output 5.1: Dissemination programme planned, developed and delivered to national and local audience
Activity 5.1.1: Prepare a dissemination program focusing on lessons learned from project activities and development of a replication strategy for the demonstrated eco effective approach
Activity 5.1.2: Provide a guideline, based on lessons learned from the demonstration experience, to streamline eco effective value chain diagnosis and solution determination
Activity 5.1.3: Disseminate project experience via media channels (internet homepage, newspapers, social media, TV etc.)

Component 6: Project Monitoring and Evaluation

76. This component will assess the impact of the project activities including lessons learned. Central to this will be the develoment a suite of indicators that will capture human resource and technical parameters. A critical success factor of apllied eco effective management is mindset change and innovative problem solving. The technical parameters indicatively encompass quantitative and qualitative material and envoronmenta resource utilization. The project monitoring and evaluation framework will be established in accordance with UNIDO and GEF requirements including the tracking tool indicators.

Output / Activity
Output 6.1: Project impact indicators designed, applied and project implementation evaluated
Activity 6.1.1: Design and implement the Monitoring and Evaluation framework in accordance with UNIDO and GEF requirements (annual project reports, tracking tool, project implementation reviews, completion report and disseminate report etc.)
Activity 6.1.2: Conduct Mid-Review and terminal evaluation

A 5.2 Global Environmental Benefits

77. This project is designed to provoke mindset change towards chemical management in product and production life cycles in a way that stimulates innovative and fresh thinking through eco-effectiveness application. The ultimate outcome and Global Environmental Benefit of this project will be the take up and replication of eco-effectiveness as a strategy for chemical management in China and elsewhere in the world.

78. This project demonstrates the decrease and elimination of POPs and SAICM concerned chemicals using an eco effective management approach in the ramie textile value chain [Yiyang] and in the automotive interior value chain [Tianjin].

79. The ramie value chain currently relies on chemical fertilizer and pesticides, while large volumes of caustic alkali, strong acid, liquid chlorine , other chemical additives and a wide spectrum of chemical wastes are generated in the degumming process. The bleaching process generates chlorine and absorbable organic halides [AOx] residual wastes. The annual reductions of liquid chlorine and AOx are expected to be 75 tons and 5.7 tons respectively concerning current chlorine bleaching generates 150,000 m^3 wastewater per ton processed with residual chlorine and a high level of AOx.

80. The automotive interior value chain currently relies on PBDE and toxic chemical inputs to improve the flame retardant quality of the product while hydrochlorofluorocarbon [HCFC] vesicant process are used in the manufacture of some plastics and Polyurethane in particular. This project can avoid using liquid chlorine in current ramie degumming process, and avoid using HCFCs as blowing agent and PBDE as flame retardant in current production of PP wood/power board. Annual reductions are 70kg of PBDE, 672 kg of floride and 400kg of VOCs. A co-benefit of the project will be the reduction of HCFCs.

81. This project is about the elimination of POPs and other toxic chemicals from products and production life cycles in Tianjin and Yiyang. The project therefore addresses the socio economic impact of exposure to POPs and hazardous chemical pollution.

82. China's rapid economic development has been accompanied by chronic environmental degradation and worsening pollution which translates directly to a social and economic cost. The health costs of pollution in China amount to about 4.3 of its GDP [World Bank 2010]. By adding the non-health impacts of pollution, which are estimated to be about 1.5 percent of GDP, the total cost of pollution in China is about 5.8 percent of GDP. The burden of pollution is not distributed evenly across the country and China's poor are disproportionately affected by the environmental health burden.

83. The project supports the GEF sustainable cities platform featuring a global coordination and knowledge concept, which will provide a range of support services to cities participating in this program. This GEF platform will focus on Tianjin and other cities of major global concern in China.

84. Chronic exposure to chemical pollution is likely to produce significant long-term health effects, including respiratory illness, heart disease, and premature mortality. High among the culprits is exposure and consumption of POPS and SAICM listed chemicals and to the health effects we can add cancer, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system. The SAICM listed chemicals of lead, cadmium and arsenic are ingested or inhaled into the human body and bio-accumulate in bone, kidney, liver and keratinous tissue.

85. The situation in China is a mirror image of what is happening or potentially happening in other parts of the world. The application of the eco-effective approach developed and demonstrated by this project and globally replicated will have Global Environmental Benefit. In both the demonstration areas [Yiyang and Tianjin] there are challenges and situations that have universal relevance.

86. This project is concerned with eco-effective principles and building blocks in the area of industry and specifically the application of the first step in a eco-effective strategy which aims to remove chemicals known to be harmful from a product or production life cycle. An eco-effective approach takes the position that the quantity of the emissions is not the problem, it is the quality of the outputs that must be addressed by making the emissions healthy. The eco-effective approach is therefore concerned with the avoidance of harmful chemical releases rather than volume reduction of current chemical releases.

87. The development and application of a eco-effective methodology to reduce POPs and toxic chemical risks to human health and the environment through reducing and eliminating production, use and releases of POPs and SAICM concerned chemicals will be a significant global environmental benefit generated by this project. Sound chemical management supported by the eco-effective principles can yield socio environmental benefits in terms of better health and longevity and stimulate innovation and economic sustainability. The indirect effect of the eco-effective approach is the foundation of a knowledge-based economy that potentially opens up socio economic opportunities for women.

88. In order to communicate the potential scale of the Global Environmental Benefit on offer it is important to conceptualize the eco-effective approach as a framework for eco-effective solutions in industry, building design, spatial development and governance. The big picture is a vision of a closed loop system where no harmful waste is generated. In this respect, the eco-effective approach is similar to a continuous improvement, ever striving, management system that ultimately seeks to create a closed loop economy.This project is designed to provoke mindset change towards chemical management in product and production life cycles in a way that stimulates innovative and fresh thinking through eco-effectiveness application. The ultimate outcome, and Global Environmental Benefit of this project will be the take up and replication of the eco-effective approach as a strategy for chemical management in China and elsewhere in the world.

A.5.3 Sustainability and replicability

Eco Effectiveness and Sustainability

89. By positively addressing [1] resource sustainability, [2] social responsibility and [3] employment creation the Eco Effective management approach is totally consistent with the UNIDO Inclusive and Sustainable Industrial [ISID] development partnership model. The Eco Effective approach advocates sustainability in the use, reuse and continuous flows of materials within and throughout the industrial life cycle. The approach is parallel in the use and reuse of energy and water emphasizing recovery and renewable energy sources. The application of eco effectiveness drives a no waste philosophy, which looks to the continuous reuse of materials and the nurturing of the supporting eco system. The Eco-effective approach promotes innovation at operational and managerial levels. At the operational level the approach demands a critical analysis of unsustainable technologies and practices with emphasis on continuous materials flows and ecologically neutral outputs.

Eco Effectiveness and Society

90. Eco Effective management is underpinned by social responsibility taking account of the social and environmental concerns of consumers and stakeholders. Social responsibility and inclusiveness is further underpinned by the Eco Effective stimulus to create new and innovative employment opportunities. The holistic economic framework that eco effectiveness generates, stimulates additional peripheral and supporting economic activity in a given industrial value chain which potentially spans the spectrum from community based employment to high level technological skill sets.

International Replicability

91. The International Standards Organisation [ISO] has concluded that applied Eco Effective principles have the potential to make industrial processes and consumption patterns more sustainable and 'greener' and have commenced a process of international standards and certification systems development for both Eco Effective products and management systems. The international take up of Eco Effective Management Systems standards will create an international context to support replication.

92. Additionally the EU Commission has initiated [2014] the design of an enabling framework for a circular economy approach that 'designs out' waste and typically involves innovation throughout the value chain rather than relying solely on solutions at the end of life of a product. For example, they may include:

- reducing the quantity of materials required to deliver a particular service (lightweighting);
- lengthening products' useful life (durability);
- reducing the use of energy and materials in production and use phases (efficiency);
- reducing the use of materials that are hazardous or difficult to recycle in products and production processes (substitution);
- creating markets for secondary raw materials (recyclates) materials (based on standards, public procurement, etc.);
- designing products that are easier to maintain, repair, upgrade, remanufacture or recycle (ecodesign);
- developing the necessary services for consumers in this regard (maintenance/repair services, etc.);
- incentivising and supporting waste reduction and high-quality separation by consumers;
- incentivising separation, collection systems that minimise the costs of recycling and reuse;
- facilitating the clustering of activities to prevent by-products from becoming wastes (industrial symbiosis); and
- encouraging wider and better consumer choice through renting, lending or sharing services as an alternative to owning products, while safeguarding consumer interests (in terms of costs, protection, information, contract terms, insurance aspects etc).

National Replicability

93. At the institutional level the project will establish a National Eco Effectiveness Knowledge Centre supported by an international network that will provide consultancy and expertise in value chain eco-effectiveness to enterprises and the public sector after the lifetime of the project. At National Eco Effectiveness Knowledge Centre will be structured around an established national academic/ research institute, which will be rolled out during the implementation of the project.

94. Additionally the sustainability and replicability this project will be driven by China's capacity to engage with world markets, where eco-effectiveness policies are increasingly reflected in an international frameworks. Sustainability will be promoted by the project dissemination strategy that will introduce the eco-effective approach to chemical management to a wider audience beyond the confines of the demonstration municipalities.

Local Replicability

95. Local authorities reflect national policy where 5 year local development plans incorporate green strategies and sustainability programmes. The project promotes the incorporation of eco effective principles into local authority development plans to guide sustainable and replicable industrial development. The project dissemination strategy will also communicate the experience of this incorporation to other local authorities with a view to replication.

96. Local replication will also be driven by enterprises that will recognize the commercial benefits of a production system that starts with the design of processes, products and services:

- Where products can be redesigned to be used longer, repaired, upgraded, remanufactured or eventually recycled, instead of being thrown away.
- Where Production processes can be based more on the reusability of products and raw materials, and the restorative capacity of natural resources, while innovative business models can create a new relationship between companies and consumers

A.5.4 Incremental Cost Reasoning

97. This project will introduce an eco-effectiveness strategy to China in a pilot and demonstrable way to provide a new vision and a practical methodology for total product and production process life cycle management and in so doing help to redirect and reorient current investment towards the elimination of toxic chemicals in product and production cycles.

98. The project context is the industrial economy in the two demonstration cities where exemplary total production cycles, from raw materials to process inputs to finished goods, will be isolated and critically subjected to fundamental rethinking and redesign and where soft solutions and hard technology innovations will emerge.

99. The demonstration value-chains cover a spectrum from ramin-cultivation, fiber degumming, textile manufacturing and automotive interior manufacturing.

100. The ramin-cultivation, fiber degumming, textile manufacturing value-chains will be demonstrated in Yiyang [Hunan Province], while the automotive interior manufacturing value-chains will be the focus in Tianjin [Tianjin]. The geographic and socio-economic context for the value-chains will be the Municipalities of Yiyang and Tianjin, selected as representative examples of many similar municipalities throughout China and covering a spectrum of challenges that will echo in many developing economies.

101. The project components for which funding from the GEF is requested, will demonstrate a way to go from managing waste and associated hazards toward designing effective, ecologically intelligent materials, products and systems that prioritized POPs elimination and SAICM concerned chemical management.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

102. The particular risks that maybe encountered in the implementation of the project as well as the measures that maybe carried out to mitigate, are given in the following table:

Outcome	**Risk**	**Rating**	**Mitigation measures**
Introduction of international experience in eco-effectiveness in the demonstration municipalities of Yiyang and Tianjin, identification and risk assessment of the major industrial emission sources of POPs and implementation of eco-design, green production and environmental management system in the related industrial sectors	Inability to transform accessible information into technical knowledge appropriate for addressing the identified problems on non-point sources in the project demonstration areas	Moderate	Human resources to guide transformation of information into area specific and applicable technical knowledge
	Scale and complexity of emission sources versus project resources	Low	Strict prioritization of actions focused on POPs and other concerned chemicals. Leveraged funding from public and private sectors will be utilized.
	Accessibility on appropriate and alternative POPs mitigation technologies	Low	Assistance through UNIDO and other UN agencies clean technology centers, technology transfer and investment promotion centers
Area-based circular economy development and toxic-chemical free management by replication and promotion of	Fear and resistance to untried strategic eco-efficiency policy for the project area	Moderate	Build on stated the local governments commitment to create a green economy that exceeds current laws and regulations

the eco-effectiveness approach	Misunderstanding and fear generated among local population	Low	Appropriate and clear communication strategy and public education implemented
	Inadequate and immature appreciation of the foundations necessary and complexity of a "green" economic structure and for POPs free environment	Low	Conversion of project inspired incentives to tangible economic benefits in the short-term to ensure sustainability.
Climate change risks	Rising sea/water levels and emerging water scarcity may potentially interfere with value chains of demonstration areas	Low/Moderate	The development of climate resilliance strategies in demonstration areas can benefit from the introduction of eco-effectivness principles (see Annex E) and the application of BAT/BEP in target values chains and their replication

A.7. Coordination with other relevant GEF financed initiatives

103. The project will utilize the capacity already built up through the UNIDO NIP and SIRE projects in PR China to encourage the two demonstration municipalities to develop their own implementation plan in line with international environmental agreements on toxic chemicals of global concern. The trained personnel of the SIRE project will play an important role in learning international practices for eco-effectiveness promotion, providing the related technical consultation and promoting the related public awareness.

104. Currently there are a number of ongoing projects, either being implemented or being further developed in China, including China's Compliance with the Stockholm Convention (NIP Update) (UNIDO); Environmentally Sound Management and Disposal of Obsolete POPs Pesticides and Other POPs Wastes (UNIDO); Environmentally Sustainable Management of Medical Waste in China (UNIDO); Reduction of Mercury Emissions and Promotion of Sound Chemical Management in Zinc Smelting Operations (UNIDO), Reduction of POPs and PTS Release by Environmentally Sound Management throughout the Life Cycle of Electrical and Electronic Equipment and Associated Wastes in China (UNDP), Dioxins Reductions from the Pulp and Paper Industry in China (WB), Municipal Solid Waste Management POPs (WB). The project will cooperate with these projects and complement their work by integrating their individual, isolated, and piecemeal efforts, at a local spatial level within the two demonstration areas.

105. The project will promote a fundamental mindset change towards toxic chemical management, demanding a more comprehensive and systematic approach; demanding fresh thinking and innovation to boost and reorient the many related national initiatives.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

B.1.1 Project Management Structure

106. The following will be the project management structure of the proposed project and the organ gram is given as follows.

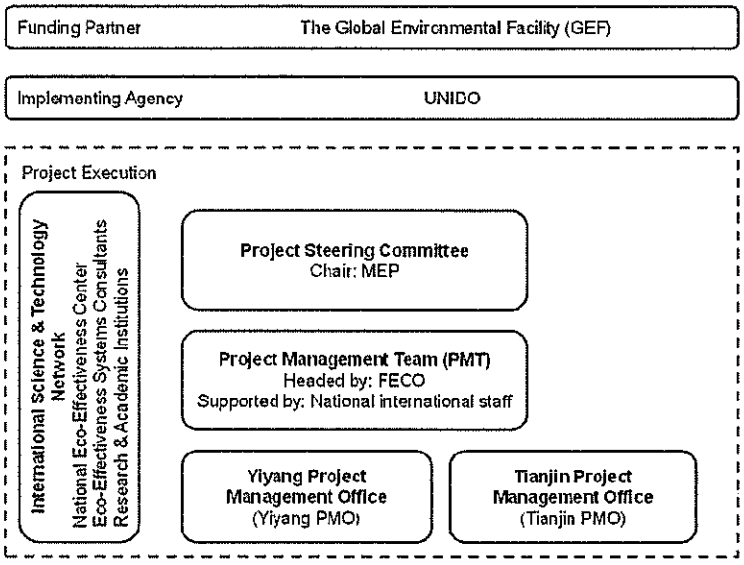


Figure 3: Project Management Structure

107. The GEF acts as financial mechanism for the Stockholm Convention on Persistent Organic Pollutants and is the partnership for international cooperation for this project.

108. UNIDO will be the GEF Implementing Agency (IA) for the project. A project manager will be appointed UNIDO to execute the project. The project management function will will be supported by professional expertise on an ad hoc basis.

109. The Foreign Economic Cooperation Office (FECO), part of the Ministry of Environmental Protection of China, is the project executing agency, who is responsible for coordinating the day-to-day management of the Stockholm Convention implementation in China. The FECO's responsibilities will include (i) assignment and supervision of project activities; (ii) recruitment of national consultants; (iii) providing guidance to local PMOs; (iv) coordination with stakeholders, donors, the IA, relevant national agencies and the private sector; (v) preparation of terms of reference (TORs) for project activities, (vi) review of project progress reports submitted by the local PMOs, (vii) supervising project procurement and financial resources in accordance with UNIDO procedures, (viii) organizing and convening project coordination stakeholder meetings, and (ix) review of project outputs. In order to provide this services during the implementation stage and to perform the agreed project milestones UNIDO and FECO will sign a subcontract as per outputs presented in Annex J or this document.

110. The project will establish a National Steering Committee [NSC]. The NSC will be chaired by MEP and membership drawn from the Stockholm Convention national coordination and implementation group including Ministry of Foreign Affairs (MFA), Ministry of Finance (MOF), General Administration of Customs of China(GACC), National Development and Reform Commission (NDRC), Ministry of Housing and Urban-Rural Development (MOHURD), General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), Ministry of Science and Technology (MOST), Ministry of Industry and Information Technology (MIIT), Ministry of Agriculture (MOA), Ministry of Commerce (MOCOM), National Health and Family Planning Commission (NHFPC), State Administration of Work Safety(SAWS) and National Energy Administration(NEA).

In addition, the NSC will draw, on an ad-hoc, upon resources from related ministries or commissions in charge of development and reform, environment, health, construction, and industrial development to provide the project team with political guidance and inter-ministerial coordination support. The NSC's responsibilities include: (i) provision of technical support for international negotiations and policy studies on

the Stockholm Convention, (ii) provision of support for development and implementation of POPs-related policy and regulations, as well as coordination of key governmental stakeholders, (iii) mobilization of co-financing from bilateral, international, and national sources. The NSC will provide guidance to ensure the successful implementation of the project, including regular monitoring and enforcement inspections. The NSC will ensure that any proposed changes or amendments to the project and /or to the annual workplan[AWP] and budgets are done in accordance with the approved project document, the GEF policy C.39/Inf.09 and UNIDO rules and regulations.

111. Yiyang PMU and Tianjin PMU, the two local project demonstration areas for the project is the local authority.

B.1.2 Stakeholder involvement and knowledge system

112. The following figure sets out the Stakeholder involvement and Operational Structure of the project, illustrating the creation of a National Eco-Effective Knowledge Center at the core and supported by knowledge flows from international scientific and technological resources and institutions, systems management expertise through local research and academic institutions to operational stakeholders along various points of the demonstration value chains.

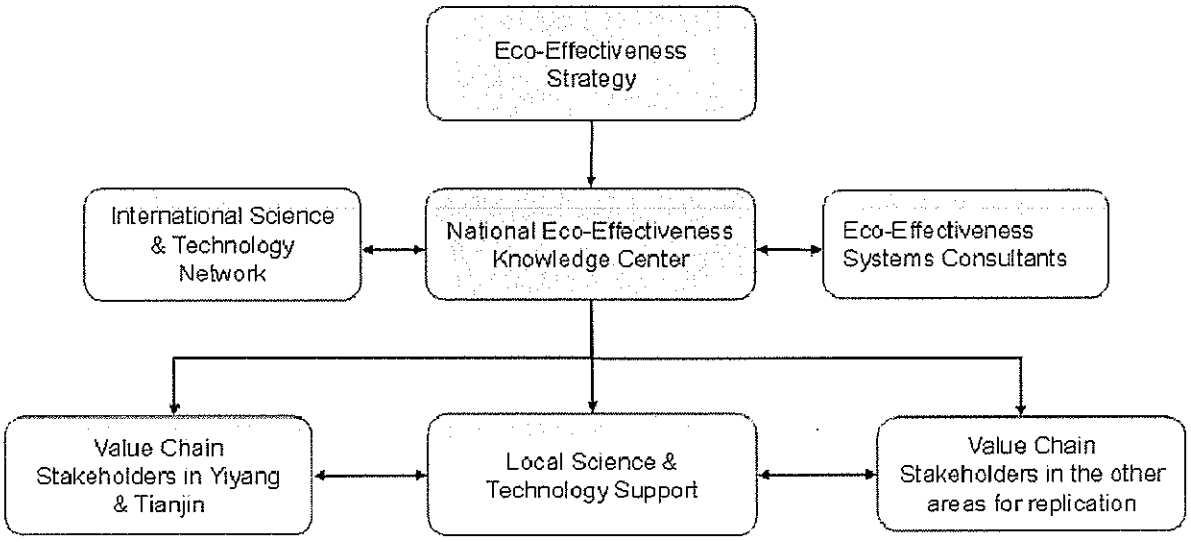


Figure 4: Stakeholder involvement and knowledge system

113. National Eco-Effectives Knowledge Center: A knowledge center will be established with the support of the Ministry of Environmental Protection and located within an existing academic/research institution specializing in ecological and environmental science and technology.

