Report of the Independent Mid-term Review of UNDP/GEF Project

´UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China´

March 2020

Basic Report Information

Project title:	UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China
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GEF project ID#:	6966
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Atlas Award/Project ID:	00086820/00094023
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Date of MTR report:	23 September 2019
Project country:	People's Republic of China
GEF Operational Focal Area/Strategic Program:	Chemicals and Waste
Executing Agency:	UNDP
Implementing Partner and other project partners:	FECO-MEE

MTR team members

- Prof. Dr. Heidelore FIEDLER (international consultant);
- Mr. Fabrice CLAVIEN (international consultant);
- Prof. Dr. Jingwei WANG (national consultant).

Acknowledgements

We wish to express our sincere gratitude to all the project management team (PMT) (i.e. UNDP China, FECO-MEE and Jiangxi EPB) for their excellent cooperation, there commitment and dedicated efforts to collect and provide all the documents demanded, and their meticulous arrangements to meet all relevant stakeholders and visit all key sites during the mission, and their time and patience in making sure to provide answers to all our questions. We would like to thank the two pilot enterprises Jiangxi Zili and Jiangxi Jinhui for their excellent preparation of the on-site visits and their presentations, their hospitality, time and patience for explanations during our site visits to answer all our questions and allow for a smooth evaluation of the project interventions in their plants and operations. Many thanks are also expressed to the representatives of the Tongling Industrial Park and the consultants (sub-) contracted for meeting us in Beijing and present the progress of their respective work related to the project.

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Acronyms and Abbreviations

APR	Annual progress report
ARR	Annual review report
AWP	Annual work plan
BAT	Best available techniques
BEP	Best environmental practices
CDR	Combined Delivery Report
CMRA	China Nonferrous Metals Association Recycling Metal Branch
CO	Country office
Cu	Copper
EA	Executing Agency
EFs	Emission factors
EPB	Environmental Protection Bureau
ESM	Environmentally sound management
FECO	Foreign Economic Cooperation Office
GEF	Global Environment Facility
HCBD	Hexachlorobutadiene
HCB	Hexachlorobenzene

IA	Implementing Agency
IR	Inception Report
LPMO	Local Project Management Office
M&E	Monitoring & Evaluation
MEE	Ministry of Ecology and Environment, PRC
MEP	Ministry of Environmental Protection, PRC (name of Ministry at the time of the project approval)
MFA	Ministry of Foreign Affairs, PRC
MIIT	Ministry of Industry and Information Technology, PRC
MOFCOM	Ministry of Commerce, PRC
MOHURD	Ministry of Housing and Urban-Rural Development, PRC
MTR	Mid-term review
NDRC	National Development and Reform Commission, PRC
NGO	Non-governmental organizations
NIP	National implementation plan
NPT	National project team
NRP	National Replication Plan
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzodioxins
PCDF	Polychlorinated dibenzofurans
PCN	Polychlorinated naphthalenes
PeCBz	Pentachlorobenzene
PIR	Project implementation review
POPs	Persistent organic pollutants
PPP	Public-Private Partnership
PRC	People's Republic of China
QPR	Quarterly progress report
SAC	Standardization Administration, PRC
SAIC	State Administration for Industry and Commerce, PRC
SAICM	Strategic Approach to International Chemicals Management
ToR	Terms of reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UPOPs	Unintentional Persistent Organic Pollutants

1 EXECUTIVE SUMMARY

1.1 Project Information Table

The essentials of the project to be reviewed are as follows:

Project title:	UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management		
UNDP Project ID (PIMS #):	5383	PIF Approval Date	29 October 2014
GEF Project ID (PMIS #):	6966	CEO Endorsement Date:	5 May 2016
ATLAS Business Unit, Award # Proj. ID:	00086820/00094023	Project Document (ProDoc) Signature Date (date project began):	6 June 2016
Country(ies):	China	Date project manager hired:	*May ,2016*
Region:	Asia-Pacific	Inception Workshop date:	12 November 2016
Focal Area:	Chemicals and Waste	Midterm Review completion date:	10 December 2019
GEF Focal Area Strategic Objective:	Outcome 1.1 and Outcome 3.1	Planned closing date:	3 August 2021
Trust Fund [indicate GEF TF, LDCF, SCCF, NPIF]:	GEF TF	If revised, proposed op. closing date:	
Executing Agency/ Implementing Partner:	Ministry of Environmental Protection (MEP) Foreign Economic Cooperation Office (FECO)		
Other execution partners:			
Project Financing	*at CEO endorsement (US$)*	*at Midterm Review (US$)*	
[1] GEF financing:	12,600,000 (cash)	4,768,061	
[2] UNDP contribution:	100,000 (in-kind)		
[3] Government:	510,000 (cash) + 3,750,000 (in-kind) = 4,260,000	FECO: 318,857 (cash) + 150,000 (in-kind) = 468,857	
[4] Other partners:	12,000,000 (cash) + 3,000,000 (cash) + 25,000,000 (in-kind) + 8,090,000 (in-kind) = 48,090,000	Industry: 15,442,414 (cash) + 9,580,000 (in-kind) =25,022,414	
[5] Total co-financing [2+3+4]:	52,450,000	25,491,271	
PROJECT TOTAL COSTS [1+5]	65,050,000	30,259,332	

1.2 Project Description

The UNDP-GEF project "UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management" is a five years full-sized project with the overall objective to "address and achieve reduction of POPs emissions in the secondary copper production sector in China. A national replication programme will be developed to disseminate demonstration results, through promotional activities to roll-out BAT/BEP for national replication". The project intends to achieve the reduction of unintentional POPs release through four components: 1) Institutional strengthening and capacity building; 2) Demonstration of BAT/BEP and PPP-based industry chain management; 3) National

replication programme; and 4) Monitoring and evaluation. This is done through nine 'outcomes'[1]. The quantitative objectives of the project are shown in Figure 1 (prepared by the executing agency, MEE/FECO).

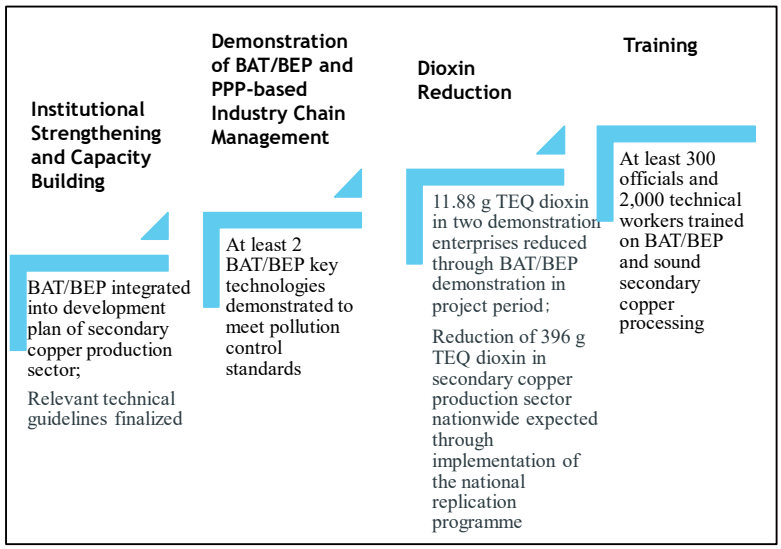

Figure 1: Outcomes of the project

The project is in line with China's priorities and strategies for fulfilling its obligation under the Stockholm Convention on Persistent Organic Pollutants (POPs), as laid out in its NIP 2007, and thus enjoy a high degree of relevance for the country.

1.3 Project Progress Summary

The majority of the activities have been initiated successfully and some of them are already finalized. More specifically, activities developing and supporting institutional strengthening and demonstration of best available techniques at two demonstration enterprises are almost completed. Accordingly, quantitative objectives of the project are already achieved. The national standards and BAT/BEP applications are in place and emissions of unintentional POPs (especially PCDD/PCDF) are reduced. As accompanying activity, people in various target groups have been trained.

Overall, the MTR Team found that the project has demonstrated some remarkable achievements, including:

- Policy development: More than 30 studies have been commissioned and largely to assess (i) current policies and research on pollution prevention and control technical policy, (ii) research on pollution prevention and control economic policy, (iii) research on technical standards of assessment indicator system and audit guideline on cleaner production for the secondary copper smelting industry, (iv) research on application and issuance technical guideline for emission permit on secondary non-ferrous metal industry, and (v) research for emission standards applicable to secondary copper, aluminium, lead, and zinc industries.

[1] The two components (4) monitoring and evaluation and (5) Project management with three outcomes are not counted

- Strengthening of the institutional capacities: Relevant government bodies (*e.g*. Jiangxi EPB) for pollution prevention and control and for implementing best available techniques and best environmental practices (BAT/BEP) in reducing unintentional POPs and other pollutants in secondary copper production and other non-ferrous metals production have been strengthened;
- Two secondary copper enterprises are improving their processes by developing and applying BAT/BEP to reduce/minimize emissions of unintentional persistent organic pollutants (POPs).

