GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

Project Identification Form (PIF) entry – Full Sized Project – GEF - 7

Improvement of the environmental performance of the foam sector: Phase out and management of hexabromocyclododecane (HBCD) in China

Part I: Project Information

GEF ID
10163

Project Type
FSP

Type of Trust Fund
GET

Project Title
Improvement of the environmental performance of the foam sector: Phase out and management of hexabromocyclododecane (HBCD) in China

Countries
China,

Agency(ies)
UNIDO,

Other Executing Partner(s)	Executing Partner Type
	Government

GEF Focal Area

Chemicals and Waste

Taxonomy

Learning, Capacity, Knowledge and Research, Capacity Development, Knowledge Generation, Innovation, Knowledge Exchange, Focal Areas, Influencing models, Stakeholders, Gender Equality, Demonstrate innovative approache, Private Sector, Non-Grant Pilot, SMEs, Large corporations, Type of Engagement, Participation, Information Dissemination, Partnership, Consultation, Beneficiaries, Local Communities, Communications, Education, Behavior change, Awareness Raising, Public Campaigns, Civil Society, Non-Governmental Organization, Academia, Community Based Organization, Trade Unions and Workers Unions, Seminar, Workshop, Training, Field Visit, South-South, North-South, Targeted Research, Chemicals and Waste, Gender results areas, Green Chemistry, Best Available Technology / Best Environmental Practices, Industrial Emissions, Disposal, Sound Management of chemicals and waste, Persistent Organic Pollutants, New Persistent Organic Pollutants, Eco-Efficiency, Waste Management

Rio Markers

Climate Change Mitigation

Climate Change Mitigation 0

Climate Change Adaptation

Climate Change Adaptation 0

Duration

60 In Months

Agency Fee($)

1,134,000

Submission Date

A. Indicative Focal/Non-Focal Area Elements

Programming Directions	Trust Fund	GEF Amount($)	Co-Fin Amount($)
CW-1-1	GET	12,600,000	88,280,000
	Total Project Cost ($)	**12,600,000**	**88,280,000**

B. Indicative Project description summary

Project Objective

Project Objective: To improve the environmental performance of the foam sector in China through the phaseout, introduction of HBCD alternatives and environmentally-sound management of HBCD-containing EPS/XPS foams.

Project Component	Financing Type	Project Outcomes	Project Outputs	Trust Fund	GEF Amount($)	Co-Fin Amount($)
1. Policy and Regulatory Framework	Technical Assistance	Outcome 1.1 Policy and regulatory framework strengthened on the management and supervision of HBCD and HBCD-containing EPS/XPS polymer foam products in China	Output 1.1.1 National legislation, regulatory framework and technical specifications to ban the production, usage, import and export of HBCD used in EPS/XPS in China. Output 1.1.2 Regulatory policies developed to reduce and eliminate the application of HBCD in EPS/XPS polymer foams, with focus on environmental quality standards and chemical limits of HBCD in EPS/XPS polymer foams and all potential HBCD users; Output 1.1.3 National managerial capacity, enforcement, supervision policies, monitoring methods of HBCD and HBCD-containing products strengthened to coordinate and monitor and establish problem-finding mechanism for the polymer foam production sector	GET	1,260,000	6,300,000

2. Promotion of technology transfer and investment on the production of HBCD alternatives and application of alternatives to the XPS/EPS foam sector	Investment	Outcome 2.1 Total ban on the production of HBCD in China Outcome 2.2 Prohibition of HBCD usage in the production of polymer foams or application of other alternatives through the promotion of BAT/BEP	Output 2.1.1 HBCD production lines closed down or converted to HBCD alternatives Output 2.1.2 Replication activities on the best alternatives undertaken in at least 5 companies and outcomes promoted national wide Output 2.2.1 Flame retardant alternatives for HBCD and alternative insulation materials for HBCD-containing EPS/XPS foams evaluated. Output 2.2.2 Demonstration activities on at least 4 types of alternative materials for EPS/XPS foam manufacturing through technology transfer and research implemented Output 2.2.3 Private Public Partnership (PPP) to promote venture capital investment and technology transfer on switching to HBCD-alternatives established.	GET	6,330,000	49,740,000
3a. Implementation of environmentally-sound management (ESM) of EPS/XPS foam wastes containing HBCD	Technical Assistance	Outcome 3.1 ESM of HBCD-containing EPS/XPS foams implemented	Output 3.1.1 Build and periodically update National inventory and data base on HBCD stocks and waste. Output 3.1.2 Develop HBCD waste identification and management methods on HBCD and HBCD-containing wastes disposal	GET	100,000	720,000
3b. Implementation of environmentally-sound management (ESM) of EPS/XPS foam wastes containing HBCD	Investment	Outcome 3.1 ESM of HBCD-containing EPS/XPS foams implemented	Output 3.1.3 BAT/BEP demonstration of environmentally sound management and disposal of HBCD waste including assessment, comparison and demonstration of different treatment technologies, including volume reduction, HBCD extraction, HBCD decomposition, disposal, circular economy approach for bromine and EPS/XPS recovery	GET	3,380,000	23,660,000

4. Information dissemination, capacity building and knowledge management	Technical Assistance	4.1 Improved technical and regulatory capacity on the management of HBCD and HBCD-containing wastes 4.2 Knowledge management platform set up to contribute to regional/global actions on HBCD management.	Output 4.1.1 Technical trainings for various stakeholders (enterprises, government staff, technicians, researchers etc.) designed and implemented to strengthen capacity on HBCD and the EXPS/EPS foam sector, in general. Output 4.1.2. Awareness raising activities undertaken for various relevant stakeholders including the general public, NGOs, women and youth sector etc. Output 4.2.1 Establishment of a knowledge hub on HBCD and the XPS/EPS foam sector to disseminate lessons learned on a national, regional and global scale.	GET	630,000	3,780,000
5. Monitoring & Evaluation	Technical Assistance	Outcome 5.1 Effective monitoring and evaluation of project impact and sustainability implemented	Output 5.1 Periodic monitoring and evaluation implemented Output 5.2 Midterm and terminal evaluation report conducted	GET	300,000	1,880,000
				Sub Total ($)	12,000,000	86,080,000

Project Management Cost (PMC)

GET	600,000	2,200,000
Sub Total($)	**600,000**	**2,200,000**
Total Project Cost($)	**12,600,000**	**88,280,000**

C. Indicative sources of Co-financing for the Project by name and by type

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Government	Ministry of Ecology and Environment	Grant	Recurrent expenditures	160,000
Government	Ministry of Ecology and Environment	In-kind	Recurrent expenditures	640,000
Government	Local government and local Environmnetal Protection Bureaus of demonstration regions	In-kind	Recurrent expenditures	6,000,000
Private Sector	HBCD production and EPS/XPS production enterprises	Equity	Investment mobilized	81,000,000
Donor Agency	Bavarian State Ministry, Germany	Grant	Investment mobilized	200,000
GEF Agency	UNIDO	Grant	Recurrent expenditures	180,000
GEF Agency	UNIDO	In-kind	Recurrent expenditures	100,000
			Total Project Cost($)	**88,280,000**

Describe how any "Investment Mobilized" was identified

Private sector investment on Component 2 and 3 is envisaged. Demonstration activities on alternative materials for HBCD in the EPS/XPS sector will be undertaken. BAT/BEP demonstration of environmentally sound management and disposal of HBCD wastes will also be implemented. These activities will require private sector participation and investment. The Bavarian State Ministry of Germany has mobilized grant for a project on HBCD management partnership with China.

D. Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNIDO	GET	China	Chemicals and Waste	POPs	12,600,000	1,134,000	13,734,000
				Total GEF Resources($)	**12,600,000**	**1,134,000**	**13,734,000**

E. Project Preparation Grant (PPG)

PPG Amount ($)	PPG Agency Fee ($)
300,000	27,000

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)
UNIDO	GET	China	Chemicals and Waste	POPs	300,000	27,000
				Total Project Costs($)	**300,000**	**27,000**

Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	900000.00	0.00	0.00	0.00
Expected metric tons of CO_2e (indirect)	0.00	0.00	0.00	0.00

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	900,000.00			
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting	2022			
Duration of accounting	5			

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)				

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)

Indicator 9 Reduction, disposal/destruction, phase out, elimination and avoidance of chemicals of global concern and their waste in the environment and in processes, materials and products (metric tons of toxic chemicals reduced)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
18,097.00	0.00	0.00	0.00

Indicator 9.1 Solid and liquid Persistent Organic Pollutants (POPs) removed or disposed (POPs type)

POPs type	Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
Hexabromocyclododecane (HBCDD)	18,000.00			

Indicator 9.2 Quantity of mercury reduced (metric tons)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.3 Hydrochloroflurocarbons (HCFC) Reduced/Phased out (metric tons)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
97.00			

Indicator 9.4 Number of countries with legislation and policy implemented to control chemicals and waste (Use this sub-indicator in addition to one of the sub-indicators 9.1, 9.2 and 9.3 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
1			

Indicator 9.5 Number of low-chemical/non-chemical systems implemented, particularly in food production, manufacturing and cities (Use this sub-indicator in addition to one of the sub-indicators 9.1, 9.2 and 9.3 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 9.6 Quantity of POPs/Mercury containing materials and products directly avoided

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
10,800.00			

Indicator 11 Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	200			
Male	800			
Total	1000	0	0	0

Provide additional explanation on targets, other methodologies used, and other focal area specifics (i.e., Aichi targets in BD) including justification where core indicator targets are not provided

Part II. Project Justification

1a. Project Description

1) Global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description)

1. Hexabromocyclododecane (HBCD) is a persistent organic pollutant which in May 2013 was listed in Annex A of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) for its elimination. In November 2014, one year after notification, the amendment to add this substance entered into force for most countries party to the Convention and, therefore, these countries will have to prepare action plans to ban and/or restrict the uses/applications, productions, import, and export of HBCD as well as to eliminate stockpiles and obsolete HBCD.

2. HBCD (CAS Number 3194-55-6) is a poly-brominated white crystalline powder. Commercial HBCD is mainly composed of three isomers, of which gamma-HBCD accounts for about 70-95%, while alpha and beta-HBCD range between 5-30%. It is mainly used as a flame retardant additive, reducing flammability during the service life of vehicles, buildings or articles, as well as protection while stored. Its primary application is in the manufacturing of extruded polystyrene and expanded polystyrene (XPS and EPS, respectively) boards, which are used for insulation purposes in the building industry. Other uses are in upholstered furniture, automobile interior textiles, car cushions and insulation blocks in trucks, packaging materials well as electric and electronic equipment.

3. The current production processes in the EPS and XPS foam industries have a number of impacts on the environment, including the emission of ozone depleting substances (ODS) like hydrochlorofluorocarbons (HCFCs) used as blowing agents, and the emission of Persistent Organic Pollutants (POPs) flame retardant HBCD. HBCD has a strong potential to bioaccumulate and biomagnify. It is persistent in the environment, and has a potential for long-range environmental transport. It is very toxic to aquatic organisms. Though information on the human toxicity of HBCD is to a great extent lacking, vulnerable groups could be at risk, particularly to the observed neuroendocrine and developmental toxicity of HBCD.

4. The latest information available on the production of HBCD, as presented by the POPRC in its eighth meeting, indicates that the estimated total production in 2011 amounted to 31,000 metric tons, almost exclusively produced in China, Europe and the United States of America. Country-level information has been facilitated by these producers, indicating that China is the greatest consumer among developing countries.

5. Whereas the production and consumption of HBCD in developed countries is currently restricted (cases of Europe and the United States) or even banned (Japan, Norway), some developing countries have requested to extend its use in the XPS and EPS sectors until November 2021, in line with the exemption provided by decision SC-6/13 of the Stockholm Convention for these two sectors in particular.

6. There are several available alternatives to HBCD-based flame retardants in commercial use globally. The most famous alternative is brominated SBS , which is styrene and butadiene copolymer bromide, a large polymeric brominated flame retardant (polymeric flame retardant PolyFR; CAS No 1195978–93–8) jointly developed by some overseas countires and largely used as a substitution for HBCD in the U.S, European countries, Japan and some western Asian countries. Tetrabromobisphenol A bis (2,3- dibromopropyl ether) and Tris (2,3- dibromopropyl) isocyanuric acid ester (TBC) also are two substitutes for HBCD. Due to the aromatic structure and the bromine, these alternatives have the potential to form brominated dioxins at end of life disposal in particular with non-BAT thermal treatment which is common practice in developing countries (Shaw et al., 2010). Also the UV degradation of brominated SBS resulted in the

formation of brominated aromatic substances (Koch and Dundua, 2017). Furthermore, they rely on the same chemical mechanism as HBCD to achieve flame retardant properties during fires/combustion, so they are likely to exhibit fire toxicity as well (Stec and Hull, 2011). Such considerations represent barriers for final users to take an optimal decision on the best alternative to be used in each case.

7. In 2000, the bromine industry aimed to recover bromine from BFR containing plastic/polymers in large scale (BSEF, 2000). There were pilot plants established and pilot tests conducted to recover bromine from BFR polymers by thermal destruction and HBr recovery (Boerrigter et al., 2002; Vehlow et al., 2002). The recovery of bromine from BFRs in polymers has not been implemented in full scale until very recently. A full-scale bromine recovery plant from EPS/XPS is planned in The Netherlands (Tange et al., 2016) is being constructed.

8. For the recovery and recycling of EPS/XPS from HBCD treated EPS/XPS a suggested approach is dissolving the HBCD containing EPS/XPS in solvents and to separate the polystyrene from the HBCD (CreaCycle http://www.creacycle.de/en/projects/recycling-of-expanded-poly-styrene-eps/eps-circle.html) . The process has been invented by Fraunhofer Institute and currently a full scale plant is constructed in The Netherlands including the aim to also recover bromine from the separated HBCD fraction (http://www.creacycle.de/en/projects/recycling-of-expanded-poly-styrene-eps/polystyrene-loop-2016.html).

9. Releases of HBCD may occur during its manufacture and use in a variety of products accounting for its environment and health impacts. Releases occurring after disposal of these products in landfills or by incineration are also thought to be significant. Thus, proper management of HBCD-containing wastes is deemed important and recycling of products containing the substance is prohibited.

2) The baseline scenario or any associated baseline projects

10. In accordance with the provisions of paragraph 4 of Article 25 of the Stockholm Convention on Persistent Organic Pollutants, any amendment to Annex A, B or C shall enter into force only upon the deposit of its instrument of ratification, acceptance, approval or accession with respect thereto. In the case of China, on 2nd July, 2016, the twenty-first meeting of the twelfth session of the Standing Committee of the National People's Congress made the decision on ratifying the amendment to the Stockholm Convention on Persistent Organic Pollutants to list HBCD. On 26th December, 2016, the amendment came into force in China.

11. Parties may register for specific exemptions listed in Annex A or B pursuant to paragraph 3 of Article 4. These specific exemptions have a limited time frame and shall expire five (5) years after the date of entry into force of the Convention with respect to that particular chemical (paragraph 4 of Article 4), unless an earlier date is indicated in the Register by the Party or an extension is granted by the Conference of the Parties under paragraph 7 of Article 4. China has applied for the specific exemptions for five years on the production of HBCD for EPS/XPS and use of EPS/XPS containing HBCD in building insulation in accordance with the provisions of Part VII of the Annex A citing that it will take some time to transition from HBCD to alternatives in production and use.

Overview HBCD production and use in China

12. In the 1980s, China began to introduce EPS board production technology and applied it to the field of building insulation. In recent years, the number of Chinese EPS flame retardant insulation board production enterprises has reached more than 3000, in which large-scale enterprises are around 100 with an annual output of more than 5000 metric tons. China has become the world's largest producer and consumer of EPS insulation materials. Enterprises distribution expanded from 2010 in Jiangsu Province, Zhejiang Province, Guangdong Province to Fujian Province, Shandong Province, Tianjin City, Hebei Province, Xinjiang Autonomous Region, and other places by the end of 2016. In 2016, there were about 40 EPS bead production enterprises, mainly located in the eastern coastal area. The production capacity of EPS reached 6.50 million tons.