114. The International Science and Technology Network: The international network is the resource to develop scientific and technical solutions to problems and challenges identified by Eco-Effectiveness value chain auditing process. The network can provide specific technical knowhow relevant to the industrial sectors and demonstration value chains. Consultation was conducted during the PPG phase and indicative partners to this network include the Tsinghua University, Beijing, Chinese Academy of Sciences, POLIMI, Milano, Italy, Leeds University, United Kingdom, Lapeeranta University of Technology, Finland, Trinity College, Dublin, Ireland, SWERA Research Institute, Sweden and other national and international institutions. The international science and technology network will support the National Eco Effective Knowledge and provide consultancy support from international experts is specialist fields. Partnership to the International Science and Technology Network will be open to Industrial Associations and NGOs working in the area of value chain management.

115. Eco-Effective Systems Consultants: International support will be required to support capacity building in the National Eco-Effective Knowledge Center to conduct eco-effective auditing procedures and practices. This support will be provided by consulting practitioners in auditing and management system development and specifically in the field of industrial eco-effectiveness. During the PPG phase a number of such consultation practices were identified and approached. It is envisaged that an appropriate consultancy will be contracted to the project in due course.

116. Local Eco-Effective Knowledge focal points will be established in the demonstration areas. Local research institutes or universities will be focal points for the demonstration area of Yiyang and Tianjin. It will collaborate with international network, the national eco-effectiveness think-tank, local EPB and local enterprises to resource and practically apply the eco-effectiveness concept to chemical management and parameter monitoring in demonstration areas. Local Academies of Environmental Science are critical to mindset change and capacity building at local municipal and academic institutional level. In the case of Yiyang value chains Hunan Academy of Environmental Sciences and Hunan university will be local supporting institution. In Tianjin, Tianjin Academy of Environmental Sciences will be the supporter and knowledge environment focal point for the demonstration area.

117. Value Chain Stakeholders in Yiyang, Tianjin and other areas of replication: The Value Chain Stakeholders are the owners of the private and public sector industry at various point of the value chain in Yiyang the stakeholders include the primary cultivators of ramie, degumming industries, textile manufacturers and related service providers. In the case of Tianjin, the stakeholders include the automotive interior sectors and related materials suppliers. In other areas for replication, the stakeholders will be identified during the project implementation.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

B.2.1 Socioeconomic benefits

118. The international experience from moving from a linear production system ['take, make, waste'] to a circular systems [eco effective production systems] suggests that the general socio economic benefits can be shown with reference to:

- Enterprises
- Economies & health risks
- Natural Capital
- Consumers

Enterprises

119. Enterprises benefit by reducing material costs, generating innovating thinking, addressing many industry level strategic challenges and building resilience as a result. Eco effective principles open opportunities for enterprises to add new downstream businesses. These will profit from the dual benefits of extracting additional value from the cascaded material as input while avoiding waste costs. Both benefits are likely to increase as waste disposal costs increase. Technologies and capabilities will open up new pathways and reduce the costs of those that already exist. Eco effective thinking demands new approaches to collection and reverse logistics as part of an overall system that aims to increase material productivity by reworking end of life products. While this project deals only with the POPs and SAICM chemical inputs and outputs of production systems these general principles and benefits arising are relevant.

120. The burden of pollution is not distributed evenly across the country and China's poor are disproportionately affected by the environmental health burden. Short-term exposure of humans to high levels of POPs may result in

skin lesions, such as chloracne and patchy darkening of the skin, and altered liver function. Long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions.[WHO Fact Sheet No 225; 2014] The SAICM listed chemicals of lead, mercury, cadmium and arsenic are ingested or inhaled into the human body and bio-accumulate in bone, kidney, liver and keratinous tissue.

Economies and health risks

121. Economies benefit by increasing net exports in a globalized market [where traceability and certification is increasingly the basic entry point], by enhancing supply security and the creation of local job opportunities in new businesses. Job creation increases tax income while innovation from the eco effective economy will have further intangible social and economic benefits. It is speculated that an eco effective economy could cut net material costs and reduce price volatility and supply risks. A potential indirect economic effect of the eco effective management approach is the foundation of a knowledge-based economy [rethinking and innovation] that potentially opens up new socio economic opportunities. Eco effective thinking drives innovation to create products, process, services and technologies that meet market needs, sustain resources and nourishes the receiving ecosystem. Local job creation alongside greater innovation coupled with greatly reduced materials intensity and lower energy demands of an eco effective economy offer a viable contribution to climate change mitigation and fossil fuel independence. While these are general benefits and speculation the principle nevertheless apply to the POPs and SAICM chemical scope of this project. A specific 'intangible social benefit' of the project is the contribution to the reduction of human exposure to these toxins.

122. The health costs of pollution in China amount to more than 4.3% of its GDP. By adding the non-health impacts of pollution, which are estimated to be about 1.5 percent of GDP, the total cost of pollution in China is about 5.8 percent of GDP. [Source World Bank 2010]. The burden of pollution is not distributed evenly across the country and China's poor are disproportionately affected by the environmental health burden. Short-term exposure of humans to high levels of POPs may result in skin lesions, such as chloracne and patchy darkening of the skin, and altered liver function. Long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions.[WHO Fact Sheet No 225; 2014] The SAICM listed chemicals of lead, mercury, cadmium and arsenic are ingested or inhaled into the human body and bio-accumulate in bone, kidney, liver and keratinous tissue

Natural Capital

123. Natural capital gains by being nourished by the production system rather than being polluted and diminished. Environmental sustainability of the critical economic production factors of land, water and air is addressed. In our linear production systems we deploy chemicals in response to soil erosion and and depletion caused by intensive agricultural practices. The application of eco effective principles to land sustainability assures the maintenance of high levels of nutrients and soil carbon by ensuring that uncontaminated organic wastes are returned to the soil and together with the deployment of broad set of agricultural practice that reduce the speed of erosion.

124. In Yiyang and Tianjin POPs and SAICM concerned chemical contamination of soil is a serious concern with respect to human health resulting from contaminated water and food. At an economic level contamination has led to the loss of safe arable soil and the destruction of vegetation. In March 2014 the Chinese Ministry of Environmental Protection published the results of a nation wide soil pollution survey which has pointed to significant inorganic chemical contamination of 20% of samples analysed.This project is concerned, [in the Yiyang demonstration] with the application of eco effective management to land productivity in the context of ramie cultivation and provides a showcase to exhibit this benefit.

125. Emissions of POPS's and SAICM chemicals to water and air are also addressed by adapting the current linear production systems to eco effective principles. Water supplies are at risk from chemical contamination in Yiyang while citizens and industry in Tianjin will directly benefit from the recently delivered strategic South–North Water Diversion Project that will offset historic chronic water shortages as ground water levels fell by 1- 1.5 metres annually with aquifers at risk by infiltration from the polluted river system as well as recharge from contaminated

industrial runoff. The air in Yiyang is frequently pungent from the emissions from pesticide manufacturing while the air quality in Tianjin is exceptionally poor due to a range of uncontrolled emissions from industries [including automotive and petrochemical industries], households and vehicles burning low-quality fuels.

Consumers

126. The utility or benefit felt be consumers may be enhanced by the additional choice or quality that the eco effective production model provides. Consumer choice increases as producers deliver systems that allow that tailoring of products or services to better met consumer needs. Consumers are likely to reap better price benefit from eco effective production systems that address the integration of the total value chain including logistics and delivery systems. To realize these benefits consumers will need to embrace new models of consumption. However the change of behavior in favour of eco effective production will be motivated by higher utility, benefit and lower prices.

B.2.2 Gender inclusion

127. During the PPG phase it was observed that both men and women worked at the operative, technical and managerial levels at all stages of the value chains. In the case of the ramie [linen] value chain in Yiyang both men and women were engaged at the cultivation, harvesting, degumming, spinning, weaving, printing and finishing stages. However there was a higher proportion of female representation in spinning and weaving. It was also evident that health and safety systems were poorly developed and consequently no associated risks assessed.

Gender is a critical component in the area of sound management of chemicals because men and women have ifferent health reactions when they are exposed to toxic chemicals. The health implications arising from even low levels of POPs and hazardous chemicals for society in general is serious. As a group, POPs are of concern to human health, most notably, because of their potential effects on the endocrine system, but also because of how they affect the immune system, liver, cognitive ability and the reproductive system. Exposure to certain chemicals during early life, respectively, is known to contribute to breast cancer risk for women. In addition environmental chemicals can induce both obesity and altered puberty timing. Women who have been exposed to agriculture chemicals have found to have excesses of non-hodgkin's lymphoma, leukemia, multiple myeloma, soft tissue sarcoma, and cancers of the breast, ovary, lung bladder, cervix and Sino nasal cavities. Dioxins are a known human carcinogen, and can cause birth defects, learning disabilities, endometriosis, infertility, suppressed immune function, reduced IQ and hyperactive behavior in children. Genetic and other biological differences may contribute to differing susceptibility to chemicals between men and women. Susceptibility may be increased or it may be reduced due to gender. Therefore, patterns of cancer among women exposed to certain chemicals may well differ from pattern observed among men.

128. In the case of gender participation in the target demonstration value chains in Tianjin there was also a high female representation at operative, technical and managerial level. However the automotive industry, due to globalization, has comparatively better developed management systems, including health and safety which provides a framework to address the gender related risks of exposure to toxic substances in the industrial setting. The opportunity presented by Component 2' 'Creation of public private partnership institutional model to encourage knowledge transfer and investment promotion relevant to eco-effective management and to ensure related capacity building " provides a basis for the integration of the gender issue relating to toxic chemical exposure to be addressed both at the policy and operational levels. The dissemination strategy, Component 5,' Planning and implementation of a dissemination strategy that will communicate to a wider global audience ' will assure that the gender dimension is transmitted to a wider audience.

129. Apart from the management of the direct risk of chemical exposure, the eco-effective management approach provides positive social and employment opportunities for both men and women. When eco effective principles are adopted, the enterprise [and the supporting local authorities] require a newly integrated set of core competences, including design, R&D and procurement. Not only will the existing teams be required to embrace the journey, but freshly created teams will be required to guide the enterprises along the value chains and mould this new way of working. These new horizons will challenge the integration of gender equality but significantly it provides an opportunity to integrate the gender mainstreaming, defined by the United Nations Economic and Social Council in

1997 as "a strategy for making women's as well as men's concerns and experiences an integral dimensions of policies and programmers in all political, economic and societal spheres' so that women and men benefit equally and inequality is not perpetuated.." This therefore will be the basis for practical gender activities, especially by identifying gaps in gender equality, throughout the project. Further, the CEN System-wide policy on gender equality and the empowerment of women, internationally adopted gender policies such as the UNIDO's policy on gender equality and the empowerment of women or the Revised Gender mainstreaming Steering Committee composition will be used as guidance materials.

B.3. Explain how cost-effectiveness is reflected in the project design:

130. The proposed project is cost-effectivenss as it will work in coordination with existing function public organizations, including: FECO and establishment of PMOs in the offices of EPB offices in Tianjin and Yiyang.

131. Private sector companies in the selected value chains in Tianjin and Yiyang have committed to participation into this project on a co-financial base.

132. The project will add incremental value to the already committed general funding for sustainable industrial development as provided for in the forthcoming Five Year Plan. The Environmental Protection Bureaus [EPB] in Yiyang and Tianjin municipalities have committed to earmarking and diverting Industrial Support funds to co-finance this project.

C. DESCRIBE THE BUDGETED M &E PLAN:

133. Project monitoring and evaluation (M&E) will be conducted in accordance with established UNIDO and GEF procedures. The M&E activities are defined under project component 6 and the M&E budget is in the table below. Monitoring will be based on indicators defined within the project results framework and complemented by the annual work plans. The GEF tracking tool will also be used as monitoring and evaluation tool, and will be submitted three times during the duration of the project (CEO approval, mid-term and at project closure).

134. UNIDO as Implementing Agency will involve the GEF Operational Focal Point, national executing counterparts and project stakeholders at all stages of project monitoring and evaluation to ensure that evaluation results lead to improved project design and implementation.

135. According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies like Country portfolio evaluations and thematic evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, provide reports or other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.

M&E Activity Categories	Reporting	Responsible Parties	GEF Grant Budget ($US)	Co-financing Budget ($US)	Time frame
Measurement GEF Tracking Tool specific indicators	Mid-term Review and Terminal Evaluation Reports	FECO	30,000	100,000	At project mid-term and completion
Monitoring of project impact	Annual GEF	FECO	90,000	190,000	Annually

indicators (as per Log Frame)	PIR				
Prepare Annual Project Reports and Project Implementation Reviews	Annual project report (APR) and GEF PIR	FECO and UNIDO	100,000	230,000	Annually
Midterm review	Mid-term Review report	Independent evaluator, PM, UNIDO	40,000	40,000	At project mid-term
Independent terminal evaluation	Terminal evaluation report	Independent evaluator, PM, UNIDO EVA	40,000	40,000	Project completion
Total indicative cost			300,000	600,000	

136. Day to day monitoring of project implementation progress will be the responsibility of the National Project Manager based on the project's Annual Work Plan and its indicators. The Project Team will inform UNIDO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion.

137. The Project Manager, the expert team will fine-tune the progress and performance/impact indicators for the project in consultation with the full project team at the Inception Workshop. Specific targets for the first year implementation progress indicators together with their means of verification will be developed in this workshop. These will be used to assess whether implementation is proceeding at the intended pace and in the right direction and will form part of the Annual Work Plan.

138. UNIDO through meetings with project counterparts or as frequent as deemed necessary, but not less than semi-annually, will undertake periodic monitoring of the project implementation progress. This will allow parties to troubleshoot any problems pertaining to the project in a timely fashion to ensure the smooth implementation of project activities.

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

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

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

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

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

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

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

146. Prior obligations and prerequisites: GEF grant assistance will be provided subject to UNIDO being satisfied that obligations and pre-requisites listed below have been fulfilled or are likely to be fulfilled. When fulfillment of one or more of these prerequisites fails to materialize, UNIDO may, at its discretion, either suspend or terminate its assistance.

147. During project implementation, progress reports and PIR reports should be prepared as per monitoring plan of the project.

148. Prior to commencement, respective commitment letters regarding financing by co-financiers other than the GEF and UNIDO specified in the project document will be made available to the project;

Project Reporting

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

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

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

152. The Project Implementation Review (PIR) is an annual monitoring process mandated by the GEF. It is an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. Once the project will be under implementation for a year, the project team shall complete the

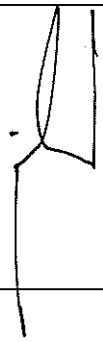
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):): (Please attach the Operational Focal Point endorsement letter(s) with this form. For SGP, use this OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Jiande Ye	GEF Operational Focal Point of China, Internal Department	MINISTRY OF FINANCE	01/03/2012

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Mr. Philippe R. Scholtès Managing Director Programme Development and Technical Cooperation Division		06/24/2015	Mr. Zhengyou Peng	+43 1 26026 3831	z.peng@unido.org

PIR. The PIR can be prepared any time during the year (July-June) and ideally immediately prior to the TPR. The PIR should then be discussed at the TPR so that the result would be a PIR that has been agreed upon by project staff, the national executing agency and UNIDO.

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

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

Independent Evaluations

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

156. (a)Mid-term Review. A Mid-Term Review will be undertaken at the end of the second year of project implementation. The Mid-Term Review will measure progress made towards the achievement of outcomes and will identify corrections if needed. The Review will focus on the effectiveness, efficiency, and timeliness of project implementation; highlight issues requiring decisions and actions; and present initial lessons learned on project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the second half of the project's term. The organization, terms of reference (TOR's) and timing of the mid-term review will be decided after consultation between the parties to the project document.

157. (b)Final Evaluation. An independent Final Evaluation will take place after the operational completion of the project implementation, and will focus on the same issues as the mid-term evaluation. The final evaluation will also review impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities. The Terms of Reference for this evaluation will be prepared by the UNIDO in accordance with the generic TORs developed by the GEF Evaluation Office.

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

The Hierarchy of Objectives	Indicator	Baseline	Target	Source of Verification	Assumption
PROJECT OBJECTIVES: The project will generate and demonstrate an area based chemical management replicable methodology based on an eco-effective management approach to systematically eliminate POPs and SAICM concerned chemical wastes from the total life cycles of products and industrial production systems.	Eco-effectiveness based on toxic chemical management policies and regulations	Preliminary chemical management regulatory system	National and local policies and environmental planning for POPs and SAICM concerned chemicals finalized At least 150 managerial and technical personnel at national and demonstration areas trained on chemical management	Policy and regulatory text finalized List of participants	Continuous commitment of stakeholders, including Ministry of Environmental Protection, Municipality of Tianjin, city of Yiyang and participating industries to fully engage with the process and to follow through with concrete actions to achieve the targets
	Eco-effectiveness demonstration in selected industrial sectors		At least 3 environmental-friendly technologies on ramie biofertilizer planting, biological degumming and chlorine-free bleaching demonstrated in the ramie textile industry value chain. At least 3 environmentally sound practices for automotive interior manufacturing industry on the EPP, PP wood production and waste plastic up-recycling and re-manufacturing.		

	Toxic Chemicals Reduction Achieved	Yiyang: Ramie Fiber Industry Current chemical based degumming processes in Yiyang consume large volumes of caustic alkali, strong acid, liquid chlorine, other chemical additives and generate a wide spectrum of chemical wastes. Current chlorine wastewater contains residual chlorine and a high level of absorbable organic halides [AOx] known for their lipophilic nature and bio-accumulation of toxic substances, namely dioxins.	Annual reduction of liquid chlorine 75 t, caustic soda 3,050 t, sulfuric acid 650 t. Eco-Effective management of chlorine bleaching process to reduce wastewater absorbable organic halides [AOx] by from current 50mg/L to 12mg/L in demonstration enterprises. Target AOx emission reductions of 5.7 tons/annual. .	Technical Reports Case study reports Monitoring and analytical results	

	Toxic Chemicals Reduction Achieved	Tianjin: Automotive Interior Material Manufacture Currently Polybrominated diphenyl ethers [PBDE] and toxic chemicals, including heavy metals, are inputs into the spectrum of plastics [PU, PVC, ABS, PP, PC] used in interior components manufacture to improve the flame retardant properties of the product.	Application of demonstration [480t/year] PP cast board production using stone powder as alternative to PBDE. Reduction of polybrominated diphenyl ethers (PBDE) 70 kg, fluoride 672 kg ,VOCs 400 kg in automotive interior sector. Reduction / elimination of toxic chemical and heavy metal inputs to SVHC-REACH and ELV standard requirements in demonstration enterprises. Application of alternative polyurethane foam production line using water instead of fluoride as a blowing agent to eliminate the use of hazardous chemicals.	Technical Reports Case study reports Monitoring and analytical results	
Project Outcome 1: Incorporation of Eco-Effectiveness principles into national and regional government green initiatives and environmental protection plans and programs; and enhancement of environmental management decision	Number of regulatory instruments and national and local guidelines / development plans incorporating eco-effectiveness principles	Current set of policies based on the "circular economy" model are not leading to the required mindset change promoted by the eco-effectiveness	A set of 3 guidelines developed and setting-up of a new institutional framework (5 year plans in Yiyang and Tianjin) taking in account the eco- effectiveness principles	Copies of proposed revisions of national legislation (5 year plans in Yiyang and Tianjin) and copies of new developed guidelines	Continuous international support and involvement of government counterparts to incorporating the eco-effectiveness principles in development plans and national guidelines

making	Number of eco-effectiveness trainings conducted, number of qualified trainers and number of training programs developed	approach Institutional capacity is low and knowledge about the application of Eco-Effectiveness mainstream approaches is insufficient	At least 10 trainings conducted based on the eco-effectiveness principle and implementation of the principle across national plans and programs Development of a training program and availability of three qualified national trainers 500 national and international participants/trainees (male/female)	Copies of training reports, certificated participation of trainees and copies of the developed training program and list of participants (female/male)	Continuous commitment, support and availability of international and local experts to provide trainings and to further develop and implement training programs
Project Output 1.1: Establish an enabling environment to incorporate eco effective management principles into national and local government chemical management policy	Number of knowledge exchange programs, networking initiatives and capacity building programs conducted to mainstream the eco-effectiveness strategic approach into regional plans and programs and to build specific expertise for target industrial value chains.	Due to the prevalence of end pipe solutions in national and regional agenda only few international exchange and networking initiatives exist, expertise, institutional capacity and knowledge for alternative solutions is low	Establishment of a platform which takes advantage of an international network of universities to transfer knowledge and to facilitate interaction among scientists and intellectuals to practically deploy eco-effective diagnosis, discovery and implementation of eco-effective solutions in industrial value chains.	Copies of meeting minutes (e.g. international, conferences, seminars, field visits, workshops) copies of participants list (male/female) and of training reports	National environmental legislation is enforced; and continuous commitment of international, regional experts and decision makers to provide policy changes, support a new research agenda and to create training capacities
	Creation of a customized eco-effectiveness management guideline	No supporting/ comparable material to implement eco-effectiveness approaches	A methodology developed for national and internal practitioner of eco-effectiveness approaches which provides technical support and enhances	Copies of supporting material (manuals, publication related to gender mainstreaming case stories etc.) representing the eco-	