As expected at mid-term, activities cannot be expected to be finalized. Important components planned for the second part of the project implementation, such as demonstration of PPP-based industry chain management and national replication of the BAT/BAP, are just about to start.

Overall, the project team (both the National Project Team (NPT) and the Local Project Management Office (LPMO)) has demonstrated strong competencies and managed the project successfully, as reflected in the project achievements to date.

1.4 MTR Ratings & Achievement Summary Table

Measure	MTR Rating	Achievement Description
Project Strategy	N/A	The project strategy is comprehensive, coherent and well-orchestrated to achieve the project objective. It encompasses policy development, BAT/BEP demonstration and replication, capacity building as well as information and dissemination.
Progress towards Results	Objective achievement rating: 6 (6 pt scale)	The overall objective and related activities are on track. Some important results have already been achieved or are close to achievement. Current results indicate that the project's goals on reduction of unintentional POPs will be achieved and that experiences made will have global impact (contribution to the Stockholm Convention's BAT/BEP guidelines)
	Outcome 1 achievement rating: 5 (6 pt scale)	The legal framework for secondary copper production in China is being improved through thorough policy research. Most outcome targets are already achieved, and the remainder are on track.
	Outcome 2 achievement rating: 5 (6 pt scale)	The demonstration of BAT/BEP and PPP-based Industry Chain Management have undergone a meticulous selection process and are set to meet targets. All targets are on track (although two are experiencing a slight delay). 4 BAT/BEP have been demonstrated (target: 2) and the contract for the PPP-based industrial park has been signed
	Outcome 3 achievement rating: 5 (6 pt scale)	The National Replication Programme (NRP) and related targets are on track, except for a slight delay in the documentation of lessons learned. The NRP has been drafted and should be finalised by the end of the year (2019). So far, there is no system developed on how to measure impact from training or public awareness raising.

	Outcome 4 achievement rating: 5 (6 pt scale)	M&E is following established national procedures. They are going smoothly with reports (PIRs, APRs, QPRs) provided timely. The MTR identified some room for improvement on documentation of project activities (e.g. missions, trainings). The NPT expressed strong commitment to correct that in the second phase.
	Outcome 5 achievement rating: 5 (6 pt scale)	The project team proved very competent and manages the project according to plan towards the targets. Some delays in disbursements and activities were experienced and documentation could be more efficient sometimes (see above), but these elements do not represent a risk for the success of the project and the project team is set to improve them during the second phase.
Project Implementation & Adaptative Management	5 (6 pt scale)	Documentation on activities (especially outputs) and budgets are all available and can be retrieved. Deviations in time and expenditures are compensated through extended deadlines and budget revisions (according to national/institutional standards)
Sustainability	4 (4 pt scale)	Since sustainability cannot be implemented *per se* in the project and can be assessed only after project closure, only a general estimation can be given at this stage. However, the MTR did not identify any risk that would hamper sustainability. The project's results and positive impacts are set to be maintained once the project ends.

1.5 Conclusions

On project overall objective: The project progress is in good shape and go beyond its immediate objective, thus increasing its benefits and impacts, but details are missing on the baseline and methodology for measuring dioxin emissions reduction.

On project design: The project enjoys a comprehensive and coherent structure, covering policy, BAT/BEP, guidance and capacity building, as well as information and dissemination.

On component 1: Policies are being developed for reduction of dioxin emissions and pollution prevention and control in secondary copper industry based on extensive research.

On outcome 2: Strong BAT/BEP have been selected and are being demonstrated, yet they would only fit exemplary plants.

On outcome 3: Despite demonstrations still being at an early phase, the national replication plan (NRP) is being developed to allow for timely application of the standards but will be fine-tuned based on demonstrations findings.

On components 4 and 5, project implementation and adaptive management: The project team (at MEE/FECO and UNDP China Office) as well as the LPMO are well established, collaborates on a regular basis and are dedicated and competent in ensuring the project success, but there is still room for improvement in documentation and communication of project activities and outputs in order to

ensure good synergies between the different project components and help independent evaluations (MTR and terminal evaluation).

On sustainability: The project results are likely to be sustainable overall.

1.6 Recommendations

1. The quantitative baseline with respect to PCDD/PCDF releases have been established. It is recommended that towards the end of the project the reduction measures and quantitative achievements are clearly documented and the final estimate (PCDD/PCDF emissions from secondary copper production in a given reference year) be reported. With such reporting, the outcomes of this project can be directly reported to the Conference of the Parties to the Stockholm Convention through national reporting (Article 15) and be reflected in the next version of the National Implementation Plan (NIP) for China. The model baseline calculation relevant to PCDD/PCDF releases developed by the MTR Team could be used for the assessment of the dioxin reduction towards the terminal evaluation (and the quantitative target).

2. A communication and transfer of any result from this project with relevance to article 5, 6 and 15 of the Stockholm Convention should be pursued with high priority.

3. The much broader project goals than only PCDD/PCDF reduction should made clearer.

4. The benefits to other non-ferrous metal industries should also be highlighted.

5. Since there is no scale to measure the impact on training activities, it is recommended to develop a scheme or at least a categorization as to the targeted groups of training.

6. A social plan for the workers on workplaces lost and new workplaces created should be developed in the second phase of this project and reported for the terminal evaluation.

2 INTRODUCTION

2.1 Purpose of the MTR and Objectives

In May 2019, the United Nations Development Programme (UNDP) issued a vacancy announcement for an independent consultant to carry out the mid-term review (MTR) of the UNDP/GEF project 'UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China´ and the terminal evaluation (TE) of project ´Reduction of POPs and PTS release by environmentally sound management throughout the life cycle of electrical and electronic equipment and associated wastes in China' (1).

Here, the MTR Team sets out its report for the MTR of the project ´UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China´.

In accordance with UNDP and GEF M&E policies and guidelines, some GEF-financed projects are required to undergo a MTR at the mid-point of project implementation. This review fulfils this requirement.

The objectives of the MTR are to:

1. Assess the relevance of the project with regards to the country's needs and priorities and whether the project is designed appropriately to meet them;
2. Assess progress towards the achievement of the project objectives and outcomes as specified in the Project Document and whether the project activities have been carried out efficiently so far; and
3. Assess early signs of project success or failure with the goal of identifying the necessary changes to be made in order to set the project on-track to achieve its intended results.

This review is guided by the following framework documents listed below. The documents referred to in 3 and 5 are guidelines issued by the GEF and used in addition to the directly project-relevant guidelines from UNDP:

1. UNDP Guidance for Conducting Midterm Review of UNDP-supported GEF-financed Projects (2)
2. Terms of Reference for the international consultant (see Annex 7.1.1)
3. GEF Evaluation and Monitoring Guideline 2010 (3)
4. GEF Guidelines on Core Indicators and Sub-Indicators (4)
5. GEF Evaluation Office Ethical Guidelines (2007) (5)
6. Guidance for Conducting Midterm Reviews of UNDP-Supported, GEF-Financed Projects (2014)
7. UNEG Ethical Guidelines for Evaluation (2008)

More specifically, the MTR will address the following:

- The purpose, objective, and scope of the review
- The MTR approach and methodology (*e.g.*, documentation reviews, stakeholder interviews, site visits, questionnaires, focus groups and other participatory techniques for information gathering)
- Any limitations of the MTR

- A proposed work plan including a schedule of tasks, activities and deliverables of the MTR (including a detailed MTR mission plan)
- A MTR matrix for evaluating progress towards results, summarising the level of accomplishment of the project targets (see Annex 7.3).

Following the vacancy announcement, ChemAnalytics Örebro AB located in Örebro, Sweden, applied as international consultant and was selected. The presentation of ChemAnalytics Örebro AB in the offeror's letter is reproduced in Annex 1 (section 7.1)**Error! Reference source not found.**.

In practical terms, the work of ChemAnalytics Örebro AB was conducted by two experts, Dr. Heidelore Fiedler and Mr. Fabrice Clavien as international consultants. Together with the national consultant, Dr. Jingwei Wang, they formed the Mid-term Review Team, thereafter referred to as ´MRT Team´.

The independent mid-term review was conducted from 20 June 2019 to 20 December 2019.

