Executive Summary

of

ENVIRONMENTAL and SOCIAL SAFEGUARD

For

China: Reduction/Phase-out of PFOS in Priority Sectors

JANUARY 2017
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Part I. Environmental Management Framework

1. Introduction

Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (PFOS/PFOSF) were listed in Annex B of the Stockholm Convention on Persistent Organic Pollutants (POPs). The POPs convention has detailed twelve "specific exemptions" and eight "acceptable uses". Due to its production level and pervasive use it is a priority of China in the list of POPs. The World Bank (WB) is working closely with the Foreign Economic Cooperation Office (FECO) under Ministry of Environmental Protection (MEP) to develop the proposed Project with support from the Global Environmental Facility (GEF). The Project aims to reduce consumption and production of PFOS in selected priority sectors and enterprises.

The project will be implemented by three PMOs including a national level PMO established in FECO, and two provincial PMOs (PPMOs), established in Hubei Provincial Environmental Protection Bureau (EPB) and Guangdong Provincial EPB, respectively. PPMOs will be responsible for implementing activities in their respective provinces while FECO will implement national level activities as well as activities outside the two provinces. The FECO will also be responsible for the overall project management and coordination.

As the national level PMO, FECO has over 30 years of experience with international financing institution (IFI) including the WB and Asian Development Bank (ADB). FECO is familiar with the WB requirements on project management and safeguard requirements. FECO have also successfully implemented similar projects such as the GEF Phase-out of HCFCs Project, GEF Contaminated Site Management Project in recent years, most of them category A.

Hubei PPMO (established in the Hubei Province Solid Waste and Chemical Pollution Control and Prevention Center under the provincial EPB) recently completed a very similar GEF-funded project: Reduction of Persistent Organic Pollutants (POPs) release by environmentally sound management throughout the life cycle of electrical and electronic equipment and associated wastes in China. The Guangdong PPMO (established in the Education, Communication and Cooperation Division under the provincial EPB), on the other hand, has recently completed the Sino-Norwegian Cooperation POPs Reduction Capacity Building project and the Phase-out of DDT in Antifouling Paint Production in China project, both of which are similar to the proposed Project.

Considering its potential environmental and social impacts, the Project is classified as a Category A as per OP4.01. Since most beneficiary enterprises could only be determined during implementation, an Environmental Management Framework (EMF) has been developed by the Hubei Academy of Environmental Science (HAES) and a Social Management Framework (SMF) by an experienced individual social safeguard specialist from Hohai University. The combined Environmental and Social Management Framework (ESMF) is summarized in this document.

Part I is the EMF which sets out the screening and selection procedures from the environmental safeguard perspective, as well as the environmental impact assessment requirements and management in sub-projects during implementation.

Part II is SMF which sets out the screening and selection procedure for candidate subprojects, as well as the social safeguard requirements during implementation, including for the grievance redress mechanism and the monitoring and evaluation.

For the company under consideration as a demonstration enterprise (Hubei Hengxin Chemical Company Limited), an environmental audit was carried out. The key findings are summarized in Part III of this document.
2. Project description

The project will be carried out through four major components described below.

Component 1: PFOS Production Reduction

This component is mainly carried out in Hubei and Fujian, and will support production phase-out and reduction for primary PFOSF producers and at secondary PFOS producers (approximately 14 companies). Activities to be financed include: closure; conversion of production to non-POPs like chemicals; and adoption of best environmental practices at facilities that will continue production of PFOS and PFOSF for acceptable uses under the Stockholm Convention.

Conversion of production facilities: This component will finance conversion of PFOSF production facilities and offer incentives to support downstream PFOS manufacturers in switching to new non-PFOS-based products. The project would not finance any production of chemicals known to possess persistence, bio-accumulative and toxic (PBT) characteristics. Eligible incremental expenditures would include: (a) development of non-PFOS products; (b) costs related to registration of new products; (c) equipment and technology transfer costs; (d) installation of equipment; (e) training; (f) trial production; (g) incremental costs of new raw materials, utilities, waste management; and (h) costs of disposal of contaminated equipment previously used for producing or storing PFOS.

Plant or production line closure: GEF incremental support would be extended to enterprises that might decide to close down their production facility altogether. GEF resources will be used to support management of environmental liabilities from such closure. Eligible incremental expenditure would include: (a) dismantling costs; (b) disposal costs of contaminated equipment and materials; and (c) consulting services to develop site risk assessment, management and monitoring plans. Remediation beyond disposal of contaminated equipment is expected to be financed by other sources outside of the Project.

Promotion of cleaner production: In line with BAT/BEP requirements under the Stockholm Convention, the project would promote introduction of cleaner production techniques and practices so as to limit the risks of environmental releases or to worker’s health and safety resulting from PFOS production. Eligible expenditures include: (a) consulting services to develop CP audits; (b) overseeing implementation of CP measures; (c) technology upgrading; and (d) training. The project would also promote phase-out at downstream producers through support to a “MEP PFOS stewardship program”, including strengthening of label specification.

Component 2: Reduction of PFOS Use

This component is mainly carried out in Guangdong and Hubei and addresses three priority sectors: chromium mist suppressants in the metal plating sector, firefighting foam sector, and pesticides for control of red imported fire ant (RIFA). The fourth large sector in terms of consumption, oil production, is addressed through TA only under component 3.

Chrome mist suppressant in metal plating: The Project will finance demonstration activities to showcase non-PFOS alternatives and closed-loop systems, with equivalent or improved efficacy in terms of protection of human health and safety. The demonstration activities include installations of approx. two closed-loop systems for different chrome-plated product lines and introduction of non-PFOS alternatives in at least 20 companies using chromium mist suppressant for manufacturing various products in up to three industrial parks. The industrial parks will be selected during the project implementation. Criteria for selection of these industrial parks would include the number of chrome plating enterprises, environmental management capacity of the industrial parks, and willingness to showcase demonstration activities to similar industry in other industrial parks.

The project will finance costs in relation to acquiring of the following: (a) upgrade of facilities to closed-loop systems; (b) chrome plating baths replacement; (c) new chromium mist suppressant; (d) other equipment, testing device, and control systems related to the use of new alternatives; (e) ventilation and safety equipment; (f) site preparation for installation of new equipment; (g) replacing Cr(VI) with Cr(III) which will eliminate the use of chromium mist suppressant altogether; and (h) advanced treatment facilities for up to three industrial parks for removing perfluorinated compounds (PFCs) from water discharge from chrome plating industry.
Firefighting foam: The project will finance development and production of non-PFOS firefighting foam at 3-5 firefighting foam manufacturers. The selection criteria of firefighting foam manufacturers would include: (a) research and development capacity; (b) relevant experience with firefighting chemicals; (c) large network of firefighting foam clients; (d) good environmental performance record; (e) in-house capacity to develop non-PFOS surfactants or technical cooperation with reputable surfactant manufacturers; and (f) cost effective proposals.

The following costs will be covered by the Project: (a) research and development of new non-PFOS based firefighting foam; (b) environmental and health impact evaluation of new alternatives; (c) new equipment for manufacturing non-PFOS based firefighting foam; (d) site preparation for installing new equipment; (e) tanks and storage facilities; (f) testing efficacy of new products; and (g) registration of new surfactants and firefighting foam. In addition, financing costs of new non-PFOS firefighting foam needed for training at 3 training facilities of the public security ministry could be supported, as well as costs of firefighting equipment retrofit or procurement of new equipment, together with facilities for treatment of wastewater discharge.

Pest control: The project will finance procurement of pesticides (9 tons total: 6 tons of indoxacarb based baits, 3 tons of cypermethrin based powder, and a small amount of hydramethylnon) for demonstration of a two-phase treatment method using bait and powder to control red fire ants, carried out under component 3.

Component 3: Policy and Technical Assistance

This component is carried out in Hubei, Fujian, Guangdong, Guangxi, Guizhou and Hainan Province and will finance technical assistance activities required to strengthen regulatory and policy framework, standards, and capacity building. These activities are essential for ensuring sustainability of PFOS phase-out in both production and consumption sectors. TA activities include:

Standards and Regulations: The Project will carry out activities to develop industry standards, good practices, and regulations to support introduction of non-PFOS alternatives. Supported activities would include: (a) labeling scheme to ensure that commercially available chromium mist suppressant will have to be properly labeled; (b) development of technical specifications for chromium mist suppressants, including efficacy in protecting human health and safety; (c) standards defining PFOS waste, and related best practices for disposal; specification of discharge of wastewater containing PFOS for electroplating industry in Guangdong province; (d) development of guidelines for cleaner production for organofluorine manufacturing industry; (e) revision of cleaner production audit indicator system for electroplating industry to include PFOS in Guangdong Province; (f) technical report on efficacy of non-PFOS based pesticides for controlling red imported fire ant; and (g) development of guidelines for green procurement for the oil sector.

Screening of non-PFOS Alternatives: To ascertain that new non-PFOS alternatives to be introduced in China should not have PBT characteristics, a PBT screening system for new chemicals will be established. Supported activities include: (a) guidelines for registration of new chemicals including reporting requirement on PBT characteristics; (b) development of standard testing protocol for determining PBT characteristic of organofluorine chemicals; and (c) screening reports on PBT characteristics of at least 10 non-PFOS chromium mist suppressants.

Technical Studies: A series of studies will be carried out under the project to enhance understanding of import/export control of PFOS, and of PFOS use as CMS in electroplating factories in Guangdong province. To guide the chrome plating industry in the future as part of the efforts to sustain achievement of this project, the Project will finance the testing of mist suppression performance of alternatives and develop a list of acceptable chromium mist suppressants. A preliminary study will also be conducted on health impacts of PFOS in China as a first step to scoping and better understanding the issue.

Technical Assistance to Eliminate the Use of PFOS in Firefighting: The project will support testing the safety and efficacy of alternative non-PFOS firefighting foams and products; devising technical way forward for substitution of PFOS in the firefighting sector; revising relevant standards as needed; capacity development to detect PFOS substances in foam extinguishing agents; and strengthening the tracking and control of PFOS containing firefighting agents. Since a large quantity of PFOS firefighting
foam is used for training, adopting new non-PFOS alternative foam could lead to permanent reduction of a significant quantity of PFOS. The project would therefore finance revision of firefighting protocols and training manuals for effective use of new non-PFOS firefighting foam without compromising safety and health of firefighting cadets.

**Technical Assistance to Eliminate the Use of PFOS for control of RIFA:** Demonstration of alternative pest management techniques and practices will be conducted for four years in 5 provinces, Fujian, Guangdong, Guangxi, Guizhou and Hainan. The project will cover costs related to the ‘training of trainers’ program that will involve ‘training schools’ in the 5 demonstration provinces and up to additional 5 provinces. Participants will include county, municipal and provincial level practitioners.