		available at present	management capacity to apply this integrated approach into praxis	effectiveness toolbox, reference of a web page (# of visitors etc.)	
Project Outcome 2: Establishment of institutional framework incorporating local government and local enterprises supported by an Eco Effective Knowledge Centre	Eco-Effective Knowledge Centre established as institutional element in a pre-existing environmental research institute	Environmental research is generally focused on delivering end-of-pipe waste management solutions; lacking of institutional/knowledge capacities fostering integrated approaches	Establishment of a national knowledge center to promote both end of pipe solutions which encourage waste diversion through recycling and resource recovery and a guiding design philosophy for elimination POPs and chemical waste at source and at all points along the value chain. Activities include technical research, guidelines and directives, managements systems and contingency planning	Copies of documents confirming that the Eco-Effective Knowledge Centre is established as legal and physical entity (with designated and contracted personnel) directed to develop integrated environmental solutions based on the eco-effectiveness approach	Elimination of POPs and hazardous chemical industrial emissions remains a high priority on a national and regional level (in particular for targeted value chains)
	Number of management system trainings conducted on local government level; Establishment of management system database; Number of procedures in place putting eco-effectiveness principles into practice; Number of trainees	Current management systems at local government level lacks of consistency with the eco-effectiveness approach and training capacity	A management system at local government level in place which streamlines the eco-effectiveness approach within the entire local organization structure and establishes a traceable documentation system 200 trainees (male/female) Integration of gender into local government and enterprise	Copies of training reports, certificated participation of trainees and copies of the developed training program and list of participants (female/male) Copies of the final management system handbook including description of the documentation system in place Copies of a table showing the revised procedures Copies of management systems handbooks'	Commitment of local government in Tianjin and Yiyang to integrate eco-effectiveness, in principle and in practice, into local institutions

			management systems		
	Final version of a strategy paper and working plan; Number of initiatives developed for technologies and processes supporting the development of eco-effectiveness solutions	At present no strategy developed on local government level to mainstream, enhance and facilitate the application of eco-effectiveness principles within demonstration areas and the selected value chains	An incentive strategy is in place to promote the research, development and application of eco effective solutions and to select innovative technologies and processes	Copies of the strategy paper (including milestones) and the working plan Copies of a detailed report of initiatives undertaken to promote innovative processes and technologies	
Project Output 2.1: Strengthen the national and local institutional capacity and promote the research for public private partnerships [PPPs] investment to implement eco-effective management as it applies to POPs and SAICM concerned chemicals	Number of study tours conducted; Number of coordination meetings held and action plans defined; Number of trainees and case studies screened	Lack of coordination, communication and of knowledge (international best practices) on local government level	Establishment of a working group and study tours for local government officials to promote the development of local eco-effective action plans and to enhance the knowledge of case studies reflecting international best practices 200 trainees (male/female)	Copies of local developed action plans; meeting protocols; Copies of study tour reports and results of local adaption exercises	Open minded engagement of local government personnel
	PPP-investment scheme finalized; Number of meetings initiated between public and private partners; Number of agreements drafted and finalized, volume of acquired funds; Amount of USD for incremental investment	Limited internal resources and capacities among local stakeholders to design and harness the full scope of merits connected to the implementation of eco-	A public-private-partnership investment scheme developed to enhance the implementation of the eco-effectiveness principals on the operational and administrative level; 6 new investments and 10 million USD of investments to be verified;	Copies of the meeting record Investment decision by company or investor	

		effectiveness approaches in value chain management			
	A Eco-effective management systems in place for target value chains focusing on the reduction POPs and SAICM chemicals, of resource use and on the balancing the carrying capacity of the local ecosystem; Number of trainees	Target industries in demonstration areas lack of an integrated eco-effective management system which limits local ecological carrying capacity and encourages excessive resource use	Demonstration eco-effective management systems in the industrial park and the eco-sensitive area focused on POPs and SAICM chemical elimination from the products and processes. Application of Eco Effective management into practices and technologies into local action plans in Tianjin and Yiyang Eco Effective management training for management and technical personnel; 200 trainees (male/female)	Copies of the Independent Assessment reports	

	ISO initiative to establish international standard for Eco Effective Management Certification monitored: dialogue established with ISO initiative leader	Low experience in developing and applying eco-certification schemes and labels in target industries and among . government officials	Feedback from ISO Eco Effective Management Systems and Product Certification development initiative integrated into Eco Effective Knowledge Centre and local institutions	ISO Eco Effective initiative documentation, communications, discussions and interactions. Copies of international case studies/reports for sample products and processes	ISO are willing to accept participation and knowledge sharing
Project Outcome 3: Selection of at least 3 processes in each demonstration area and the pilot application of eco-effective methodology to design out toxic chemicals from total life cycles of the materials and the production systems employed.	An Eco-Effective diagnosis in selected value chains to estimate material flows during total product life cycle and conduct environmental risk assessments; Quantity of eliminated POPs (tons);	Integrated diagnostic tools to put eco-effectiveness principles into practice and to reduce residual point emissions are not applied	Eco-effective diagnosis undertaken in selected enterprises of target industrial chains coupled with best international practice undertaken to assess residual point emission sources and elimination/ remediation plans generated. The diagnosis would consist of an Energy and Materials Flow Environmental Risk Assessment targeting on chemicals inputs, usage in products and production processes of totals life cycle assessment; Yiyang: Annual amount avoided of liquid chlorine 75 t, caustic soda 3,050 t, sulfuric acid 650 t; Reduction of wastewater absorbable organic halides [AOx] by from current 50mg/L to 12mg/L in	Eco effective industrial value chain diagnostic reports Eco effective and best international practice diagnosis of point emission sources	Commitment of local enterprises secured Technical capacity at local level sufficient to support practical implementation eco-effective management interventions in the demonstration valve chains Technical support available from the Eco Effective Knowledge Centre and specialist support available through the international network of universities and technical institutions

	Quantity of materials avoided or reused.		demonstration enterprises. Target AOx emission reductions of 5.7 tons/annual. Tianjin: Reduction of polybrominated diphenyl ethers (PBDE) 70 kg, fluoride 672 kg, VOCs 400 kg in automotive interior sector.		
	A guideline document drafted, documented technical solution to apply eco-effectiveness principals in value chains (following initial technical assessment)	For target value chains current innovative capacity is low and no guiding document is available to foster and mainstream technical solutions based on eco-effectiveness principles into total product life cycle and processes	Guidelines in place to streamline the process from value chain eco-effective diagnosis develop identification to determine eco-effectiveness solutions	Documented guidelines addressing eco-effectiveness procedural and technological solutions and POPs and SAICM concerned chemical management within the demonstration value chains.	

	Assessment conducted to investigate and isolate potential market based instruments, that in concert with regulatory enforcement, could promote the production of products based on the eco-effectiveness methodology	Limited understanding of the relationship between self-regulation and regulatory enforcement. Limited capacity to commercially measure resource input and loss.	Completion of assessment of potential market based incentives to promote eco-effective products and production systems focusing on POPs and SAICM chemical inputs and emissions.	Documented assessment including illustrative case studies	
Project Output: 3.1. POPs and SAICM chemicals focused eco effective diagnostic and technological management strategies/methodologies applied to target industrial value chains in the demonstration areas.	Number of trainings/ trainees; establishment of an auditing team at participating enterprises;	Lack of local capacity and knowledge on the enterprise level to conduct regular eco-effectiveness audits and training according to international standards	Eco Effective auditing and technical teams established and trained with support from Knowledge Centre and International Network of Expertise 100 trainees (male/female)	Copies of training reports, certificated participation of trainees and copies of the developed training program and list of participants (female/male)	
	Number of processes implementing a new eco-effectiveness management system; number of procedures in place; target indicators for residual emissions reductions; number of companies adopting BAT/BEP	Industrial processes in demonstration areas lack of an integrated eco-effective management system focusing on assessment of emission sources	Eco effective management systems put in place in 3 processes [YiYang and Tianjin] to facilitate proposed solutions / changes to inputs, products and production procedure. At least 4 companies adopting BAT/BEP	Documented procedures/new innovations implemented by enterprises in the demonstration value chains; a management handbook finalized, documented elimination and remediation of POPs point emission sources conducted in demonstration areas	

	Number of production systems harmonized with eco-effectiveness assessment results; Number of design innovations conducted; number of new job positions created	The design of products and process is not compliant with the eco-effectiveness principles, lack of knowledge to streamline this methodology into R&D processes	Implement design changes to production systems and to products in targeted value chains in consultation with National Eco Effective Knowledge and international experts 200 employment opportunities arising from eco-effective management	Copies of technical reports; Copies of new product portfolios at target enterprises Gender balance in new positions at local authority and enterprise level (male/female]	
Project Outcome 4: Documentation of results of the applied eco effective approach to chemical management including case studies of the process with reference to changed procedures, new and alternative materials, technology innovations and energy. Financial and commercial aspects of applied eco-effective	Recording, reporting and documentation system in place	Lack of trained personnel, inadequate analytical and technical monitoring equipment, underdeveloped monitoring management system across	Build personnel and technological capacity consistent with best practice analysis and reporting systems	Trained personnel (male/female) Technical monitoring and analytical equipment Monitoring and reporting management system Monitoring data	Commitment of local government

management as well as the environmental monitoring and results		target parameters, sampling, analysis, recording and reporting		Reports and case studies	
Project Output: 4.1 Eco-Effective monitoring parameters established and local government institutional capacity strengthened to capture and interpret data built	Monitoring of Circular Economy parameters is generally focused on end of pipe waste measurement; Poor capacity to measure and monitor in-process material inputs and material flows as is required by eco-effective management; Number of trainees	Municipal and Research Institution Laboratories in Yiyang and Tianjin are generally not equipped to provide monitoring support because of deficiencies in Equipment , Technical Competence and Laboratory Management Systems.	Monitoring platform and technical parameters defined. Relevant laboratory equipment procured and installed in selected laboratories in the Yiyang and Tianjin municipal areas. Technical training programme initiated; 100 trainees (male/female)	Project Support Laboratories in demonstration areas working in collaboration with Eco Effective Knowledge Centre providing access to international expertise Sampling equipment and analytical equipment in place and functioning Field sampling training Training course materials	Local institutions are receptive to upgrading and change
Project Outcome 5: Planning and implementation of a dissemination strategy that will communicate to a wider global audience. Eco-effective approach methodology documented and made available to wider audience	Level of international awareness of the project	Cultural propensity to rely on slogans for public communication rather than contextual, technical and socio-economic discussion and	A communication strategy implemented to reach an international audience Exposure to chemicals and its negative effect on health to the public, male/female to be	Communication and published records including electronic and hardcopy media, workshops, conference participations Strategy paper disseminated	Awareness that this project is of global significance and that the communication audience is therefore global

		explanation	documented and be disseminated in the strategy paper.		
Project Output 5.1: Dissemination programme planned, developed and delivered to local and global audience	Number of awareness raising campaigns related to the environmental and human health risk from POPs SAICM chemical exposure Number of targeted awareness raising and dissemination workshops on applied eco effective management of chemicals in the production value chains	Awareness raising campaigns are typically of a general nature to alert risk and may not be solution or alternative orientated. Limited access by general public and industries to the possibilities of eco-effective value chain management including environmental, financial and commercial co-benefits	Communication and Awareness raising plan established encompassing human health risks associated to the exposure of POPs taking in consideration their gender relevance Publicity generated around establishment of Eco-Effective Knowledge Centre Eco Effective website established Project case studies published on website International papers and studies on eco effectiveness published on internet Technical papers relating to solutions implemented by the project published on website Open access on website for technical discussion. Dedicated stakeholder workshops for feedback and refinement of communication material	Copies of the final communication and awareness raising plan Dedicated project eco effective publicity website Eco effective web pages on the case study experience in the demonstration areas Eco effective web pages on international developments at technical and policy levels	The challenge of communicating technical information to a wider audience can be successfully met.

Project Outcome 6: Assessment of the impact of project activities including lessons learned	Assessment and analysis documentation materials addressing both the successes and, even more critically, the failures encountered	The dominant mindset is 'cradle to grave' industrial production and the paradigm of eco-effectiveness is new and challenging	To assure a project assessment process that is intellectually faithful to the principles of eco effectiveness as applied to POPs and SAICM concerned chemical management. As a secondary target the assessment process shall address the wider positive and negative impacts of applied eco effective management of the demonstration value chains.	Assessment reports and related documentation	Objective assessment capacity is in place
Project Output: 6.1 Project impact indicators designed, applied and project implementation evaluated	Indicators for applied eco effective management of products and production processes	Eco-effective management spans a wide spectrum of potential impacts from energy and resource flows, to mindset change, to innovative design, to ecological and environmental relationships to the indirect economic, social, financial and commercial benefits.	Framework of indicators to measure impact across impact spectrum designed. Indicatively, technical indicators will include applied eco effective management impact on chemical inputs and emission in industrial value chains and on residual POPs point emission sources, material flows, energy efficiency, product life cycle design, process assessment. Socio economic indicators include such topics as mindset impact, social acceptance and economic factors including financial and commercial implications. The indicators will be informed by the wide range of	Annual Project Reports and Project Implementation Reviews Biannual Steering group meeting minutes Inception workshop meeting minutes Inception report Mid-term and terminal external evaluation reports Terminal Report Annual project financial audit reports Field inspection reports Database development documentations and reports generated by properly retrieving data and information from the Database.	

			records and reports generated by the project	Project website development and maintenance documentation	

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Comments from Council, Convention Secretariat and STAP	Responses to Project Reviews
Council Comments: Germany's Comments Germany approves the following PIF in the work program but asks that the following comments are taken into account: Germany requests that the following requirements are taken into account during the design of the final project proposal: Germany welcomes the PIF, especially since it integrates in a sound way the different aspects of the cradle to cradle approach in the management of hazardous substances in the industries of two pilot regions. The proposal is relevant for the region, with its fast industrialization and the high strain on natural resources. As such the project could serve best as a practice example. However: • The descriptions of the institutional and financial details of a later implementation are not sufficiently described and need to be detailed to a greater extent. Japan's Comments Japan acknowledges the importance of the project and would like to have detailed information of it. We sincerely request the Secretariat to provide us the draft final project document for consultation	Institutional and stakeholder arrangements (B.1.1/B1.2) are outlined in the final CEO endorsement document as well as financial details which refer to budget details and co-financing contributions (Annex G, H). Final project document will be provided
GEF Secretariat Review Comments: Detailed plans from the industries on the type of investments they will make to improve the management of chemicals and waste from their industries.	The project addressed two demonstration industrial value chains [Ramin / Chinese Linen Production and the Automotive Component Manufacture] where 10 companies in each value chain are concerned. The project will focus on three enterprises in each value chain. The detailed Eco Effective Management plans will be generated at project implementation stage through systematic investment in operational tools including the Materials Assessment Protocol and the Eco-Effectiveness

	Life Cycle Analysis Framework as elaborated in the project logical framework. The Material Assessment Protocol would typically target the total life cycle of chemical inputs, usage and waste in products and production processes using risk criteria for human health and ecological balance. Initial planning was conducted during the PPG phase to implement eco effective management in the target value chains and to streamline financial contributions in local demonstration areas. [Ref: Table C and Annex X] Procurement, procedural, protocol, process and technology innovations respond to the assessment and analysis process to [at best case] remove the chemical from the value chain, [or worst case] contain and mitigate the impact. The type of investments required may include combinations of human resource, equipment, technology or infrastructure
STAP Comments: There should be a clear intent to document experiences under this project with an eye to a specific knowledge management output to benefit the GEF partnership (at least), and replication in the portfolio. `	The National Eco Effective Knowledge Centre established by this project will become the repository for applied eco effective management experience with a focus on POPs and SAICM hazardous chemicals in industrial value chains. The body of knowledge will be built from direct experience supported by and drawing on international experience through a scientific and technological network. The project will initiate a knowledge exchange and dissemination strategy that will be sustained in the longer term by the center functioning as an international reference point. The Centre will play an essential role for knowledge management, exchange of experiences, case studies and replication of eco-effectiveness management strategies and approaches.
The PPG of the project should have a clearer commitment to baseline setting for waters contamination by the prevailing chemical pollutants in the implementation areas. Component 4 of the PIF does indicate intent to measure results of the C2C chemicals reduction, but there needs to be baseline setting in the PPG in order to do this (unless this data is already in hand through other pre-existing monitoring networks in the project areas). Target setting for specific compounds in environmental media, waste, and products should be set a priory to ensure that	The PPG has established the baseline of POPs and Chemical usage and inputs into the demonstration value chains with targets of elimination and mitigation stated.

GEBs will be achieved. More attention should be given to potential climate change related issues. The indicated risk of Low/nonexistent for climate change might be optimistic. Production and use patterns may shift influenced by climate related changes in supply and demand, and climate change may influence the receiving environment such that assumed GEBs might be compromised or enhanced.	The climate change risks section is revised drawing further attention to the potential of the eco-effectiveness approach to assist in climate resilience measures. Specifically the risks and impacts of rising sea/water levels and emerging water scarcity are acknowledged. Potential impacts may be mitigated throught the application of eco-effectivness principles (see Annex E) and the BAT/BEP in target values chains.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[5]

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF:			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent To date***	***Amount Committed***
UNIDO	150,000	149,849	151
Total	150,000	149,849	151

[5] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

ANNEX E: THE ECO-EFFECTIVENESS APPROACH TO INDUSTRIAL MANUFACTURING AND CONSUMPTION CYCLES

158. The purpose of this ANNEX is to provide a background explanation to the concept and application of eco-effective design and management in the context of this project.

159. The eco-effective approach to industrial value chain management demonstrated in Yiyang and Tianjin is a showcase for innovative resource management as a two sided gain by showing and promulgating results that can be quantified in positive financial terms and commercial advantage, as well as environmental and health benefits.

160. At the heart of the eco-effective approach is mindset change that stimulates innovation and rethinking that can have advantages well beyond the immediate chemical management objective.

161. Eco-effectiveness is a concept that is being incorporated into national development strategies in Western economies, one sich example being New Zealand from where this definition is drawn:

Eco Effectiveness aims to eliminate rather than "manage" waste.

- is a whole system approach that aims for a massive change in the way materials flow through society - resulting in NO WASTE.
- is both an end of pipe solution which encourage waste diversion through recycling and resource recovery, and a guiding design philosophy for eliminating waste at source and at all points down the supply chain.
- is a unifying concept or "brand" for a basket of existing and emerging technologies aimed at the elimination of waste.
- resets the compass with new tools and new ways of thinking so that normal, everyday activities contribute to the answer rather than the problem.
- is a way to transform the current cost-plus waste industry - whose existence is increasingly dependent on doing more and more for less and less, into a value-added resource recovery industry.
- redesigns the current, one-way industrial system into a circular system modelled on Nature's successful strategies.
- helps communities achieve a local economy that operates efficiently, sustains good jobs, and provides a measure of self-sufficiency.
- maximises recycling, minimises waste, reduces consumption and ensures that products armade to be reused, repaired or recycled back into nature or the marketplace.
- is a powerful new concept that enables us to challenge old ways of thinking and inspires new attitudes and behaviour - the hallmarks of a breakthrough strategy.

162. The fundamental challenge addressed by this project is to better spend the current private and public investment in chemical waste management by incorporating and demonstrating the eco-effectiveness approach in order to gain acceptance and traction as a complementary strategy [and ultimately alternative strategy] to the current 'take, make, waste' approach.

163. The application of the eco-effective approach to POPs and SAICM concerned chemical management is guided by the general principles and facilitated by operational tools including the Materials Assessment Protocol and the Eco-Effectiveness Life Cycle Analysis Framework.

164. The Material Assessment Protocol would typically target the total life cycle of chemicals inputs and usage in products and production processes using risk criteria for human health and ecological health. For illustrative purposes an assessment protocol could include some of the following parameters:

Human Health Criteria	Ecological Health Criteria
Carcinogenicity	Algae Toxicity
Teratogenicity	Bioaccumulation
Reproductive Toxicity	Climatic Relevance
Mutagenicity	Content of Halogenated Organic Compounds
Endocrine Disruption	Daphnia Toxicity
Acute Toxicity	Fish Toxicity
Chronic Toxicity	Heavy Metal Content
Irritation of Skin/Mucous Membranes	Persistence/Biodegradation
Sensitization	Other (water danger list, toxicity to soil organisms, etc.)

165. The Eco Effective Life Cycle Analysis framework incorporates the principles of Green Engineering that will be used as a guidance in this project to develop a practical internationally replicable methodology. The Twelve Principles of Green Engineering can be viewed as a toolbox of approaches to be used systematically to optimize a system or its components. As is the case in any complex multi-parameter system, there will be the need to contextually understand when to balance one principle or collection of principles versus another. Often an understanding of this type is not obvious or transparent and requires asking questions that apply locally and across the life-cycle. Applied thoughtfully, however, these principles can be useful tools for turning vision into reality.

Inherent Rather Than Circumstantial Designers need to strive to ensure that all materials and energy inputs and outputs are as inherently nonhazardous as possible.
Prevention Instead of Treatment It is better to prevent waste than to treat or clean up waste after it is formed
Design for Separation Separation and purification operations should be designed to minimize energy consumption and materials use. Maximize Efficiency Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency.
Output-Pulled Versus Input-Pushed Products, processes, and systems should be "output pulled" rather than "input pushed" through the use of energy and materials.

Conserve Complexity Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition.
Durability Rather Than Immortality Targeted durability, not immortality, should be a design goal.
Meet Need, Minimize Excess Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design flaw.
Minimize Material Diversity Material diversity in multicomponent products should be minimized to promote disassembly and value retention.
Integrate Material and Energy Flows Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows.
Design for Commercial "Afterlife" Products, processes, and systems should be designed for performance in a commercial "afterlife."
Renewable Rather Than Depleting Material and energy inputs should be renewable rather than depleting

166. Technological and Systems Response will emerge through the knowledge base created by the project through institutional capacity building linking the academic and technical resource network to generate innovative thinking and technological solutions.