13. The XPS foam industry in China started relatively late but the number of enterprises has developed rapidly. At present, China has more than 400 XPS production lines, and the majority of enterprises is small and medium-sized private enterprises with only 1 production line, while the number of large scale enterprises with 10 production lines and above is only about 10. According to the relevant industry associations' statistics, in 2017 production of XPS insulation board containing HBCD reached 152,300 tons, mainly distributed in Shandong, Jiangsu, and Zhejiang Provinces.

14. Since the regulations on the use of flame retardants in building material were promulgated and implemented by relevant government authorities, China has become a leading country in the production and application of HBCD. According to the industry associations' statistics, the Chinese annual output of HBCD in 2015, 2016, 2017 were 18000, 21000, 18000 metric tons, respectively. Since 2017, the Chinese annual production of HBCD remained at 18000 metric tons. The manufacturers are mainly distributed in Shandong, Jiangsu and Hebei provinces. Since the beginning of 2010, China's HBCD output has been used only in the production of EPS and XPS, accounting for 80% and 20%, respectively. The production of EPS beads containing HBCD in 2015, 2016, and 2017were 1.40, 1.28, and 1.07million metric tons. In 2017, China's flame retardant EPS production was about 1.07 million metric tons. Typically, the concentration of HBCD in B1 class EPS is about 0.8%, and 8,560 metric tons HBCD was used. In order to achieve the combustion performance of class B1 XPS, 4% of HBCD was added and the total HBCD consumption in this sector was 6100 tons in 2017. Thus, the total consumption of HBCD in EPS and XPS was 14,660 metric tons in 2017.

15. Most of the HBCD producers use semi-automated production line and only a small number of enterprises use advanced automated production lines. Pollution control technology of HBCD production in China is relatively backward. During the production processes of HBCD and EPS beads containing HBCD, the collected waste gas was treated by alkali absorption, adsorption and oxidation in oxidation washing tower, membrane absorption, and activated carbon adsorption; wastewater was treated by biological treatment or sewage treatment equipment processing after catalytic oxidation; produced waste residues containing HBCD were treated as hazardous solid waste and disposed through incineration.

16. In the production of HBCD chemicals and HBCD-containing EPS/XPS insulation board, the emissions of HBCD in the flue gas and waste water were 3.5 tons/y and 4.9 tons/y, respectively. In the life cycle of HBCD, waste gas, water and solid waste are likely to pollute the storage, production, and management sites. Large amount of dust containing HBCD pollutes the workshop and the surrounding environment. HBCD manufacturers, HBCD-containing insulation board production enterprises, and storage facilities may be considered contaminated sites.

17. During the years 2009-2017, the amount of HBCD used as flame retardant in external insulation materials was 111,900 tons. Huge amount of insulation materials containing HBCD may become a persistent source of HBCD environmental emissions, and the insulation board wastes may become a major source of HBCD environmental emissions in the future.

18. During the production of HBCD chemicals and flame retardant insulation materials containing HBCD, a relatively small amount of solid wastes (treated as hazardous waste) is generated. However, previously used HBCD-containing insulation board maybe a hazardous solid waste issue in future years. In the building industry, China began to use insulation board containing HBCD since the 1980s. Especially in recent years, a large number of HBCD-containing insulation board has been used in construction industry. Therefore, a large number of HBCD-containing flame retardant insulation plate wastes and construction wastes would be generated. It is expected that in 2035, China will produce nearly ten thousand tons of HBCD construction waste per year, which need to be properly managed to mitigate impacts to human health and the environment.

Baseline Projects

19. To meet its obligation to the Stockholm Convention, China has successfully established a number of government departments to implement the coordination with the support of "Building the capacity of the People's Republic of China to implement the Stockholm Convention on POPs and develop a National Implementation Plan" and "Strengthening Institutions, Regulations and Enforcement (SIRE) Capacities for Effective and Efficient Implementation of

the National Implementation Plan in China". Many administrative departments, including the Ministry of Ecology and Environment, the Ministry of Foreign Affairs, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Commerce, the Ministry of Science and Technology, the Ministry of Housing and Urban-Rural Development, the State Administration of Work Safety, the Ministry of Industry and Information Technology, the National Health and Family Planning Commission have formed an organic collaborative framework to ensure compliance to the Convention.

20. On policy framework, China has several laws and regulations relevant to HBCD including the following:

• In 2014, HBCD was included in the "Key Environmental Management Hazardous Chemicals Inventory" released by the MEE.
• In 2015, HBCD was included in the "Catalogue of Hazardous Chemicals (2015 Edition)" and the "Catalogue of Products with High Pollution and High Environmental Risk (2015 Edition)". All processes of production, storage, use, transportation and operation shall be subject to safety supervision and management and environmental management control in accordance with the requirements of the relevant management regulations and systems such as "Hazardous Chemicals Safety Management Regulations"
• On December 26, 2016, 11 ministries, including MEE, MFA and NDRC jointly released effective notice of the "Stockholm Convention on Persistent Organic Pollutants, New Amendments of Hexabromocyclododecane". Since December 26, 2016, the production, use, import and export of HBCD have been banned, except for the specific exempted uses for EPS and XPS in buildings.
• HBCD has been included in the "China's Toxic Chemicals Toxicity List (2018)" published in 2017 and "List of Preferential Control Chemicals (First Batch)".
• According to the announcement, as of January 1, 2017, enterprises that import or export HBCD should apply to the MEE for the registration of the environmental management certificate for the import of toxic chemicals and the import and export environment for toxic chemicals Manage Release Notes. The import and export uses comply with the provisions of the Stockholm Convention, that is, for the production or use of EPS and XPS before the expiry date of the specific exemption registration (December 25, 2021).

21. From the aspect of identification of the hazards of chemicals and management of hazardous chemicals, scientific and complete categorizing and labeling system helps with the effectiveness of risk assessment and information exchange, contributing to efficient risk management of chemicals. In "Environmental Labeling Products Technical Requirements of Voice Recorder (HJ 2510-2012)" and "Environmental Labeling Products Technical Requirements of Color TV (HJ2506-2011)", HBCD was added in the required environmental labeling of the products. As for XPS and EPS containing HBCD, however, no regulations are yet formulated in terms of labeling for presence of POPs.

22. The Fire Department under the Ministry of Public Security formulated and promulgated the Management Measures of Flame Retardant Products Logo (Trial) in 2007, including flame-retardant logo style, application method, application, sampling, inspection, tracking and supervision of flame retardant, clarifying the responsibilities of supervision and management of flame retardant products, strengthening the unified supervision and management of fire retardant products logo, and the effective protection of personal and property safety.

23. The regulations and standards on building exterior insulation material indirectly affect the amount of HBCD in the insulation material. In September 2009, the Ministry of Public Security and the Ministry of Construction jointly issued the regulation: Civil Building External Wall Insulation System and External Decorative Fireproof Interim Provisions, in which exterior wall insulation materials in most of the civil buildings require class A and B1 and a few buildings can use class B2. The revised Code for Fire Prevention in Building Design (Draft) makes a similar requirement. According to the above criteria, the construction industry generally chooses class B1 insulation materials.

24. On June 8, 2013, in the "Legal Interpretation on the Handling of Criminal Cases of Environmental Pollution" of Supreme Court of the Judicial Committee, HBCD has been identified as "toxic substances". In 2013, HBCD was incorporated into the first part of the "high pollution, high environmental risk" products of Comprehensive Catalogue of Environmental Protection (2013 Edition) issued by the Ministry of Environmental Protection.

25. Considering the number and extent of regulations in China that are relevant to HBCD usage, there are still no specific requirements for the identification of POPs contained in insulation materials. Pollutant discharge standards still do not include HBCD, thus related wastes are treated as general industrial wastes and there is no systematic monitoring and evaluation of HBCD from sources. There are still no emission standards, environmental standards and monitoring methods related to HBCD in China. Although GC-MS, LC-MS detection methods for HBCD in environmental samples have been developed in some institutes and relevant monitoring agencies, the standard methods for HBCD in environmental samples have not been established. Also, labeling policies and procedures on HBCD in EPS/XPS are not yet developed in China.