2.2 Scope and Methodology

2.2.1 Principles of Design and Execution of the MTR

The MTR has utilized the mix of methods to yield the most reliable and valid answers to the evaluation questions within the limits of resources, timeframe and availability of data. The MTR activities were as follows:

1. Liaised with the Commissioning Unit and the evaluation team to organize the work. Four teleconferences were held prior to the field mission – *i.e.* on 14 June 2019, 29 June 2019, 19 July 2019 and 28 July 2019;

2. Conducted a desk evaluation by reviewing the project documents and project (progress) reports – both financial and technical – provided electronically by either the implementing agency (UNDP) or the executing agency (MEE/FECO). Throughout the evaluation period, the MTR Team requested evidence-based documentation to substantiate the report;

3. Jointly developed with UNDP and MEE/FECO the field visit itinerary and specified partners for interview or sites for visiting;

4. Prepared the MTR Inception Report. The report was prepared as a basis for the discussions with the stakeholders in the field mission as well as for developing the MTR report;

5. Conducted a field mission to include visits to the Implementing and executing agencies as well as to the pilot plants;

6. Presented initial findings to implementing and executing agencies (UNDP and MEE/FECO);

7. Prepared the draft report and submitted to UNDP for completion and feedback;

8. Finalized the MTR report.

2.2.2 MTR Approach and Data Collection Methods

The MTR approach was as specified in the TOR and first started with a collection of relevant documents. Depending on the availability of the documents, as well as other relevant sources of information, the

evaluation progressed according to availability and clarity. Since most documents were available in Chinese only and there was no systematic filing system at neither UNDP nor MEE/FECO, the collection of information and the understanding of the linkages to project activities or outputs took much longer than expected.

In practical terms, the vast majority of the documentation was submitted electronically. For practical implementation, the MTR Team established a shared folder using Box where all project team members (national and international consultants, substantive staff at UNDP and MEE/FECO) had editorial rights; *i.e.* were able to upload, delete or change files or folders.

In order to facilitate communication, two groups were established in WeChat: (1) between all MTR members and (2) between the three evaluation consultants.

Intensive communication between MTR Team and executing/implementing agencies were maintained throughout the evaluation period and the project team was extremely helpful and responsive to all questions that were raised.

2.2.3 Field Mission in China

A field mission in China was organized from 8 to 15 August 2019. The mission plan is shown in section 7.5. The main objectives of the field mission were to: (i) verify the outputs from the desk evaluation at the implementing and the executing agencies, MEE/FECO and UNDP; (ii) undertake face-to-face interviews with the main stakeholders; and (iii) visit the demonstration plants in Jiangxi province to verify implementation and buy-in of the private sector.

The field mission in China and direct contact with the implementing and executing agencies as well as other stakeholders including sub-contractors was extremely useful for the preparation of the MTR report. Most of the information was obtained and verified through stakeholders consultations and on-site visits in Beijing and in Jiangxi Province. The stakeholder groups met and interviewed are shown below and the details as to individuals, their affiliations and roles can be found in section 7.7**Error! Reference source not found.**.

Stakeholders in Beijing

1. Ministry of Ecology and Environment, Foreign Economic Cooperation Office (MEE/FECO)
2. UNDP China
3. Experts invited to the MEE/FECO seminar (see speakers from the agenda of the meeting, see Table 18)

Field visit to demonstration plants in Jiangxi province

1. Jiangxi Solid Waste Management Office on 12 August 2019 (Table 20)
2. Jiangxi Zi Li Environmental Protection Technology Co. Ltd., Fuzhou on 13 August 2019 (Table 21)
3. Jiangxi Jin Hui Environmental Protection Technology Co., Ltd., Shangrao on 14 August 2019 (Table 22)

The MTR team followed a collaborative and participatory approach ensuring close engagement with the Project Team, government counterparts and key stakeholders as specified in the TOR. Stakeholder involvement included interviews with stakeholders who have project responsibilities.

The MTR international consultants met with the MTR national consultant bilaterally and with the China implementation and execution team three times (at the onset of the mission with UNDP and then together with UNDP and MEE/FECO (2-times)) as well as with some of the subcontractors and experts during a 1-day technical seminar organized by MEE/FECO where the main findings from experts and subcontractors were presented. The schedule of the seminar is shown in Table 18. Ample time was provided to ask questions.

Besides these meetings, two demonstration sites in Jiangxi province – in Shangrao and Fuzhou – were visited as well as the Jiangxi Environmental Protection Bureau (EPB) – in Nanchang. UNDP, MEE/FECO provided the MTR team with an interpreter to facilitate communication on-site, which was found very helpful.

At the end of the visit, initial findings were presented to UNDP and MEP/FECO in Beijing on 15 August 2019. The schedule of the mission is shown in the Annex in Table 21 and the list of the stakeholder representatives met and interviewed can be found in the Annex in Table 20, Table 21, and Table 22.

2.2.4 Limitations to the MTR

Language is one of the barriers in the MTR evaluation since as a national project in China, Chinese is used in many documents and almost all presentations. In addition, official and legal texts are in Chinese only. It shall be highlighted that all reports are extremely long, which makes it difficult to extract relevant information.

UNDP and MEE/FECO did help a lot by providing an interpreter during the field mission to facilitate the communication on-site.

2.2.5 Scope, Criteria and Rating

The MTR assessed the following elements (as detailed in the TOR of this assignment) and as recommended in the Annex 12 of the MTR Guide (2) "Report Content Review Checklist"

1. Project Strategy: Project design and results framework/logframe;

2. Progress towards Results: Progress towards outcomes analysis;

3. Project Implementation and Adaptive Management: Management arrangements; work planning; finance and co-finance; project-level monitoring and evaluation systems; stakeholder engagement; reporting; communications;

4. Sustainability: Financial risks to sustainability; socio-economic risks; institutional framework and governance risks; environmental risks.

The following criteria were used to assess the performance of the project at midterm:

1. Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels?

2. Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?

3. Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?

4. Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?

5. Impacts: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?

The rating system used for the evaluation can be found in Annex section 7.4.

2.3 Structure of the MTR Report

This evaluation report is structured according to the *Guidance for Conducting Midterm Reviews of UNDP-Supported, GEF-Financed Projects* (2014) and the indications in the Terms of Reference for the MTR itself (Annex 7.1).

The report consists of three main sections:

- Project Description and Background Context
- Presentation of the findings of the MTR regarding: (i) the project strategy; (ii) the progress towards results; (iii) the project implementation and adaptive management; (iv) sustainability towards financial, socio-economic, institutional as well as environmental risks.
- Conclusions (including lessons learned) and recommendations

Besides, the report includes a section containing 'Annexes', which provides additional information and supporting documentation.

3 PROJECT DESCRIPTION AND BACKGROUND CONTEXT

3.1 Development Context

China's secondary copper production is becoming increasingly important owing to the increased demand for copper metal and decreasing copper mine resources in the world. Increased production, combined with low technology production and primary pre-treatment approaches, predominantly practiced in small and medium size enterprises, is drastically increasing the release of unintentional POPs in China. Converter smelting and anode furnaces, for instance, are widely used in China. Such releases of unintentional POPs are not only impacting the workers in this sector, but also surrounding communities as well as the environment and human health at local as well as global level. According to the data from The Yearbook of Nonferrous Metals Industry of China (2014), the production of secondary copper increased rapidly from 2004 to 2013 in China, and reached 2.16 million tons in 2013, which accounted for 58 percent of global production. Although international prices of copper continued to decline in recent years, the production of secondary copper is still rising in China.

The 2007 National Implementation Plan (NIP) for China states that in 2004, 26 secondary copper plants produced 1,160,000 ton of coper. There were two enterprises that had inputs of over 100,000 tons *per* year, six enterprises had feed materials in the range of 50,000-100,000 tons. The eight large-sized enterprises produced 700,000 tons of copper. The remaining 460,000 tons of copper were by about 2,000 small enterprises with annual use of waste copper below 5,000 tons.

3.2 Problems to Be Addressed

Polychlorinated dibenzo-*para*-dioxins and dibenzofurans (PCDD/PCDF) are listed in the Stockholm Convention Annex C as unintentionally produced Persistent Organic Pollutants. They occur as by-products of many industrial processes, such as metallurgical processes, the incineration of chlorine-containing substances etc. It is commonly considered that the formation mechanism of PCB, HCB, PeCBz and PCNs is similar to that of PCDD/PCDF. The formation of PCDD/PCDF needs the presence of carbon, oxygen, and chlorine. The unintentional formation of PCDD/PCDF in high temperature processes is facilitated by the presence of metal catalysts whereby copper is the most potent. Other criteria that favour the formation of PCDD/PCDF are temperatures between 200 °C and 500 °C, the so-called 'reformation window' where smaller molecules (precursors) can recombine to PCDD/PCDF (but also PCB, PCNs, HCB or PeCBz). Further, the presence of soot particles in the flue gas cleaning system and low turbulences in the furnaces favour the formation of unintentional POPS. In order to prevent the formation of PCDD/PCDF or destroy them within the thermal process, high temperatures (>850 °C) and long residence time at these temperatures are recommended as BAT. Due to the batch-wise operation, the input materials (containing oxygen, carbon or chlorine at varying levels) and the presence of copper as a catalyst, plants producing copper from secondary materials have been listed in part 1 of annex C of the Stockholm Convention on Persistent Organic Pollutants, *i.e.* with a high potential to generate and release PCDD/PCDF. One of the obligations under the Stockholm Convention's provision in article 5 is to reduce the releases from part 1 sources as a priority.