167. A knowledge centre will be established iby the project initially within an existing acdemic/research institution before being spun off as a stand alone commercially independent consultancy supported in the early development stage by the experience and knowhow of an established international consulting practice specalising in eco-effective design and management.

168. The knowledge centre will be further supported by a [Chinese] national and international network of research institutions and universities that can contrubutev to the technological and systems response demends of specific issues in specialised value chains. This network was established during the PPG stage of this project and includes the School of Environment, Tsinghua University, Beijing, POLIMI, Milano, Italy, Leeds University, United Kingdom, Lapeeranta University of Technology, Finland, Trinity College, Dublin, Ireland, SWERA Research Institute, Sweden

ANNEX F: PROJECT Timeline

TIMELINE FOR COMPONENT 1		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
OUTCOME 1	Incorporation of Eco-Effectiveness principles into local government green initiatives, plans, programmes; and enhancement of environmental management decision making																				
Output 1.1	Establish an enabling environment through awareness raising and strategy integration to incorporate eco effective management principles into national and local government chemical management policy																				
Activity 1.1.1	Incorporate the eco effectiveness approach at national chemical management policy level to include technical research, guidelines and directive, management system and contingency planning. The systematic incorporation of this approach will provide a long term framework to build chemical sustainability.																				
Activity 1.1.2	Conduct awareness raising campaign to strengthen stakeholder engagement through direct and indirect communication strategies; to explain and deepen the understanding eco-effective principles and to generate public ownership of the project by demonstrating eco effective management and positive outcomes.																				
Activity 1.1.3	Revise and adapt the existing cluster based chemical management practices in industrial park or eco-sensitive area consistent with the eco-effective management approach in Tianjin and Yiyang																				
Activity 1.1.4	Develop a technical guideline for the application and evaluation of eco-effective management at industrial value chain and eco system levels with core emphasis on POPs and SAICM concerned chemicals in Tianjin and Yiyang																				
Activity 1.1.5	Reflecting national policy as expressed in the 13th National 5 Year Plan, incorporate the eco effective management approach into the forth coming Local Government 5-year Plans in Tianjin and Yiyang as a strategy to achieve local environmental protection objectives and specifically in the area of POPs and Hazardous Chemicals																				

TIMELINE FOR COMPONENT 2		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
OUTCOME 2	Establishment of institutional framework incorporating local government and local enterprises supported by an Eco-Effective Knowledge Center.																				
Output 2.1:	Strengthen the national and local institutional capacity and promote the research for public private partnerships [PPPs] investment to implement eco-effective management as it applies to POPs and SAICM concerned																				

TIMELINE FOR COMPONENT 2		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	chemicals																				
Activity 2.1.1	Create a national knowledge center as a repository for research, international best practice of institutional learning for eco effective management and access to appropriate technologies and systems to support sustainable industrial value chains																				
Activity 2.1.2	Establish a task group in local government to promote communication, coordination and ultimate adoption of eco-effective management inspired practices and technologies into action plans in Tianjin and Yiyang. The membership of this task group will draw on the local technical and scientific talent pools available from the technical bureaus of local government supported by local academic and research institutions.																				
Activity 2.1.3	Research to generate partnership investment models reflecting both public and private resources to integrate eco effective management capacity and application at administrative and enterprise level to assure value added and sustainability across the total value chain. Research will be conducted by national and academic institutions specializing in closed loop production systems																				
Activity 2.1.4	Develop training materials and conduct eco-effectiveness management trainings for management and technical personnel in Tianjin and Yiyang																				
Activity 2.1.5	Develop the area based eco effective management database, integrate the procedures and processes for training of personnel, summarizing, and reporting environmental information to local Environmental Protection Bureaus in Tianjin and Yiyang																				
Activity 2.1.6	Establish the chemical contingency planning capacity building in Tianjin and Yiyang																				

TIMELINE FOR COMPONENT 3		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
OUTCOME 3	Selection of at least 3 processes in each demonstration area and the pilot application of eco-effective methodology to design out toxic chemicals from total life cycles of the materials and the production systems employed.																				
Output 3.1	POPs and SAICM chemicals focused eco effective diagnostic and technological management strategies/methodologies applied to target industrial value chains in the demonstration areas																				
Activity 3.1.1	Conduct detailed Environmental Risk Assessment [ERA] of all POPs and SAICM concerned chemicals in demonstration areas																				
Activity 3.1.2	Conduct Materials Assessment Protocol [MAP] of total life cycle of POPs and SAICM concerned chemicals in target industrial value chains																				
Activity	Identify specific eco effective solutions in consultation with the																				

TIMELINE FOR COMPONENT 3		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
3.1.3	international network of universities and technical institutions																				
Activity 3.1.4	Select the 3 demonstration technologies and associated public launching events in Tianjin and Yiyang																				
Activity 3.1.5	Develop appropriate eco effective chemical solutions and implement identified eco effective design changes in the automotive components and printed circuit board sectors at Tianjin in consultation with expertise from the international network																				
Activity 3.1.6	Develop and implement appropriate eco effective chemical solutions in the natural fiber textile sector (primary cultivation of natural fiber, fiber degumming, chlorine-free bleaching, weaving processes and textile dyeing) at Yiyang in consultation with expertise from the international network																				
Activity 3.1.7	Integrated approaches for chemical management in Tianjin and Yiyang																				

TIMELINE FOR COMPONENT 4		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
OUTCOME 4	Documentation of results of the applied eco effective approach to chemical management including case studies of the process with reference to changed procedures, new and alternative materials, technology innovations and energy. Financial and commercial aspects of applied eco-effective management as well as the environmental monitoring and results																				
Output 4.1.	Eco-Effective monitoring parameters established and local government institutional capacity strengthened to capture and interpret data built.																				
Activity 4.1.1	Design and finalize a monitoring framework including eco effective monitoring parameters for demonstration sites and participating enterprises																				
Activity 4.1.2	Record and update the inventory data of target sites (e.g. material flows, energy consumption, emission data etc.);																				
Activity 4.1.3	Enhance local monitoring capacity by the procurement of equipment and tools to gather and analyze information data																				

TIMELINE FOR COMPONENT 5		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
OUTCOME 5	Planning and implementation of a dissemination strategy that will communicate to a wider audience. Eco-effective approach methodology documented and made available to wider audience																				
Output 5.1.	Dissemination programme planned, developed and delivered to national local audience																				

TIMELINE FOR COMPONENT 5		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Activity 5.1.1	Prepare a dissemination program focusing on lessons learned from project activities and development of a replication strategy for the demonstrated eco effective approach																				
Activity 5.1.2	Provide a guideline, based on lessons learned from the demonstration experience, to streamline eco effective value chain diagnosis and solution determination																				
Activity 5.1.3	Disseminate project experience via media channels (internet homepage, newspapers, social media, TV etc.)																				

TIMELINE FOR COMPONENT 6		Year 1				Year 2				Year 3				Year 4				Year 5			
	Outcome/Output/Activity Quarter	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
OUTCOME 6	Assessment of the impact of project activities including lessons learned																				
Output 6.1	Project impact indicators designed, applied and project implementation evaluated																				
Activity 6.1.1	Design and implement the Monitoring and Evaluation framework in accordance with UNIDO and GEF requirements (annual project reports, tracking tool, project implementation reviews, completion report and disseminate report etc.)																				
Activity 6.1.2	Conduct Mid-term and terminal evaluation																				

ANNEX G: PROJECT Budget - GEF Grant Allocation

OUTCOME 1		Incorporation of Eco-Effectiveness principles into local government green initiatives, plans, programmes; and enhancement of environmental management decision making supported by a central knowledge center with access to international and national technical and scientific institutions											
	GEF Outputs	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 1.1:	Establish an enabling environment through awareness raising and strategy integration to incorporate eco effective management principles into national and local government chemical management policy	International Expertise	20,000	2	20,000	2	0		0		0		40,000	4
		Local Travel	9,000		9,000		4,000		2,000		2,000		26,000	
		National Expertise	32,000	16	64,000	32	38,000	19	4,000	2	4,000	2	142,000	71
		Contractual Arrangement	126,000		228,000		98,000		46,000		14,000		512,000	
		Training / Workshops	20,000		47,000		15,000		10,000		12,000		104,000	
		International Meetings / Workshops	0		0		0		0		0		60,000	
		Equipment	0		0		0		0		0		0	
		Miscellaneous	3,200		3,200		3,200		3,200		3,200		1,600	
	Sub Total		210,200	18	431,200	34	158,200	19	65,200	2	35,200	2	900,000	75

OUTCOME 2		Establishment of institutional framework incorporating local government and local enterprises supported by international and national expertise											
	GEF Outputs	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 2.1:	Strengthen the national and local institutional capacity and promote the research for public private partnerships [PPPs] investment	International Expertise	10,000	1	30,000	3	40,000	4	20,000	2	20,000	2	120,000	12
		Local Travel	4,000		6,000		8,000		8,000		4,000		30,000	
		National Expertise	0		15,000	7.5	5,000	2.5	0		0		20,000	10
		Contractual Arrangement	20,000		210,,000		180,000		200,000		30,000		640,000	

	to implement eco-effective management as it applies to POPs and SAICM concerned chemicals	Training / Workshops	0		25,000		25,000		10,000		0		60,000	
		International Meetings / Workshops	30,000		30,000		60,000		0		0		120,000	
		Equipment	0		0		0		0		0		0	
		Miscellaneous	2,000		2,000		2,000		2,000		2,000		10,000	
	Sub Total		66,000	1	318,000	10.5	320,000	6.5	240,000	2	56,000	2	1,000,000	22

OUTCOME 3		Selection of at least 3 processes in each demonstration area and the pilot application of eco-effectiveness methodology to design out toxic chemicals from total life cycles of the materials and the production systems employed.												
	GEF Outputs	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 3.1:	POPs and SAICM chemicals focused eco effective diagnostic and technological management strategies/methodologies applied to target industrial value chains in the demonstration areas.	International Expertise	0		55,000	5.5	55,000	5.5	30,000	3	0		140,000	14
		Local Travel	0		36,000		45,000		31,000		9,000		121,000	
		National Expertise	0		32,000	16	34,000	17	19,000	9.5	4,000	2	89,000	44.5
		Contractual Arrangement	0		576,000		687,000		602,000		300,000		2,165,000	
		Training / Workshops	0		20,000		0		0		0		20,000	
		International Meetings / Workshops	0		0		0		60,000		0		60,000	
		Equipment	0		20,000		40,000		40,000		0		100,000	
		Miscellaneous	0		7,000		6,000		5,000		2,000		20,000	
	Sub Total		0		746,000	21.5	867,000	22.5	787,000	12.5	315,000	2	2,715,000	58.5

OUTCOME 4		Documentation of results of the applied eco effective approach to chemical management including case studies of the process with reference to changed procedures, new and alternative materials, technology innovations and energy. Financial and commercial aspects of applied eco-effectiveness as well as the environmental monitoring and results												
	GEF Outputs	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 4.1:	Eco-Effective monitoring parameters established, inventory data recorded and updated and local government institutional capacity strengthened to capture and interpret data built	International Expertise	0		0		0		0		0		0	
		Local Travel	0		5,000		5,000		5,000		5,000		20,000	
		National Expertise	0		7,500	3.8	12,500	6.25	12,500	6.25	7,500	3.8	40,000	20
		Contractual Arrangement	0		110,000		140,000		130,000		80,000		460,000	
		Training / Workshops	0		0		0		0		0		0	
		International Meetings / Workshops	0		0		0		0		0		0	
		Equipment	5,000		15,000		10,000		10,000		10,000		50,000	
		Miscellaneous	0		7,500		7,500		7,500		7,500		30,000	
	Sub Total		5,000		140,000	3.8	175,000	6.25	165,000	6.25	110,000	3.8	600,000	20

OUTCOME 5		Planning and implementation of a dissemination strategy that will communicate to a wider global audience. Eco-effectiveness approach methodology documented and made available to wider audience												
	GEF Outputs	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 5.1	Dissemination programme planned, developed and delivered to national and local audience	International Expertise	0		0		20,000	20	40,000	40	40,000	40	100,000	100
		Local Travel	0		0		0		0		0		0	
		National Expertise	0		0		0		0		0		0	
		Contractual Arrangement	0		0		0		30,000		30,000		60,000	
		Training / Workshops	0		0		0		20,000		20,000		40,000	
		International Meetings / Workshops	0		0		0		0		0		0	
		Equipment	0		0		0		0		0		0	
		Miscellaneous	0		0		0		0		0		10,000	
	Sub Total		0		0		20,000	20	90,000	40	90,000	40	200,000	100

OUTCOME 6		Assessment of the impact of project activities including lessons learned												
	GEF Outputs	Description	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
			US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m	US$	w/m
Output 6.1	Project impact indicators designed, applied and project implementation evaluated	International Expertise	0		0		20,000	20	0		20,000	20	40,000	40
		Local Travel	6,000		18,000		28,000		18,000		22,000		92,000	
		National Expertise	0		0		4,000	2	0		4,000	2	8,000	4
		Contractual Arrangement	20,000		30,000		30,000		30,000		20,000		130,000	
		Training / Workshops	5,000		6,000		3,000		7,000		4,000		25,000	
		International Meetings / Workshops	0		0		0		0		0		0	
		Equipment	0		0		0		0		0		0	
		Miscellaneous	1,000		1,000		1,000		1,000		1,000		5,000	
	Sub Total		32,000		55,000		86,000	22	56,000		71,000	22	300,000	44

ANNEX H: PROJECT BUDGET (GEF GRANT)

Project Framework	Financing		
	GEF	COFI	Total
OUTCOME 1: Incorporation of Eco-Effectiveness principles into local government green initiatives and environmental protection plans and programmes; and enhancement of environmental management decision making	900,000	3,600,000	4,500,000
Output 1.1: Establish an enabling environment through awareness raising and strategy integration to incorporate eco effective management principles into national and local government chemical management policy.	900,000	3,600,000	4,500,000
Activity 1.1.1: Incorporate the eco effectiveness approach at national chemical management policy level to include technical research, guidelines and directive, management system and contingency planning. The systematic incorporation of this approach will provide a long term framework to build chemical sustainability.	350,000	850,000	1,200,000
Activity 1.1.2: Conduct awareness raising campaign to strengthen stakeholder engagement through direct and indirect communication strategies; to explain and deepen the understanding eco-effective principles and to generate public ownership of the project by demonstrating eco effective management and positive outcomes.	210,000	1,092,000	1,302,000
Activity 1.1.3: Revise and adapt the existing cluster based chemical management practices in industrial park or eco-sensitive area consistent with the eco-effective management approach in Tianjin and Yiyang	180,000	720,000	900,000
Activity 1.1.4: Develop a technical guideline for the application and evaluation of eco-effective management at industrial value chain and eco system levels with core emphasis on POPs and SAICM concerned chemicals in Tianjin and Yiyang	140,000	800,000	940,000
Activity 1.1.5: Reflecting national policy as expressed in the 13th National 5 Year Plan, incorporate the eco effective management approach into the forth coming Local Government 5-year Plans in Tianjin and Yiyang as a strategy to achieve local environmental protection objectives and specifically in the area of POPs and Hazardous Chemicals	20,000	138,000	158,000
OUTCOME 2: Establishment of institutional framework incorporating local government and local enterprises supported by an Eco-Effective Knowledge Center	1,000,000	3,000,000	4,000,000

Output 2.1: Strengthen the national and local institutional capacity and promote the research for public private partnerships [PPPs] investment to implement eco-effective management as it applies to POPs and SAICM concerned chemicals	1,000,000	3,000,000	4,000,000
Activity 2.1.1: Create a national knowledge center as a repository for research, international best practice of institutional learning for eco effective management and access to appropriate technologies and systems to support sustainable industrial value chains	610,000	1,230,000	1,840,000
Activity 2.1.2: Establish a task group in local government to promote communication, coordination and ultimate adoption of eco-effective management inspired practices and technologies into action plans in Tianjin and Yiyang. The membership of this task group will draw on the local technical and scientific talent pools available from the technical bureaus of local government supported by local academic and research institutions.	80,000	320,000	400,000
Activity 2.1.3: Research to generate partnership investment models reflecting both public and private resources to integrate eco effective management capacity and application at administrative and enterprise level to assure value added and sustainability across the total value chain. Research will be conducted by national and academic institutions specializing in closed loop production systems.	20,000	120,000	140,000
Activity 2.1.4: Develop training materials and conduct eco-effectiveness management trainings for management and technical personnel in Tianjin and Yiyang;	60,000	340,000	400,000
Activity 2.1.5: Develop the area based eco effective management database integrate the procedures and processes for training of personnel, summarizing, and reporting environmental information to local Environmental Protection Bureaus in Tianjin and Yiyang	170,000	690,000	860,000
Activity 2.1.6: Establish the chemical contingency planning capacity building in Tianjin and Yiyang	60,000	300,000	360,000
OUTCOME 3: Selection of at least 3 processes in each demonstration area and the pilot application of eco-effectiveness methodology to design out toxic chemicals from total life cycles of the materials and the production systems employed	2,715,000	13,060,000	15,775,000

Output 3.1: POPs and SAICM chemicals focused eco effective diagnostic and technological management strategies/methodologies applied to target industrial value chains in the demonstration areas.	2,715,000	13,060,000	15,775,000
Activity 3.1.1: Conduct detailed Environmental Risk Assessment [ERA] of all POPs and SAICM concerned chemicals in demonstration areas	160,000	120,000	280,000
Activity 3.1.2: Conduct Materials Assessment Protocol [MAP] of total life cycle of POPs and SAICM concerned chemicals in target industrial value chains	105,000	65,000	170,000
Activity 3.1.3: Identify specific eco effective solutions in consultation with the international network of universities and technical institutions	300,000	450,000	750,000
Activity 3.1.4: Select the 3 demonstration technologies and associated public launching events in Tianjin and Yiyang	160,000	220,000	380,000
Activity 3.1.5: Develop appropriate eco effective chemical solutions and implement identified eco effective design changes in the automotive interior sector at Tianjin in consultation with expertise from the international network	790,000	5,065,000	5,855,000
Activity 3.1.6: Develop and implement appropriate eco effective chemical solutions in the natural fiber textile sector (primary cultivation of natural fiber, fiber degumming, chlorine-free bleaching and weaving processes, textile dyeing) at Yiyang in consultation with expertise from the international network	800,000	5,140,000	5,940,000
Activity 3.1.7: Integrated approaches for chemical management in Tianjin and Yiyang	400,000	2,000,000	2,400,000
OUTCOME 4: Documentation of results of the applied eco effective approach to chemical management including case studies of the process with reference to changed procedures, new and alternative materials, technology innovations and energy. Financial and commercial aspects of applied eco-effective management as well as the environmental monitoring and results	600,000	1,800,000	2,400,000
Output 4.1: Eco-Effectiveness monitoring parameters established and local government institutional capacity to capture and interpret data built	600,000	1,800,000	2,400,000

Activity 4.1:1: Design and finalize a monitoring framework including eco effective monitoring parameters for demonstration sites and participating enterprises	100,000	300,000	400,000
Activity 4.1:2: Record and update the inventory data of target sites (e.g. material flows, energy consumption, emission data etc.)	450,000	1,350,000	1,800,000
Activity 4.1.3: Enhance local monitoring capacity by the procurement of equipment and tools to gather and analyze information data	50,000	150,000	200,000
OUTCOME 5: Planning and implementation of a dissemination strategy that will communicate to a wider audience. Eco-effectiveness approach methodology documented and made available to wider audience	200,000	800,000	1,000,000
Output 5.1: Dissemination programme planned, developed and delivered to national and local audience	200,000	800,000	1,000,000
Activity 5.1.1: Prepare a dissemination program focusing on lessons learned from project activities and development of a replication strategy for the demonstrated eco effective approach	120,000	400,000	520,000
Activity 5.1.2. Provide a guideline, based on lessons learned from the demonstration experience, to streamline eco effective value chain diagnosis and solution determination;	10,000	60,000	70,000
Activity 5.1.3: Disseminate project experience via media channels (internet homepage, newspapers, social media, TV etc.)	70,000	340,000	410,000
OUTCOME 6: Assessment of the impact of project activities including lessons learned	300,000	600,000	900,000
Output 6.1: Project impact indicators designed, applied and project implementation evaluated	300,000	600,000	900,000
Activity 6.1.1: Design and implement the Monitoring and Evaluation framework in accordance with UNIDO and GEF requirements (annual project reports, tracking tool, project implementation reviews, completion report and disseminate report etc.)	220,000	480,000	700,000
Activity 6.1.2: Conduct Mid-term and terminal evaluation	80,000	120,000	200,000
Project costs	5,715,000	22,860,000	28,575,000
Project management cost	285,000	1,140,000	1,425,000
TOTAL Project costs	6,000,000	24,000,000	30,000,000

ANNEX G: Legal Context

169. The Government of the People's Republic of China agrees to apply to the present project, mutatis mutandis, the provisions of the Standard Basic Assistance Agreement between the United Nations Development Programme and the Government, signed on 29 June 1979 and entered into force on 24 June 1985.