26. At present, many developed countries, including European countries, have developed styrene and butadiene copolymer brominated SBS, tetrabromobisphenol A bis (2,3- dibromopropyl ether), and tris (2,3- dibromopropyl) isocyanuric acid ester as substitutes for HBCD.

In terms of HBCD alternatives, China has started to investigate the use of brominated SBS in the production of EPS and XPS as alternative to HBCD. But due to the small scale of production, the replacement cost was 15% ~ 25% higher than that using HBCD; at the same time, Chinese manufacturers have carried out the production pilot of flame retardant tetrabromobisphenol A bis (2,3- dibromopropyl) ether; the TBBPA is still in the development stage in China and not ready for industrial production. Likewise, manufacturing and processing facilities need to significantly invest in new equipment in order to shift to alternative flame retardants. There are some commercially available alternatives, for example thermosetting polystyrene foamed polymer and polyurethane boards, for EPS/XPS insulation board. However, most of them are still at a small scale production, command higher pricing and has a lower market share.

27. To meet its obligation of the Montreal Protocol, MEP/FECO, GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) and UNIDO jointly developed the Sector Plan for Phase out of HCFCs in the XPS Foam Sector in China (Phase I and Phase II). The Sector Plan for Phase I was submitted to the 62nd ExCom Meeting in August 2010 and approved in July 2011 with grant fund of 50 million dollars. All targets set in the Phase I has been completed in 2015 with 25 phase-out contracts and a total of 9589.98 tons of HCFCs reduced. Also, in accordance with the phase-out activities under Phase I, technical standards were formulated, alternative technologies were developed and the Production Safety Whitepaper was revised.

Phase II was approved at the 77th ExCom meeting with a grant fund of about US$112 Million to be released for HCFCs phase-out activities, TA activities and project management. As per the sector plan, HCFCs are expected completely phased out by 2026. In terms of enterprise renovation activities, this project has already signed phase-out contracts with 10 enterprises in 2016 and 2017 and phased out 4,296.796 tons HCFCs.

The activities in the ongoing HCFC phase out project may be linked to the current project on assessing the use of HBCD alternatives in the XPS sector.

28. UNIDO builds on a strong and early program to support China in the implementation of the Stockholm Convention, including the implementation of GEF funded projects, and a growing program related to waste and pollution management. The action plan on HBCD is highly concerned in the recently published The People's Republic of China National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (enlarged), which was updated by UNIDO and China with GEF fund. UNIDO also works with China over the last two decades to implement sector plans for ODS control. Similarities between HBCD and ODS issues include: a large number of diverse stakeholders for which different types of incentives are required to influence phase-out; the continuing use of these chemicals subject to sanction from international markets; targeted beneficiaries of the project are private entities; and the phase-out involves conversion of chemical and/or production processes at enterprise level. Moreover, the counterpart is familiar with tools and approaches employed by ODS projects for transferring technology and financial assistance to private enterprises. This existing knowledge is highly relevant to the proposed project.

29. Several research works have also been undertaken by Chinese universities and researchers with regard HBCD. From an initial material and substance flow analysis on EPS/XPS done by researchers from Peking University, a large stockpile of HBCD-containing EPS/XPS and related stocks and impacted buildings is present in China and needs urgently to be addressed to avoid further and future pollution (Li et al., 2016). Currently, however, information on the disposal of

insulation boards containing HBCD highlights that management of such wastes is not appropriate and that considerable release occurs at the end of life. It is expected that this pollution will increase with increasing HBCD containing EPS/XPS waste volumes in the future.

30. A socio-economic analysis (SEA) was also conducted by Peking University applying the case of HBCD phase-out in China. The study indicates that, under the possible scenarios of 10 years and 5 years, the economic costs of HBCD phase-out in China would be between 9.032 and 19.021 billion RMB (USD 1.4–2.8 billion). Although the total economic costs seem to be significant, it would only have a marginal impact on the house building industry with a likely cost increase by about 0.07‰–0.14‰. Meanwhile, the HBCD phase-out may render significant environmental and health benefits (Zhu et al., 2016).

31. In China, no attempt on the recovery of bromine from BFR containing polymers has been reported and considering that the country does not have a good source for bromine, bromine recovery from discarded HBCD-containing XPS/EPS foams could be explored. China has officially adopted the framework of circular economy in 2002 (Geng and Doberstein, 2008) and such large upcoming waste flow should be assessed for recovery of resources.

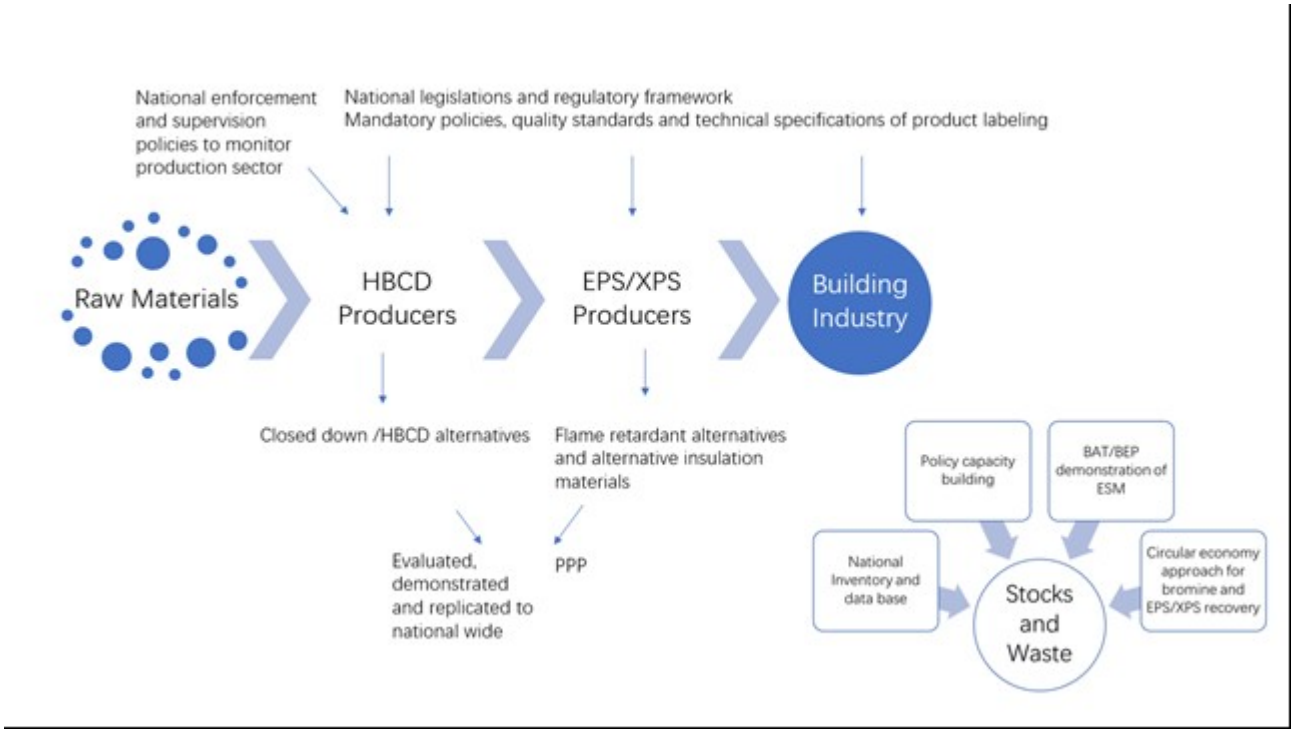
32. In terms of awareness raising, China, in recent years, has carried out a number of large-scale promotional activities, through newspapers, television, the Internet, and other media to popularize the POPs hazards. In 2003, China set up a national leading group for the implementation of the plan, and in 2005 a national coordination group for the implementation was set up. In the past decade, public awareness on POPs issues has been further raised. However, the country has not yet carried out HBCD-related information awareness-raising education; most stakeholders (including users, construction industry, demolition industry, and waste management sector) and the public have insufficient understanding of the problem and actions are needed. There is currently an overall lack of HBCD environmental awareness among HBCD producers, users and the public.