**PFOS Registration and Reporting System:** The project will strengthen capacity of Ministry of Environment Protection (MEP) and local Environmental Protection Bureaus (EPBs) to enforce regulations and monitoring requirements for hazardous substances. A tracking system will be developed to support registration of producers of PFOSF, secondary PFOS based product manufacturers, and users of PFOS products in firefighting foam industry. The system will assist China to monitor production and supply of PFOS materials from sources to end users. Technical capacity of local EPBs will be strengthened to enable them to carry out or supervise factory audits to prevent any diversion of PFOSF to banned applications. Efforts would mainly focus on strengthening capacity of local EPBs in Fujian and Hubei to control the PFOS supply chain.

**Component 4: Project management**

Component 4 will finance: (i) costs of operations of three project management offices (PMOs) at FECO, Guangdong EPB and Hubei EPB, as well as (ii) Monitoring and Evaluation. Eligible costs include expenditures incurred by the PMOs in carrying out the Project.

Among these components, Component 1 and 2 have environmental and social impacts envisaged as described in next chapter and Part II (social).

3. **Major processes and their environmental issues**

Major processes of producing and using PFOS in China as well as their associated environmental impacts and issues are summarised below.

3.1 **Production of PFOS**

Electrochemical fluorination (ECF) is the main process adopted for PFOS production in China. The major pollution sources from PFOS production are the wastewater (COD, NH3-N and chloride), solid waste (CaF2) and F-containing gas (mixture of HCl, HF and SO2, etc.) emission produced in the process. The PFOS containing or other production wastes are often hazardous wastes, which need special handling. Due to the wastes produced in the PFOS production, soil contamination is also likely to occur near PFOS production facilities. The storage and transfer to PFOS products are also sources of environmental risks.

3.2 **Application of PFOS**

The three priority application sectors will be covered by the project.

**Metal plating**

Main environmental impacts are from the production wastewater, waste gas, and solid waste and potential environmental risks in production facilities. In metal plating, PFOS is mainly used in decorative and hard chrome plating as chromium (Cr) mist suppressant thus it can help reduce Cr usage and mitigate the impact of chromium mist due to its high toxicity. While both the economic and environmental benefits are significant, the PFOS itself is also causing high environmental risks. The mist suppressant does not degrade or convert in the process; instead it will be discharged together with the waste into the environment, causing lasting and bio-accumulative toxicity to human health.

There are four alternative processes: i) the **closed-loop chrome plating process** can recycle the mist suppressant and thus reduce its usage through condensing and recycling the Cr containing wastewater; ii) **substituting the Cr(VI) with the less toxic Cr(III)** thus eliminating the need of mist suppressant. This process can be used in decorative plating but not for hard chrome (VI) plating, iii) **use other**
substitute mist suppressant or non-chrome metals in plating, e.g. the Nickel-Tungsten alloy, and iv) upgrade of wastewater treatment for PFOS removal. The main environmental issues of all above are wastewater containing metals, acid or alkali, acidic air emission and dusts, sludge and solid/hazardous wastes with heavy metals.

**Pesticide**

The main application is PFOS containing pesticide, mainly sulfluramid, widely used for red imported fire ants control in south China. Sulfluramid is produced in a synthesis process from PFOSF, amine, hydrochloric acid and relevant solvents. It can inhibit the metabolism of insects, thus it is used as bait to control their proliferation. The main environmental issues are the Sulfluramid-containing bait can have persistent, bio-accumulative and poisonous effect to human health. In addition, improper application or disposal of such pesticide can also cause human poisoning or severe water or soil pollution.

**Firefighting**

Due to its thermal stability and chemical compatibility, PFOS containing Aqueous Film-Forming Foam Concentrate (AFFF) is a widely used fire distinguishing reagent, especially used for fires involving oil. The main environmental issue is that, in a fire fighting event, the AFFF used will likely flush out to water bodies and soil, causing persistent pollution. Literature suggests that the PFOS concentration in water bodies near firefighting training is usually high, sometimes as high as 22 ug/L. In addition, in the disposal of waste of extinguishing agent, the PFOS containing reagent entering the natural environment as hazardous waste will likely cause secondary pollution.

### 4. Regulatory framework

The relevant national and international laws, regulations and requirements are summarized below.

#### Chinese Laws and Regulations

The EMF collected a series of China national laws, regulations, technical guidelines and procedures that are related to PFOS production, storage and use. Apart from laws on Environmental Protection, Air and Water Pollutions and on Appraising Environmental Impact, regulations special for this project, i.e. related to chemicals, are summarized in Table 4-1.

<table>
<thead>
<tr>
<th>China Laws and Regulations</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circular Economy Promotion Law of PRC (January 2009)</td>
<td>Requirements on pollution control</td>
</tr>
<tr>
<td>Clean Production Promotion Law of PRC (July 2012)</td>
<td>Requirements on cleaner production</td>
</tr>
<tr>
<td>Measures for Cleaner Production Audit (July 2016)</td>
<td>Requirements on the audit of PFOS production process</td>
</tr>
<tr>
<td>Regulations on the work area protection exposing to toxic substances, State council order No. 352, May 12, 2002; Notice on the Issuance of Implementation Plan for the Pollutant Discharge Permitting; State Council No. 81, 2016; Emergency Response Plans for Emergency Environmental Incidents, MEP NO. 34</td>
<td>Requirements for all pollutant discharge related activities Requirements for environmental emergencies</td>
</tr>
<tr>
<td>Regulations on Safe Management of Hazardous Chemicals (State Council No. 591, December 1, 2011); Catalog of Hazardous Chemicals (2015); Safety Supervision and Management Methods for Hazardous Chemicals Construction Project (National Safety Production Bureau No. 45, April 1, 2012); New Chemicals Environmental Management Methods (MEP No. 7, October 15, 2010); Regulations on Environmental Management for Chemicals Import and Toxic Chemical Export and Import (MEP, 2007) Notice on Enhancing Toxic Chemical Import and Export Registration</td>
<td>Requirements on: PFOS production PFOS containing materials storage, transport and application</td>
</tr>
</tbody>
</table>
**Applicable discharge standards**

Based on the selected priority sectors, the following domestic discharge standards apply with key indicators and their standard values summarized in the Table 4-2.

<table>
<thead>
<tr>
<th>Item</th>
<th>Discharge concentration and regulations</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integrated Air Pollutant Discharge Standards (GB16297-1996)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF</td>
<td>0.02 mg/m³</td>
<td>all subprojects</td>
</tr>
<tr>
<td>Chromic acid mist</td>
<td>0.0075 mg/m³</td>
<td>chrome plating</td>
</tr>
<tr>
<td><strong>Integrated Waste Water Discharge Standard (GB8978-1996)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoride</td>
<td>Class I: 10 mg/L; Class II: 10 mg/L; Class III: 20 mg/L</td>
<td>Wastewater for PFOS production, metal plating</td>
</tr>
</tbody>
</table>

**Major applicable technical guidelines**

The EMF also summarized the major applicable technical guidelines for the project. These guidelines will form the basis for the Annexes on environmental site assessment and environmental audit. These guidelines include:

1) Technical Guidelines for Environmental Site Assessment (HJ25.1-2014);
2) Technical Guidelines for Environmental Site Monitoring (HJ25.2-2014);
3) Technical Guidelines for Polluted Site Risk Assessment (HJ25.3-2014);
4) Technical Guidelines for Polluted Site Soil Remediation (HJ25.4-2014);
5) Guidelines for Industrial Site Environmental Investigation and Remediation (Trial) (MEP No. 78, 2014); and

Other relevant guidelines include the laws and regulations, evaluation system and technical standards for cleaner production audit, i.e. the Metal Plating Sector Cleaner Production Evaluation System (National Development and Reform Committee NDRC No.25, 2015), the Specifications of Metal Plating (Ministry of Industrial and Information Technology MIIT No.64, 2015), the Metal Plating Discharge Standards (GB21900-2008).

**World Bank Safeguard Policy Requirements**

The following WB safeguards policies are triggered: OP4.01 Environmental Assessment, OP4.09 Pest Management and OP 4.12 involuntary resettlement. In addition, relevant EHS requirements shall be followed, i.e. the EHS Guidelines for Semiconductors and Other Electronics Manufacturing.

**Gap analysis**

Gap analysis was conducted between domestic standards and those of the WB focusing on the most relevant ones. The comparison found that for non-metal parameters, the Chinese standards are somewhat less strict than the WB’s. However, the Bank's guidelines and standards are applicable to all kinds of electronic products. Electroplating commonly used in electronic products, such as printed circuit boards, is not the same as that on larger industrial products covered under this project. Therefore, the WB corresponding emission standards cannot be fully applied. For the metal related indicators, the domestic standards are similar to the WB standards. Complying with domestic standards will ensure compliance with WB requirements to control environmental impact.
5. Environmental screening and management requirements
This chapter summarizes the procedure and criteria for FECO and PPMOs to screen and select subprojects and to management their impacts during implementation. It also serves as guidance for potential subprojects on conditions and preparation they need in order to participate.

5.1 Subproject selection criteria
The National PMO (FECO) and provincial PMOs (PPMOS) should select the subprojects against relevant environmental criteria below. Given the objective of this project, all PFOS producers should be eligible from environmental perspective (though subject to other selection criteria), therefore the environmental selection criteria below do not apply to PFOS production enterprises.

- **Criteria 1:** The subproject shall belong to the priority sectors. Their processes are typical with PFOS produced or used.
- **Criteria 2:** The enterprise should have sufficient environmental approval and permits for its operation.
- **Criteria 3:** The enterprise is generally compliant with discharge standards with no major violation or environmental incident.

5.2 Environmental preparation of subprojects
The subprojects can be either enterprises or non-enterprise entities. For the enterprises, there are scenarios in subprojects, including (1) conversion to other products, (2) retrofit or technical renovation; (3) alternative application; and (4) plant closure. Non-enterprise entities are for pesticide and firefighting applications. Based on national regulations and WB safeguard requirements, subproject entities will need to conduct the below safeguard work respectively:

5.2.1 Enterprise to convert to other products
For the participating enterprise that will convert to the production of other non-PFOS products, an environmental impact assessment (EIA) is needed as per domestic regulation and the WB safeguard policies. The EIA prepared should be submitted to local environmental protection bureaus (EPB) for approval and to the WB for review. Based on the EIA, Environmental management Plan (EMP) needs to be developed as part of the EIA to propose mitigation measures and action plans. Terms of Reference (ToR) and requirements on EIA/EMP are summarized in Section 7.1. The ToR specifies that baseline investigation in the EIA is in effect environmental audit of current situation and should meet the requirements of an Environmental Audit detailed in Annex 2.