ANNEX J: Term of References

170. To ensure smooth and efficient implementation of the project under the arrangement of national execution modality agreed between UNIDO and FECO/MEP, major component of the project activities will be implemented with the support of qualified technical national and international experts and institutes, to be engaged through contractual agreements (subcontracts) by FECO/MEP with the qualified individual experts or institutions as appropriate and applicable, in accordance with established financial rules and regulations, through competitive bidding process. Such contractual agreements will be a more effective and simplified mechanism that will enable efficient supervision and monitoring by FECO/MEP and UNIDO to assure the timely delivery of anticipated results. Furthermore, the subcontract arrangements will also afford better financial management as payments will only be effected on agreed deliverables and upon satisfactory completion of the tasks stipulated in the subcontract. The table below highlights the major subcontracts to be awarded under each of the project component:

No.	Subcontract	GEF	Indicative Activities/Outputs of the subcontracts
Component 1. Introduction and incorporation of area based eco-effectiveness approach as a component of the Yiyang and Tianjin Local Government forthcoming 5 Year Economic and Social Development Plan.			
Deliverable 1	Mainstream the eco effectiveness approach at national chemical management policy level to include technical research, guidelines and directive, management system and contingency planning	160,000	Policy recommended to promote the research, development and application of eco-effective solutions and to select innovative technologies and processes; White book on chemical management developed to integrate eco-effectiveness principle into national chemical management directives; Research report developed and policy recommendation proposed on contingency planning on chemical management
Deliverable 2-4	Conduct awareness raising campaign to strengthen stakeholder engagement and the understanding of eco-effective principles	96,000	Public awareness raised on eco-effectiveness based chemical management at national and local level
Deliverable 5-6	Revise and adapt the existing cluster based chemical management practices in industrial park or eco-sensitive area consistent with the eco-effective management approach in Tianjin and Yiyang	120,000	A management system in place which streamlines the eco-effectiveness approach within the local industrial park or eco-sensitive area and establishes a traceable documentation system in Tianjin and Yiyang
Deliverable 7- 8	Develop a technical guideline for the application and evaluation of eco-effective management at industrial value chain and eco system levels with core emphasis on POPs and SAICM concerned chemicals in Tianjin and Yiyang	120,000	A technical guideline developed for the practitioner of eco-effectiveness approaches which provide technical support and enhances management capacity to apply this integrated approach into praxis in Tianjin and Yiyang
Deliverable 9- 10	Incorporate eco effective management approach into the forth coming 5-year Plans in Tianjin and Yiyang	16,000	Area based eco effective management approach into the forth coming 5-year Plans in Tianjin and Yiyang Municipality
Component 2. Creation of public private partnership institutional model to encourage knowledge transfer and investment promotion relevant to eco-effective management and to ensure related capacity building			

No.	Subcontract	GEF	Indicative Activities/Outputs of the subcontracts
Deliverable 1	Create a national knowledge center as a repository for research, international best practice of institutional learning for eco effective management and access to appropriate technologies and systems to support sustainable industrial value chains	340,000	Establishment of a national knowledge center to promote both end of pipe solutions which encourage waste diversion through recycling and resource recovery and a guiding design philosophy for elimination POPs and chemical waste at source and at all points along the value chain; Training materials on eco-effectiveness management developed and training programs conducted at national level and 300 of management persons trained and 300 of technical practices in the enterprises trained in Tianjin and Yiyang
Deliverable 2-3	Establish a working group in local government to promote communication, coordination and ultimate adoption of eco-effective management inspired practices and technologies into action plans in Tianjin and Yiyang;	80,000	Working groups in local governments and project management office established
Deliverable 4-5	Develop the area based eco effectiveness database integrate the procedures and processes for training of personnel, summarizing, and reporting environmental information to Local Environmental Protection Bureaus in Tianjin and Yiyang;	160,000	Local area based eco effectiveness database developed in Tianjin and Yiyang
Deliverable 6-7	Establish the chemical contingency planning capacity building in Tianjin and Yiyang.	60,000	Research report developed and policy recommendation proposed on contingency planning on chemical management in Tianjin and Yiyang
Component 3. Pilot demonstrations at enterprise level to showcase eco effective management application to encourage wider investment in eco effective solutions and access to appropriate technologies			
Deliverable 1	Conduct detailed Environmental Risk Assessment [ERA] of all POPs and SAICM concerned chemicals in demonstration areas	10,000	Environmental Risk Assessment [ERA] of all POPs and SAICM concerned chemicals in demonstration areas implemented;
Deliverable 2	Conduct Materials Assessment Protocol [MAP] of total life cycle of POPs and SAICM concerned chemicals in target industrial value chains;	5,000	Scope and design concept of local demonstrations established and Materials Assessment Protocol of total life cycle of POPs and SAICM concerned chemicals in target industrial value chains implemented to include technical economic, commercial, environmental and social parameters.

No.	Subcontract	GEF	Indicative Activities/Outputs of the subcontracts
Deliverable 3- 4	Identify specific eco effective solutions in consultation with the international network of universities and technical institutions;	160,000	Design changes and technical modification solutions identified for specific eco effective solutions in consultation with the international network of universities and technical institutions.
Deliverable 5-6	Select 3 technologies and associated public launching events in Tianjin and Yiyang;	140,000	Identification 3 industrial processes for eco-effective management demonstration in each of the two demonstration areas for stabilizing resource use and ecological carrying capacity
Deliverable 7	Develop appropriate eco effective chemical solutions and implement identified eco effective design changes in the automotive interior sector at Tianjin in consultation with expertise from the international network;	720,000	Completion of an action plan to promote eco-effective products and production systems and eco-effective diagnosis undertaken in selected enterprises of automotive components and printed circuit board industrial chains coupled with best international practice undertaken to assess residual point emission sources and elimination/ remediation plans generated in Tianjin.
Deliverable 8	Develop and implement appropriate eco effective chemical solutions in the natural fiber textile sector (primary cultivation of natural fiber, fiber degumming, chlorine-free bleaching, weaving processes and textile dyeing) at Yiyang in consultation with expertise from the international network ;	730,000	Completion of an action plan to promote eco-effective products and production systems and eco-effective diagnosis undertaken in selected enterprises of natural fiber textile production industrial chains coupled with best international practice undertaken to assess residual point emission sources and elimination/ remediation plans generated in Yiyang.
Deliverable 9-10	Implement integrated approaches for chemical management in Tianjin and Yiyang	400,000	Integrated approaches for chemical management effectively implemented in Tianjin and Yiyang
Component 4. Quantitative measurement of results of eco-effective chemical management measures expressed in materials, financial and commercial terms in pilot enterprises within selected value chains including monitoring and assessment of changes in impact on receiving ecosystems			
Deliverable 1	Design and finalize a monitoring framework including eco effective monitoring parameters for demonstration sites and participating enterprises;	70,000	Monitoring platform and technical parameters defined. Relevant laboratory equipment procured and installed in selected laboratories in the Yiyang and Tianjin municipal areas. Technical training programs initiated

No.	Subcontract	GEF	Indicative Activities/Outputs of the subcontracts
Deliverable 2	Record and update the inventory data of target sites (e.g. material flows, energy consumption, emission data etc.)	390,000	The inventory data of target sites recorded
Component 5.Planning and implementation of a dissemination strategy that will communicate to a wider global audience			
Deliverable 1	Prepare a dissemination program focusing on lessons learned from project activities and development of a replication strategy for the demonstrated eco effective approach	20,000	Dissemination program and communication plan established with professional technical input. Publicity generated around establishment of Eco-Effective Knowledge Centre
Deliverable 2	Provide a guideline, based on lessons learned from the demonstration experience, to streamline eco effective value chain diagnosis and solution determination;	10,000	Guideline based on lessons learned from the demonstration experience developed
Deliverable 3-5	Disseminate project experience via media channels (internet homepage, newspapers, social media, TV etc.)	30,000	Project experience disseminated through internet homepage, newspapers, social media, TV etc.
Component 6. Project monitoring and evaluation			
Deliverable 1	Design and implement the Monitoring and Evaluation framework in accordance with UNIDO and GEF requirements (inception workshop, annual project reports, completion report and disseminate report etc.);	130,000	Project Implementation Manual developed to design the framework of indicators to measure impact across impact spectrum.

ANNEX K: STUDIES/REPORTS DURING PPG STAGE

Annex K1: Analysis Report for Chemical Management and Demonstration Industry in Yiyang City

Analysis Report for Chemical Management and Demonstration Industry in Yiyang City

June, 2015

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1 Analysis for Policies and Regulations Related to Chemical Management in Yiyang City

As the center of Dongting Lake Ecological Economic Area, Yiyang City is rich in wet land and water resources, the South Dongting Lake Wet Land of which belongs to ecological sensitive area and is considered as one of the most important domestic wet lands listed in international *Ramsar Convention*. Thus, the reduction and control of

POPs and toxic chemicals in Yiyang City with South Dongting Lake Wet Land sensitive area play an important role in protecting and reducing local or even global biodiversity and climatic change. In order to promote regional reduction of toxic chemicals, implementation of control strategies, realization of non-POPs prospective targets and efficient control of toxic chemicals, the people in Yiyang City develop specific, efficient reduction and control for POPs and toxic chemicals practically.

1.1 Policies and regulations relevant to POPs management in China

In China, there are many laws and regulations for monitoring and managing POPs, among which Article 26 of *Constitution of the People's Republic of China*: "protect and improve life, prevent and control pollution and other public hazard", provide general principles for POPs management in China while the Article 33 of *Environmental Protection Law of the People's Republic of China*: The toxic chemicals and articles with radioactive substance shall be produced, stored, delivered, sold or used according to relevant national regulations to prevent environmental pollution" promotes the general principle for toxic chemical management. Besides, *Water Pollution Prevention and Control Law of the People's Republic of China, Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, Marine Environment Protection Law of the People's Republic of China, Law of the People's Republic of China on Appraising Environmental Impacts, Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste* and *Cleaner Production Promotion Law of the People's Republic of China* regulate prevention and treatment for POPs pollution from respective aspects.

Since POPs substance is listed in *List of Hazard Goods* and covered by *Regulations on the Safety Administration of Dangerous Chemicals* and the wastes are listed in *National Hazardous Waste Inventory*, the relevant regulations for hazard goods, hazard chemicals and hazards wastes management are formed into regulations for POPs substance management. The *Regulations on the Safety Administration of Dangerous Chemicals* in 2002 regulates produce, operation, use, import and export of hazard chemicals which includes POPs substance and monitoring, management of important hazard source, and becomes the most integrated direct, comprehensive management regulation for managing POPs substance (except for by-product POPs). The life cycle of POPs includes: production, import and export, operation, package, storage, delivery, use, waste and discharge at all links. Except the regulations above, there are also a series of management regulations focused on all aspects of POPs substance in China.

Table 1 Main National Standard Relevant to Hazard Chemical (Including POPs) Management

Name of standard and No.	Authorized by	Scope of management
Classification and Labels of Common Hazard Chemicals (GB 57-1992)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Standard for hazard classification, division and package mark of hazard goods
General Principle of Preparation for Safety Label of Hazard Chemicals (GB/T 15258-1994)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Contents, preparation formats, printing and use of safety label
List of Hazard Goods (GB 12268-1990)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Name and No. of hazard chemical goods
Classification of Health Hazard Levels from Occupational Exposure to Toxic Substances (GB 5044-1985)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Health and hazard level of chemical poison under working environment
Name of standard and No.	Authorized by	Scope of management
Principle of Classification for Transportation and Packages of Hazard Goods (GB/T 15089-1994)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Classification and level of package for hazard goods
Label for Package of Hazard Goods (GB 190-90)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Categories, name, dimension and color of package label under hazard goods
General Principle for Storage of Common Hazard Chemicals (GB 15603-1995)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Storage mode of hazard chemicals, delivery management and treatment for wastes
General Technical Condition for Delivery and Package of Hazard Goods (GB 12463-1990)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Technical requirements for package during hazard goods delivery
Classification and Labels of Common Hazard Chemicals (GB 13690-1992)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Classification and label of common hazard chemicals
Guideline for Safety Application of Pesticides (1-5) (GB 8321.1-5, 87-97)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Guideline for safety application of pesticides
Regulation for Preparation of Chemical Safety Technical Instruction (GB 16483-2000)	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China	Preparation format and content requirements of chemical safety technical instruction

1.2 Policies and regulations relevant to chemical management in Yiyang City Hunan Province

For monitoring and management of toxic chemicals with POPs, Yiyang City has not published professional management methods and relevant policies but collecting, dividing policies, regulations and standards relevant to management for toxic chemicals with POPs published in China and Hunan Province based on the urgency of

requirement for *Stockholm Convention* performance and prevention, management for POPs and toxic chemicals in Yiyang City, and promoting capacity construction demand for POPs pollution prevention and treatment institutions in order to promote smooth development and efficient implementation of management and control strategies for POPs and toxic chemicals.

2 Development of POPs Pollution, Prevention and Treatment for POPs in Yiyang

2.1 Current pollution, prevention and treatment condition of POPs and chemicals in Yiyang

In order to implement strategies and actions of national implementation plan, identify current condition of POPs pollution and environmental risks in the province and promote harmonious development between environmental protection and economy in Hunan Province after the *12th Five-year Plan for Prevention and Treatment of Persistent Organic Pollutants Pollution in Main Industry in China* was approved at Executive Meeting of Ministry of Environmental Protection of the Peoples' Republic of China, the people in Hunan Province responses to the call positive by preparing the *12th Five-year Plan for Prevention and Treatment of Persistent Organic Pollutants (POPs) Pollution in Main Industry in Hunan Province* which can enhance monitoring and management of POPs pollution sources, control dioxin discharge from the source, adjust integrated industry structure, get rid of laggard equipment and facilities, reduce dioxin discharge, implement BAT/BEP project demonstration, reduce dioxin discharge intensity, implement identified environmental innocent treatment for POPs wastes, enhance protection for drinking water source, prevent POPs from moving into water, enhance POPs management capacity and deal with long-term management, which can be divided into six tasks mainly.

In accordance with *12th Five-year Plan for Prevention and Treatment of Persistent Organic Pollutants Pollution in Main Industry in China* and *12th Five-year Plan for Prevention and Treatment of Persistent Organic Pollutants (POPs) Pollution in Main Industry in Hunan Province*, the people in Yiyang City implement regional control and management of persistent organic pollutants and toxic chemicals from the aspects set forth below:

1) Investigating and researching POPs pollution sources and production of toxic chemicals

According to social, economical development and practicality of pollutant discharge in Yiyang City, the production conditions of POPs pollution sources and toxic chemicals (mainly relevant to insecticides, polychlorinated biphenyl, dioxin, toxic chemicals, tetrabromodiphenyl ether, pentabromodiphenyl ether and other new POPs) in Yiyang City should be investigated in order to reflect regional production, circulation, storage and other conditions of POPs pollution sources and toxic chemicals completely, systemically and truly.

It is finally determined that there are 47 dioxin and POPs pollution source enterprises and 68 dioxin and POPs pollution source discharge facilities in Yiyang after investigation, which should be divided into 29 cement plants, 1 non-ferrous metal plant, 1 steel plant, 1 iron plant and 2 crematories, 9 plants that incinerate wastes and 4 paper making plants according to industry classification. The toxic chemicals in Yiyang are mainly used by pesticide manufacturers, ramie manufacturers or used in rodenticide baits, ampullaria gigas prevention and treatment, fish

raising and pond cleaning and other fields. After investigation, there are not any toxic manufacturers in Yiyang City and the ramie manufacturers have stopped to use sulfuric acid, liquid ammonia and other toxic chemicals, which are not stored.

2) Enhancing capacity construction of prevention and treatment for POPs pollutants and toxic chemicals

The capacity construction of prevention and treatment for POPs pollutants and toxic chemicals in Yiyang City mainly include: enhancing management for important discharge source of persistent organic pollutants, reducing persistent organic pollutant capacity, starting demonstration for persistent organic pollutant site treatment and maintenance, enhancing protection for drinking water sources, preventing POPs and toxic chemicals from moving into water, establishing POPs management institution and coordination mechanism, establishing POPs environmental monitoring team and enhancing public propaganda, education.

2.2 Content relevant to chemical management in planning for ecological civilization construction in Yiyang City

The planning for ecological civilization construction will be promoted recently in Yiyang where the ecological civilization construction is put in an important position. During ecological civilization construction in this demonstrative area, the environmental management for chemicals should be controlled strictly according to safety monitoring practicality of hazard chemicals in order to bring evaluation for ecological civilization construction into daily monitoring and establish lifelong responsibility system and all process administrative accountability system for chemical environmental pollution.

In accordance with currently prepared Implementation Planning for Comprehensively Promoting National Ecological City Construction in Yiyang City and Implementation Planning of Comprehensive, Matching Revolution and Test for Resource-conserving, Environment-friendly Society, the people in Yiyang City will use new, advanced technologies and advanced process to improve cotton and fiber weaving, paper making, construction materials and other traditional industries and to promote traditional industries to develop at modern, large-scale and high-end directions in order to reduce production and use of toxic chemicals. In addition, the people in Yiyang will enhance prevention and control of chemical risks, optimize industry layout of chemicals, establish regionalization management for production industry of hazard chemicals, plan and evaluate industry layout of important chemicals and restrict new projects relevant to high risk chemicals in environmental sensitive area strictly. The current enterprises for producing hazard chemicals should be evaluated at the aspect of cleaning production compulsively in order to control production scale of enterprises relevant to high-pollution, high-risk chemicals strictly. The capacity of enterprise for preventing emergent environmental incidents should be enhanced and the important risk source, important and sensitive areas should be inspected regularly and specially. The high-risk enterprises should be supervised and handled emphatically to control rectification and removal according to relevant laws and those without rectification conditions should be stopped insistently according to

laws. The internet of things and electronic marking system should be used for storing, transporting and using toxic chemicals and high environmental risk materials for the purpose of whole process monitoring. At the aspect of ecological agriculture, the people in Yiyang will promote high efficient ecological agriculture, positively use high efficient, low toxic, low remaining pesticide or bio-pesticide, comprehensively generalize testing soil for formulated fertilization, encourage to use organic fertilizers or organic-inorganic mixed fertilizers and execute reduction project for pesticides and fertilizers in order to reduce capacity of pesticides and fertilizers and to improve development of organic agriculture.

Through safety monitoring for the enterprise that produces, uses, stores and operates hazard chemicals, the ecological civilization construction of hazard chemical enterprises should be promoted greatly, the integrate safety level of municipal hazard chemical enterprises should be promoted practically and the green, safety manufacturers should be constructed as much as possible in order to build green economic system, health environmental system, appropriate living system, harmonious culture system and high-efficient system and promote ecological civilization construction in demonstrative area in Yiyang.

3 Analysis for Focused Chemicals and Key Enterprise in Yiyang

3.1 Production, use and discharge condition of key chemicals in Yiyang

The enterprises that produce, use and discharge POPs in Yiyang demonstrative area have been investigated and researched preliminarily at the early stage. Since many categories under investigation and research have been stopped for many years and relevant data cannot been inquired, only some data of Taojiang County in Yiyang City can be found and the investigation and research are still on the way. The important enterprises that produce, use and discharge POPs in Yiyang demonstrative area should be investigated and listed for statistics in detail. At present, the important enterprises that produce, use and discharge POPs and are investigated and researched previously, should be analyzed.

The enterprises that produce, use and discharge POPs in Yiyang demonstrative area are investigated and researched preliminarily at the early stage and the enterprises that use POPs pesticides are listed in Table 1.

Table 1 The Enterprise for Using and Storing POPs Pesticides in Yiyang City

Name of unit	Site	Category of pesticide
Termite Control and Prevention Institution of Taojiang Real Estate Bureau	New, rebuilt and expanded house in this county	Chlordane
Taojiang Plant Protection Station	Xianfengtang Lane, Taohua Road	DDT
Taojiang Plant Protection Station	Xianfengtang Lane, Taohua Road	Hexachlorobenzene
Taojiang Plant Protection Station	Xianfengtang Lane, Taohua Road	PCP-Na
Taojiang Plant Protection Station	Xianfengtang Lane, Taohua Road	Toxaphene
Taojiang Plant Protection Station	Xianfengtang Lane, Taohua Road	Mirex
Taojiang Plant Protection Station	The whole county	None
Total		

3.2 Important enterprise for storing waste POPs and pesticides

The industries relevant to previous investigation and research include: agricultural industry, ramie production, paper making industry, ampullaria gigas prevention and treatment and use and storage condition of toxic chemicals, among which the usage amount of toxic chemicals in Yuanjiang City is 100,265 kg and the storage capacity is 2,207 kg; the usage amount of toxic chemicals in Anhua County is about 43,080 kg and the storage capacity is 910 kg; the usage amount of toxic chemicals in Datong District is 4,600 kg, without storage.