Secondary copper smelting involves copper production from sources that may include copper scrap but also sludges from other metal operations. Releases of unintentional POPs and especially PCDD/PCDF include emissions to air and releases with the residues such as ashes (from the furnace and from flue gas cleaning). Amounts and concentrations of PCDD/PCDF in these releases vary with technology and input. Studies from China and elsewhere have shown that releases of unintentional POPs from secondary copper smelters are higher than those from all other secondary metal production including iron and steel, zinc, aluminium or lead. So far, there is no information as to the

presence of PCDD/PCDF in any of the primary metal production processes. In addition to unintentional POPs listed in Annex C of the Stockholm Convention, secondary metal production is associated with the formation and release of a variety of pollutants, including carbon oxides (CO_x), nitrogen oxides (NOx), particulate matter (PM) and metal compounds, as well as organic carbon compounds.

As part of the preparation of China's National Implementation Plan on POPs (NIP) (2007 version), an unintentional POPs inventory ("National Dioxin Inventory of China") using the UNEP Toolkit was undertaken for PCDD/PCDF. The estimated total PCDD/PCDF releases from secondary copper production sector was estimated at 1,133.8 g TEQ/a, including atmospheric emissions of 403 g TEQ/a and fly ash releases of 730.8 g TEQ/a, respectively.

3.3 Policy Measures to Control Unintentional POPs Emission from Secondary Copper Sector

The project document lists a large number of standards and laws in relation to general environmental protection including sector-specific or special dioxin-related items. Overall, the number of limits, regulation, standards and guidelines (including legally binding) in China appears high in comparison to the European Union for example.

Clearly identified and applied since many years in China is the Environmental Dioxins monitoring technical specification (HJ 916-2017) (6). This standard entered into force on 4/1/2018. This standard is formulated for the purposes of enforcing the Environment Protection Law of the People's Republic of China, Water Pollution Prevention and Control Law of the People's Republic of China, Air Pollution Prevention and Control Law of the People's Republic of China, and Law of the People's Republic of China on the Prevention and Control of Pollution by Solid Wastes, and setting standards for the monitoring technologies and actions of dioxins. This standard specifies the environmental monitoring specifications for dioxins in the water, air, soil, sediments, and solid wastes. The appendix A to this standard is normative, and the Appendixes B-D are referential.

3.4 Project Description and Strategy

The project overall objective is stated as follow: "The project aims to address and achieve reduction of POPs emissions in the secondary copper production sector in China. A national replication programme will be developed to disseminate demonstration results, through promotional activities to roll-out BAT/BEP for national replication". The overall project strategy is to blend GEF funding into the overall national secondary copper production management system development process, ensuring that international best practice experience and technology options are considered.

The project has the quantitative goal to reduce PCDD/PCDF releases from secondary copper production in China by up to 396 g TEQ, whereby 11.88 g TEQ shall be reduced by the two demonstration enterprises, the rest through the implementation of the National Replication Plan (NRP).

The project intends to achieve the reduction of unintentional POPs release through four components: 1) Institutional Strengthening and Capacity Building; 2) Demonstration of BAT/BEP and PPP-based Industry Chain Management; 3) National Replication Programme; and 4) Monitoring and Evaluation.

In order to attain its objective, the project plans to achieve the following nine outcomes (according to the project's four components):

- **Outcome 1.1:** Improved legal framework through policy research for the secondary copper production sector;

- **Outcome 1.2:** Capacities of enterprises, industries and Local Project Management Office strengthened to facilitate effective management and monitoring of the secondary copper sector;
- **Outcome 1.3:** Enhanced cooperation with other international environmental conventions;
- **Outcome 2.1:** BAT/BEP demonstration conducted;
- **Outcome 2.2:** Circular economy, PPP and centralized park-based approach demonstrated for the secondary copper sector;
- **Outcome 3.1:** Replication and promotion of demonstration results and experience;
- **Outcome 3.2:** Promotional events for public awareness raising;
- **Outcome 4.1:** Project monitoring and evaluation;
- **Outcome 4.2:** Knowledge sharing and information dissemination.

The causal chain of the project's intervention towards achieving its overall objective is depicted in Figure 6 (see page 89).

3.5 Project Budget

The budget of the project consists of cash budget from the GEF Trust fund and of co-finance contributions (either in cash or in-kind). The overall cash budget of the full-size project (FSP) at approval state is USD 12,600,000 and the co-finance is USD 52,450,000. The details according to focal area is shown in Table 1 and according to project component in Table 2. The majority of the cash will go into Component 2: Demonstration of BAT/BEP and PPP-based Industry Chain Management, planned USD 8,500,000 (Table 2). The project management fee (component 5 in Table 1, is shared between UNDP and MEE, but the majority is assigned to MEE (USD 591,188).

Table 1: Overall budget according to focal area at project approval

Focal Area Objectives	Project outcome	Indicator type	Budget (in USD)	
			GEF Financing	Co-financing
CW-1 Program 1	1.1 Countries have appropriate decision-making tools and economic approaches to promote the removal of barriers preventing the sound management of harmful chemicals and waste	1.1.1 Number of demonstrated tools for mercury, new POPs and emerging chemicals and waste issues	1,580,000	6,320,000
CW-2 Program 3	3.1: Quantifiable and verifiable tonnes of POPs eliminated or reduced	3.1 Amount and type of POPs eliminated or reduced	11,020,000	46,130,000
Total project costs			12,600,000	52,450,000

Table 2: Overall cash budget according to component at project approval

GEF Outcome / Atlas Activity*	Implementing Agent/Resp. party	Total (USD)
Component 1: Institutional Strengthening and Capacity Building	MEP	1,500,000
Component 2: Demonstration of BAT/BEP and PPP-based Industry Chain Management	MEP	8,500,000
Component 3: National Replication Programme	MEP	1,500,000
Component 4: Monitoring and Evaluation	MEP	500,000
Component 5: Project management	UNDP	600,000
Grand total		12,600,000

The co-financing budget is reproduced in Table 3. It can be seen that the largest co-financing contributions (both grants and in-kind) are from the private sector (USD 37,000,000 in total).

Table 3: Overview of co-financing at project approval (all amounts in USD)

Source of co-financing	Name of co-financier	Grants (USD)	in-kind (USD)	Sub-total (USD)
Recipient government	MEE/FECO	360,000	2,250,000	2,610,000
Recipient government	Jiangxi Environmental Protection Bureau	150,000	1,500,000	1,650,000
Private sector	Demonstration enterprises and industrial parks	12,000,000	25,000,000	37,000,000
GEF Agency	UNDP	0	100,000	100,000
Others	Stakeholders relating to demonstration enterprises and industrial park	3,000,000	8,090,000	11,090,000
Total co-finance		15,510,000	36,940,000	52,450,000

3.6 Project Stakeholders and Implementation Arrangements

The implementation of this project involves a wide range of stakeholders. The sketch below (Figure 2) shows the implementation arrangements with the different stakeholders.

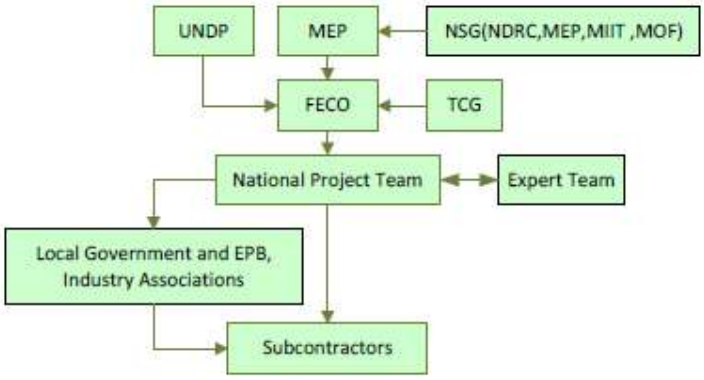

Figure 2: Project implementation arrangement

The roles of these stakeholders can be summarized as follows (the full description can be found in the project document section "V. Management Arrangements" and are not reproduced in this report):

- **United Nations Development Programme (UNDP):** Acts as the GEF Implementing Agency (IA) for the project and provide overall supervision;
- **Ministry of Environmental Protection (MEP), today Ministry of Ecology and Environment (MEE):** Acts as the GEF Executing Agency (EA) for the project and is responsible for its daily management. MEP has designated Foreign Economic Cooperation Office (FECO), today Foreign Environmental Cooperation Center**,** as the entity in the implementation of activities relating to fulfilling China's obligations under multilateral environmental conventions;
- **National Steering Group (NSG):** An inter-ministerial steering group consists of the National Development and Reform Commission (NDRC), MEP, the Ministry of Industry and Information Technology (MIIT) and the Ministry of Finance (MOF). It provides overall guidance and coordination for the implementation of relevant activities and legislative measures;
- **National Project Team (NPT):** Manage project procurement and financial resource, organize project coordination and review meetings, prepare TORs and contracts consultants, provide guidance to the LPMO, and organise inspections;
- **Technical Coordination Group (TCG):** Coordinates the implementation of the project and inform relevant stakeholders on the project progress;
- **Local Project Management Office (LPMO):** Is responsible for the daily management and monitoring of the demonstration activities;
- **Expert Team:** Is composed of international and national experts recruited to carry on certain project activities or related studies or technical direction;
- **Private Sector:** Participates in the project demonstrations.