When an EIA is needed per domestic regulations, the enterprise should be responsible for preparation and to seek approval of such EIA. The key sections and measures should be integrated into the EMP.

5.2.2 Enterprise to retrofit
Participating enterprise undergoing technical retrofit are mainly in the metal plating sector (i.e., adopting closed-loop metal plating process, replacing Cr(VI) with less toxic Cr(III), or retrofitting treatment facilities for the metal plating wastewater). Domestically EIA might not be necessary as the retrofit will reduce the environmental risks by reducing discharge, replacing PFOS with less toxic chemicals and improving wastewater treatment facilities. However, simplified EIA is required by the WB, with focus on the EMP in order to mitigate adverse impacts of retrofit. The ToR for EIA specifies that baseline investigation is in effect an environmental audit of current situation and should meet requirements of an Environmental Audit.

5.2.3 Enterprise to apply alternatives
This mainly refers to enterprises that will switch to the use of alternatives for chromium (Cr) mist suppressant in metal plating sector. As the application of alternative chemicals does not involve any changes of process or equipment, there is no need to conduct EIA. However, according to the WB policies, the environmental audits should be conducted to understand the status of environmental compliance and performance of the enterprises. Based on the results of the audit, the EMP should be developed to propose relevant measures to optimise the process and management to achieve cleaner
production. Terms of Reference (ToR) and requirements on environmental audit are summarized in Section 7.2.

5.2.4 Enterprise to close down

For enterprise that will close down its plant or production lines (mainly for PFOS production) under the project, environmental site assessment should be conducted based on relevant domestic and WB requirements (detailed requirements see 7.3). If necessary, supplementary environmental monitoring should also be conducted to analyze the site pollution conditions and long term impacts. Based on potential future use of the land if known during project implementation, site remediation plan could be proposed. The environmental site assessment report should include an EMP to cover mitigation measures and monitoring plans.

5.2.5 Non-enterprise subprojects

The non-enterprise subprojects are mostly in the sectors of pesticide and firefighting application.

(1) Agriculture use: The subprojects promoting substitutes for PFOS-containing pesticides have publicly disclosed this EMF and the Pest Management Plan (PMP, see a summary in 7.4). They will participate in the trainings organized by different levels of PMOs. The implement units should provide written commitment to ensure that the PMP should be implemented accordingly, and to clearly define the institutional arrangements and their responsibilities.

(2) Firefighting: the PFOS containing firefighting foam is mainly used by firefighting department. When the firefighting testing and demonstration units (such as training bases) are selected, environmental assessment needs to be conducted following domestic regulations and WB policies as there might be environmental impacts. While the EIA can be simplified, the focus will be the development of the EMP.

5.3 Information disclosure and public consultation

At least two rounds of information disclosure and public consultation are required for all environmental safeguard documents for candidate subprojects. Relevant documents should be disclosed for at least 14 days. The participating enterprises will be responsible for the public consultation. Meaningful public consultation should be conducted after the information disclosure is completed to allow sufficient time (i.e., 2 weeks) for the public to understand the disclosed project information and to provide feedback. The consultation can be conducted by different means including household surveys, individual interviews, seminars, or questionnaires. The target of consultation should be focused on affected people instead of on government agencies.

5.4 Review and approval of environmental safeguard documents

Other than the official approval of relevant domestic EIAs by EPBs, all environmental safeguard documents described above should be submitted to PMOs for review in order to meet the WB requirements in the meantime. The first subproject of each sector and all Category A subprojects should also be submitted to the WB for review.

5.5 Implementation and Supervision Arrangement

The main responsibilities of various stakeholders during implementation are summarized in the following Table 5-2.

<table>
<thead>
<tr>
<th>Main Parties</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FECO</strong></td>
<td>1. As the national PMO, is responsible for the overall management, EMP supervision and coordination during the implementation; 2. Conduct irregular site inspection (at least one time per year) to the participating enterprises to ensure compliance of this EMF; 3. Report to WB regularly on the EMP implementation</td>
</tr>
<tr>
<td><strong>Provincial EPBs (PPMO)</strong></td>
<td>1. With assistance from environmental specialists, conduct project screening and confirm safeguard documents requirements; 2. Review relevant environmental safeguard documents; 3. Be responsible for supervising the implementation of relevant</td>
</tr>
</tbody>
</table>

Table 5-2 Key Environmental Management Responsibilities during implementation
5.6 Environmental Reporting

Provincial PMOs will prepare and submit to FECO the semi-annual progress reports. The reports shall cover at least (1) the implementation status of EMPs for ongoing subprojects; (2) the implementation status of pest management plans (if any); (3) review and comments provided to environmental safeguard documents received; (4) environment-related trainings conducted; (5) environmental monitoring data and analysis; (6) next stage work plan and key modification measures.

Based on the semi-annual reports from provincial PMOs, FECO should develop its semi-annual report and submit to World Bank.

To further enhance the environmental management during implementation, PMOs at different levels can hire environmental consultants to conduct independent external monitoring.

6. Information Disclosure and Public Consultation

6.1 Information Disclosure

The draft of the EMF and SMF were first disclosed on the official website of FECO in March 2016 for a period of 14 calendar days. After the EMF, SMF and the environmental audit report were developed, they were disclosed on the official website of FECO for the second round for a period of 14 calendar days from June 30 to July 14, 2016. The EMF and SMF were also disclosed on the official websites of the two PPMOs in July 2016, and on the official websites of key sectoral associations (www.zgbmcl.com, www.csea1991.org, www.zgdcl.org, www.ccaon.com, etc.), key portal service (i.e. www.sohu.com), and relevant NGOs (national agricultural technology center, and provincial plant protection and inspection centers in Fujian, Guangdong, Guangxi, and Hainan provinces). In addition, the audit report was also disclosed on the official website of HHCC for 2 weeks in July 2016. The detailed information disclosure of this document is summarized in the Table 6-1.

Table 6-1 Summary of information disclosure for EMF

<table>
<thead>
<tr>
<th>Round</th>
<th>Entity</th>
<th>Period</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>First round</td>
<td>FECO</td>
<td>March 23 to April 6</td>
<td><a href="http://www.mepfeco.org.cn/dtxx/tzgg/201603/t20160324_24929.html">http://www.mepfeco.org.cn/dtxx/tzgg/201603/t20160324_24929.html</a></td>
</tr>
<tr>
<td></td>
<td>FECO</td>
<td>June 27 to July 11</td>
<td><a href="http://www.mepfeco.org.cn/dtxx/tzgg/201606/t20160627_67864.html">http://www.mepfeco.org.cn/dtxx/tzgg/201606/t20160627_67864.html</a></td>
</tr>
<tr>
<td></td>
<td>PIU: HHCC and Yingcheng EPB</td>
<td>August 3 to present; August 4 to August 18</td>
<td><a href="http://www.hbycepb.gov.cn/html/2016/0803/891.html">http://www.hbycepb.gov.cn/html/2016/0803/891.html</a></td>
</tr>
<tr>
<td></td>
<td>NGOs: (Pesticide sector) ATESC</td>
<td>June 27 to July 11</td>
<td><a href="http://www.mt0033.com">http://www.mt0033.com</a> <a href="http://www.natesc.gov.cn/Html/2016_07_0">www.natesc.gov.cn/Html/2016_07_0</a> 1/2_1878_2016_07_01_429710.html;</td>
</tr>
</tbody>
</table>
### 6.2 Public Consultation

Multiple rounds of public consultations were conducted during the preparation of the EMF. These activities are summarized in the Table 6-2.

<table>
<thead>
<tr>
<th><strong>Date</strong></th>
<th><strong>Participants</strong></th>
<th><strong>Topics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First round consultation for the EMF:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| June 26, 2015     | FECO, WB, Consultants, priority sector authorities, sector organizations, enterprise representatives | 1. China’s PFOS obligations (policies);  
2. Activities under this Project;  
3. WB safeguard requirements and policies |
| January 14, 2016  | FECO, WB, primary producer enterprise representatives                            | 1. National policies  
2. Project progress (producer sector)  
3. WB safeguard requirements and policies |
| March 14, 2016    | FECO, Sector specialists, sector organizations; metal plating enterprise representatives | 1. National policies  
2. Project progress (metal plating sector)  
3. WB safeguard requirements and policies |
| July 2015 to March 2016 | More than 10 times seminars, phone interviews or meetings with FECO, Relevant specialists, sector organizations, agricultural technology promotion centers, fire-fighting product certificate center, and enterprise representatives. | 1. Project related activities arrangement and progress;  
2. Relevant WB safeguard requirements. |
| **Second round consultation for the EMF:** |                                                                                 |                                                                                            |
| July 7, 2016      | FECO and enterprise representatives through phone interview                       | Firefighting sector activities  
Firefighting demonstration enterprise conditions. |
| July 2016         | FECO, Tsinghua University Professor Mr. Huang Jun, Guangdong PPMO, Guangdong Metal Plating Industrial Park and enterprise representatives. | National policy requirements;  
Metal plating sector activities and budget;  
WB relevant safeguard requirements. |
| July 2016         | Phone interview between Hubei PPMO and 8 PFOS production enterprises.             | No objections from enterprises. |
### Sectors Project-China: Reduction/Phase-out of PFOS in Priority Sectors

<table>
<thead>
<tr>
<th>Date</th>
<th>Participants</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2016</td>
<td>Written inquiry or phone interview. FECO and one enterprise.</td>
<td>No objection from the enterprise.</td>
</tr>
<tr>
<td>July 2016</td>
<td>Phone interview. Guangdong PPMO and 3 metal plating industrial parks and some enterprises.</td>
<td>No objection from the parks enterprises.</td>
</tr>
<tr>
<td>July 2016</td>
<td>Written inquiry or phone interview. National Agricultural Technology Promotion Center under MoA consults with provincial stations via phone call and emails. Consulted stations including the Guangdong, Fujian, Guangxi, Hainan, etc.</td>
<td>All supported the procedures and requirements stipulated in this EMF.</td>
</tr>
</tbody>
</table>

For environmental audit of Hengxin Company:

<table>
<thead>
<tr>
<th>Date</th>
<th>Participants</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 10, 2016</td>
<td>HHCC, HAES, and residential representatives (total number of 35). In addition, questionnaires were distributed.</td>
<td>In the seminar, types of POPs and their impact on human health and surrounding environment were introduced. 100 questionnaires delivered and 86 recovered. Most AP supported the conversion of the facility, and expressed concerns on technology to be used in the future.</td>
</tr>
</tbody>
</table>

### 7. Annexes

A series of Terms of References (ToRs) for different safeguard instruments that could be used in the project have been developed and included in the EMF as appendix.