The toxic chemicals are not used and stored in ramie production in Yiyang; the usage amount of toxic chemicals for ampullaria gigas prevention and treatment institution is 4,600 kg, without storage; the usage amount of toxic chemicals in agricultural production is 32,850 kg and the storage capacity is 910 kg; the usage amount of toxic chemicals for forestry department and plant protection departments is 108,820 kg and the storage capacity is 2,132 kg; the use amount of termite prevention and control institutions is 175 kg and the storage capacity is 75 kg; the usage amount of toxic chemicals for schistosomiasis control station should be 1,500 kg, without storage. The enterprises that use, store toxic chemicals and specific information are listed in Table 6:

Table 6 Using and Storage Condition of Toxic Chemicals in Yiyang

Name of unit	Site	Name of toxic chemicals	Usage amount (kg)	Storage capacity (kg)
Qonghu Schistosomiasis control station	Yuanjiang City	Niclosamide	1500	0
Termite Prevention and Control Institution	Yuanjiang City	Fenvalerate missible oil	25	75
Yuanjiang Bureau of Forestry	Yuanjiang City	Deltamethrin	3000	0
Yuanjiang Bureau of Forestry	Yuanjiang City	Permethrin	1000	0
Yuanjiang Bureau of Forestry	Yuanjiang City	Bacillus thuringiensis	3000	0
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Buprofezin	18750	360
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Imidacloprid	2000	20
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Pymetrozine	5000	12
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Chlorantraniliprole	3000	30
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Abamectin	900	100
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Triazophos	20000	300
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Chlorpyrifos	24000	600
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Methyl-chlorine abamectin	90	10
Yuanjiang Plant Protection and Inspection Station	Yuanjiang City	Phoxim	18000	700
Hunan Shenghua Agrochemical Co., Ltd.	Anhua County	High-efficient cypermethrin	5000	0

Hunan Shenghua Agrochemical Co., Ltd.	Anhua County	Avermectin	500	0
Hunan Shenghua Agrochemical Co., Ltd.	Anhua County	Methylamino avermectin Benzoate	300	0
Hunan Shenghua Agrochemical Co., Ltd.	Anhua County	Chlorpyrifos	3000	0
Hunan Shenghua Agrochemical Co., Ltd.	Anhua County	Phoxim	3000	0
Operation Dept. of Anhua Bureau of Agriculture	Anhua County	High-efficient cypermethrin	50	10
Operation Dept. of Anhua Bureau of Agriculture	Anhua County	3% Carbofuran granular	5000	500
Operation Dept. of Anhua Bureau of Agriculture	Anhua County	Omethoate	8000	200
Operation Dept. of Anhua Bureau of Agriculture	Anhua County	Isocarbophos	8000	200
Operation Dept. of Anhua Bureau of Agriculture	Anhua County	Dimehypo	10080	0
Termite Prevention and Control Institution	Anhua County	Esfenvalerate	150	0

3.3 Important enterprise relevant to ramie production

Yiyang City is a main producing area of ramie in Hunan Province or even in China, the annual ramie planting area of which is more than 150, 000 mu and the annual ramie yield of which can reach 50,000 t/year. At present, many fertilizers and pesticides are used for planting ramie and the liquid alkali, acid, chemical additives and liquid chlorine capacity for 1 t of ramie should be 1.06 t, 0.13 t, 0.09 t and 0.015 t with chemical degumming process, the annual usage amount of which are 53,000 t, 6,500 t, 4,500 t and 750 t in Yiyang City. The used chemicals are not only dangerous during using but affect the ecological environment seriously when some of them enter three wastes through production process. Thus, it is necessary to establish demonstrative project for chemical reduction and discharge, which can reduce to discharge fertilizers and pesticides for ramie efficiently, reduce alkali, acid, chemical additives and liquid chlorine for degumming production greatly and keep concentration of waste water, AOX and other pollutants under internal discharge standard. Thus, the construction of demonstrative project for ramie industry is significant to project construction.

4 Main Contents and Implementation Planning for Eco-effective Demonstrative Project

4.1 Analysis for features of persistent organic pollutants and toxic chemicals in Yiyang City and assessment for environmental risk

According to basic features of persistent organic pollutants and chemicals in Yiyang, the persistent pollutants should be researched and environmental impact of toxic chemicals should be focused by promoting basis conditions and capacity construction demand for persistent organic pollutants and chemical management and analyzing typical industry and enterprise in order to establish prevention and treatment measures for environmental impact and promote ecological environment in Yiyang City.

Main expected results include:

1) List of persistent organic pollutants in Yiyang City;
2) List of chemical use and management in Yiyang City;
3) Basic information database of persistent organic pollutants and chemicals in Yiyang City;
4) Construction planning for management capacity of persistent organic pollutants and chemicals in Yiyang City;
5) Information database of typical industry and enterprise for persistent organic pollutants and toxic chemicals in demonstrative area; and
6) List of chemical risk source in important areas in Yiyang City

4.2 Planning for prevention and treatment of persistent organic pollutants and research for relevant management policies and modes

The C2C mode for typical industry should be established by establishing and improving policies, laws and regulations relevant to persistent organic pollutants and chemical management in order to manage persistent organic pollutants and chemicals in Yiyang City efficiently.

Main expected results include:

1) Planning for pollution prevention and treatment of persistent organic pollutants (POPs) in Yiyang City;
2) Planning for chemical management in Yiyang City;
3) Safety management method of hazard chemicals in Yiyang City;
4) Management rules for hazard chemicals in Yiyang City;
5) Enforcement regulation of management and registration for hazard chemicals in Yiyang City;
6) Technical specification of management and implementation for hazard chemicals; and
7) C2C management system of ramie industry.

4.3 Management, training and implementation for persistent organic pollutants and toxic chemicals

The awareness of various layers of personnel for persistent organic pollutants and chemicals should be improved and the emergency treatment ability of environmental managers should be improved by propagandizing relevant contents, technologies, laws and regulations of persistent organic pollutants through various layers of objects and making environment managers deal with emergency maneuver to prevent and control the harm of persistent organic pollutants and chemicals effectively.

Expected results include:

1) Implementing training materials;
2) Propagandizing training planning;
3) Training technicians and managers 4 times;
4) Propagandizing in more than 5 schools and propagandizing more than 10 institutions through network;
5) Twice abroad investigation and training;
6) One C2C concept demonstrative base;
7) Emergency planning for pollution accidents of persistent organic pollutants in Yiyang City; and
8) 1 emergency manoeuvre for pollution accidents of persistent organic pollutants in Yiyang City.

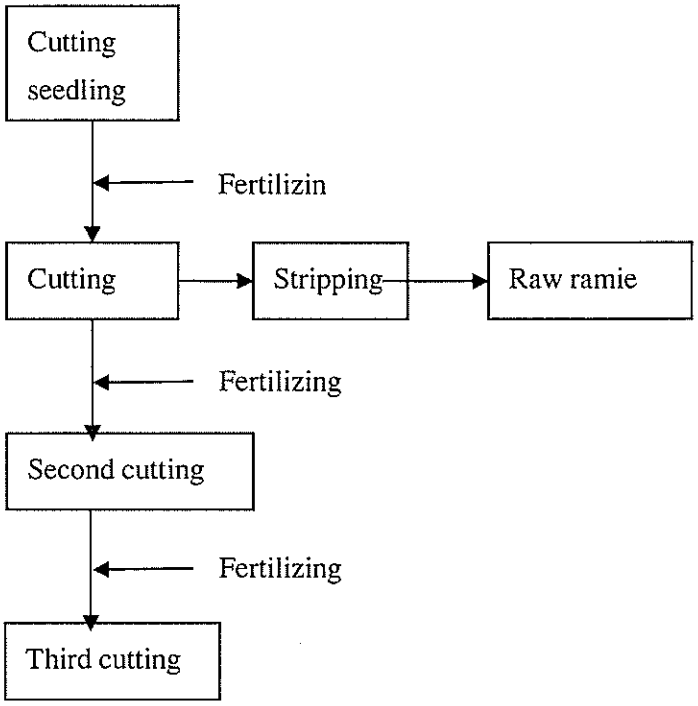
4.4 Chemical management demonstration for ramie industry based on eco-effectiveness

4.4.1 Demonstration for ramie planting

At present, there are 4 ramie planting enterprises, the annual planting area of which is more than 150,000 mu and a lot of fertilizers and pesticides should be used with current ramie planting technologies. 120 kg fertilizers and 3 kg pesticides should be used for each mu of ramie and the annual fertilizers and pesticides for ramie planting in Yiyang City should be 18,000 t and 450 t. The high efficient Agri bio-fertilizers for ramie cannot only be used as fertilizer but also used for improving immunity of ramie, with which the fertilizers and pesticides can be avoided. Thus, this technology has quite high demonstrative and application value and the demonstrative projects can reduce the fertilizers and pesticides by 600 t and 1.5 t. In case of planting ramie in whole Yiyang, the fertilizers and pesticides in Yiyang City can be reduced by 18,000 t and 450 t. The demonstration for ramie planting is quite important.

The demonstrative planting area of ramie can reach 5,000 mu. In order to cultivate excellent ramie category, the planting for ramie should be generalized positively and the people from one village (or one town) had better plant one category uniformly with the targets that the ramie planting area breaks through 5.000 mu and excellent category can cover 98%. The ecological planting technologies of high efficient Agri bio-fertilizers should be

generalized powerfully in order to reduce fertilizers and pesticides.



Flow Diagram of Production Process for Ramie

Production process of ramie: cutting seeding, fertilizing, cutting, circulating

List of new equipment is shown in the table set forth below:

No.	Name of equipment	Scale	Unit price (USD)	Amount (USD)
1	Small-scale ramie stripper	100 sets	800	80,000
2	Rotary tiller	3	10,000	30,000
Total				110,000

4.4.2 Demonstration for ramie degumming and producing

The chemical degumming production line in current workshop should be improved in order to match some production processes, equipment with new equipment for ramie bio-enzyme degumming process (mainly increasing some raw ramie treatment equipment and bio-enzyme preparation system) and to produce 5,000 t fine degummed ecological dry ramie every year.

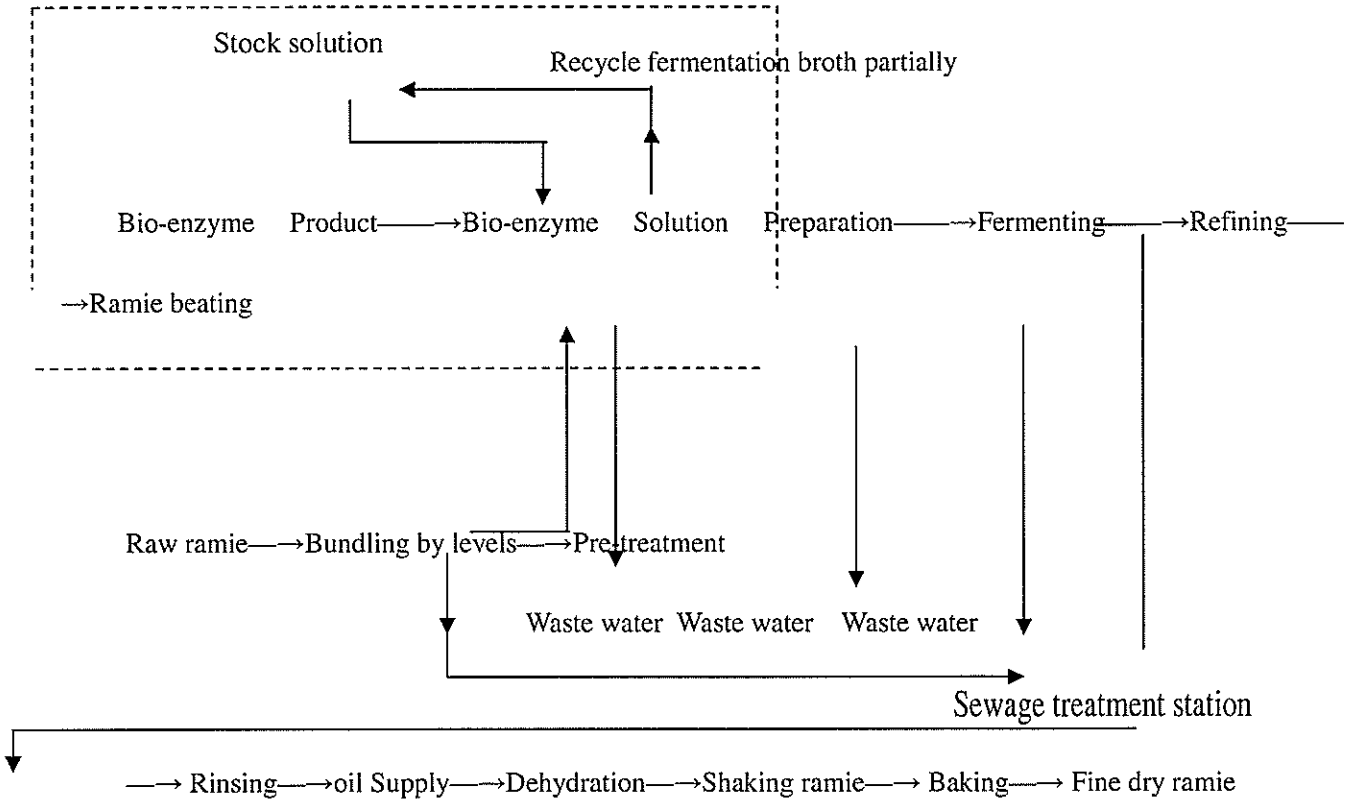


Diagram of Ramie Bio-enzyme Degumming Technology

With this demonstrative project, the alkali, acid, chemical additives and liquid chlorine for each ton of rime can be reduced by 0.61 t, 0.13 t, 0.08 t and 0.015 t, the usage amount of which are reduced by 58%, 100%, 89% and 100%. Provided that the 4 enterprises (50,000 t scale) in Yiyang produce ramie use chemical degumming, the alkali, acid, chemical additives and liquid chlorine can be reduced 3,050 t, 150 t, 450 t and 75 t so the demonstration for chemical degumming process in ramie industry can reduce chemicals greatly, the demonstration significance of which is quite important.

List of New Equipment for Improving Process is shown as Follows.

No.	Name of equipment	Scale	Unit price (USD)	Amount (USD)
1	Grade 1 activation tin	2	80000	160000
2	Grade 2 activation tin	2	40000	80000
3	Mechanical rubbing duster	4	10000	40000
4	Biological vaccination pot	5	8000	40000
5	Pressure inactivation pot	4	20000	40000
6	Fiber separator	10	10000	100000
7	Water oil cleaner	5	20000	100000
8	Waste heat recycling and preparation tin	6	10000	60000
Total				620000

4.4.3 Demonstration for chloride-free bleaching project of ramie

The current chlorine bleaching process should be improved to chlorine-free bleaching process which can bleach 5,000 t fine dry ramie and each ton of fine dry ramie should be bleached with 0.02 kg sodium hypochlorite, which can generate 30 m^3 waste water. The annual bleaching water can reach 150,000 m^3 and all kinds of organic chlorides can be generated, for the chlorine can react with residues of amino acid in ramie substances during bleaching. The high concentration AOX can be generated and enter waste water, the AOX concentration of which can be reduced to uninspected condition with chlorine-free bleaching process. Thus, 100 kg sodium hypochlorite can be reduced every year and the corresponding AOX can be discharged totally. The discharging efficiency is distinctive.

4.4.4 Demonstrative project for improvement of ramie cleaning and dyeing and finishing technologies

A lot of chemicals should be consumed for ramie dyeing and finishing and 10,000 m linen will consume sodium hypochlorite, caustic soda, dye, industrial salt, hydrogen peroxide, refining agent, stabilizer, chelating agent, water glass, penetrating agent, sulfuric acid, boiling agent, sodium sulfite, urea, soda, amino silicone oil, fixing agent and citric acid 6.6 kg, 846 kg, 61.3 kg, 434.7 kg, 17.6 kg, 20.5 kg, 20.5 kg, 16.4 kg, 20.5 kg, 28.7 kg, 20.4 kg, 20.4 kg, 8.8 kg, 40.9 kg, 61.3 kg, 82.0 kg, 71.7 kg and 5.7 kg. After process rectification and equipment updating, the sodium hypochlorite is reduced by 100% with chlorine-free bleaching process and most caustic soda is recycled, the relevant usage amount of which is reduced by 70%. The dye, industrial salt, hydrogen peroxide, refining agent, stabilizer, chelating agent, water glass, penetrating agent, sulfuric acid, boiling agent, sodium sulfite, urea, caustic soda, amino silicone oil, fixing agent and citric acid can be reduced by 25% respectively.

3 million m 160 cm wide pure ramie high-count cloth can be bleached with relevant fibers are removed and the excellent ramie can be blended with soluble vinylon; the blended grey cloth should bleached on overflow dyeing machine with relevant fibers removed. The annual yield of 160 cm wide bleached cloth weaved with pure ramie and dyed cloth is 6 million m, among which the bleached cloth is 4 million m and dyed cloth is 2 million m. The annual yield of 160 cm wide semi-bleached cloth, bleached cloth and dyed cloth of ramie cotton fabric is 2 million m, among which the yield of semi-bleached cloth and bleached cloth is 1 million m and the yield of dyed cloth is 1 million m. For 160 cm wide coarsely weaved pure linen, the annual yield of semi-bleached, bleached and dyed cloth is 4 million m. The high count polyester ramie blending cloth is mainly used for shirts and can be divided into 160 cm wide bleached cloth, dyed cloth and color-woven cloth, the annual yield of which is 3 million m. The annual yield of 160 cm wide semi-bleached cloth, bleached cloth and dyed cloth is 2 million m.

The annual yield of semi-bleached cloth, bleached, fiber removal cloth and dyed cloth is 20 million m, the main engineering technical process is: returning → sewing joints→ burning fur→ fading, boiling and bleaching (or cold dome and oxygen bleaching)→ mercerizing→ drying→ infrared rendering→ soaping→ stentering →pre-shrinking → equipping

The using information of all chemicals is shown in the following table.

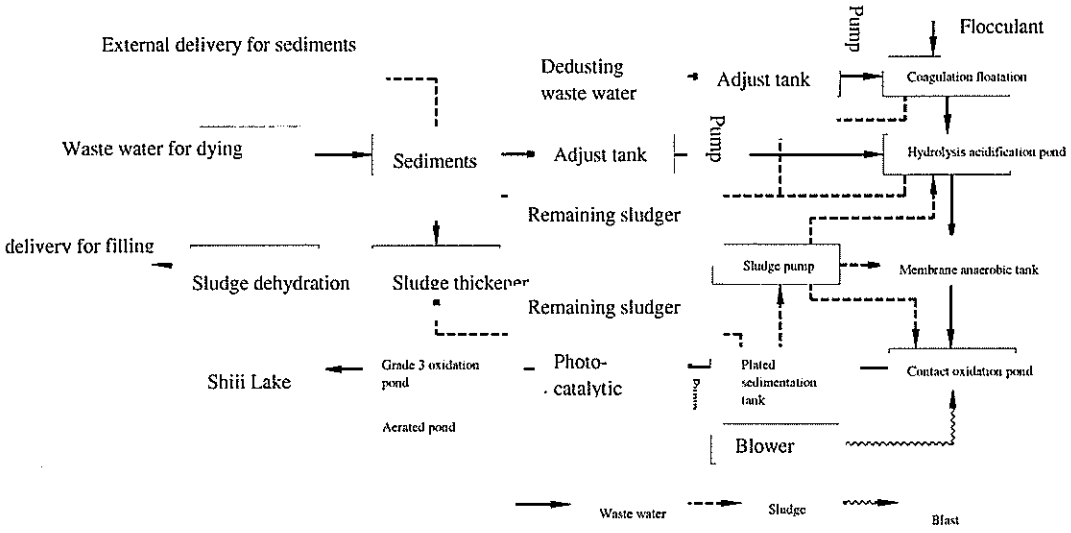
Name of chemicals	Usage amount of 10,000 m linen before technical improvement (kg)	Usage amount of 10,000 m linen after technical improvement (kg)	Reduction amount of 10,000 m linen after technical improvement (kg)	Reduction amount of 20 million (t)
Sodium hypochlorite	6.6	0.0	6.6	33.0
Caustic soda	846.0	254.0	592.0	2960.0
Dye	61.3	46.0	15.3	76.7
Industrial salt	434.7	326.0	108.7	543.3
Hydrogen peroxide	17.6	13.2	4.4	22.0
Refining agent	20.5	15.4	5.1	25.7
Stabilizer	20.5	15.4	5.1	25.7
Chelating agent	16.4	12.3	4.1	20.5
Water glass	20.5	15.4	5.1	25.7
Penetrating agent	28.7	21.5	7.2	35.8
Sulfuric acid	20.4	15.3	5.1	25.5
Boiling agent	20.4	15.3	5.1	25.5
Sodium sulfite	8.8	6.6	2.2	11.0
Urea	40.9	30.7	10.2	51.2
Caustic soda	61.3	46.0	15.3	76.7
Amino silicone oil	82.0	61.5	20.5	102.5
Fixing agent	71.7	53.8	17.9	89.7
Citric acid	5.7	4.3	1.4	7.2

According to the table above, the sodium hypochlorite, caustic soda, dye, industrial salt, hydrogen peroxide, refining agent, stabilizer, chelating agent, water glass, penetrating agent, sulfuric acid, boiling agent, sodium sulfite, urea, soda, amino silicone oil, fixing agent and citric acid can be reduced by 33.0 t, 2,960 t, 76.7 t, 543.3 t, 22.0 t, 25.7 t, 25.7 t, 20.5 t, 25.7 t, 35.8 t, 25.5 t, 25.5 t, 11.0 t, 51.2 t, 76.7 t, 102.5 t, 89.7 t and 7.2 t. While the sodium hypochlorite is reduced, the AOX generated by 33.0 t sodium hypochlorite can be charged. The discharging efficiency is distinctive

4.4.5 Demonstration for treatment of printing and dyeing waste water

Based on high-efficient biochemistry and oxidation waste water treatment technologies, the waste water treatment facilities of photochemical catalyzing oxidation should be increased for deep treatment of dyeing and finishing waste water and the scale of waste water treatment is 1,400 m^3/d. The COD can be reduced and decoloring treatment can be handled further in order to make sure that the waste water can reach discharging standard of developed countries.

Main technical process



Process flor charge of waste water treatment

After treatment for waste water from enterprise, the BOD, COD, sulfide, aniline categories and other pollutants are reduced obviously, the discharge concentration of which can meet relevant standards of developed countries so that the pollutants in wastewater can be reduced or discharged efficiently.