33. The LfU Bayerisches Landesamt für Umwelt with their ongoing project on setting up a POP Coordination Center for the Environment aims at strengthening the international cooperation regarding POPs issues between Bavaria and China with focus on HBCD and its replacement in the foam sector and HBCD wastes disposal. The main activities include exchange of experts on HBCD management and study visits and workshops. As per the project document, the involvement of Shandong stakeholders is envisaged.

34. Considering the initiatives undertaken so far and even given the exemptions provided by the Stockholm Convention on the use of HBCD in the EPS and XPS sectors, there are, obviously, identified gaps for China to comply with the HBCD amendment. These gaps encompass laws and regulations, product labeling, public awareness, alternative technologies, information on HBCD waste inventory and technologies for HBCD wastes disposal. The current project aims to remove the barrier and address the gaps that would allow China to fully address the HBCD issues in the country.

3) The proposed alternative scenario, with a brief description of expected outcomes and components of the project

35. The aim of the current project is to improve the environmental performance of the foam sector in China through the phase-out, introduction of HBCD alternatives and environmentally-sound management of HBCD-containing EPS/XPS foams. With the assistance of the GEF, China plans to improve HBCD management policies, regulations and standards, prohibit new and expansion of enterprises producing/using HBCD, limit the production and use of HBCD, identify the EPS and XPS flame retardant products containing HBCD in the entire life cycle, develop and introduce alternative production technology of flame retardant insulation board without HBCD, encourage and support production of alternatives to HBCD and flame retardant insulation materials containing HBCD, strict control of emissions of HBCD, carry out survey of HBCD potential waste and contaminated sites, develop environmental sound technology of potential HBCD waste and contaminated sites, develop environment monitoring technology and carry out environmental monitoring activities, carry out environmental protection propaganda, raise public environmental awareness. Figure 1 below summarizes the project framework.



The following provides the details of the project components:

Component 1. Policy and regulatory framework

Outcome 1.1 Policy and regulatory framework strengthened on the management of HBCD and HBCD-containing EPS/XPS polymer foam products in China

36. The proposed project will support the improvement of the current governance for an environmentally sound management of HBCD production and HBCD-containing products in China. The component will be led by the Ministry of Ecology and Environment in coordination with various relevant ministries and stakeholders. The main outputs include the development of the following regulations and policies:

• National legislation, regulatory framework and technical specifications to ban the production, usage, import and export of HBCD used in EPS/XPS in China.
• National regulatory policies to reduce and eliminate the application of HBCD in EPS/XPS polymer foams, HBCD quality standards for EPS/XPS polymer foam to eliminate HBCD, with focus on environmental quality standards and mandatory policy to label HBCD in EPS/XPS polymer foams and all potential HBCD users;
• Product labeling policies and regulations developed and promoted for proper identification and management of HBCD-containing products and articles.

The project will also support the research of HBCD and related products and their substitute products, construction of supporting testing capabilities for supervision, strengthening of managerial and enforcement capacity of relevant stakeholders to coordinate and monitor the polymer foam production sector.

Component 2. Promotion of technology transfer and investment on the production of HBCD alternatives and application of alternatives to the XPS/EPS foam sector

Outcome 2.1 Total ban on the production of HBCD in China

37. The proposed project will work with HBCD producers to close down production or convert to the production of HBCD alternatives. By virtue of the 5-year exemption granted to China by the Stockholm Convention, China would need to close down HBCD production by 2021.

Outcome 2.2 Prohibition of HBCD usage in the production of polymer foams or application of other alternatives through the promotion of BAT/BEP

38. The need to switch to HBCD alternatives requires an in-depth analysis of available options. This may be conducted in coordination with research institutes in China and in collaboration with international institutions already engaged in the research, pilot testing or technology transfer of HBCD alternatives. The current project also aims at assessing not only polymeric flame retardants but also other potential alternatives which are proposed by manufacturers or those under development. In addition, the project will put forward "Green Chemistry" solutions, where fire safety is considered not only in the foam but also the overall building structure.

39. The project also envisages the implementation of demonstration activities on at least 4 types of alternative materials for EPS/XPS foam manufacturing through technology transfer and research implemented. Replication activities on the best alternatives will also be undertaken in at least 5 companies. A set of criteria on the selection of the partner industries will be developed during the PPG stage.

40. Establishment of Private Public Partnership (PPP) to promote venture capital investment and technology transfer on switching to HBCD-alternatives will also be undertaken.

Component 3:Implementation of environmentally-sound management (ESM) of EPS/XPS foam wastes containing HBCD

Outcome 3.1 ESM of HBCD-containing EPS/XPS foams implemented

41. As initially mentioned, huge amount of HBCD was used in insulation foams in the construction industry and insulation board wastes may become a major source of HBCD environmental emissions in the future . Thus the project aims to build and periodically update a national inventory and database on HBCD stocks and waste. It also proposes to develop HBCD waste identification methods/standards and regulation on the disposal of HBCD and HBCD-containing wastes.

42. BAT/BEP measures will be identified, implemented and demonstrated or the environmentally sound management and disposal of HBCD wastes. This will also include the assessment, comparison and demonstration of different treatment technologies that maybe applicable and economically-viable for the disposal of HBCD wastes. The project also aims to assess the possibility of a circular economy approach for bromine recovery and EPS/XPS recovery and develop a pilot facility to undertake such activity.

Component 4. Information dissemination, capacity building and knowledge management

Outcome 4.1 Improved technical and regulatory capacity on the management of HBCD and HBCD-containing wastes

43. Technical information on the management of HBCD, HBCD-containing products and wastes will be disseminated through workshops for various stakeholders including enterprises, government staff, researchers etc. This component will help China to develop a qualified base of professional experts in the field of HBCD management and will be beneficial in the phase out and disposal of HBCD and HBCD-containing foam wastes.

44. Awareness raising activities for the public sector will be carried out to disseminate information on the adverse effects of POPs to human health and the environment and on HBCD, in particular. This would also allow collection of some required information in building up the inventory and data base on HBCD in the country.

Outcome 4.2 Knowledge management platform set up to contribute to regional/global actions on HBCD management.

45. In Asia, China remains to be one of the top countries producing excellent research work on POPs. Several institutes have also embarked on HBCD researches. Thus, it is envisage that the outputs of the proposed project will contribute to the establishment of a knowledge hub on HBCD and the XPS/EPS foam sector to disseminate experiences and lessons learned on a national, regional and even, at a global scale. It is envisaged that the knowledge hub will be set up in one of the leading universities/research institutes in China.

46. The project will also contribute to the depository of information of the Stockholm Convention Secretariat on addressing HBCD issues and Convention obligations.

Component 4. Monitoring and evaluation

Outcome 4. Effective monitoring and evaluation of project impact and sustainability implemented

47. An effective monitoring and evaluation process of project impact and sustainability will be designed and implemented, including setting a periodic review process to monitor the quality and the state of progress of the project. Gender issues and environmental and social safeguards will be fully integrated in the project's activities.

4) Alignment with GEF Focal Area and/or Impact Program Strategies

48. The project falls within the GEF-7 Chemicals and Wastes strategy, more particularly under Chemicals and Wastes Industrial Chemicals Program (CW 1-1) which aims at strengthening sound management of industrial chemicals, and their wastes through better control and reduction and/or elimination. It will assist China to reduce and eliminate POPs listed in the Stockholm Convention by supporting the application of technologies, techniques and approaches for eliminating HBCD in processes and products.

5) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and co-financing;

49. As discussed above, the baseline projects in China are firstly related to the government's recent initiatives focused on the inventory of HBCD's current consumption and, secondly, to the average annual investments manufacturers undertake in order to maintain the production lines optimized and operative. Despite the fact that research on appropriate alternatives to replace HBCD is considered as essential, none of the above-mentioned initiatives includes such researches due to its high specialization and international dimension. Therefore, the incremental costs in these initiatives are linked to the additional budget required to identify the appropriate alternatives to HBCD.