#### 7.1 ToR for Environmental Impact Assessment

According to the World Bank safeguard policy OP4.01 on Environmental Assessment and domestic EIA requirements, the main tasks of EIA are as below.

#### 7.1.1 Project description

This task is to summarize the subproject basis including content, scale, location, technical specification, associated facility, implementation schedule and cost estimate, etc.

#### 7.1.2 Baseline

This task is to collect and summarize the subproject-related existing conditions for both the social and environmental baseline and the enterprise baseline. It includes the natural background, social environmental background, pollution sources in the region and environmental (ecological) functions etc. The enterprise baselines include the history, main business and basic conditions; main production process, product, and capacity; status of the workshop and associated facilities; materials type and usage; main pollutants and discharge, hazardous chemical usage, new chemical usage, handling of solid waste and hazardous waste, and environmental and safety risks, etc. The baseline investigation is in effect equal to environmental audit of enterprise, see also 7.2.

#### 7.1.3 Assess Environmental impact

The environmental impacts should be identified, analyzed and predicted for whole project cycle including the design stage, the construction stage and the operation stage.

#### 7.1.4 Alternative comparison

The objective is to seek the environmentally sound alternatives and provide support to decision making to optimize the facility design. The source of alternatives can be no-project, alternatives from project feasibility study, alternatives from public consultation, or alternatives from EIA.
7.1.5 Information disclosure and public consultation

Information disclosure and public consultation should be conducted following relevant World Bank policies. Two rounds of public consultation should be conducted during ESIA preparation, i.e. 1) TOR stage and 2) when draft ESIA is available. The consultation shall be conducted in meaningful way, i.e. combination of public meeting, individual interview and questionnaire survey. For the first round of consultation, information about the project and potential environmental concerns shall be provided to project-affected public. For the second round of consultation, key findings of ESIA and proposed mitigation measures should be provided to public for comments. The public consultation should focus more on affected public instead of local officials. Their concerns shall be incorporated into ESIA and ESMP development. The reports shall document in detail the date, places, topics, method, number of participants, their profession, and main concerns expressed and how these concerns are addressed in EIA or design.

7.1.6 Develop Environmental Management Plan

The EMP should include the institutional arrangement, mitigations measures (with cost budget) proposed, monitoring plan, capacity building and training plan, and reporting requirements.

7.1.7 Qualification requirements

The consultant should be familiar with relevant national regulations and technical standards related to EIA, and have the EIA qualifications for chemical industry and metal plating sectors. Familiarity with relevant World Bank safeguard policies and requirement is a plus.

7.2 ToR for Environmental Audit

This ToR applies for all participating enterprises undergoing technology retrofit or renovations. The environmental audit is a process to assess whether the facility and its operation conditions comply with relevant regulations, standards and policies. If any gaps are identified in the audit, corresponding mitigation measures and monitoring arrangements should be developed in the forms of an environmental management plan.

Currently there are no specific national guidelines for environmental audit. The Bank issued the guidance note on *Environmental Auditing* in the Environmental Assessment Sourcebook Update in 1995. An Environmental Audit is a methodical examination of environmental information about an organization, a facility, or a site, to verify whether, or to what extent, they conform to specified audit criteria. The criteria may be based on local, national or international environmental standards, national laws and regulations, permits and concessions, internal management system specifications, corporate standards, or guidelines of organizations such as the World Bank. The detailed requirements and contents of this TOR are developed with reference to domestic and international practices.

7.2.1 Scope and tasks

The scope of environmental audit includes:

1. Basic conditions of the enterprises/facilities and project. Including components of production shops (or devices) & auxiliary facilities; production scale, production methods and product categories of production shops (or devices); product categories and production and varieties and consumption of materials and auxiliaries; consumption of public works (e.g. water, electricity, steam) in auxiliary facilities. Identify relevant environmental and occupational health and safety legislation in the national and the World Bank.

2. Verify compliance with host country laws and regulations, World Bank guidelines or accepted international standards for all important environmental impacts. Implementation status of relevant requirements of EIA and of the “three simultaneousness” policy which means the environmental facilities and the main infrastructure are designed, constructed and operation simultaneous. The consultant should review both the fulfillment of procedural requirements and the actual facilities conditions. Such facilities should include all physical facilities required in the EIA approval or required by the three simultaneousness policy. Any incompliance should be recorded with detailed explanation so that the enterprise can take correction measures. For the cleaning production of the enterprise: Whether cleaning production and audit will be carried out,
whether audit results will be adopted, as well as the energy consumption of some unit in the enterprise.

3. Pollutant discharge. The consultant should audit the actual pollutant discharge against relevant discharge standards. The valid sources of actual pollutant discharge include the monitoring data from local environmental protection authority, the approved online monitoring data, the monitoring data from acceptance test (valid for 1 year), testing data from CMA licensed entity, third party (contracted by the enterprise) monitoring data or other valid sources.

4. Operational condition of environmental protection facilities and automatic monitoring equipment (if any). The consultant should audit the integrity, reliability, capacity, and operational status of these facilities.

5. Hazardous chemical pollution prevention, forbidden chemicals and new chemicals registration (if any). The consultant should review the hazardous chemical usage or production and the management practice of such chemicals. If a plant using or producing hazardous chemicals will be closed, the hazardous chemicals’ pollution to the site, surrounding area and the groundwater should be assessed. Past pollution incidents should also be reviewed. The consultant also should review the materials used to identify and forbidden chemicals or unregistered new chemicals.

6. Disposal of hazardous waste and industrial solid waste (if any). The consultant should review the disposal of these wastes to identify any incompliance with relevant regulations. If such incompliance is identified, detailed explanation should be recorded for correction measures purpose.

7. Environmental safety risks, emergency plans and environmental incidents (if any). The consultant should review the preparedness of the enterprise for any environmental safety risks and the implementation status of the emergency plans. For past incidents, the consultant should review the results and any modification measures taken.

8. Occupational health and safety conditions. The consultant will examine procedures and rules for employee protection and assess the compliance level with company policies; evaluate accident or incident reporting, analysis and follow-up; check medical examination availability for employees with potential exposure to dangerous substances; evaluate adequacy of training and emergency drills; examine record of complaints and assess hazards or risks for local community, etc. In addition, the consultant will review the practice in separating the harmful work area from non-harmful work area, applying warning and venting facilities in work areas with toxic substances, and providing safety gears that comply with relevant domestic regulatory requirements.

7.2.2 Methods
The audit should be conducted through documents review and site investigation. The documents should include all approval environmental documents, environmental management policies documents, operational records, and descriptions of the enterprise, production process, materials used, plant layout, etc. The site investigations include facility inspection, and on-site interviews. All site investigation should be recorded.

7.2.3 Qualification requirements
The consultant should be familiar with relevant regulations and technical requirements related to EIA and environmental audit and have relevant experience. Familiarity with relevant World Bank safeguard policies and requirement and similar project experiences are a plus.

7.3 ToR for Environmental Site Assessment
This ToR applies for environmental site assessment required for all participating enterprises under plant closure or production line closure. The project only support site assessment and dismantling, not site remediation or clean up. The requirements for environmental site assessment are:

(1) Stage I- Identification of pollution
The focus on this stage of work is to identify potential pollutants and their sources, preliminary assess the potential of pollution. By conducting desktop study on collected data and materials, and
conducting site inspection and interviews with key personnel, the consultant shall preliminarily assess the pollution conditions of the site. The details of data collection and desktop study should follow the technical guidelines for environmental site assessment (HJ25.1). Then the consultant should site inspection to verify information acquired from the desktop study. The key areas to be inspected include the suspicious pollution sources, past pollution traces, places involving hazardous materials, buildings and surrounding areas. The scope of surrounding area based on the nature of identified pollutants. In addition, the consultant will interview key personnel during site inspection. The site inspection and interviews should also follow the technical guidelines for environmental site assessment (HJ25.1). Based on the desktop study and site inspection, if there is a pollution possibility, a conceptual model for the site pollution will need to be established. Key parameters include the key pollutants, potential polluted areas, hydrological and geotechnical conditions, characteristics and fate of pollutants in environmental media, receptors, exposure patterns and hazard identification, etc.

(2) Stage II- Sampling and testing
The Stage II work will use sampling and testing to identify the extent of pollution of each pollutant in the site. First a preliminary sampling and testing will be conducted based on the Stage I findings. The sampling should follow the technical guidelines for environmental site assessment (DB11/T656) and (HJ25.1). In-situ testing can be used to detect the dissolved oxygen (DO), pH, conductivity, color and turbidity. Other samples should be sent to certificated lab for testing following national standards (or international standard methods if no applicable domestic standards available).

If preliminary testing confirmed that the site has pollution risks, detailed sampling and testing will be needed. The detailed sampling and testing should follow relevant requirement of Technical Guidelines for Environmental Site Monitoring (H25.2).

(3) Stage III- Site risk assessment
The Stage III work will evaluate the environmental risks in the site and the needs for remediation based on Stage 2 findings. The consultant will first need to identify the hazards based on Stage I and Stage 2 findings, and then identify the exposure model of sensitive receptors to the pollution risks, based on which the toxicity analysis can be conducted. With this information, the consultant will determine the environmental risks characteristics following the Technical Guidelines for Polluted Site Risk Assessment (HJ25.3). And lastly the consultant will need to determine acceptable level of environmental risks and the scope of areas that need remediation.

(4) Develop Environmental Management Plan
Based on the site assessment, the consultant will propose a series of suggestions and measures, as well as monitoring requirements for the equipment demolishing and necessary urgent cleanup. These will form an EMP. If the future use of the sites is clear, the EMP also needs to provide additional measures and monitoring for the site cleanup and rehabilitation, which is also termed as restoration plan.