3.7 Project Timing and Milestones

The workplan and timetable is detailed in the project document in chapter "IV Annual Work Plan" and section "Part 2 Total Project Workplan and Budget Reflecting GEF Resources and Co-Financing Based on Activities" and not reproduced in this report. The table provides the timeline of the project's activities on an annual basis throughout the project's duration and funds allocated. The MTR Team used this information for its evaluation of budget, co-financing and results.

It shall be noted that no milestones were developed in the project document. The MTR Team thus had to use the CEO approved workplan and tracking list, which include some indicators such as the POP reduce indicators and number of the demonstration projects, as alternatives to assess progress, looking at the current status of activities rather than milestones towards the project targets to assess if project activities were on track.

4 FINDINGS

4.1 Review of Documentation

The minimum information sources consulted were those specified in the TOR for the evaluation of the project. These included documents but also interviews with stakeholders and information of the evaluation team.

At the onset of the evaluation, the MTR team was provided by the implementing and the executing agencies with some key documents (*e.g.* quarterly and annual project reports). After initial study of the project documents, the MTR team requested documents and other information from the implementing and executing agencies as well as from other stakeholders of the project (*e.g.* the Local Project Management Office). For this purpose, the MTR team compiled a quite extensive MTR data request checklist, which was submitted to the project team on 12 June 2019. The documents had the four purposes as follows: (i) cover the technical basis for the goals and activities of the project; (ii) prove the expenditures according to the project logframe; (iii) provide the evidences to back-up the information reported in the reports; and (iv) form the basis for the evaluation of the effectiveness at final stage of the project. The MTR data request checklist can be obtained from the MTR Team since is not included in this final report. Instead, the documents and information provided are listed in the annexes or referenced. The list of documents was maintained in MsExcel and was made available to the project team members electronically.

The documents reviewed can be categorized into two broad categories:

1. Documents related to administration and implementation of the project, and
2. Technical reports (often subcontracted) in support of project implementation.

The documentation received and reviewed is listed in section 7.6.

The MTR Team has not received the GEF focal area Tracking Tool submitted to the GEF at CEO endorsement; instead it used the UNDP Annual Portfolio Indicators template from 2018 API.

The project is mainly implemented through commissioning of reports to national experts or expert institutions. Until the mid-term review, MEE/FECO had subcontracted a very large number of institutions (through 14 contracts) that produced 81 reports (see Table 31; the reports were not all finished yet and were not studied in detail by the MTR team. Some of these were in English language but the majority was in Chinese.

The subcontracts were commissioned to national experts (universities or research institutions), industry associations or local governments. They covered technical performance issues such as technologies used in the secondary copper industry but also on cleaner production including guidelines, standards, operational procedures or improvements and refinements, many risk assessments on various impacts, policy document including indicator and control measures and settings or development of training materials.

4.2 Project Strategy (i.e. Relevance)

The baseline information as to releases of unintentional POPs at the start of the project was not readily available in a handy manner at the onset of the MTR. Together with the project team, the MTR Team developed the baseline emission scenario to assess the reduction achievements at the end of this secondary copper project.

It shall be noted that the project document does not substantiate such information in the logframe matrix contained in the project document. Whereas the approved project document expresses quite specifically quantitative reduction goals, neither the derivatization of the baseline nor the reduction is specified. As a starting point, only PCDD/PCDF emissions are included. The project implementation may include other unintentional POPs such as polychlorinated biphenyls (PCB), hexachlorobenzene (HCB), pentachlorobenzene (PeCBz), polychlorinated naphthalenes (PCN), or hexachlorobutadiene (HCBD) and report relevant data.

The baseline defined in output 3.1 of the project document is based on the dioxin inventory for the reference year 2004 found in the first National Implementation Plan (NIP) for China (submission date 2007) (7). Therein, an excerpt addressing the releases of PCDD/PCDF from all sources listed in the Toolkit states that 403 g TEQ/a are released to air from the production of 1,160,000 ton of copper from copper scrap (or waste). Additionally, 730.8 g TEQ/a are concentrated in the residues. The information is reproduced in Table 4. From Table 4 it can be concluded that the small plants, producing 460,000 tons in 2004 were assigned category 1 plants (Note: in the Toolkit, these are Class 1 plants) with the higher emission factors (EFs) and the Class 2 plants are the larger plants that produced 700,000 ton of secondary copper.

Table 4: Excerpt from Table 2-16 Inventory of estimated Dioxin releases in 2004 (7)

Total amount in 2004 (t)	Comments	Releases in (g TEQ/a)		
		Air	Residue	Total
1,160,000	26 Secondary copper production IV 1,160,000 t There were 2 enterprises with annual waste use of over 100,000 tons, 6 enterprises with annual waste use of 50,000-100,000 tons, and about 2,000 small enterprises with annual use of waste copper below 5,000 tons. The total output of the 8 large-sized enterprises was 700,000 tons and that of small-sized enterprises was 460,000 tons, for which emission factors for Category 1 to Category 2	403	730.8	1,133.8

The calculations of releases according to the Toolkit are shown in Table 5 using the emission factors from the Toolkit and the numbers from the NIP 2007 and also shows the number of plants in each of the classes.

Table 6 displays the estimated PCDD/PCDF releases at the start of the project with the reference year 2015. According to information from MEE/FECO, the annual production was 2,740,581 ton of copper by a total of 182 plants. There were 142 plants that were assigned class 1 since they had either basic technology or did process copper sludges; a feed that was assumed to be more prone for generating PCDD/PCDF than copper scrap. The other 40 plants did process copper scrap with technologies to control PCDD/PCDF emissions; they were assigned class 2.

It can be seen that the secondary copper sector did undergo certain changes and although the number of plants decreased, the activity increases and subsequently the PCDD/PCDF releases also increased.

Table 5: Estimation of PCDD/PCDF releases from secondary copper production in China, reference year 2004 (1st NIP), category 2d

			Source categories	Number of	Potential Release Route (µg TEQ/t)					Production	Annual release		
Group	Cat.	Class		plants	Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a
2			**Ferrous and Non-Ferrous Metal Production**								**Air**	**Water**	**Residue**
2004 NIP	**d**		**Copper production**	**2008**						**1,160,000**	**403.00**	**0.58**	**730.80**
		1	Sec. Cu - Basic technology	2000	800	0.5	NA	NA	630	460,000	**368.00**	**0.23**	**289.80**
		2	Sec. Cu - Well controlled	8	50	0.5	NA	NA	630	700,000	**35.00**	**0.35**	**441.00**
		3	Sec. Cu - Optimized for PCDD/PCDF control		5	0.5	NA	NA	300		-	-	-
	Subtotal										**1134**		

Table 6: Estimation of PCDD/PCDF releases from secondary copper production in China, reference year 2015 (start of the project), category 2d

			Source categories	Number of	Potential Release Route (µg TEQ/t)					Production	Annual release		
Group	Cat.	Class		plants	Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a
2			**Ferrous and Non-Ferrous Metal Production**								**Air**	**Water**	**Residue**
2015 project baseline	**d**		**Copper production**	**182**						**2,740,581**	**592**	**1.37**	**1,727**
		1	Sec. Cu - Basic technology	32	800	0.5	NA	NA	630	298,897	**239**	**0.15**	**188**
		1	Sec. Cu - Basic technology	110	800	0.5	NA	NA	630	307,286	**246**	**0.15**	**194**
		2	Sec. Cu - Well controlled	22	50	0.5	NA	NA	630	1,542,105	**77.1**	**0.77**	**972**
		2	Sec. Cu - Well controlled	18	50	0.5	NA	NA	630	592,293	**29.6**	**0.30**	**373**
		3	Sec. Cu - Optimized for PCDD/PCDF control		5	0.5	NA	NA	300		-	-	-
	Subtotal										**2320**		

The project BAT/BEP demonstration is still underway, and the evaluation of the project's PCDD/PCDF emission reduction effect will be undertaken after finalization of all upgrading and technology improvements. Due to the influence of raw materials and operational working conditions at the two demonstration enterprises, at present the PCDD/PCDF measurements are not representative and the emission factors as proposed in the UNEP Toolkit are applied (since they were found consistent with most measurements at other companies).

Through open tendering, MEE/FECO will identify a qualified company to thoroughly assess the PCDD/PCDF measurements and the working conditions for their generation.

4.3 Consistency with GEF Priorities

The project is consistent with the GEF-6 Chemicals and Waste Focal Area Objective CW-2 "Reduce the prevalence of harmful chemicals and waste and support the implementation of clean alternative technologies/substances", Program 3 "Reduction and elimination of POPs". The project will contribute towards GEF-6 Outcome 1.1 "Countries have appropriate decision-making tools and economic approaches to promote the removal of barriers preventing the sound management of harmful chemicals and waste" as well as Outcome 3.1 "Quantifiable and verifiable tonnes of POPs eliminated or reduced". The project will also contribute to the overall objective of the SAICM of achieving the sound management of chemicals throughout their life-cycle in ways that lead to the minimization of significant adverse effects on human health and the environment.