50. The annual investments normally assumed by companies need to be increased in order to convert the production lines to use alternative flame retardants. This conversion relates to the installation of appropriate fire retardant feeding systems, where needed, and/or the adaptation of equipment and processes for obtaining production optimization with the new substance. The certification of products using such a substance is the last element to be considered in the incremental costs at industrial level. Regarding costs, both fixed and operating costs have to be considered when referring to the switch from one flame retardant to another. Fixed costs here relate to the cost of the development work, end-product certification, or equipment change. Manufacturing and processing facilities may need investment in new equipment in order to shift to alternative flame retardants. It also contains the cost of research and development endeavors which may not succeed in finding an efficient flame retardant alternative.

51. Likewise, the operating costs are considered incremental as it reflects the premium price of the HBCD-alternative flame retardant (raw) material cost. The costs of manufacturing are heavily dependent on the costs of these materials, but the degree of this dependency varies among the flame retardants and the current supply of each. In all cases early adopters of HBCD-alternatives are facing a higher cost compared with manufacturers not switching to non-Stockholm Convention listed alternatives. Therefore, the risk and cost that would need to be assumed by XPS and EPS manufacturers in developing countries for the selection of the most appropriate alternative and the adaptation of the production lines for the new substance are also considered in this project as barriers for the phase-out of HBCD, which needs to be addressed.

52. The project components for which funding from the GEF is requested, are strictly linked to the incremental costs identified, and will contribute to both setting the basis for a correct selection and usage of alternatives to HBCD, and also facilitating and incentivizing an optimal shift to these alternatives by companies.

6) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

53. The project seeks to phase out HBCD production and apply BAT/BEP for the key acceptable purposes for HBCD consumption in EPS and XPS, the specific exemptions of HBCD. This project is expected to generate multiple benefits for the global environment as it will not only lead to a reduction in HBCD production and consumption from the sectors, but also will reduce ODS and GHG (Greenhouse Gas) emissions as co-benefits.

54. The direct global environmental benefits will result from a significant reduction of HBCD production. By 2021, all HBCD production enterprises with a total output of 18,000 metric tons of HBCD will be phased out (based on the HBCD output of 18000 metric tons in 2017). HBCD has only been allowed for use in EPS and XPS manufacturing, accounting for 80% and 20% of HBCD production, respectively. China's EPS production using HBCD was about 1.07 million metric tons, and the production of XPS insulation board containing HBCD was 152,300 tons. Thus, the total material, EPS and XPS products containing HBCD, is estimated to be around 1.22 million metric tons in 2017, which is estimated as the amount that will be avoided/reduced annually.

55. In this project, 2 EPS enterprises with a total annual capacity of 10,000 metric tons of EPS will produce HBCD-free EPS, and in total, 400 metric tons of HBCD will be reduced in the consumption sector within 5 years, given the concentration of HBCD in EPS is 0.8% and the total output of HBCD-free EPS was 50, 000 tons in five years.

56. During the project's replication phase, as all EPS enterprises with a total output of 1.07 million metric tons of EPS will produce HBCD-free EPS, 8,560 metric tons of HBCD in total will be reduced annually and 42,800 metric tons of HBCD will be reduced in five years, based on the EPS output of 1.07 million metric tons in 2017.

57. In this project, 2 XPS enterprises with a total annual capacity of 800 tons of XPS will produce the HBCD-free XPS. HCFC and CO2 are reduced in the HBCD-free XPS production as well. Totally 160 tons of HBCD and 484 tons of HCFC-22 will be reduced within 5 years, given the total output of XPS is 4000 tons in five years and the concentration of HBCD and HCFC-22 in the XPS are 4% and 12.1%, respectively. As the global warming potential of HCFC-22 is 1810, around 0.9 million tons of CO2 will be reduced in five years. This represents a direct co-benefit attained from the project.

58. During the project's replication phase, as all XPS enterprises with a total output of 152,300 tons of XPS will produce HBCD-free and ODS-free XPS. Thus, HBCD, HCFC-22 and CO2 will be reduced annually by 6,100 metric tons, 18400 tons and 33.4 million tons respectively, and totally reduced by 30500 metric tons, 92000 metric tons and 167 million metric tons in five years, based on the annual XPS output of 152,300 metric tons in 2017.

7) Innovation, sustainability and potential for scaling up.

59. This initiative would complement other GEF projects aimed at phasing out HBCD and work on the alternatives of HBCD in EPS and XPS production sector. As China is the biggest HBCD producer and consumer in the world, relevant experience and lessons can be shared to other countries effectively in order to address similar issues. The alternative to EPS and XPS containing HBCD is also effective to reduce HCFC. Synergistic reduction could be achieved through the envisaged activities.

60. The assessment and pilot study on the recovery of bromine and if feasible, the recovery of the EPS/XPS either thermally or after the separation of PS from HBCD could be considered as part of the innovative approaches of the project. This would also support the circular economy program of the Government of China.

61. It is always wise to avoid the “pollution first and clean up later” approach, which is more often not only more expensive, but less likely to succeed in solving environmental issues. By taking a preventative and precautionary principle and targeting reduction of HBCD risks to humans and the environment, the project creates a paradigm of eco-civilization oriented development.

62. Institutional and legal framework and technical capacity developed in the demonstration areas through this demonstration project will be applied throughout the country. Sustainability will be ensured by involving all key stakeholders, including local participation from the beginning of project formulation and throughout its implementation, demonstrating the effectiveness of alternative to HBCD, EPS, and XPS production and HBCD emission, supporting provincial and national capacity building, putting in place and demonstrating the phase out of HBCD, PPP-based management system, and public awareness raising, and strengthening legislations which will continue to regulate HBCD in the whole life cycle from production, use, and disposal after the project completes.

63. Multiple means and instruments will be adopted to regulate and promote HBCD phase-out and substitution. During the project implementation, opportunities will be made full use for the identification and application of public-private partnerships. Effective enforcement of the regulations and standards can be expected as a sustainable outcome of the project’s intensive institutional capacity building activities.

64. The project further seeks to ensure replicability by including a specific component on promoting and disseminating project results and lessons learned to the rest of China. National, provincial, and local governmental organizations, institutes, and enterprises involved in this project will also help ensure the dissemination of relevant information. The public-private partnerships scheme that will be developed through the project will be used as mechanism to ensure the scale up of demonstration activities throughout the country. The role and commitment of partner industries and the private sector engaged in HBCD or foam manufacturing is also very critical in ensuring that the interventions maybe replicated and scaled-up to the whole HBCD sector in China.

1b. Project Map and Coordinates

Please provide geo-referenced information and map where the project interventions will take place.

'here There are 10 HBCD producers in China, of which 9 are located in Shandong province and 1 in Jiangsu Province. However, EPS and XPS enterprises that urrently use HBCD are all cross the country because of its own low weight and difficulty in long-distance shipping. Pilot XPS/ XPS sites will be determined during ıe PPG phase.

Figure 2 shows the location of HBCD producers where interventions will be implemented.

2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

Indigenous Peoples and Local Communities

Civil Society Organizations Yes

Private Sector Entities Yes

If none of the above,please explain why:

In addition, provide indicative information on how stakeholders, including civil society and indigenous peoples, will be engaged in the project preparation, and their respective roles and means of engagement.

While the project envisages collaboration with civil society on its activities, the participation of indigenous people is not foreseen.

Key project stakeholders have been engaged and consulted during the project development mainly on data validation, research activities and future engagement in the project. Details of previous consultations and future works with various stakeholders are provided below.

65. Central government: A number of government departments in China have been involved and consulted in HBCD-related regulation at national level and the POPs Convention implementation, including: the Ministry of Ecology and Environment, the Ministry of Foreign Affairs, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Commerce, the Ministry of Science and Technology, the Ministry of Housing and Urban-Rural Development, General Administration of Quality Supervision, the Ministry of Industry and Information Technology, etc. The line ministries will be further involved and consulted for the identification of specific legislative pieces for formulation or amendment and associated institutional capacity needs.