7.4 Pest Management Plan
7.4.1 Regulatory framework and institutional capacity
The regulatory framework of pesticide management contains three parts including the national laws and regulations, sector rules and technical standards. The national laws include the Regulations on Pesticide Administration (2001 revision), which is the regulatory basis for pesticide management and stipulates detailed regulations on pesticide registration, pesticide production, pesticide-business operation, pesticide application, penalties and others, and the Law on Quality and Safety of Agricultural Products (2006), which requires that pesticides should be regularly inspected by authorities of different levels. The sector rules include the three orders from the Ministry of Agriculture (MOA) issued on December 8, 2007 regarding the revision of the implementation methods of the Regulations on Pesticide Administration, the pesticide registration data, and pesticide labelling and user’s instructions etc., a notice from the MOA regarding pesticide name registration management, and two notices jointly issued by MOA and NDRC regarding the pesticide naming and effective composition. The technical standards include nearly 200 national and sectoral standards on products, 400 standards on methods and 100 standards on safety, and 10 standards on emergency response and environmental safeguard.
Currently the pesticide management systems still have rooms for improvement in that (1) the institutional arrangement needs to be streamlined to avoid overlaps and gaps as currently multiple agencies are involved; (2) the licensing system for pesticide application and business operation hasn’t been in place and the standards for pesticide residual need to be strengthened; (3) the special pesticide registration system doesn’t work properly resulting from the low operability of relevant regulations. Currently the national government is promoting the revisions on the Regulations on Pesticide Administration to improve the current situation.

Shortly after the presence of RIFA was identified in mainland China, MOA issued a notice to define the RIFA as quarantine pests and the "Emergency Response Plan for RIFA Control" in January 2005. In June 2005, MOA issued a series of notice and reports regarding RIFA control including the national RIFA eradication plan, the RIFA control public awareness training plan and the RIFA risk analysis reports. Other national government agencies also issued a series of policies, including the warning of invasion of RIFA by General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) in November 2004, the notices on strengthening RIFA monitoring and quarantine by National Forestry Administration (NFA) in January 2005, and the notice on strengthening monitoring and prevention of the RIFA attacking accidents of human by Ministry of Health (MOH) in March 2005.

Following the MOA regulations, a series of provinces issued local regulations accordingly, including Guangdong, Guizhou, Hunan, Chongqing, Fujian, Jiangxi, and Hainan etc.

Relevant standards are also being developed regarding RIFA control. Currently there are 7 standards effective, including the RIFA quarantine and identification methods (GB/T20477-2006), the RIFA quarantine rules (GB/T23634-2009), the RIFA monitoring procedures (GB/T23626-2009), the field efficacy trials criterion (b) part 149: insecticides against RIFA (GB/T17980.149-2009), the technical rules on chemical prevention and control of RIFA (NY/T2415-2013), the technical rules on RIFA prevention in nursery garden (DB44/T598-2009), and the RIFA prevention evaluation standards (DB44/T1323-2014), etc.

Currently the pesticide production is under supervision of the Ministry of Industry and Information Technology (MIIT) and the pesticide application is under supervision of the MOA with assistance from other ministries. There are currently near 1800 pesticide manufacturing enterprises, 350,000 pesticide business units, and millions of pesticide users. Thus the supervision of pesticide is very difficult.

For the RIFA pesticide, sulfluramid, currently there is not much limitation except that the manufacturer should have the three certificates including the pesticide manufacturing certificate, the pesticide standards certificate and the pesticide registration certificate. However, as China will phase out the PFOS application by 2019, relevant government agencies will gradually revoke the certificates for sulfluramid production and provide relevant regulatory framework for phasing out such products.

The implementation of the RIFA control is dominated by the plant protection stations or the agricultural technology centers at different levels in agricultural sector. The plant protection system is well-developed with stations at all levels from the central government to the county levels. These stations are usually well staffed (generally the size of 30 people at provincial level, 5-10 people at municipal level and 3-5 people at county level). These stations have been on the frontline battling against the RIFA in the past years and accumulated extensive experience. Therefore, they are capable of taking up the responsibility for this project.

7.4.2 Methods of Pest Management

RIFA origins in South America and was first detected in mainland China in 2004 in Guangdong Province. Since then it has been spreading at fast pace due to its strong reproduction capacity and numerous pathways of spreading. By 2015 it has spread to 10 provinces in China.

Listed as one of the top 100 most destructive organisms by the International Union for Conservation of Nature (IUCN), RIFA is considered an ecological killer due to its threat to human health, to the agricultural production, to the public safety, and to the ecological system. Some studies were conducted to investigate potential geographic distribution of RIFA. The results suggested that the RIFA can spread to 25 provinces in China in the next decades.
Due to the different natural environment conditions and the actual RIFA breakout conditions, different province adopted different approach to battle against the RIFA invasion. However, the key measures taken are similar, including:

(1) Investigation and monitoring– using field investigation to identify the area affected by RIFA.
(2) Quarantine and supervision– using quarantine measures to prevent RIFA from spreading. The quarantine measures include phytosanitary inspection and treatment in producing areas and before transportation, which will prevent RIFA from being mixed into the agricultural products and being shipped to other places, respectively. Chemical treatment is usually used to ensure that the agricultural products shipped out are RIFA free.
(3) Chemical treatment – using chemical treatment to control RIFA. The chemical treatment methods include poison bait method, nest irrigation method, granule or powder pesticide application. The poison bait method applies to different RIFA locations, targeting at individual ant nest or at larger area. The nest irrigation method applies to areas with significant RIFA activity, demanding emergent treatment due to the imminent threat to safety or public health. The granule or powder pesticide applications also apply to larger areas with significant RIFA application. In order to completely eliminate the RIFA, a two-stage treatment method is recognized as more effective and widely used by first applying poison bait in the region and then disinfect the ant nest with remaining living RIFA individually after approximately two weeks.

As the RIFA control is a government-led initiative, the pesticide is usually purchased through wholesale with little involvement of retailers. Therefore, there is no much training provided to retailers. Most of training activities are provided by the plant protection stations with assistance and participation from forest bureaus and gardening departments. In terms of funding source for RIFA control, the government accounts for more than two thirds of the total funding, while the enterprises and individuals provide the other one third. Approximately one third of RIFA control activities are centralized implemented by professionals while the other two thirds are conducted through decentralized implementation by household. Most of the pesticides are provided by the government and applied by individual household under the instruction by the village leaders. Therefore, it is likely that the households are not well trained or do not strictly follow instructions.

In the past decade of RIFA control, dozens of pesticides were developed and tested including 28 poison bait and 3 contact toxic powders. Among them, 8 poison baits and 2 contact toxic powders are sulfluramid containing and the other 21 can be used as substitute for sulfluramid. Some of them are proven very effective in RIFA control. However, they are not used for major application for RIFA control yet as they haven’t received the three certificates. As the market remains small, the manufactures are not willing to invest in achieving the certificates.

The current methods used have the following shortcomings:

(1) The RIFA control is heavily relying on chemical treatment;
(2) Some pesticides are not properly registered; and
(3) Some pesticides are not very effective but bring about severe environmental pollution issues.

Many RIFA control methods have also been used in other nations and regions, including:

(1) Plant quarantine;
(2) Physical control, including incineration, hot water boiling, water drowning and frozen kill etc.;
(3) Biological control; and
(4) Chemical control, including chemical fumigation, chemical irrigation, toxic powder, toxic particle and poison baits.

As it is very difficult to complete eliminate the RIFA through one single method, Australia and US have switched to the two-stage methods by first applying poison bait and then applying contact toxic material after approximately two weeks.

Based on the domestic and international experiences, in the demonstration area, the recommended RIFA control approach should be using quarantine management and two-stage treatment following outbreaks. At the same time, environment-friendly substitutes should be promoted to achieve the dual
objectives of controlling RIFA and phasing out sulfluramid. Some of current issues in RIFA control will also be addressed in this demonstration, including:

(1) Through a series of training and awareness raising activities, disseminate correct understanding about RIFA and the right approach to control it and attain stronger support from various players in society;
(2) Through pesticide screening and policy study on special pesticide registration, promote registration of effective and environment-friendly pesticides;
(3) Through promotion of two-stage approach, improve the RIFA control effectiveness and reduce environmental pollution.

7.4.3 Pesticide application and management
Currently there are 7 kinds of active ingredients and 12 types of formulated pesticide products registered for RIFA control in China.

After comparison of the registered pesticide, it is suggested for the demonstration a two-stage approach should be used in RIFA control, including a first stage application of 0.1% or 0.05% Indoxacarb poison bait and a second stage application of 0.1% Cypermethrin powder. After the two-stage treatment, 0.1% of Hydramethylnon can be applied as a supplementary measure if there is any living ant nest left. The project will support 32 demonstration pilots, each with an area of 500 mu. The total estimated pesticide usage in a 4-year period of demonstration will be 6 tons of 0.1% or 0.05% Indoxacarb and 3 tons of 0.1% Cypermethrin.

All these pesticides are low-toxicity pesticide and can comply with the requirements in WB OP 4.09 regarding the selection and applications of pesticide. Therefore, the environmental risk is low if their application properly follows relevant instructions. They are also comparatively safe during their transportation, storage, dealing and application. During application, personnel should be wearing masks, gloves and rubber boots for effective protection. Main risks include:

(1) Poison risk if they are accessed by children during storage;
(2) Environmental pollution risk if not properly applied; and
(3) Health risks for personnel if not properly protected during application.

In order to mitigate the risks, well designed training for the base level government staff or village leaders is the key. By extensive training, the pesticide distribution process can become a knowledge dissemination process.

7.4.4 Project activities
In addition to the demonstration of sulfluramid substitutes as described above, this project will also conduct a series of other activities to promote the overall capacity including: (1) Public awareness raising by preparing and releasing TV program, poster and book and website construction; (2) Conduction of a series of workshop on the control of RIFA and phase-out of sulfluramid and enhancement of pesticide supervising capacity; (3) Screening of alternative pesticides; (4) Development of BAT/REP guidelines including Technical Guidelines on the Control of RIFA and Recommend List of Pesticides for the Control of RIFA and Their Methods of Use; (5) Built-up of national capacity including amendment of Rules for Chemical Control Technologies of RIFA, studies of the requirement for registration of RIFA pesticides and the supportive policy for phasing-out sulfluramid.

In addition, a series of training will be provided to the governmental staff, representatives from relevant agencies in agricultural, forest, gardening and financial sector, township and village leaders and RIFA control professionals. The training will cover national and local regulations and standards, the pest management plan under this project, the RIFA identification and control techniques, the RIFA pesticide application, and the environmental risks of sulfluramid.