This project was approved before the GEF guidelines on indicators and sub-indicators (4) were finalized and therefore, such indicators were not included in the project document at approval. However, since evaluations shall transition to harmonized indicators, it is highly recommended to structure the outputs and outcomes of this project so that these indicators can be easily identified and evaluated at terminal evaluation stage. The relevant indicators can be found in section 7.11**Error! Reference source not found.**.

In addition, the UNDP Annual Portfolio Indicator for 2018 (see 7.11, Table 27**Error! Reference source not found.**) includes already the above-mentioned indicators and therefore, can be used for this mid-term review.

4.4 Project Design

The project is in line with China's priorities and strategies for fulfilling its obligation under the Stockholm Convention, as laid out in its NIP 2007, and thus enjoys a high degree of relevance for the country. Indeed, the NIP 2007 informs that the secondary copper is the biggest source of PCDD/PCDF within the non-ferrous metal industry and consequently represents a strategic target for reducing POPs (see section 3.2). The NIP placed a high priority on reduction of unintentional POPs and lists the secondary nonferrous metal industry as one of six priority industries to be targeted for control of PCDD/PCDF releases. This is reinforced by the 12th Five Year Plan (FYP), which reiterates that PCDD/PCDF emissions have to be reduced in four key industries by strengthening supervision and management, by phasing out outdated capacity, by implementing technological upgrading, etc. It is also reflected in the 2010 national level strategy "Guidance on strengthening dioxin prevention and control" as well as the 2015 guidance document "Technical Policy on Strengthen Dioxin Prevention and Control in key industries". In addition, the associated China's Secondary Non-Ferrous Industry Development and Promotion Plan issued in 2011 propose to speed up technology transformation.

By identifying and testing BAT/BEP and by developing technical standards, emission permits, indicators and guidelines for pollution prevention and control in the secondary copper production industry, the project not only aims at reducing unintentional POPs in China by up to 396 g TEQ of PCDD/PCDF (11.88 g TEQ dioxin through the demonstration and the rest through the implementation of the NRP) but also at adopting a national plan for the industry. In identifying and testing the BAT/BEP, the project follows a thorough selection process for the demonstration plants, based on the level of commitment and financial resources to guarantee sustainability of adoption. The outcomes for the project according to the project document are shown in Figure 3.

The numeric achievements as reported in the two UNDP Annual Portfolio Indicator reports (section 7.11**Error! Reference source not found.**), may be premature and not the final. Nevertheless, the numbers demonstrate good progress. For example, 2,816 people (2,394 men and 422 women) were trained in 2018 and 1,570 people were trained in 2017.

With respect to national standards, the following five standards are envisaged and shown in Table 7 together with the intended date of completism.

Table 7: Plans for standards in the secondary copper industry

Number	Name of Standard	Completion time
1	BAT/BEP guideline for Secondary copper industry	2020
2	Pollutant emission standard for dismantling enterprises of secondary copper	2020
3	BAT/BEP guideline for comprehensive utilization of multi metal hazardous waste	2020
4	Cleaner production evaluation index system for comprehensive utilization of multi metal hazardous waste	2020
5	Revision of Emission standard for industrial pollutants of secondary copper, aluminium, lead and zinc	2021

As mentioned in section 4.4**Error! Reference source not found.**, the measurement data are not yet consistent enough and the BAT/BEP upgrading not yet completed so that no firm numbers as to PCDD/PCDF reduction can be provide. Nevertheless, UNDP Annual Portfolio Indicator report for 2018 states that at a production of about 200,000 t of sec copper produced by the two demonstration plants, 1.6 g TEQ in the flue gas and 24 g TEQ in dust were reduced. The 2017 report did not give any number as to PCDD/PCDF reduction in the two demonstration plants.

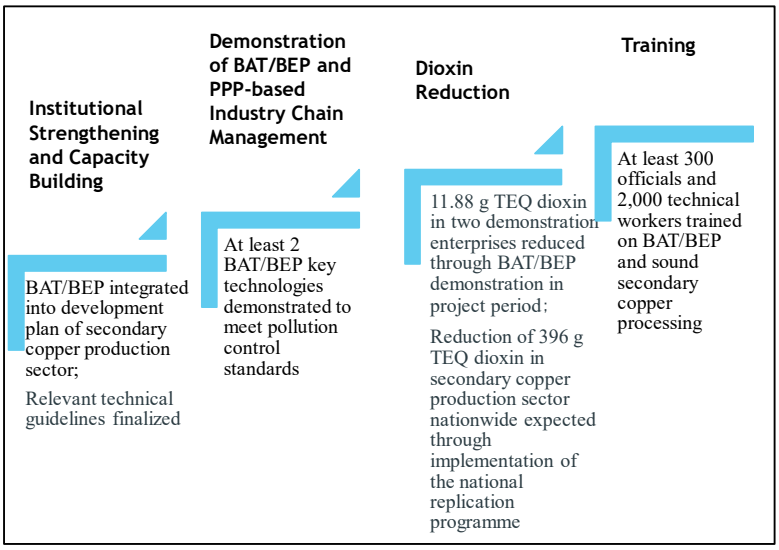

Figure 3: Outcomes of the project

4.4.1 Unintentional POPs Reduction Measures Implemented at the Two Demonstration Enterprises

The two demonstration enterprises, located in Jiangxi province, produce secondary copper from either copper scrap or copper-containing sludges (obtained from industries). The use of copper sludges represents a new raw material that so far has not been studied for PCDD/PCDF emissions. For example, the European Union Best Available Techniques Reference (BREF) document does not include sludges as raw material in the BAT document (8).

The planned BAT/BEP routes for the two demonstration enterprises are shown in Figure 4 and Figure 5 below.

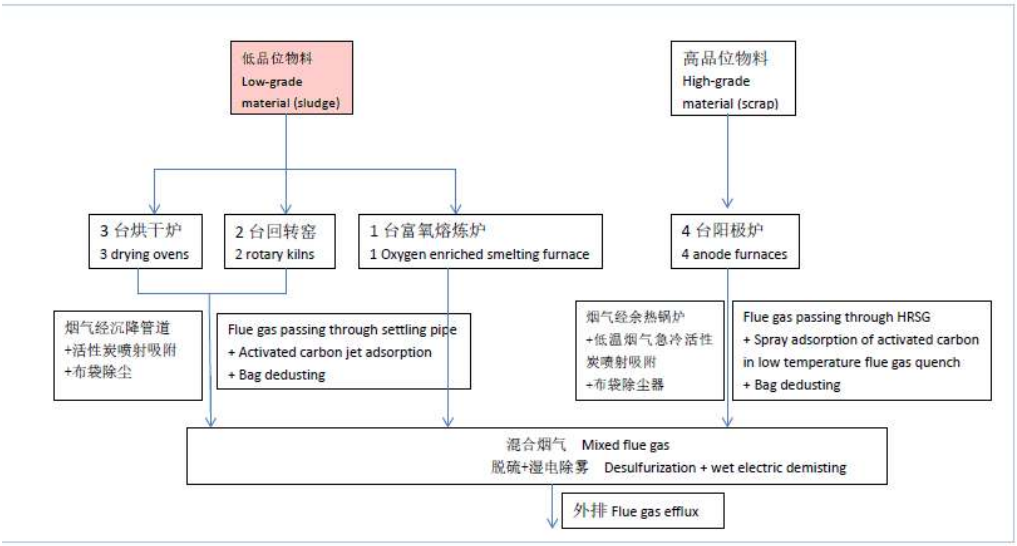

Figure 4: JiangXi ZiLi BAT/BEP flue gas emission route map

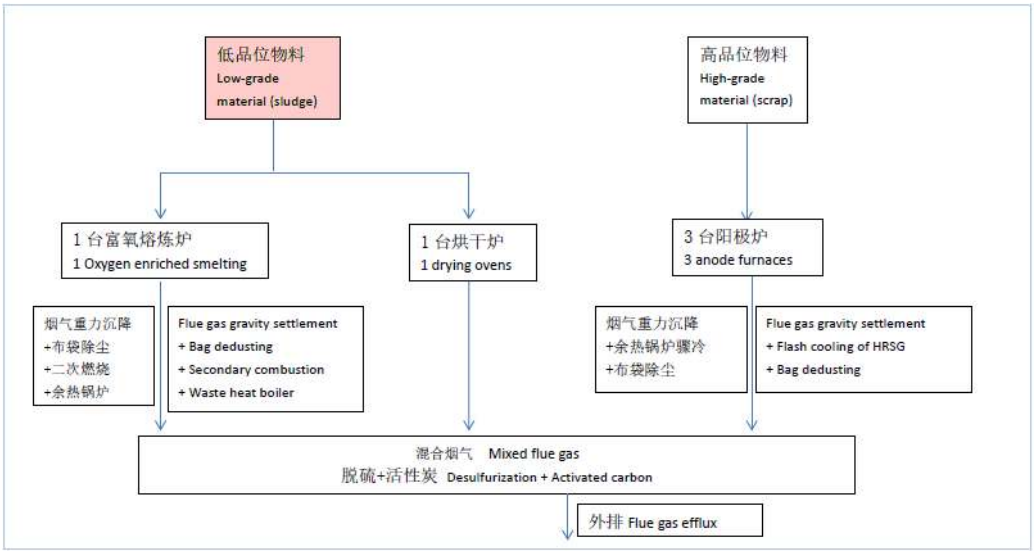

Figure 5: JiangXi Jinhui BAT/BEP flue gas emission route map

Both demonstration enterprises have undertaken a lot of activities to reduce PCDD/PCDF releases at their plants. A summary of indicative results for both enterprises was presented in the report at the MEE/FECO seminar which indicates that the targets for PCDD/PCDF could be reached within this project.