66. Local governments: Local governments are mandated to enforce regulations and compulsory standards under the technical guidance issued by the line ministries. Local governments will be involved to identify gaps and needs of capacity building.

67. Industries and industrial associations: The China Fire Protection Association, China Plastics Processing Industry Association, and EPS Specialized Committee are also involved in HBCD management. The Flame Retardant Association of China and the China Plastic Processing Association have worked and are currently working with the central government on some projects on domestic and international baseline researches on HBCD and EPS/XPS sectors with government funds to support the development of the project concept. These industries and industry associations will take part in the construction, implementation and supervision of HBCD's product quality standards in EPS/XPS and HBCD related products. Enterprises of HBCD and its derivative EPS and XPS will be the major entities to phase in alternatives and apply BAT/BEP in order to comply with the formulated/amended regulations and standards that have transposed the requirements of the Stockholm Convention. Enterprises will be involved through industrial associations to design incentive programs that would promote them to research and develop, demonstrate, and commercialize alternatives and BAT/BEP. Industries will also be consulted for assessing technical and economic feasibility for complying with the formulated/amended regulations and standards. The project will also involve stakeholders relevant to construction and demolition wastes containing HBCD.

68. International technology vendors: HBCD, EPS, and XPS containing HBCD and alternatives have long been researched, developed, and provided by large international companies. International technology vendors will be encouraged to participate in the open functionality tests and risk assessments of alternatives to HBCD and transfer know-how and technologies on a commercial win-win basis. During the project preparation, they will be involved in the presentation of the profiles of their alternatives or technologies as well as their willingness to participate in the project.

69. Scientific research community: Fundamentally and ultimately, HBCD phase out and substitution depends on key alternatives/technologies made locally available and affordable. The scientific research community, including the Research Center of Ecological Environment Sciences, Peking University and Tsinghua University, have been conducting researches on various HBCD-related topics including material and substance flow analysis, socio-economic analysis, researches on alternatives, etc. These efforts have been communicated and shared with the Ministry of Environment and Ecology. These research institutions will be involved in identifying key alternatives/technologies and designing incentive programs for research and development with industries. They also will be involved in building HBCD testing laboratory and strengthening the monitoring of EPS/XPS product to eliminate HBCD finally in China.

70. Civil society and the public: While individual consumers have the opportunity to be exposed to HBCD in everyday life, there is a very low level of awareness on POPs characteristics among the public. During the project preparation, surveys would be carried out to identify the level of public awareness and risk response and to support the design of awareness-raising campaigns during the project implementation

3. Gender Equality and Women's Empowerment

Briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis).

71. Gender considerations are taken into account in the present project, since women and men might be exposed to different kinds and levels of POPs at different frequencies and there would be impacts on human health, due to social and biological factors. According to the study conducted in China, whose result corresponds with another study conducted in Canada, the level of hexabromocyclododecane (HBCD) in human serum from the HBCD production source region doesn't show statically significant differences between genders. However, the rough estimation based on the published research and the 2014 Chinese Rural Migrant Workers Report issued by Chinese State Statistics Bureau shows that the number of male workers is more than twice of that of female workers in Chinese chemical plants. In this respect it should be noted that male exposure may be more direct due to the handling of flame retardants in factories while female HBCD exposure is predominantly indirect through environment. Since HBCD is an endocrine disrupting chemical, the effects might differ between women and men and will be taken into account.

72. The concept of gender mainstreaming is a globally agreed strategy for achieving gender equality and women empowerment and it was 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 dimension of policies and programmers in all political, economic and societal spheres' so that women and men benefit equally and inequality is not perpetuated".

73. Therefore, gender mainstreaming will be an integral part of the project, as it is helpful to identify gaps in gender equality. Particularly it will be incorporated under the first component above-described. In 2015, Chinese Women and Children Statistics issued by Chinese State Statistics Bureau indicates that female accounts for 42.6% of all the trained employees in 2014, which is greater than 38% in 2010, but it is still less than 50%. Thus, training sessions for company's personnel will consider this dimension, as well as others addressed to public institutions in order to influence future national policy.

74. This component will record gender ratio and set targets for women participation. The guidance sources for incorporating gender mainstreaming in the project are as follows: the UN System-wide Policy on Gender Equality and the Empowerment of Women, and the UNIDO's Policy on Gender Equality and the Empowerment of Women.

75. In return, the UN Secretary-General's Review and Appraisal of the implementation of the Beijing Platform Action will provide a basis for gender assessment during this project's implementation. Especially with regard to the action of speeding up phasing out small HBCD companies for transition to HBCD substitutes, the job transfer of female workers will also be attached greater attention, due to greater economic and social pressure they shoulder and the higher risk of depression and gynecological diseases when facing job transfer and removal.

76. A detailed explanation of the gender mainstreaming incorporated in the project will be conducted in the PPG stage, in consultation with the UNIDO gender advisor. A gender study on the sector and a gender action plan will also be carried out during the PPG. As per the GEF and UNIDO requirements, monitoring of gender compliance will be conducted as part of the Monitoring and Evaluation component of the project. The project will engage a gender expert to support this activity.

Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment? Yes

closing gender gaps in access to and control over natural resources;

improving women's participation and decision-making; and/or Yes

generating socio-economic benefits or services for women.

Will the project's results framework or logical framework include gender-sensitive indicators?

Yes

4. Private sector engagement

Will there be private sector engagement in the project?

Yes

Please briefly explain the rationale behind your answer.

77. The project will strongly involve and engage private sector entities engage in the manufacture of HBCD or are using HBCD in the production of XPS/EPS foams. A key component of the project is the “Promotion of technology transfer and investment on the production of HBCD alternatives and application of alternatives to the XPS/EPS foam sector” which will involve industries in designing and implementing technologies to achieve the objectives of the project.

78. The private sector will also contribute a significant co-financing in the form of hard investments to the project and will ensure that the baseline is implemented. As mentioned, the project also envisages the implementation of demonstration activities in the industrial facilities.

5. Risks

Indicate risks, including climate change, potential social and environmental risks that might prevent the Project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the Project design (table format acceptable)

Risks	Level	Mitigation measures
Lack of ideal and economical alternatives to HBCD in the production of EPS and XPS.	Medium	The project will encourage EPS and XPS enterprises to develop substitutes of HBCD during the exemption period and introduce international advanced alternative technologies. The project will organize functionality tests in order to select technically qualified alternatives that will meet the quality requirements for concerned uses. Financial incentives will be awarded to those who successfully phase in alternatives to cover part of the incremental costs associated with the R&D, production, and distribution.
Insufficient number of companies showing interest to attend the information sessions included in the first component.	Low	These activities will count on the support of corresponding ministries, which will also be in charge of HBCD regulation developed after project completes. These ministries will then assist the project in facilitating the attendance of concerned companies in these sessions.
Reluctance of companies to undertake a conversion to HBCD alternatives.	Medium	The prospect of one-time technical assistance by the project will lessen the risk. The close involvement of responsible ministries advising companies on the benefits of getting involved in conversion activities in light of future regulation will mitigate the risk.
Financial incentives may not be adequate for investment in alternatives production and distribution.	Low	Besides financial incentives, the project will push the promulgation of regulations and compulsory standards which constitute another type of incentives or pressure to force enterprises to meet time-bound requirements to phase out HBCD production and uses.

There is no envisaged climate change risk/s during the project implementation

6. Coordination

Outline the institutional structure of the project including monitoring and evaluation coordination at the project level. Describe possible coordination with other relevant GEF-financed projects and other initiatives.

Institutional structure

79. UNIDO is the GEF Implementing Agency (IA) for the project. As the GEF Implementing Agency, UNIDO will lead the process of project preparation and development with the participation of key stakeholders from the Government and the Private Sector. On request of the Government, UNIDO may also provide targeted technical assistance and administrative execution support, which will be further discussed with national stakeholders during the PPG phase and elaborated in detail in the CEO Endorsement document.