7.4.5 Capacity building
Together with the promotion of sulfluramid substitutes, this project will also promote capacity including: (1) Promote pesticide supervision capacity; (2) Update the technical specification for RIFA control; and (3) Support PFOS phase out policy study.
In addition, a series of training will be provided to the governmental staff, representatives from relevant agencies in agricultural, forest, gardening and financial sector, township and village leaders and RIFA control professionals. The training will cover national and local regulations and standards, the pest management plan under this project, the RIFA identification and control techniques, the RIFA pesticide application, and the environmental risks of sulfluramid.
Part II Social Management Framework

The GEF-financed PFOS Reduction and Phase-out Project in Priority Sectors in China (hereinafter, the "Project") initiated by FECO and the Bank was approved by the Global Environmental Facility (GEF) on June 4, 2015. The Project focuses on demonstration, replacement, reduction and phase-out in major enterprises in the PFOS production, metal plating, pesticide and firefighting sectors. The gross investment in the Project is USD67.22 million, including a GEF grant of USD24.25 million.

According to social screening of the possible project enterprises and estimation from previous experience, most of the project activities will be done within existing compounds of project companies with no need for involuntary resettlement. Most subprojects are not expected to lay off any worker, because the enterprise usually reassigns the workers within the same company or has workers move within the company to a new location. If there is any worker lay off however, it would be of a very small scale. Such social impacts as displacement of workers would be covered by ESMP under OP 4.01 in most cases.

Nevertheless, social impacts of this project might emerge from partial of full closure of production line or project enterprise relocation which is often in an industrial park of an urban area. Such kind of changes are likely to trigger involuntary resettlement and labor impacts (due to product change or production suspension). But such impacts are expected to be very limited as project activities will be carried out on existing state-owned land of an existing project or industrial park. Usually an enterprise in China is located in urban or suburban area which typically does not have presence of ethnic minorities by the Bank IP term definition. In conclusion, the whole project cannot fully rule out future possibility of triggering Bank OP 4.12 related to involuntary resettlement due to possible project enterprise partial closure or relocation during implementation. According to the Bank's social safeguard policy requirements, a Social Management Framework (SMF) including a resettlement policy framework and employee resettlement plan framework has been prepared to address such possibilities.

To address potential job changes or losses which are foreseeable for a small number of workers of project enterprises, beneficiary enterprises will provide training, new job assignments within the same group of the company, and other kinds of assistance for affected workers. Chinese labor laws and regulations will be followed to ensure appropriate compensation and livelihood restoration to affected workers. The ESMP states that local Chinese labor laws and regulations, and World Bank safeguards policies should be followed to ensure appropriate compensation and livelihood restoration for affected people. In case of workers’ redundancy with labour contract termination from the participating enterprises, an employee resettlement plan should be prepared in consultation with professional expert and submitted to the Bank via FECO for prior review and agreement. The employee resettlement plan will be monitored and evaluated during the project implementation period. Those enterprises that will proposes laying off less than 20 employees, will include the employee resettlement plan as part of ESMP under OP 4.01. A social screening will be done for every subproject to assess social impacts and risks. A comprehensive social assessment will be done for every subproject which has negative social impacts and risks. A social assessment report will be done as required for those cases of significant social risks and impacts accordingly through hiring experienced professionals. In case the project involves any closure or relocation of the existing facilities, social impacts on livelihoods and employees’ job security occur, specific social management instruments will be prepared to fully address such issues on specific subproject basis.

Pilot subprojects

One pilot subproject is under consideration in Hubei Hengxin Chemical Company which would not require any land or lay off any employees because of piloting under this project. This pilot subproject is Hubei Hengxin Chemical Company Limited (HHCC). It was established in 2004 occupying less than two hectares on existing public land in Yingcheng City. It is currently the largest PFOS producer in China. This enterprise would phase out some of its production capacity and upgrade the remaining
capacity for other less toxic products. This subproject would have very limited negative social impacts and would undertake project activities on existing public land and all employees if affected would be reassigned within the same enterprise.

**Involuntary resettlement**

The first subproject under consideration does not involve any acquisition of land or house demolition. But future project enterprises have not been identified at project appraisal. Partial production line closure of PFOS producers or relocation of such enterprises may trigger the Bank policy OP4.12 Involuntary Resettlement during the project implementation. A resettlement policy framework is therefore prepared and included in the social management framework. The framework provides guidance on dealing with the issues of land acquisition and resettlement if it occurs in the implementation stage of the project, so as to ensure the OP 4.12 Involuntary Resettlement is properly considered and complied with.

**Ethnic minorities**

All subprojects will be located in urban or suburban areas, involving no minority community and there won't be indigenous people by the Bank IP term requirements. Therefore, the Bank policy OP4.10 Indigenous Peoples is not triggered.

**Labor impacts**

Special attention is given to the unemployment risk of workers of the project enterprises to be relocated, closed down or subject to product changeover. Each selected pilot enterprise needs to conduct public consultation on worker resettlement with workers, and address their concerns. All the pilot enterprises will ensure that: i) All workers will be provided equal opportunity with no discrimination, reemployed by former enterprises or employed by new enterprises after product changeover; ii) Their wages will be in line with the value of similar jobs in the labour market after reemployment; iii) Their previous lengths of service will remain unchanged; iv) Pre-job training will be offered; and v) Workers who are unwilling to be reemployed or work at new enterprises may go through resignation formalities and ending labour contracts according to the Labor Law. In case of workers’ redundancy with labour contract termination from the pilot enterprise, an employee resettlement plan should be prepared in consultation with professional expert and submitted to the Bank via FECO for prior review and agreement. The employee resettlement plan will be monitored and evaluated during the project implementation period.

1. **Social Management Framework**

The Project involves PFOS reduction and phase-out. The sites and scopes of the specific subproject are unclear by appraisal of the project, but they may involve land acquisition, house demolition, worker's job losses due to project enterprise or production full or partial closure, and other social risks during implementation. Therefore, it is necessary to prepare a Social Management Framework (SMF) for the Project.

Since the Project is mostly implemented in urban or suburban areas, and does not involve any minority area, there will not be indigenous people by the World Bank IP term requirements, thus this SMF does not include an Indigenous Peoples Policy Framework (IPPF).

The Social Management Framework (SMF) covers involuntary resettlement framework, social assessment and employee resettlement framework. It is developed to ensure that all measures are taken to avoid or minimize negative social impacts in all grant-funded project activities. Unavoidable impacts will be identified according to the applicable Bank policies, and PRC laws and regulations, and necessary mitigation measures developed and implemented.

The SMF, including a resettlement policy framework and an employee resettlement plan framework, establishes the objectives, procedure, organizational framework and implementation arrangements for identifying and managing potential social impacts arising from project activities, and public participation and grievance redress mechanisms.
2. Public Consultation and Information Disclosure

The RAP following the RPF, the Employee Resettlement Plan (ERP), and Social Assessment report should describe the measures taken or to be taken, and enable the affected persons and workers to participate in the proposed project activities.

The RAP and the ERP/SA report should be subject to meaningful consultation, and all documents that ensure the adequate participation of and consultation with the affected persons (APs) should be disclosed as required by the Bank.

Public consultation should be implemented ahead of project design, and must run through the whole process of RAP implementation and external M&E.

During public consultation, this SMF was disclosed in the affected cities and enterprises for comment in Chinese in China in August 2016 and in English in the InfoShop in September 2016.

3. Grievance Redress Mechanism

During project preparation and implementation, an effective grievance redress has and will continue to be applied in order to deal with the Project’s impacts on stakeholders, and ensure extensive public participation:

Stage 1: An AP may file an oral or written appeal with the employer or village/community committee. In case of an oral appeal, the employer or village/community committee shall keep a written record. Such appeal should be solved within two weeks.

Stage 2: If the AP is dissatisfied with the result of Stage 1, he/she may file an appeal with the IA or project management agency after receiving such result, which shall make a result within two weeks.

Stage 3: If the AP is still dissatisfied with the result of Stage 2, he/she may file an appeal with the competent authorities, level by level, in accordance with the Administrative Procedure Law of the PRC for arbitration.

Stage 4: If the AP is still dissatisfied with the arbitration result, he/she may file a suit in a civil court in accordance with the Civil Procedure Law of the PRC after receiving the arbitration result.

The grievance Redress mechanism will be maintained throughout the project life-cycle to deal with any public concerns in environmental and social management.

4. Institutional arrangements

FECO, under assistance of social expert, local EPB and relevant authorities, and external monitoring institution, will lead the overall supervision of the implementation of SMP. FECO will also provide capacity building for local EPB and project enterprises in managing social risks and impacts of the project.

In case of land acquisition and house demolition, local land Resource Bureau will be responsible for review and approval of the design documents for the works associated with the project land use.

Local EPB will provide support to coordinate with local land resources bureau, human resources and social security bureau as well as project enterprise in addressing social issues of the project.

5. Supervision, Monitoring and Evaluation

The implementation of social management plans (SMP) such as RAP or ERP will be managed by FECO and local EPBs as well as project enterprises concerned. A social management staff/team will be designated in FECO, local EPB and project enterprises. Civil work contractors and supervision companies will be required to assign qualified social staff to ensure effective implementation of the SMP. FECO should also establish an M&E mechanism for the implementation of the RAP and the ERP, including internal and external monitoring.
Internal monitoring will be implemented by FECO, which will establish a topside-down internal monitoring mechanism. FECO or the appointed consultants will monitor the implementation of the RAP and the ERP semi-annually, and prepare two progress reports annually for submission to the Bank.

External M&E will be conducted by an independent agency appointed by FECO or the PMOs through public bidding over all resettlement activities of the Project, and reported to FECO and the Bank annually or semi-annually until project completion. Such independent agency may be an academic institution, NGO or consulting firm, but it should have qualified and experienced staff, and its TORs should be accepted by the Bank.
Part III. Summary of Environmental Audit for Hengxin Company

1. Introduction

Hubei Hengxin Chemical Company Limited (HHCC) is currently the largest PFOS producer in China. It is located in Yingcheng City approximately 120 km to the west of Wuhan in Hubei Province. First established in 2004, currently the facility has a production capacity of 30 tons of PFOS annually, occupying less than two hectares. The company is under consideration as a demonstration enterprise for conversion of production to new non PFOS-based products under component 1 of the project, although participation of the enterprise is not confirmed at time of project approval, and details of possible investments are not known. Still in proposal stage, an environmental audit is thus conducted to review the environmental compliance of its current operation. The enterprise will prepare an EIA as soon as details of the possible investments are known. The audit was conducted by Hubei Academy of Environmental Sciences in 2016 following the requirements in the EMF (see Section 7.2). The key findings are summarized here.

With reference to common practice in environmental audit for public listed company in China, the operation period to be audited is 36 months prior to the audit. Therefore, the audited operation period is from January 1, 2013 to December 31, 2015.

2. Sensitive receptors and applicable standards

The production facility of HHCC is situated by the west bank of Yanshui River, which is the receiving water body of the wastewater discharge from the facility. The Yanshui River is a tributary of the Laoxianhe River, which later merges into the Dafushui River and then merges into the Hanbei River, a major tributary of the Yangtze River.