The investments at both companies to improve their processes are shown in section 7.8 (Table 25 and Table 26). The technology modifications target mainly the PCDD/PCDF emissions from the furnaces (melting furnace, anode furnace) but also pre-treatment steps to prepare the raw materials (sludge and scrap) for the melting and refining steps.

It was not the task of the MTR Team to verify or assess in detail the numeric achievements (in addition, the measurements are indicative and not necessarily representative of the final BAT/BEP optimized process) but the information obtained so far provides enough confidence that the targets on dioxin

reduction can be achieved. The preliminary results are briefly summarized below in sections 4.4.1.1 and 4.4.1.2

4.4.1.1 Activities Undertaken at Pilot Enterprise #1

1. By the end of 2018, the demonstration enterprises have received partial contract funding, and have completed the bidding and equipment transformation of the main equipment. The demonstration enterprises have adopted the following technologies and management measures in raw material pretreatment, clean production and APCD facilities to reduce control dioxin emissions.

2. Establish a raw material procurement control system in the raw material pretreatment section. When purchasing copper-containing scrap, measure the chloride ion content, control the chloride ion content in the input raw material, and take measures to separate the raw materials. The chlorine-containing plastics and other substances have taken measures to reduce dioxin from the source;

3. In the smelting stage, the demonstration enterprise establishes a daily sound operation management system to strictly control the furnace temperature above 850 °C, adopts oxy-combustion to increase the oxidation degree of the flue gas, reduces the composition of unburned organic matter, and adopts in the production process. Renovation clean production facilities to reduce the dioxins generation, such as the quenching system;

4. After the flue gas enters the FF, the desulfurization and wet electric mist eliminator are added, and the dioxin in the flue gas is effectively removed during the desulfurization and defogging process to reduce the dioxin emission;

5. Demonstration enterprises has carried out a lot of training on waste management, anode furnace operation, etc.

4.4.1.2 Activities Undertaken at Pilot Enterprise #2 (Report at MEE/FECO seminar)

1. By the end of 2018, the demonstration enterprises have received partial contract funding, and have completed the bidding and equipment transformation of the main equipment. The demonstration enterprises have adopted the following technologies and management measures in raw material pretreatment, clean production and APCD facilities to reduce control dioxin emissions.

2. Establishing a raw material procurement control system in the raw material pretreatment section, restricting the purchase of high-chlorinated copper mud, rejecting the copper-containing scraps that are gravity-screened by the waste circuit board, the anode furnace refining slag containing organic matter and the copper mud containing organic matter. Separate raw materials for smelting, reducing the introduction of organic matter and chlorine from the source;

3. In the smelting stage, the demonstration enterprise reasonably controls the feeding sequence, first adding raw materials such as copper and electrolytic residual poles without organic matter. When the temperature in the furnace is above 1000 °C, the addition of organic copper containing impurities is taken in the production process. Renovation of second combustion chamber to reduce the production of dioxins;

4. The demonstration enterprise adds the pulse FF and the activated carbon adsorption tower reduce the dioxin emission;

5. In the production process, the demonstration enterprises formulate control systems and operational procedures for each part of raw material purchase, analysis, production process, and pollution prevention facilities, and conduct all staff education and training to enable all employees to understand the control of dioxin pollution and environmental protection.

4.4.2 PPP-based Industry Chain Management

MEE pays high attention to reduction of pollutants including POPs in the industrial zones/parks and PPP investment for environment protection; therefore, the project also covers PPP for environment protection including secondary industrial parks. The goals are to use sustainable and economical BAT/BEP application and comprehensive management ("smart management") to reduce POPs emission in the industrial parks, using the internet technologies such IoT, waste management system to monitor, manage the logistics, production, and transportation of industrial parks, as well as to monitor and analyse the POP emissions. Tongling is a famous city for producing primary copper and secondary copper in China, with 5.2 million tonnes of copper-related wastes generated in the city. Through PPP modality, almost all secondary copper enterprises (6 in total), as well as some internet companies, waste management companies (such as sewage treatment companies, PCB treatment centres), and research institutes have moved to the *Tongling secondary industrial park*. All enterprises work together and coordinate through internet technologies. There are 7 PPP enterprises in the park with hazardous waste disposal business. Those coves various enterprises based on the industrial chain related to the secondary copper industry. All the companies must meet the national criteria of hazardous management including the BAT/BEP technologies newly introduced by MEE to reduce the emissions of pollutants and POPs.

The MTR team reviewed the PPP contract/agreement between FECO and the committee of tongling high-technology Park, and made the following observations, Tongling park launches the smart park construction, the first goal is to achieve smart monitoring, intelligent supervision, and take into account the smart management of enterprises. Through intelligent management, achieve better control of pollutant emissions, including unintentional POPs such as PCDD/PCDF. Control of PCDD/PCDF involves synergistic emission reduction with other pollutants targeting both, PCDD/PCDF in the particle and the gas phase

By applying a bag filter, most of the dioxins adsorbed to particulate matter and removal of particulate matters, PCDD/PCDF are simultaneously removed. Similarly, denitrification and desulfurization measures will also absorb PCDD/PCDF.

The total investment of the demonstration project is 39 million RMB, of which 6.5 million RMB is applied from the "Global Environment Facility" grant fund, the in-kind and co-financed cash are 32.5 million RMB. The GEF grant was a great incentive to improve the management of the park, and reduce the emission of POPs in all the related secondary enterprises, as well as the hazardous waste disposal enterprises in the park.

The PPP is under the implementation and construction and could be served as paradigm for Similar types of industrial zones, especially those related to POP emission reduction in China. The MTR Team recognized with appreciation this approach within the project and values towards sustainability and replication criteria.

4.4.3 Results Framework

A classic Theory of Change is missing in the project document. Yet, a similar chain is somewhat reflected in the graphic on page 9 of the project document (also displayed in Figure 6), although the causality is displayed between the project components rather than between activities, outputs and outcomes. Nevertheless, the intervention logic is well orchestrated and demonstrate that, in theory, the project can reach its overall objective of reducing POPs emissions in secondary copper production through the planned interventions.

Each activity of the project is carried out based on project documents and is carried out in individual steps and through (sub-)contracts in steps. Each output is carried out for a specific purpose. An example on the synergy between outcomes, activities, sub-contractors, contracts and finance is provided in Table 24. An emphasis is on synergies between activities and actors within the chemicals and waste cluster; *i.e.* Basel, Rotterdam, Stockholm and more recently mercury conventions.

4.5 Progress towards Results (i.e. Effectiveness)

The majority of the activities have been initiated successfully and some of them are already finalized. More, specifically, activities developing and supporting institutional strengthening and demonstration of best available techniques at two demonstration enterprises are almost completed. Accordingly, quantitative objectives of the project are already achieved. The national standards and BAT/BEP applications are in place and emissions of unintentional POPs (especially PCDD/PCDF) are reduced. As accompanying activity, people in various target groups have been trained.

Overall, the MTR Team found that the project has demonstrated some remarkable achievements, including:

- Policy development: More than 30 studies have been commissioned and largely to assess (i) current policies and research on pollution prevention and control technical policy, (ii) research on pollution prevention and control economic policy, (iii) research on technical standards of assessment indicator system and audit guideline on cleaner production for the secondary copper smelting industry, (iv) research on application and issuance technical guideline for emission permit on secondary non-ferrous metal industry, and (v) research for emission standards applicable to secondary copper, aluminium, lead, and zinc industries.

- Strengthening of the institutional capacities: Relevant government bodies (*e.g*. Jiangxi EPB) for pollution prevention and control and for implementing best available techniques and best environmental practices (BAT/BEP) in reducing unintentional POPs and other pollutants in secondary copper production and other non-ferrous metals production have been strengthened;
- Two secondary copper enterprises are improving their processes by developing and applying BAT/BEP to reduce/minimize emissions of unintentional persistent organic pollutants (POPs).