Main expected results:

1) 1 demonstrative project for producing ramie;
2) 1 biological degumming demonstrative project for production;
3) 1 demonstrative project for bleaching ramie without chlorine
4) 1 demonstrative project for dyeing and finishing ramie;
5) 1 dyeing and finishing waste water treatment project;
6) The ramie products of demonstrative enterprises are certified by authorities; and
7) The environmental management system of demonstrative enterprises is certified by China Quality Certification Center.

4.5 Eco-effectiveness assessment and popularization, application of demonstrative projects

The quantitative assessment for demonstrative activities should be handled by establishing assessment planning of demonstrative activities in order to generalize advanced technologies and management mode from different layers and improve people on various layers to recognize C2C concept and the influence of C2C management mode on environmental protection and economic development.

The assessment framework of demonstrative project should be built and the principle for index structure should

be designed according to the 4 demonstrative projects of this project to build the indexes that include basic conditions for implementation of demonstrative activities, application prospect of demonstrative activity results, economic environment of demonstrative activities, social benefits and others, to resolve all indexes, to analyze weight of all indexes and to design scientific marking table for demonstrative projects in order to establish assessment planning of demonstrative projects based on all work above and prepare quantitative assessment report for effectiveness of demonstrative projects.

The effectiveness from demonstrative projects should be analyzed and the advanced technologies, process, policies and mode for chemicals management of demonstrative project construction should be summarized in order to establish application for communication, learning and popularization and to generalize them in Yiyang City, Hunan Province or even in whole China.

All implementation contents of the "management for regional persistent organic pollutants and toxic chemicals based on eco-effectiveness" in Yiyang demonstrative area should be summarized and the environmental, economic and social effectiveness brought by single implementation content should be analyzed in order to establish assessment table for effectiveness of project implementation activities and prepare assessment report for total effectiveness of project implementation.

5 Implementation schedule of projects

No.	Framework	Contents	Implementation time (calculated from commencement of project launch)
1	Preparation for project implementation planning	Building project management office, project leading team and working mechanism for project management, coordination	Season 1
2		Establishing expert team and determining technical supporting unit for project implementation	Season 1
3		Collecting basic materials and determining demonstrative factors or objects	Season 1
4		Exploring national or international policies and regulations relevant to management for POPs and toxic chemicals and pre-preparing the policies and regulations relevant to promotion of management for POPs and chemicals through this project	Season 1
5		Preliminarily investigating and researching the enterprises that product, use and discharge POPs and toxic chemicals and those that implement efficient management of toxic chemicals and get good effectiveness, and pre-determining the enterprise relevant to urgent treatment for toxic chemicals	Season 2
6		Preparing implementation planning and specific budge for project costs	Season 2-3
7		Modifying and improving implementation planning according to uniform arrangement of Foreign Economic Cooperation Office, Ministry of Environmental Protection	Season 3-4
8	Research of POPs in Yiyang and influence of mainly focused chemical on environment	Investigating and researching POPs in Yiyang City and focusing on using and storage condition of toxic chemicals, establishing relevant lists and analyzing the influence on environment	Season 5-6
9	Research for policies in Yiyang City	Research for policies of chemicals in Yiyang	Season 5-6
10		Planning for prevention and treatment for persistent organic pollutants, rules of management for using chemicals in Yiyang City and research for bringing it into planning for environmental protection	Season 5-6
11		Research of C2C in ramie industry	Season 7-8
12		Building expert database	Season 7-8
13	Trainings in Yiyang	Training for technicians	Season 9
14		Training for public propaganda	Season 9
15		Construction for demonstrative base of C2C concept	Season 10-11
16		Investigation trip abroad	Season 11-12
17		Demonstration for ramie planting	Season 10-12
18		Research for demonstration of ramie degumming production	Season 10-16
19		Demonstration for ramie bleaching	Season 10-16
20		Demonstration for improving ramie dyeing and finishing technologies	Season 10-16
21		Demonstration for treatment for dyeing and finishing	Season 10-16

		waste water	
22		Construction for emergency response plan for pollution accidents of persistent organic pollutants in Yiyang City	Season 13-14
23		Emergency response manoeuvre for pollution accidents of persistent organic pollutants in Yiyang City	Season 15-16
24	Assessment for demonstrative activity effectiveness	Establishment for assessment planning of demonstrative activities	Season 17-18
25		Quantitative assessment for effectiveness of demonstrative activities	Season 17-18
26	Technical communication and popularization, application of demonstrative projects	Communicating advanced management methods and technologies in Yiyang City	Season 17-18
27		Learning and communicating management methods and technologies in China	Season 18-19
28		Communicating advanced management methods and technologies internationally	Season 18-19
29		Generalizing and applying relevant projects or technologies in Yiyang City	Season 18-19
30	Project assessment and acceptance	Project startup	Season 1
31		Middle assessment of project	Season 11
32		Preparing, improving all reports, preparing for file materials and completing all project acceptance	Season 19-20

Analysis Report for Chemical Management and Demonstration Industry in Tianjin

June, 2015

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1. Analysis for Policies and Regulations Related to Chemical Management in Tianjin City

1.1 Laws and regulations of chemical management in Tianjin City

Since the "11th Five-Year Plan", a series of laws and regulations have been issued, specific to the weak links and hidden dangers on such aspects as safety production and the safety management of hazardous chemicals in our city. In 2007, according to such laws, regulations and relevant stipulations as *Production Safety Law* and *Administrative Licensing Law of the People' Republic of China* and combined with practical situation of this city, the *Rules for Implementation of Safety Licensing for Hazardous Chemical Construction Projects of Tianjin City* (Jin An Jian Guan Wei Zi [2007] No. 75) was issued and implemented, to carry out relevant requirements in *Implementation Measures on Safety Licensing for Hazardous Chemical Construction Projects*, which powerfully improved the overall safety level of construction projects in Tianjin City. In 2008, to further regulate and improve safety licensing works of construction projects, and practically perform the responsibilities of safety supervision, the *Supplementary Instruction of Rules for Implementation of Safety Licensing for Hazardous Chemical Construction Projects* (Jin An Jian Guan Wei Zi [2008] No. 79) was issued, in which some problems to be solved during the specific course of licensing works related to construction projects of hazardous chemicals were clearly defined.

In 2008, the *Measures on the Safety Management of Hazardous Chemicals of Tianjin City* (Jin Zheng Ling No. 11) (hereinafter referred to as *"Measures"*) was deliberated and passed at the 13th People's Congress of Tianjin Municipal People's Government. According to the *Measures*, the monitoring system for major hazard sources should be established by production, storage and use units of hazardous chemicals in Tianjin City, to conduct 24-hour real time monitoring for relevant sites, facilities and main technical parameters. This *Measures* intensified the safety supervision on hazardous chemical operation units in Tianjin City, and promoted the realization of centralized operation, specialized storage, and uniform distribution.

In September, 2012, the *Articles for Environmental Education of Tianjin City* (hereinafter referred to as "Articles") was deliberated and passed on the 35th session of the 15th Municipal People's Congress. This Articles regulated responsibilities and obligations of national and municipal intensive monitoring enterprises for discharge of pollutant, and legally punished enterprises for environmental violation, which positively promoted the risk prevention and control as well as standard management of hazardous chemicals in Tianjin City.

1.2 Planning for chemical management policies in Tianjin City

(1) Planning Outline for Ecological City Construction of Tianjin City

The Cleaner Production Promotion Law is clearly proposed to be carefully implemented, to guide enterprise to carry out cleaner production and realize the minimization, reutilization and harmlessness of wastes during the whole production course. Mandatory audit should be carried out for key industries with high environmental risk, or key industries using toxic and hazardous raw materials or of "three 'high's (energy consumption, water consumption and material consumption) and two 'exceeding's (pollutant discharge concentration and total amount)", to guide enterprises establish ISO14001 environmental management system.

The control of total amount of pollutant discharge and industrial pollution sources should be intensified; discharge standard and total amount control standard of local pollutants should be prepared; and total amount control of pollutant discharge as well as pollutant discharge permitting system should be implemented in areas and drainage basins. Toxic and hazardous exhaust gas and malodorous gas pollution should be mainly prevented and cured in such industries as chemical engineering, medicine and smelt; and prevention and cure of solid waste pollution and resource utilization should be vigorously promoted; reutilization engineering projects on chromium slag, carbide slag, and alkaline residue and etc. should be continuously implemented, to establish and improve the whole-course environmental management supervision system for the collection, transportation and disposal of hazardous wastes and medical wastes.

(2) "12th Five-Year Plan" Planning for Ecological City Construction of Tianjin City (hereinafter referred as "Planning")

This Planning clearly indicates that, resource saving and environmental friendly ecological industry system should be established. Cleaner production should be strengthened to promote the ecological transformation of key industries. Circular economy industrial cluster should be built around leading industries such as Port-Related Petrochemical Industry, heavy equipment industry, metallurgical industry and electronic information, to realize the level upgrading and closed cycle of industries. By 2015, the ratio of mandatory cleaner production enterprises which have passed inspection and acceptance should be 100%, and the resource and environmental efficiency of key industries should reach national advanced level.

Soil remediation pilot project should be carried out, to improve land intensive use efficiency. Polluted and degenerated soil remediation should be carried out. Soil environmental quality monitoring should be strengthened; soil environmental quality should be regularly monitored; and soil environmental function division as well as soil pollution prevention planning should be prepared for agricultural production base, and periphery of industrial parks and township enterprises.

Industrial waste gas pollution control should be strengthened, to reduce VOC and odor pollution. The cleaner production and technical progress of key industries such as metallurgy; electric power and chemical engineering should be strengthened to improve the reutilization level and reduce the output of

industrial solid waste. The management of industrial solid waste and the construction of information exchange platform system should be promoted, to improve the cyclic utilization level of industrial solid waste. By 2015, the ratio of industrial solid waste treated should be more than 98%. Facilities for hazardous waste disposal should be established; disposal ability of hazardous waste utilization and harmlessness should be improved; and supervision level should be improved.

In addition, this Planning also clearly indicates that, the management for major emission sources of POPs (persistent organic pollutants) should be strengthened; and information management system for POPs of Tianjin City should be established, to realize the dynamic supervision for pollution sources, wastes, and pollution site of POPs.

(3) "12th Five-Year Plan" planning for environmental protection of Tianjin City

This Planning proposes that, investigation and law enforcement inspection of POPs wastes should be continuously carried out; list of POPs wastes should be identified and established; and management and disposal for environmental harmlessness should be gradually conducted. Government construction for POPs pollution prevention ability should be positively promoted; monitoring lab for dioxin POPs of Tianjin City should be established as well as information management system for POPs of Tianjin City, to realize the dynamic supervision for pollution sources, wastes, and polluted site of POPs. Meanwhile, the Technical Support System for Hazardous Chemical Accident Emergency of Tianjin City based on GIS is established, and the pilot project for "PRTR" of hazardous chemicals is carried out.

In addition, the Planning also proposed that, during the management of POPs, the long-term objective is, the overall reduction of dioxin should be promoted, and environmental harmless disposal of identified POPs wastes should be completed to control the risk of pollution site from 2015 to 2020; dioxin discharge under certain standard should be realized, management and disposal for environmental harmlessness should be conducted for all wastes, and the governance of pollution site should be basically completed from 2020 to 2025.

1.3 Reduction strategy for POPs and hazardous chemicals in Tianjin City

The reduction strategy for POPs and hazardous chemicals in Tianjin City mainly covers:

1) reducing the intensity of existing POPs pollution sources;
2) controlling the intensity of existing POPs pollution sources;
3) accelerating the disposal of POPs wastes left over by history;
4) establishing the list of POPs pollution sites;
5) improving the pollution prevention ability of POPs;
6) expanding the investigation scope of enterprises involved with POPs.

2. Pollution Prevention Progress of POPs in Tianjin City

The municipal government clearly requires us to steadily promote the pollution prevention of POPs by

combining with the practical situation of our city. According to the requirements of municipal government, we positively take feasible management measures to strive for the control, reduction, and elimination/replacement of POPs and hazardous chemicals.

2.1 Strengthening organizational leadership and clearly defining responsibilities

Through such works as POPs investigation, planning implementation promotion, project implementation organization and reinforcement of supervision and inspection, the working mechanism is formed, which is leaded by municipal government and organized by environmental protection department, and of which the responsibilities should be separately taken by all relevant departments. Environmental departments of all levels have implemented organizations as well as responsible departments and responsible persons, and have established leading groups, with bureau directors as group leaders. Municipal Environmental Protection Bureau has formed the pollution prevention system of POPs, administratively directed by Solid Dept. of the bureau, specifically implemented by Solid Waste Management Center, supervised and enforced by general supervision team, technically supported by Tianjin Academy of Environmental Sciences, and guaranteed by Treatment and Proposal Center for Hazard Wastes for waste disposal. Besides, the Planning and Finance Dept. of Municipal Environmental Protection Bureau has established the fund channel by positively coordinating with relevant departments, to provide fund guarantee for the pollution prevention of POPs of our city.

2.2 Overall carrying out chemical registration

To well carry out chemical registration of our city, the spirit of Measures on the Administration of Registration of Hazardous Chemicals (Yuan Guo Jia Jing Wei Ling No. 35) as well as the Implementation Suggestions of Measures on the Administration of Registration of Hazardous Chemicals (An Jian Guan Guan Er Zi [2002] No. 103) and Notice of Overall Implementing Hazardous Chemical Registration (An Jian Zong Wei Hua Zi [2005] No. 155) issued by the State Administration of Work Safety, and Planning of Overall Implementing and Promoting Hazardous Chemical Registration (Hua Deng Zi [2005] No. 14) issued by National Registration Center for Chemicals, SAWS, should be carefully implemented, strictly according to the Implementation Planning of Overall Implementing Hazardous Chemical Registration of Tianjin City.

2.3 Promoting the formation of long-term mechanism by involving the Planning into daily work

The implementation of Stockholm Convention on Persistent Organic Pollutants (POPs) and Planning should be involved into annual responsibility document of work objective; POPs statistic report work shall be listed into annual work plan of Solid Waste Management Center; and environmental management file for POPs should be established, to promote the formation of long-term dynamic supervision mechanism of POPs and hazardous chemicals.

2.4 Promoting Planning implementation by strictly law enforcement and supervision

Since 2009, 170 law enforcers have been dispatched in our city, to successively carry out works such as law enforcement inspection for emprises producing or using DDT, Chlordane, Mirex and Hexachlorobenzene; law enforcement inspection for pollution site of enterprises producing pesticide POPs; and inspection for efficient dust removal facilities of emission sources of key industries on dioxin POPs, to invest suspected landfill points for PCB wastes and electric power facilities of electric power system, especially for the law enforcement inspection for POPs wastes left over by history, to promote the implementation of pollution prevention planning of POPs of our city.

2.5 Reducing discharge intensity of pollution sources by implementing statistic report system

Since 2011, the statistic statement system of POPs has been implemented for dioxin pollution sources of 10 industries, on the basis of dioxin POPs investigation and update investigation of Tianjin City, to dynamically learn the condition of pollution sources and reducing the discharge intensity of pollution sources of existing dioxin POPs for key industries.

2.6 Guaranteeing Planning implementation by implementing supporting measures

Works such as pollution control technology research of POPs waste proposal, vehicle R & D of medical waste disposal, and remediation technology research of POPs pollution sites are positively carried out, to improve the technical supporting ability pollution prevention of POPs in Tianjin City. The acquaintance, understanding and participation of all walks should be improved by intensifying publicity and education, and carrying publicity and training for decision-making level, management level and enterprise personnel, to promote monitoring and emission reduction of POPs pollution. The performing awareness and awareness rate should be improved by carrying out extensive publicity and education, to promote the extensive implementation of pollution prevention of POPs.

2.7 Establishing stereo management mechanism for POPs and toxic & hazardous chemicals

All commissions of Tianjin City should establish the stereo management mechanism, to guarantee the smooth implementation of management measures for POPs chemicals. Environmental Protection Bureau, Development and Reform Commission, Public Security Bureau, Water Resources Bureau, Economic and Information Technology Commission, Municipal Commission of Rural Affairs, Family Planning Commission, Customs, and Administration of Work Safety should perform their responsibilities respectively and cooperate closely, to promote the formation of management system for POPs chemicals.

3. Analysis for Mainly Concerned Chemicals and Key Enterprises of Automotive Industry in Tianjin City

As automotive industry is always the pillar industry of Tianjin City, with the development of Bohai Economic Rim, Tianjin City will be one of the largest automobile production areas in China. Also, as Tianjin City is the Northern economic center and Tianjin Port is the largest port among Beijing-Tianjin-Hebei area, Tianjin City has been the main import and export channel of automobiles and automotive components, which can bring great radiation and leading influence on northeast and northern China markets.

Since the development and opening up of Binhai New Area been included into the development strategy of national "11th Five-Year Plan", the Binhai New District, Tianjin City has also prepared industrial development strategy focused on the four advantaged industries including electronic information, automobile manufacture, pharmaceutical and chemical industry, and food and beverage. In February, 2010, Tianjin Economic-Technological Development Area (automotive industry) won the first batch of "National Industrialization Demonstrative bases". It may be said the automotive industry in Tianjin City has gained rare development opportunity. All of these advantages will promote the further development of automotive industry in Tianjin City, consolidate its status as pillar industry, and accelerate economic development of Tianjin City. With the construction of Binhai New Area and the implementation of strategy for renewing Bohai Economic Rim, Tianjin City further are improving investment environment, encouraging the investment of relevant automobile institutions, such as multinational automotive companies national automotive groups and enterprises of automotive components, and setting up production center, R & D center, and procurement center, to form a new round of investment fever of both international and domestic capital and gradually develop the production ability of Tianjin City year by year.

3.1 Using type of chemicals for automotive industry

As chemical materials have been widely used for automotive production, material technology has become a large pillar of automotive industry. Automotive materials and chemicals mainly include plastic, rubber, pressure casting resin, chemicals for lubrication system, automotive cleaner, brake fluid, antifreezing solution, protective articles, coating, sealant, and adhesive, etc. In 2010, there were 2.4 million t materials needed for automotive industry of China, including 994,000 t plastic, 598,600 t rubber, 144,000 t coating, 166,000 t adhesive and 357,000 t chemical fibers. The using type of chemicals for automotive industry at present is shown as following table.

Table 4-1 Classification of Main Automotive Chemicals and its Disaggregated Classification

Classification of automotive chemicals	Disaggregated classification
Chemicals for lubrication system	Engine oil
	Non-engine oil lubricating oil
	Lubricant additive
Cleaner for automotive	Cleaner
	Polishing agent
	Glazing agent
	Paint remover
Protective articles for automotive	Antifreezing solution
	Brake fluid
	Antifogging agent
	Other automotive protective articles
Coating for automotive	Primer
	Varnish
	Colored paint
	Enamel
	Anticorrosive paint
Adhesive for automotive	Common adhesive
	Adhesive dedicated for automotive body and others
	Cohesive repair adhesive
	Automotive sealant

Table 4-2 Materials for Main Plastic Components of Present Automobiles

Applied part	Components	Main Materials
Exteriors	Bumper and face decoration	TPO, PC, PET, PP, PUR, PA, and composite materials
	Automotive body sheet	SMC, PUR—RIM, and thermoplastic plastic (including TPO)
	Illuminating system	PC, and acrylic resin
	Decorating parts (specular seat, doorknob, side trim and	PA, PC, PS, ASA-AES, PVC, PP, PET, and PUR

	etc.)	
Interiors	Interior decorating parts	Foaming PUR (for vibration attenuation), and PVC (flooring material)
	Dash board	ABS, ABS/PC alloy, PC, PP, modified PPE, PVC, SMA, and PUR
	Steering wheel	PVC, and mixed PUR－RIM
	Air conduit	ABS, PP, and SMA
	Others (seat, car roof, door inner, and etc.)	GMT, ABS, PC/ABS, PVC and PP wood flour
Electric	Work bin	PA, high heat-resistance PS, PP, and PET
	Switch and socket	PA, PET, and acetyl resin (switch); PPA, PPS, and SPS (socket)
	Joint	PBT, recycled PET, and PA
	Lighting system	PPA
	Circuit board and wire	PVC
Drive system	Transmission	Glass fiber reinforced PF
	Bearing	PA
	CV joint and U-type joiny	Acetyl resin
Fuel system	Fuel tank	HDPE
	Fuel pipe	PA
	Oil & gas recovery system	Glass fiber reinforced PA and Glass fiber reinforced PP
Chassis	Suspension	Acetyl resin, PA, PP (pipe and connecting piece)
	Brake	Aromatic polyamide fiber (brake shoe)
Engine	Air intake system	PET, PA, and PP (air purification system)
	Oil supply system	PA (intake manifold)

	Cooling system	PA (radiator), PA, and PPS (water pump)

3.2 The use and production of POPs and toxic & hazard chemicals involved in automotive industry

According to above analysis, during the production of automotive industry, except common fine chemicals such as brake fluid, cleaner, and anti-freezing solution, the production of parts such as exteriors and interiors consumes much plastic raw materials, during which the production of part plastic raw materials is involved with adding hazardous substances such as POPs, with relatively low contents, for example, BFR is added in PP wood flour material. As some plastic products need printing ink, such as bumper, emission may be produced during production and disposal after abandonment.