The sensitive receptors include the residents near the facility and the Yanshui River by the facility. The applicable environmental standards for them include the Surface Water Environment Quality Standards (GB3838-2002) Class III standard, the Ambient Air Quality Standards (GB3095-1996) Class II standard, and the Urban Area Environmental Noise Standards (GB3096-93) Class II.

In addition, there are several applicable discharge standards including the Integrated Discharge Standards for Air Pollutants (GB16297-1996), the Discharge Standards for Air Pollutants from Boilers (GB13271-2014), the Integrated Wastewater Discharge Standards (GB8978-1996), the Hubei Province Fuhe River Basin Chloride Discharge Standard (DB42/168-1999) and the Industrial Enterprise Border Noise Standards (GB12348-2008); see summary in the Table below.

<table>
<thead>
<tr>
<th>NO.</th>
<th>Item</th>
<th>Applicable standards</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HF</td>
<td>0.02 mg/m³</td>
<td>Border of Production Facility</td>
</tr>
<tr>
<td>2</td>
<td>HCl</td>
<td>0.2 mg/m³</td>
<td>Border of Production Facility</td>
</tr>
<tr>
<td>3</td>
<td>Fume</td>
<td>50 mg/m³</td>
<td>Flue gas at chimney</td>
</tr>
<tr>
<td>4</td>
<td>SO₂</td>
<td>100 mg/m³</td>
<td>ibid</td>
</tr>
<tr>
<td>5</td>
<td>NOx</td>
<td>400 mg/m³</td>
<td>ibid</td>
</tr>
<tr>
<td>6</td>
<td>pH</td>
<td>6-9</td>
<td>Wastewater discharge outlet</td>
</tr>
<tr>
<td>7</td>
<td>COD&lt;sub&gt;Cr&lt;/sub&gt;</td>
<td>100 mg/L</td>
<td>ibid</td>
</tr>
<tr>
<td>8</td>
<td>Ammonia</td>
<td>15 mg/L</td>
<td>ibid</td>
</tr>
</tbody>
</table>

Table III-1 Key Applicable Discharge Standards
### 3. Production process water balance

As part of the cleaner production audit, a water balance analysis was conducted for the entire production process. The findings are illustrated in Figure III-1 and discussed in Section 4.3.

![Water Balance Diagram](image)

Figure III-1 FFOS production water balance analysis, tons/year

### 4. Main findings of audit

#### 4.1 Main findings of environmental audit

According to ToR for environmental audit (Part I Section 7.2), the following 12 aspects of the Company are checked against applicable criteria with the results summarized below:

1) Implementation status of relevant requirements of environmental assessment and of the “three simultaneousness” policy.
Findings: Compliance in that an EIA and a retroactive EIA were prepared and acceptance tests were conducted. In 2015, its actual production exceeded the approved 30 tons limit, though.

2) Compliance with national industrial policy.

Findings: Compliance with the Industrial Structure Adjustment Guidance Catalog (2011 Edition, updated 2013). However, PFOS was later added to the Stockholm Convention on Persistent Organic Pollutants (POPs) and thus is subject to phase-out.

3) Pollution discharge registration, discharge permit, discharge tariff (if any).

Findings: Compliance.

4) Pollutant discharge.

Findings: Compliance with relevant discharge standards; Non-compliance with total COD quota. Currently there is no discharge standard specified for PFOS. Therefore, the current monitoring is focused on general pollutants.

5) Operational condition of environmental protection facilities and automatic monitoring equipment (if any).

Findings: A series of Non-compliance identified, including: no domestic wastewater treatment; no sound shield for cooling facility; insufficient accident containing tanks volume; and Height of stack insufficient.

6) Implementation of cleaner production policy (if any).

Findings: No cleaner production audit conducted. A water balance analysis was conducted instead, based on WB suggestions. The findings are: Wastewater from spray tower recycled for material recovery; Sulfonation process water loss not recovered but has recovery potential; Fluorination process waste and Electrolysis process waste discharged. Landscaping water usage too large. More details are discussed in the following sections.

7) Heavy metal pollution prevention (if any). The consultant should check the heavy metal pollutants discharged against relevant national and local regulations. Such information should be disclosed to the public regularly.

Findings: Not applicable. As the project is not involved the heavy metal pollutions.

8) Hazardous chemical pollution prevention, forbidden chemicals and new chemicals registration (if any).

Findings: A series of non-compliance identified in the storage, and transfer of hazardous chemical. Emergency plan was developed, but lack sufficient practice and isn’t reported to local authorities for file keeping.

9) Disposal of hazardous waste and industrial solid waste (if any).

Findings: A series of non-compliance identified in the handling and disposal of CaF2 sludge.

10) Ecological protection measures (if any).

Findings: Not applicable as its operation does not involve ecological environmental protection.

11) Impacts on sensitive areas such as source water protection areas (if any).

Findings: Not applicable. The waste discharge does not involve any environmental sensitive sites such as drinking water source protection area.
12) Environmental safety risks, emergency plans and environmental incidents (if any).

Findings: Response plans available but need improvement. Current there is no environmental claims, complaints, pollution incidents or penalties against the company.

4.2 Main pollutant producing process and control measures

Against applicable standards and requirements set in the retroactive EIA reports (2008) and acceptance reports (2005), the producing process, its pollutions and control measures are checked more in-depth, with results summarized in the Table III-2 below.

4.3 Findings of Cleaner Production audit

The project aims at promoting cleaner production and best applicable technologies/best environmental practices (BAT/BEP) through demonstration and promotion. However, HHCC has never conducted the cleaner production audit. Cleaner production audit usually focusses on the material balance analysis. One of the most important material balance analysis is the water balance analysis. Therefore, this audit conducted the water balance analysis for HHCC. The findings are discussed in this section.

(1) The total recycling water usage is 829,800 tons/year, including 1800 tons/year in vacuum pump, 720,000 tons/year for cooling machine and another 108,000 for cooling system. Each year there will be 4,325 tons/year of fresh water for supplement. Therefore, the recycling efficiency is 99.5% (close to 100% benchmarking for clean production). Other than supplementing the recycling water, there are 369 tons/year of fresh water for production, 3001 tons/year for domestic use, 8730 tons/year for landscaping, and 5100 tons/year for boilers. The total fresh water usage is 21,525 tons/year.

(2) The landscaping (8730 tons/year) use and domestic use (3001 tons/year) account for 54.5% of total fresh water consumption, which is too huge. Based on the water balance analysis, the actual landscaping water usage exceeded the standard value (Code for Planning of Urban Water Supply GB 50282-98) by two to five times while the domestic water usage was within the standard range. The excessive landscaping water usage might cause dilution of the discharged wastewater. This might explain the conflicting findings of compliance in discharge standards of COD and ammonia but non-compliance in total amount of COD and ammonia discharged. Therefore, the landscaping water management should be enhanced through stipulated irrigation time, usage and scope, regular inspection of irrigation pipelines, etc., to avoid waste. In addition, with consideration of the heavy precipitation in the region, the storm water and domestic waste water can also be considered for landscaping water use.

(3) The fresh water usage for boiler is 5100 tons/year, from which approximately 4600 tons/year will be lost by vaporization. The boiler is small and operates intermittently. The temperature and pressure of the steam drops after pressure reduction valve and heat exchange. Therefore, it is not feasible to use it for power generation. In addition, during the sulfonation process, 114 tons/year of water will be lost by vaporization. It is recommended to reclaim the heat from the steam for heating in the facility to avoid loss of water.

(4) The water usages for HCl and HF adsorption are 103 tons/year and 26 tons/year, respectively. The products are high concentration acid. During the fluorination process, 87 tons of bromide containing wastewater will be produced. This waste water is mixed with HCL wastewater. All the waste acid waters are sold as raw material in the market. This practice is in line with the clean production concept.

(5) The cleansing water usage is 30 tons/year. The wastewater produced is insignificant.
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(6) The production water usage is 369 tons/year (including cleansing). The unit product water consumption is 12.3 tons of water per tons of product. Currently there are only 8 enterprises in this industry in China with HHCC leading in size and capacity. There are no statistics of water consumption in the industry to be used as reference.

5. Information Disclosure and Public Consultation

An audit-related disclosure was conducted between June 2016 and August 2016. The revised ESMF was disclosed on the official website of HAES and the Hubei Provincial EPB, and the audit report was disclosed on the official websites of the FECO, HHCC, and Yingcheng City EPB. In addition, a public consultation was also conducted on August 10, 2016.

About 35 affected persons including staff and surrounding residents are invited in the public consultation workshop; the technical General-Manager introduced the proposed project component especially the alternative technical. The requirement of the Stockholm Convention on Persistent Organic Pollutants (POPs) is also be introduced on the consultation meeting. The Consultant from HAES introduced the main environmental impact and the mitigations from the PFOS production and the three priority application industries in this proposed project, and briefed the main procedure of the various scenarios. However, the affected people are concerned the safety of the chemical production process, conversion plan and the compensated standards. Meanwhile, about 100 questionnaires were distributed to the affected persons with a recovery rate of 86%. The conclusion of the survey is that the affected people are supportive to the project implementation.

6. Environmental management plan

In order to help HHCC improve its environmental management and to satisfy the environmental safeguard requirement as a participating subproject, an EMP was developed and included in the audit report.

The EMP included a list of risks identified and relevant mitigation measures proposed targeting specific environmental pollution or risks sources (refer to Table III-3). The EMP also included a monitoring plan (refer to Table III-4) for waste air emission, waste water discharge and boundary noises, and a capacity building plan to improve the company's capacity in fulfilling the safeguard requirement for participating in the GEF Project. All costs incurred in the EMP implementation will be covered within the operational cost of the company.