80. A project officer will be appointed in UNIDO HQ to oversee the implementation of the project, assisted by a support staff and supervised by a senior professional staff engaged in the management and coordination of UNIDO's Stockholm Convention Programme. The UNIDO Country Office in China will also play a significant role in the supervision and monitoring of the project. UNIDO country-level monitoring will be provided as part of the in-kind contribution of the organization to the project.

81. The International Environmental Cooperation Center(IECO) under the Ministry of Ecology and Environment with be the main executing partner in the project. An execution agreement between UNIDO and IECO is envisaged to fully identify execution and implementation functions.

The detailed implementation arrangement will be finalized during the PPG phase.

Coordination with other GEF-financed projects and other initiatives

82. Currently, there are 19 completed and ongoing projects in the focal of areas of POPs and Chemicals and Waste funded by GEF in China, within which the proposed project will coordinate by integrating the individual, isolated, and piecemeal efforts. The outputs and results from these projects will be made an integral framework of the proposed project regarding of capacity building, regulatory guarantee and technical support.

83. For example, the development of the original NIP and updated NIP provides a good institutional capacity for the preparation and implementation of the proposed project with support of the UNIDO-GEF project "Building the Capacity of the People's Republic of China to Implement the Stockholm Convention on POPs and Develop a National Implementation Plan" (GEF ID 1412) and the UNIDO-GEF project “China’s Compliance with the Stockholm Convention” (GEF ID 5624). In particular, the updated NIP has also developed a preliminary inventory of HBCD in China and identified prioritized action plans to reduce and eliminate the production and usage of HBCD, which are fully coordinated in the proposal project.

84. Legally binding policies and relevant regulation issued by the completed and ongoing project funded by GEF can provide a reliable guarantee for the project implementation. HBCD was already strategically listed in the draft updated NIP by the UNIDO-GEF project “China’s Compliance with the Stockholm Convention” (GEF ID 5624), which will be finally sent to the State Council for approval. At the same time, HBCD was included in the “Catalogue of Hazardous Chemicals (2015 Edition)” and the “List of Products with Heavy Pollution and High Environmental Risk (2017 Edition)”. Its production, storage, use, transportation and treatment should be managed by the "Regulations on the Safety Management of Dangerous Chemicals" and other related regulatory systems. In addition, since HBCD and

PFOS are both new POPs with special exemptions that where they are still produced in China, experiences on World Bank-GEF Reduction and Phase-out of PFOS in Priority Sectors (GEF Project ID 9269) could be referred in the industrial chemical regulatory management mechanism of HBCD.

85. The completed and ongoing project funded by GEF also provided technical support for the implementation of the proposed project. For instance, the technology transfer center, which was established by the UNIDO/GEF projects "Strengthening institutions, regulations and enforcement capacities for effective and efficient implementation of the National Implementation Plan (NIP) in China" (GEF ID 3263), will continuously provide service for identifying and evaluating of alternatives of HBCD in XPS and EPS sector. The cement co-processing technology, which was successfully demonstrated and validated in the UNIDO/GEF “Environmentally Sound Management and Disposal of Obsolete POPs Pesticides and Other POPs Wastes” (GEF ID 2926), will be used as a potential technology for HBCD containing waste disposal. The incineration technology and facilities built by the World Bank project “PCB Management and Disposal Demonstration” (GEF ID 2360) can be another option for the disposal of HBCD containing waste in the proposed project.

86. Coordination with the Turkey HBCD project (GEF ID 10082) will be ensured. As the two projects share a common objective, knowledge exchange and sharing will ensure best use of resources and experiences. Coordination will also be established with other initiatives, as those related to the XPS sector under the framework of the Montreal Protocol for the Protection of the Ozone Layer. Meanwhile, an initiative funded by Bavarian State Ministry, Germany is coordinated with the output 4.3 of the project to establishment of a knowledge hub on HBCD and the XPS/EPS foam sector to disseminate lessons learned on a national, regional and global scale. The knowledge and experience gained from the Turkey HBCD and the current project will contribute greatly to these knowledge hub.

7. Consistency with National Priorities

Is the Project consistent with the National Strategies and plans or reports and assesments under relevant conventions

Yes

If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc

87. The project design will take advantage of the updating of the NIP to ensure the consistency with the strategy and action plan for HBCD phase out and substitution.

88. The proposed project aims at large-scale reduction of HBCD in the production, consumption, and release from priority sectors. Thus, it is highly responsive and contributive to the GEF-7 chemical and waste strategy's long term goal, which is to prevent the exposure of humans and the environment to harmful chemicals and waste of global importance, including POPs, mercury, and ozone depleting substances, through a significant reduction in the production, use, consumption, and emissions/releases of those chemicals and waste. Specifically, the reduction measures and the capacity building interventions fall under Program 1 and Program 3 for POPs.

89. UNIDO builds on a strong and early program to support China in the implementation of the Stockholm Convention, including the implementation of GEF funded projects, and a growing program related to waste and pollution management. UNIDO works with China over the last two decades to implement sector plans for ODS control. Similarities between HBCD and ODS issues include: a large number of diverse stakeholders for which different types of incentives are required to influence phase-out; the continuing use of these chemicals subject to sanction from international markets; targeted beneficiaries of the project are private entities; and the phase-out involves conversion of chemical and/or production processes at enterprise level. Moreover, the counterpart is familiar with tools and approaches employed by ODS projects for transferring technology and financial assistance to private enterprises. This existing knowledge is highly relevant to the proposed project.

8. Knowledge Management

Outline the Knowledge management approach for the Project, including, if any, plans for the Project to learn from other relevant Projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

90. Knowledge management is a central piece in this initiative, which will be canalized through the establishment of a knowledge hub in China, whose major task will be to compile and assess information on the current use of HBCD-based flame retardants in the XPS and EPS sectors and on the existing alternatives. More possibly, the knowledge hub can be built upon existing institutions, which have already accumulated considerable amount of experience and expertise with previous focus on other POPs. These institutions can act as the leading organizers in the formation of such knowledge hub. Their academic nature will also serve to promote active exchange of knowledge with international researchers.

91. International organizations, such as UNIDO can also make unique contributions with its experience on the development and implementation of similar initiatives and programmes. In this regard, coordination with the Turkey HBCD project (GEF ID 10082) will be ensured. As the two projects share a common objective, knowledge exchange and sharing will ensure best use of resources and experiences. This will ensure an effective flow of information among the stakeholders and, consequently, a greater impact in China and other countries. In this regard, the knowledge hub, composed by both Chinese and international experts on this subject, will be assisted by agencies like UNIDO that have the experience in working with the above-mentioned sectors under the framework of other initiatives, for example, those related to the Montreal Protocol on the Protection of the Ozone Layer.

92. In return, the knowledge hub will assist local experts in terms of sharing with them and publicizing among other stakeholders the corresponding findings, as it has been described before. This mechanism will be also used in the conversion of production lines and related awareness activities: training and information sessions, as well as publicity on websites of governments and companies, among other activities that have been detailed above. After the completion of the pilot conversion activities, the corresponding lessons learnt will be shared with relevant stakeholders at national and international level through the same channels.

93. Data and information will be produced or procured in laboratories and industries in the process of implementing the project. An active exchange of data and information among research institutions, administrations, and relevant stakeholders is beneficial for scientific research and the development of sound HBCD management strategy. A large repository can be constructed and attached to an ad-hoc website or the knowledge hub to serve this purpose.

94. A knowledge map which shows who has what knowledge, where our knowledge resides, and how it is transferred or disseminated will allow people and organizations involved in the project to identify more easily the expertise and technology produced in the progress, which can promote the development and application of BAT/BEP.

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 with this template).

Name	Position	Ministry	Date
Fu Jing	GEF Operational Focal Point	Ministry of Finance	3/29/2019

ANNEX A: Project Map and Geographic Coordinates

Please provide geo-referenced information and map where the project intervention takes place

There are 10 HBCD producers in China, of which 9 are located in Shandong province and 1 in Jiangsu Province. However, EPS and XPS enterprises that currently use HBCD are all cross the country because of its own low weight and difficulty in long-distance shipping. Pilot EPS/XPS sites will be determined during the PPG phase. Figure below shows the location of HBCD producers where interventions will be implemented.