(1) PU product—buffer material of hallstand

- Production process

The production process flow for foaming PU products of automotive industry is shown as follow:

料温 35°C	Material temperature 35°C
混合	Mixing
注射	Injection
结合剂	Binding agent
复合催化剂	Composite catalyst
聚醚/异氰酸酯	Polyether/isocyanate
模温 40-60°C	Mold temperature 40-60°C
混合时间 12s	Mixing time 12 s
注模	Injection molding
乳白化	Opalization
纤维化	Fibration
不粘化	Non-stick treatment
模内发泡	Foam in mold
发泡剂	Foaming agent
熟化 80-140s	Curing 80-140 s
脱模	Mold stripping
修整	Finishing
性能测试	Performance test
成品	Finished product

- Production link of POPs pollutants

As fluoride (the specific chemical remains to be verified) is adopted in the traditional production process of PU material as foaming agent (with a dosage of about 0.2-0.4), certain fluoride volatilization will be

produced during foaming process, with a little fluoride left. As a result, the pollutant emission link during the product life cycle mainly is the production as well as the incineration and landfill disposal process of wastes.

(2) PP wood flour product—rear table of automotive

➢ Production process

The production process flow for PP wood flour products of automotive industry is shown as follow:

10~15%木粉	10~15% wood flour
混合	Mixing
改性添加剂	Modified additive
加热共混	Heating and mixing
挤出	extrusion
压板注塑	Pressing plate and injection molding
无纺布	Non-woven fabric
无纺布-PP 木粉板产品	Non-woven PP wood flour products

➢ Production link of POPs pollutants

Additives (with an additive amount of 0.02%~0.04%) such as brominated flame retardants need to be added in the traditional production process of PP wood flour material, to optimize the performance of materials. At present, as this material is mainly purchased from foreign by relevant enterprises producing automotive parts in Tianjin City, the POPs emission link during the product life cycle mainly is incineration and landfill disposal of wastes within Tianjin City. According to the investigation, there has been an automotive part enterprise (Tianjin Aogang Auto Parts Science Development Co., Ltd.) planning to investment and construct production line of PP wood flour materials, which will replace brominated flame retardants with rock flour material, so there will be no POPs discharged during production.

(3) Coating spraying

➢ Production process

Automotive manufacture industry is generally involved with ink and coating spraying, such as finished automotive spraying and automotive parts spraying. Especially automotive parts spraying, oil coatings are adopted for traditional process, of which the oil paint ordinarily adopts toxic & hazardous solvent such as toluene and xylene as diluents, with a dosage of 30-40% of oil paint. Besides, the spaying methods are different according to different enterprise properties. Generally, automotive assembly enterprises adopt automatic spraying process for finished automotive spraying, while automotive parts industry usually adopts manual spraying method due to small product volume and different shapes, with a low spraying efficiency.

➢ Pollutant production link

The pollutant emission of spraying process distributes in the whole link of process, as oil coatings include toxic & hazardous solvent such as toluene and xylene, generally with a content of about 30-40%, in which 80-85% organic solvent volatilizes into environment during spraying, and the residual 15-20% organic solvent volatilizes into environment during baking.

4. Main Contents and Implementation Planning of Eco-Effectiveness Demonstrative Project

4.1 Main objective and technical route of eco-effectiveness demonstrative project in Tianjin City

4.1.1 Operational objective of project

Pollution prevention management ability of POPs and chemicals in Tianjin City should be improved, including publicity and training ability, supervision and management ability, technical support management ability, and emergency treatment ability, to lay a solid foundation for the establishment of long-term pollution prevention mechanism for POPs and chemicals.

The C2C demonstration for typical products of demonstrative enterprises of automotive industry in Tianjin City should be completed. At the same time, the C2C"cyclic development principle should be promoted among demonstrative enterprises; and the systematism of C2C management mode should be realized, to promote the establishment of whole-course environmental management mode of demonstrative industry.

4.1.2 Technical route of project

Through the investigation of the production and emission condition of dioxin POPs, combined with the current management situation of POPs and toxic & hazardous chemicals in Tianjin City, the implementation technical route of this project is prepared (as following diagram), to improve our pollution prevention management ability of POPs and popularize C2C principle:

4.2 Management policy research of POPs and chemicals in Tianjin City

➢ Management policy research of chemicals in Tianjin City

The deficiencies and focuses on management measures of chemicals, especially hazardous chemicals should be analyzed, on the basis of chemical management framework of our city. Corresponding rules for implementation or technical specifications should be researched and formulated through carrying out project activities, to improve the chemical management system of Tianjin City, and promote the realization of zero-risk environmental management of chemicals in our city.

➢ Research on C2C enterprise certification system for environmental management

As the management concept of area POPs and toxic & hazardous chemicals based on eco-effectiveness is a new principle and mode to domestic environmental management, under the coordination of the Foreign Cooperation Center of Environmental Protection Dept., the project team plans to organize environmental management personnel and members of project team to carry out investigation and research in typical enterprises and relevant management departments abroad (2-3 countries), study and communicate contents such as environmental management mode, technical skill, and engineering experience, of which the advanced principles should be combined with the practical situation of chemical management, to carry out the research on "C2C" enterprise certification system for environmental management. At present, at least the following aspects is tentatively confirmed to determine certification standard:

(1) Raw production materials for products

Raw and auxiliary materials as well as other materials selected for product production should not contain POPs or other toxic chemicals.

(2) Production technical process for products

The level of production technical process for products should be at national advanced level.

(3) Product production

POPs or other toxic chemicals should not be produced and discharged during product production, or pollution abatement equipment should be established by enterprises, to confirm pollutants can be discharged up to standard.

(4) Product package

The package material of products should be recoverable for recycle or nationally degradable.

(5) Product utilization

POPs or other toxic chemicals should not be produced and discharged during product utilization.

(6) Product wastes

Product waste (including leftovers, defective products and abandoned products during production) should be recycled back to the ranking-equally production process directly or after pretreatment, or should be nationally degradable, without any danger and risk to crowds and environment.

Based on the summary and analysis of relevant domestic and overseas data, as well as field research result, combined with the practical situation of Tianjin City, the project should be researched from above aspects at

least. Appropriate forms should be selected for grade setting; and comparative analysis should be conducted specific to the conditions of demonstrative enterprises, to improve certification contents, and form the suggestion draft of "C2C" management certification system for local enterprises in Tianjin City.

4.3 Construction of environmental pollution prevention ability for POPs and chemicals in Tianjin City

As the environmental management of POPs and chemicals is a new and long-term work in the field of environment, we are still in the starting phase with imperfect links on management, though, in recent years, a series of works such as POPs investigation, the preparation for the "12th Five-Year Plan" Planning of POPs, and implementation have been carried out in our city under the lead and support of leader of Environmental Protection Dept., and we have possesses certain foundation. As a result, we plan to further carry out such works as investigation, research, monitoring, publicity, and training, through the implementation of this project, to gradually improve the environmental management ability of POPs and chemicals in our city, and lay a solid foundation for the establishment of long-term pollution prevention mechanism for POPs and chemicals.

(1) Institution ability construction

Project institution should be established and institution ability should be clearly defined, to improve the management ability of performing project.

To guarantee the smooth implementation of project, project leading group and office should be established. The leading group should be responsible for making decisions for support and implementation of projects in demonstrative areas; approving the work plan and implementation scheme of demonstrative projects; and supervise and instruct the operation of project management offices and the management of organizations, by taking bureau directors as group leader, and respective responsible persons of Solid Dept., Planning and Finance Dept., Tianjin Solid Waste and Toxic Chemical Management Center (hereinafter referred to as "TSWTCMC"), and Tianjin Academy of Environmental Sciences (hereinafter referred to as "TAES") as members, to promote the project completed on time.

Under leading team, project management office should be established at TSWTCMC, of which the members should be composed of responsible persons of TSWTCMC and TAES as well as technical personnel, mainly responsible for the organization, management and implementation of project.

Under project management office, management policy team as well as investigation, technical team on analysis and research for POPs and chemicals should be established, which will carry out long-term investigations and researches for POPs and chemicals, and provide long-term technical services for performing projects and administrative departments in Tianjin City.

(2) Construction of publicity and training ability

As the management concept of area POPs and toxic & hazardous chemicals based on eco-effectiveness is a new principle and mode to domestic environmental management, project teams should carry out publicity

and training activities specific to the project, to form POPs science dissemination system in Tianjin City, and complete the organization construction, system construction and publicity team construction of POPs science dissemination.

➢ Publicity and training objects

Different publicity and training activities should be carried out for different-level and different-type personnel, such as environment management cadres of districts and counties, relevant enterprise personnel and social public, etc., to improve their acquaintance, understanding and participation of POPs and chemicals, improve the performing publicity ability of POPs and chemicals, and promote the wide implementation of pollution prevention of POPs.

➢ Publicity and training methods

Special propaganda and education column for the pollution prevention of POPs and chemicals as well as "C2C" environmental management should be established by using the website of TSWTCMC;

Brochure for the Pollution Prevention of POPs and Chemicals and *Brochure for "C2C" Environmental Management Principle* should be prepared, and issued to social public through public benefit activities such as "June 5" Environment Day;

on holidays and festivals or other time, publicity popularization should be conducted for social personnel at all level at public places such as community and school, through such methods as site explanation and panel demonstration, to improve their cognitive level of relevant contents and the scope of influence of this project. Training activities with totally about 150 people, including managers or supervisors of pollution prevention, and executive leaders, environmental monitoring personnel, and evaluation personnel for environmental impact at environmental protection bureaus of districts or counties, as well as responsible persons of key enterprises of emission reduction, should be organized.

➢ Publicity and training contents

The publicity and training contents should include at least:

① Characteristics and dangers of POPs and domestic and overseas relevant laws and regulations;

② Current environmental management situation of POPs and toxic chemicals in Tianjin City;

③ Historic origin of C2C concept and core ideology of C2C;

④ Advantages of C2C environmental management, especially for chemical management;

⑤ Whole-course environmental management of industrial product design and successful cases of "C2C" environmental management.

In addition, relevant experts and enterprise personnel should be organized to conduct project principle training and implementation effect publicity for enterprises of at least 1-2 industries except demonstrated industry, to promote the establishment of relevant management mode of other enterprises, and drive the formation of "C2C" chemical management system of other industries.

(3) Promoting emission reduction of POPs and improving area supervision and management ability

Through project implementation, the supervision and management ability of main POPs emission enterprises in Tianjin City should be improved.

- Implementing statistic report system for POPs

Statistic report system for POPs should be implemented; and basic information such as the production or treatment scale of dioxin emission sources, process kind, emission of three wastes, and pollution control devices of 10 industries in our city should be investigated, to grasp the distribution and dynamic change of dioxin emission sources.

- Organizing enterprises to carry out dioxin and specific pollutant monitoring, to grasp the emission condition of dioxin and toxic chemicals.

Representative enterprises of key industries of dioxin emission in Tianjin City should be organized to conduct monitoring, of which the main activities include selecting enterprises, researching and preparing monitoring planning, organize and implement monitoring and analyzing and researching monitoring results, to grasp the emission condition of dioxin and lay a data foundation for the research and preparation on elimination and reduction direction of POPs.

Key enterprises producing or using toxic chemicals in Tianjin City should be organized to carry out specific pollutant monitoring, including petroleum, cyanide, fluoride, and sulfide, etc. in water, and formaldehyde, benzene, xylene and phenols, etc. in atmosphere.

- Carrying out cleaner production audit for enterprises of key industries, to promote the emission reduction of dioxin

Cleaner production audit should be carried for enterprises of key industries. The main production and emission link of POPs and toxic chemicals of enterprises should be found out through cleaner production audit; and enterprises should be supervised and urged to establish pollution prevention measures, to promote enterprises to carry out emission reduction, and form the audit system for cleaner production of POPs in Tianjin City.

(4) Construction of information management ability

The environmental management information system for chemicals of Tianjin City should be established, which covers such businesses in chemical environmental management field of Tianjin City as registration of POPs and hazardous chemicals, new chemical substances and source of mercury pollution; realizes such functions as on-line filling, data report, data query, and summary and analysis, and provides such functions assisting filling and submission for enterprises as historical data query, mutual invocation among data of chemical management system, and various assistance and hints, to simplify the filling task of enterprises, and improve the filling quality of data. Also, this system can be used as an auxiliary audit tool for management departments, with powerful data query, summary and analysis functions, to assist comparison among data of chemical management system and improve the work efficiency of management departments.

(5) Construction of technical support ability

Investigation and analysis training of POPs and chemicals should be carried out specific to managers and technical personnel, and on this basis, a investigation and analysis team of POPs and chemicals with 3-5

people should be established, mainly to carry out technical researches on such aspects as investigation, assessment, and disposal for POPs and chemicals as well as C2C environmental management. This team should be established in project management office, and composed by relevant personnel of TAES and TSWTCMC, to provide long-term services for management departments.

During the implementation of the project, this team should organize implementing the following activities, to enrich its work experience and improve its practical ability of investigation and analysis; and purchase relevant R & D equipment to improve the operational ability and technical level of this team from many aspects such as hardware and software, to strengthen the technical support ability of investigation and analysis for POPs and chemicals of our City, and meet the demand of serve for competent environmental protection departments.

(1) Typical pollution site of POPs and hazardous chemicals should be selected to carry out chemical investigation and risk assessment and safe waste disposal demonstration. Report on pollutant investigation and risk assessment analysis as well as the analysis report on safe disposal effect of POPs wastes of the site should be completed.

(2) Water quality investigation of Northern Haihe River (Tianjin Section) should be carried out, during which sampling and detection should be conducted mainly specific to normal pollutants, organic pollutants, and heavy metal; and analysis of current pollution situation should be conducted for detected result. Meanwhile, combined with the industrial characteristic of Northern Haihe River (Tianjin Section) plain basin dominated by chemical engineering, petrifaction and pharmacy, the ecological risk of POPs should be analyzed, to establish the screening and assessment system for specific pollutants in water ecological function area of Northern Haihe River dominated by POPs.

(6) Construction of emergency disposal ability of POPs and hazardous chemicals

Emergency fund should be prepared for identified POPs wastes and pollution sites by communicating with Tianjin Finance Bureau, to improve the emergency disposal ability for POPs of our city.

4.4 Chemical management demonstration of automotive industry based on eco-effectiveness

Based on project principle and combined with the operation characteristic of automotive parts production industry, the C2C during the whole life cycle of project demonstrative automotive parts production industry should be tentatively determined, to reduce the utilization and emission of toxic & hazardous chemicals maximally, and form the green industrial chain of automotive plastic interiors from raw material selection (procurement), production and waste recovery.

4.4.1 Demonstrative design for eco-efficiency chemical management of automotive industry

Different industries and enterprises should be selected as demonstration. According to the current practical production management situation of enterprises, technical optimization points of enterprises should be screened on existing basis, to complete the design of project demonstrative contents.

(1) Demonstration of product design

The utilization of POPs and toxic & hazardous chemicals should be controlled, reduced, and eliminated/replaced from the source of product life cycle. Under the precondition of meeting use requirements of products, raw production material optimization of 2-3 demonstrative products should be completed through replacement of raw production materials.

(2) Demonstration of production process optimization

Based on the existing production technical process and production methods of demonstrative enterprises, combined with the construction and development planning of enterprises, relatively obvious emission links of toxic & hazardous chemicals during the spraying of automotive industry should be identified; and the project demonstration of this process technology should be completed through process improvement and technical promotion, to significantly decrease the production and emission of hazardous chemicals of this link.

(3) Demonstration of production waste recycling closed cycle

The current situation of arbitrary landfill and incineration without monitoring for defective products, leftover materials and etc. produced during the production of demonstrative enterprises should be altered, by promoting them to carry out research on recycle technology for abandoned products, to achieve the C2C principle of demonstrative products.

(4) Assisting enterprises to carry out project implementation effect assessment

Enterprises should be assisted to complete project implementation effect assessment from such aspects of demonstrative products as raw material selection, process technology improvement, and resource utilization of product wastes, of which the assessment contents should include environmental benefit assessment for emission reduction of POPs and toxic & hazardous chemicals, product property assessment caused by raw material and process improvement, and increment assessment for product economic cost caused by project implementation, at least.

Combined with the basic requirements of project environmental management and adhered to certain screening principle of demonstrative enterprises, Tianjin Aogang Auto Parts Development Co., Ltd. (hereinafter referred to as "Aogang Company"), Tianjin Printronics Circuit Corp. (hereinafter referred to as Printronics Corporation), Zhongneng Environmental Protection Renewable Resource Utilization Co., Ltd. (Tianjin) (hereinafter referred to as "Zhongneng Company") are determined to be the demonstrated enterprises of demonstrated areas in Tianjin City of this project.

Tianjin Aogang Auto Parts Development Co., Ltd., one of the project demonstrative enterprises, is an enterprise independently researching and developing interiors and exteriors, of which the main products are shown as following table:

No.	Main products
1	Steering wheel
2	Sun louver
3	Rear table
4	Car roof
5	Carpet
6	Bumper and crash bar
7	Front grille
8	Side body
9	Sealplate
10	Other pressing components

Among the products, the carpet is mainly exported to Europe, of which the quality should reach relevant EU standards. Other products are mainly produced as supporting components of inland automotive models, of which the quality should reach relevant standards of inland automotive industry or standards required by customers' automotive models.

4.4.2 Main demonstration activities and implementation planning for ecological benefit chemicals of automotive industry

As Aogang Company is a typical enterprise of automotive parts production industry, through project implementation, typical products of this company is selected as demonstration, to carry out following activities:

1) Carrying out technical optimization research based on "C2C" principle

Two typical products of demonstrated enterprises should be selected as the demonstrated products of this project. Through the ingredient detection for raw production materials and production course analysis of demonstrated products, main pollution substances and their production links should be confirmed. Combined with industrial development tendency, the technical optimization research based on "C2C" principle of demonstrative products should be carried out, including replacement feasibility research for raw materials containing POPs and hazardous chemicals and feasibility research on product waste reutilization closed cycle, to provide technical support for its industrialization.

2) Construction for industrialization production line based on "C2C" principles

The industrialization production line for demonstrative products should be built by investment based on research results, including plant construction, equipment configuration and production line debugging and operating in order to gradually complete replacement for all raw materials of demonstrative products at project implementation stage and resource recycling, closing and industrializing operation of wastes. In addition, the assessment for project implementation effect should be developed according to practical

operating condition, which should at least include assessment for product performance, assessment for discharge effect and assessment for economic costs.

3) Optimization for production technology links based on "C2C" principles

A spraying coating line should be built by investments with water paint as the raw materials by means of mechanical arm spraying coating in order to improve current condition of manual spraying coating oil paint in current demonstrative enterprises and the effect assessment should be developed according to practical operating condition at the same time, including assessment for VOCs emission reduction effects, assessment for spraying coating rate and assessment for economic costs.

4) Selection for demonstrative products

5 categories of products should be selected from interiors and exteriors in 10 categories of vehicles for the purpose of demonstration, which should be divided into steering wheel, sun louver, rear table, car roof, bumper and crash bar.

4.4.3 Production demonstration for natural degradation steering wheel and sun louver in automotive industry

- Selection for raw materials

The environmental material EPP should be used for replacing main materials of products, polyurethane for post-natural degradation of product wastes.

- Production process

The EPP foaming machines should be used instead of polyurethane foaming process in order to avoid hazard chemicals (hydrogen containing chlorofluorocarbon) during production of polyurethane.

- Product application

EPP material belongs to green plastic, the production process of which will not cause peculiar smell or hazard gas.

- Waste recycling

After discarded, the products can be degraded naturally or handled for resource recycling according to form of waste products in order to meet C2C features.

4.4.4 Production demonstration for POPs-free rear table in automotive industry

- Selection for raw materials

The POPs-free brominated flame retardants, PP plastic should be used as raw material instead of PP wood powder in order to reduce the dosage of brominated flame retardants by raw material manufacturers while reducing the demand for wood.

- Production process

The PE film bonding process should be used instead of die casting process in order to bond non-woven fabric with substrate, reduce processing temperature and reduce emission of hazard gas in plastic.

- Waste recycling

The non-woven fabric can be degraded naturally among product wastes and the PP plastics can be recycled to become the main raw materials of products in order to meet C2C features.

4.4.5 Production demonstration for environmental car roof in automotive industry

The environmental rubber powder should be used for replacing Glue 801 which includes free formaldehyde with strong pungent smell while the main materials of environmental rubber powder include potatoes, sticky rice and other plants without formaldehyde, benzene or other hazard chemicals.

The adhesive rubber powder does not discharge hazard gas during non-woven fabrics bonding substrate on car roof and glass fiber on both sides while the Glue 801 in current process will cause a lot of hazard gas and peculiar smell.

During product application, the car roof products with rubber powder will not discharge hazard gas.

4.4.6 Production demonstration for POPs-free bumper and crash bar in automotive industry

- Selection for raw materials

The POPs-free brominated flame retardants, PP plastic should be used as raw material instead of PP raw materials that include pollutants in order to reduce the dosage of brominated flame retardants by raw material manufacturers.

- Production process

The environmental water soluble paint should be used instead of oil plaint with a mechanical arm for spraying coating instead of manual spray coating in order to reduce usage amount of toxic and hazard solvent and emission of hazard gas

- Product application

The water paint belongs to green environmental coating, the application process of which does not generate peculiar smell or hazard gas.

- Waste recycling

The defective products, scraps and wastes should be recycled and used as main raw materials of products, which meet C2C principles.

By implementing projects above, the Aogang Company plans to send demonstrative products above to professional inspection institutions in order to make sure that they can meet relevant EU standards and to cultivate the productivity of vehicle assembly for international famous brands.