7. Conclusions of Environmental audit

Since HHCC commenced its production, there has never been any environmental or safety accidents in the company or any complaints of illegal environmental misconduct filed against the company. During the audit, it was found that the company had good performance in compliance with relevant air emission and pollutant discharge standards, and good performance in environmental management. However, the audit also identified some rooms for improvement, including that there are defects in the storage methods of the industrial solid waste and hazardous waste. Modifications thus are needed to strictly follow environmental protection and pollution prevention and control measures.
Table III-2. Main pollutant sources and control measures

<table>
<thead>
<tr>
<th>Pollutant source</th>
<th>Proposed measures by EIA</th>
<th>Current Status</th>
<th>Audit conclusions and proposed measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production wastewater</td>
<td>Reuse as recycling water for cooling system after neutralization.</td>
<td>Implemented. Water conservation achieved.</td>
<td>Reasonable. Water conservation can be achieved.</td>
</tr>
<tr>
<td>Cleansing wastewater</td>
<td>Add Ca(OH)₂ and coagulants for treatment then discharge to city sewer.</td>
<td>Implemented. Can satisfy relevant discharge standards</td>
<td>Reasonable. Wastewater discharge can meet relevant standards.</td>
</tr>
<tr>
<td>Domestic wastewater</td>
<td>Build a domestic wastewater treatment system</td>
<td>Did not build the system. Wastewater discharged into city sewer.</td>
<td>HF can be detrimental to bacteria; thus biological treatment is not feasible. The facility is small and the wastewater can meet the acceptance standards for city sewer, therefore the treatment system is not recommended.</td>
</tr>
<tr>
<td>Storm Water</td>
<td>Build separated storm water drainage pipeline.</td>
<td>Implemented. Wastewater and storm water are separately discharged</td>
<td>Reasonable. The storm water can be separately discharged from wastewater.</td>
</tr>
<tr>
<td>Air emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCl containing waste gas</td>
<td>Recover in spraying tower then discharge.</td>
<td>Implemented. More than 99% HCl recovered.</td>
<td>Reasonable. HCl concentration can meet relevant standards.</td>
</tr>
<tr>
<td>HF containing waste gas</td>
<td>Use 3-stage spraying tower to recover then discharge.</td>
<td>Implemented. More than 99% HF recovered.</td>
<td>Reasonable. F- concentration can meet relevant standards.</td>
</tr>
<tr>
<td>Boiler exhaust</td>
<td>Switch to natural gas-fired boiler</td>
<td>Implemented. Emission standards satisfied</td>
<td>Reasonable. NOx and fly ash can meet relevant standards.</td>
</tr>
<tr>
<td>Noise at border</td>
<td>(1) Boiler contained in boiler room; (2) Use low-noise cooling tower; (3) Use sound insulation windows; (4) Shut windows and doors during night shift.</td>
<td>(2). (3) and (4) not implemented.</td>
<td>Site inspection results suggest that the cooling system is noisy. Recommend to adopt the measure No.2 and No. 3 from the EIA.</td>
</tr>
<tr>
<td>Solid waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distillation residue</td>
<td>The precedent fraction of distillation will be further process as by product.</td>
<td>Implemented. The residue is stored in hazardous waste storage room without discharge.</td>
<td>The hazardous waste storage room isn't properly established, i.e.: the room isn't separated by impermeable material to separate hazardous waste and other waste; warning signs and environmental protection signs are not properly established.</td>
</tr>
<tr>
<td>CaF2</td>
<td>Use for inner roads pavement.</td>
<td>Based on relevant EPB requirements, CAF2 will be sent to Yingcheng Hazardous Waste Handling Center for disposal since 2013.</td>
<td>No landfill needs. The handling methods comply with relevant regulations.</td>
</tr>
<tr>
<td>Garbage</td>
<td>Collected by sanitation department.</td>
<td>Implemented.</td>
<td>Reasonable. The handling methods comply with relevant regulations.</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollutant source</td>
<td>Proposed measures by EIA</td>
<td>Current Status</td>
<td>Audit conclusions and proposed measures</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------</td>
<td>----------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Fire</td>
<td>Establish a 250 m³ fire-fighting water tank.</td>
<td>The fire-fighting water tank is shared with the recycling water tank with capacity of 1000 m³. In addition, hydrants are installed at workshops and buildings to provide fire-fighting water supply.</td>
<td>Reasonable. The fire-fighting tank capacity is sufficient for emergency use.</td>
</tr>
<tr>
<td>Failure in wastewater treatment</td>
<td>Establish emergency water tank (minimum capacity of 22 m³).</td>
<td>The original fire-fighting water tank (25 m³) is converted to the emergency tank with pipeline connection.</td>
<td>Reasonable. The capacity is sufficient for emergency use.</td>
</tr>
<tr>
<td>Landscaping</td>
<td>Plant trees and grasses</td>
<td>Implemented.</td>
<td>Currently the landscaping water usage is huge (8730 m³/year). Water conservation is recommended in landscaping management.</td>
</tr>
</tbody>
</table>

**Table III-3 Proposed Mitigations for the EMP**

<table>
<thead>
<tr>
<th>Environmental Element</th>
<th>Issues/Risks</th>
<th>Mitigation/Prevention Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Waste</td>
<td>Improper storage methods for industrial solid waste and hazardous waste</td>
<td>Enhance environmental management of hazardous material, chemical and waste. Hazardous chemical should be sorted. Toxic chemicals should be transported by qualified contractors. The storage site should be equipped with leakage detecting and warning device and containing measures. The relevant management mechanism and facility should be improved. The storage site should be divided by impermeable separation. The hazardous waste should be separated from other waste. Other waste should be sorted to avoid mixing of hazardous waste and garbage. Install warning and environmental protection signage as required in GB15562.2.</td>
</tr>
<tr>
<td></td>
<td>Leakage and soaking of solid waste</td>
<td>Install intercepting ditches around the storage site to prevent runoffs from entering the site and to prevent increase of leachate. In addition, design leachate collection and discharge facilities and improve leakage prevention. Collected leachate should be treated in the treatment facility before being discharged. Use solid and anti-leakage material for the ground.</td>
</tr>
<tr>
<td></td>
<td>Risks in transportation of hazardous waste</td>
<td>Retain a qualified contractor for loading/unloading and transportation. Develop emergency response plan for the transportation.</td>
</tr>
<tr>
<td>Environmental Element</td>
<td>Issues/Risks</td>
<td>Mitigation/Prevention Measures</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sectors</td>
<td>Project - China: Reduction/Phase-out of PFOS in Priority Sectors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mitigation/Prevention Measures</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- CaF2 is a hazardous waste (HW49). According to the local EPB requirements, all CaF2 sludge was sent to Yichang Hazardous Waste Handling Center for disposal. Thus there are no needs of landfill. However now the Center no longer takes new wastes and there are approximately 40 tons of CaF2 piled up at the plant. The Yingchang EPB is now working on a solution for the sludge. For the existing CaF2, temporary storage site should be developed with containment to avoid risk of HF release when CaF2 contact with acids.</td>
</tr>
<tr>
<td>Waste water</td>
<td>CaF2 handling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Domestic wastewater</td>
<td>Enhance management on landscaping water and domestic water usage. Adopt water conservation methods.</td>
</tr>
<tr>
<td></td>
<td>Production wastewater and emergency handling</td>
<td>Install a 250m3 emergency water tank (already implemented) for wastewater storage when WWTP fails. Improve the reactor emergency response facility by changing the entrance of HF emergency tank. During accidents, all outlets should be shutoff and all wastewater should be diverted to the emergency storage tank.</td>
</tr>
<tr>
<td></td>
<td>Discharge of HF and HCl</td>
<td>Use a sprinkling tower to reclaim HCl and HF (already implemented). The waste air will be discharged in compliance with relevant standards.</td>
</tr>
<tr>
<td></td>
<td>Boiler waste air emission</td>
<td>Use natural gas-fired boiler (already implemented) to control SO2, NOx and dust in emission.</td>
</tr>
<tr>
<td>Noise</td>
<td>Noise from cooling machine</td>
<td>Install sound proof doors and windows and low noise cooling tower as required in EIA. Shut all doors/windows during night shift.</td>
</tr>
<tr>
<td>Environmental accident</td>
<td>Fire/Explosion from production</td>
<td>Enhance the automatic control, detecting and warning, and accident protection. The safety control system should have complete DCS control and safety system, including warning, emergency stop and accidents handling. Install 250m³ emergency storage tank for fire-fighting.</td>
</tr>
<tr>
<td></td>
<td>Leakage from production</td>
<td>Improve the maintenance for the production line equipment. Design dual-circuit system to avoid HF emission from accidental power off.</td>
</tr>
<tr>
<td></td>
<td>Fire/explosion or leakage in storage</td>
<td>Hazardous chemical should be stored separately with minimum distance of 50 m and containment. The storage house should be well vented and far from fire and flame. The room temperature should not exceed 30 ºC. Develop a complete fire-fighting system and categorize the warehouses. Based on the category of the houses, determine the inspection frequency and keep relevant records. Install fire prevention dike. Strictly follow relevant code to design discharge system; the oil storage warehouse should be paved with specific material to prevent oil leakage.</td>
</tr>
<tr>
<td></td>
<td>Fire/explosion or leakage</td>
<td>Hazardous chemical will be transported by qualified contractors.</td>
</tr>
</tbody>
</table>
### Environmental Element

<table>
<thead>
<tr>
<th>Sectors Project-China: Reduction/Phase-out of PFOS in Priority Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Element</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Environmental Management</td>
</tr>
</tbody>
</table>

### Table III - 4.1 Waste Air Monitoring Plan

<table>
<thead>
<tr>
<th>No.</th>
<th>Monitoring Location</th>
<th>Nearest workshop</th>
<th>Indicator</th>
<th>Frequency</th>
<th>Pollution source</th>
<th>Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Border</td>
<td>No.1 Workshop</td>
<td>HCl</td>
<td>Once every quarter; each time at least 3 samplings</td>
<td>Acylation production waste</td>
<td>Yingcheng City Environmental Monitoring Station</td>
</tr>
<tr>
<td>2</td>
<td>Border</td>
<td>No.2 Workshop</td>
<td>HF</td>
<td></td>
<td>Electrolytic gas</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3# Stack</td>
<td>Boiler Room</td>
<td>Dust, SO2, NOx</td>
<td></td>
<td>Boiler emission</td>
<td></td>
</tr>
</tbody>
</table>

### Table III-4.2 Wastewater Monitoring Plan

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>Indicator</th>
<th>Frequency</th>
<th>Pollution source</th>
<th>Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater outlet</td>
<td>Flow rate, pH, COD, Ammonia, and Fluoride</td>
<td>2 times each day. One sample every 8 hours. Each time 3 samplings at least.</td>
<td>Domestic wastewater, cleansing water</td>
<td>HHCC</td>
</tr>
<tr>
<td></td>
<td>Flow rate, pH, COD, Ammonia, Chloride and Fluoride</td>
<td>Once a quarter, 3 sampling each time</td>
<td></td>
<td>Yingcheng City Environmental Monitoring Station or other qualified station</td>
</tr>
<tr>
<td>Wastewater treatment station outlet</td>
<td>PFOS</td>
<td>Once a year, 3 sampling each time</td>
<td>Cleansing wastewater</td>
<td>Hubei Provincial Environmental Monitoring Station</td>
</tr>
</tbody>
</table>