As expected at mid-term, activities cannot be expected to be finalized. Important components planned for the second part of the project implementation, such as demonstration of PPP-based industry chain management and national replication of the BAT/BAP, are just about to start.

Overall, the project team (both the National Project Team (NPT) and the Local Project Management Office (LPMO)) has demonstrated strong competencies and managed the project successfully, as reflected in the project achievements to date.

The assessment of progress towards results is reported by project component below. An assessment by project indicator/target is placed in annex 7.2.

4.5.1 Project Objective

25.6 g TEQ reduction in the two demo plants were reported. Yet, these are interim results which are indicative but not representative, since the dioxin measurements are still too scattered. The results indicate that the BAT/BEP measures in both demo plants show reduction. A final assessment is planned to quantify the reduction at the end of the project. BAT/BEP development/optimization is

with the demonstration plants. The national replication plan (NRP) has been drafted and will be finalized at the end of the year (2019), and the multi-stakeholder communication platform is in place and running. Based on indicative reduction from the two demonstration plants, it is likely that the reduction goal of 396 g TEQ dioxin can be met. In order to achieve, the NRP has to be finalized and implemented during the second half of the project. Four BAT/BEP technologies are being demonstrated and target the two raw materials - low and high grade raw materials - in an efficient way. It is expected that at the end of the project for both raw materials several options for BAT/BEP have been developed and the target met. Technical guidelines have been developed and published. MEE is reported to have officially released standards on pollutant permits for non-ferrous metal, and the evaluation index has been consulted by NDRC. Technical guidelines include pollution control standards, pollution permits, demonstration evaluation manual and indicators, manual on management of hazardous waste in secondary copper. 1,608 officials and 1,825 technical workers trained so far, although the impacts of these trainings could not be assessed. Proper attention should be given in the second half of the project to insure quality meets quantity.

4.5.2 Component 1: Institutional Strengthening and Capacity Building

Two policy evaluations have been delivered (on the implementation effectiveness of pollution reduction and on its economic effectiveness) consisting of nine studies. They have been submitted to MEE, the MoF, and MIIT as reference materials for policy formulation work, with one specification having been officially released by MEE. In addition, two technical standards have been finalized (on green production evaluation index and on pollutant permit) and three additional standards as being finalized. MEE is reported to have officially released standards on pollutant permits for non-ferrous metal, and the evaluation index has been consulted by NDRC. Five international exchanges are reported, namely: (i) 13th Int'l Symposium on PTS; (ii) 17th Int'l Recycling Metal Exhibition; (iii) study visits in Italy and (iv) Germany; (v) annual meeting of the American Waste Industry Association. Other international exchanges are also reported under other outputs, namely: 14th Int'l Symposium on PTS; 16th Int'l Forum on Secondary Nonferrous Metal in Guangzhou (Nov 2016 or 2017). Future exchanges should ensure exchange on lessons learned from/for the project demonstrations.

The Manual for Environmental Management of Hazardous Waste in the Recycled Copper Smelting Industry in Jiangxi Province has been distributed to the project partners (e.g. LPMO) and is now in the process of being finalized. It will guide enterprises in both standardizing the disposal of hazardous waste generated from secondary copper production and provide a reference for local environmental departments managing and inspecting secondary copper enterprises. The LPMO is set up and active. 1,608 governmental officers are reported to have been trained (16 times above target) and six times as many training activities are reported to have been carried out. The LPMO is composed of staff from a Jiangxi EPB affiliated center for waste management. In addition, 1,825 technical workers (91.25% completion) and 3,285 managers (164.25% completion) from 135 enterprises are reported to have been trained so far. Yet, we could not verify the numbers (e.g. list of participants), the content of the trainings (e.g. PPTs) nor their impacts. A data information management system (IMS) is established and operational. Data and project progress are reported to having been disseminated *via* the official China POPs website, and the Jiangxi Province has set up, in 2017, the Jiangxi Hazardous Waste Supervision and Management Online Platform, which is integrating the control of unintentional POPs during production. A multi-stakeholder platform has been established and is used for communication. The platform includes secondary copper smelting companies, universities, research institutes, industry associations and local environmental protection agencies. It is used for regular meetings and knowledge exchange.

Activities to strengthen collaboration among MEAs and Minamata Convention are underway. The Basel and Stockholm Convention Regional Centers in China are assisting MEE and others to

establishing synergies between the Conventions for efficient chemicals and waste management. Among the international and national exchanges and the project with the BCCC and SCRC, meetings were reported but not further assessed by the MTR Team.

Typically, China participates in international meetings and conferences as well as in Stockholm and Basel Convention working groups or expert meetings.

4.5.3 Component 2: Demonstration of BAT/BEP and PPP-based Industry Chain Management

The national Cu sludge investigation is still at a starting phase (20% completed, when it should have been finalized by end of Yr2) but the smelting industry implementation and evaluation plan has been finalized. BAT/BEP and technical support are identified and selected. The two demonstration enterprises have been selected and their implementation plans have been developed and approved. The implementation is underway. Only one of the manuals on smelting and dismantling process operations have started being developed so far (according to reports) when actually all manuals should have started by the beginning of year 2 already. Besides, further details need to be provided regarding the purpose, content and timeline of these manuals. We suggest to speed-up the finalisation of these manuals in order to assist successful demonstration/replication. A demonstration plan has been developed for the two enterprises and is being implemented. No results assessment is expected at this stage of the project.

Management guidelines for circular economy and PPP are being developed but with a delay (it should have started in the beginning of year 2). The PPP-based industrial park has been selected and is finalizing its implementation plan. Tongling Economic and Technological Development Zone Management Committee (in Anhui Province) has been selected and just signed an agreement to be the industrial park for the PPP demonstration.

A manual for evaluation and indicators are being developed and several inspections have been carried out by FECO and the LPMO.

4.5.4 Component 3: National Replication Programme

No lessons learned documented yet since the demonstrations just started, but preliminary findings have been shared within China and with other countries, although experience gained should have been developed during year 3 already according to the workplan. The NRP and the incentive plan have been drafted and will be finalized at the end of the year (2019). If the NRP is open for revision based on the demonstration findings, the fact that it was developed before the demonstration and its lessons learned have been completed might affect the quality of the NRP and the replication effort. Hence, proper attention should be given to keep replication tied to the results of the demonstration.

Over 1,825 technical workers (91.25% completion) and 2,300 people from the general public (0.23% completion) have been reported as being trained. It is recommended to categorize the trainings according to content and target group and define indicators.

4.5.5 Components 4-5: Monitoring & Evaluation and Project Management

M&E activities implemented according to plan, with all related reports (QPRs, APRs and PIRs) submitted on time. The project team proved very competent and successfully managed the project according to plan and targets. Some delays in disbursements were experienced and documentation

could be more efficient sometimes (e.g. missions), but these elements do not represent a risk for the success of the project and the project team is set to improve them during the second phase.

Table 8: MTR matrix for assessing progress towards results

Outcome	Indicator	Baseline	End of project target	Midterm Level & Assessment*	Rating **	Justification
The project aims to address and achieve reduction of POPs emissions in the secondary copper production sector in China. A national replication programme will be developed to disseminate demonstration results, through promotional activities to roll-out BAT/BEP for national replication	Quantity of UPOPs reduction at the demonstration locations	The total PCDD/Fs emission from secondary copper production sector was estimated at 1,133.8 g TEQ/a, including atmospheric emissions of 403 g TEQ/a and fly ash emissions of 730.8 g TEQ/a respectively	11.88 g TEQ dioxin in two demonstration enterprises reduced through BAT/BEP demonstration in project period	25.6 g TEQ reduction in the two demo plants were reported	5	These are interim results and indicative but not representative since the dioxin measurements are still too scattered. The results indicate that the BAT/BEP measures in both demo plants show reduction. A final assessment is planned to quantify the reduction at the end of the project
	Number of facilities replicating or establishing environmentally sound secondary copper production		BAT/BEP integrated into development plan of secondary copper production sector	Underway. BAT/BEP development/optimization is with the demonstration plants	5	The nat'l replication plan (NRP) has been drafted and will be finalized at the end of the year (2019), and the multistakeholder communication platform is in place and running.
	Estimated reduction quantity through implementation of the national replication programme		Reduction of 396 g TEQ dioxin in secondary copper production sector nationwide expected through implementation of the national replication programme	Quantitative assessment nationwide can only be done at the end of the project.	5	Based on indicative reduction from the two demonstration plants (see above), it is likely that the reduction goal can be met. In order to achieve, the NRP has to be finalized and implemented during the second half of the project.
	Number of new technologies demonstrated	None	At least 2 BAT/BEP key technologies demonstrated to meet pollution control standards	4 BAT/BEP technologies are being demonstrated.	5	BAT/BEP demonstration is underway and targets the two raw materials - low and high grade raw materials - in an efficient way. It is expected that at the end of the project for both raw materials several options for BAT/BEP have been developed and the target met.
			Relevant technical guidelines finalized	Technical guidelines have been developed and published.	6	The target is on track. MEE is reported to have officially released standards on pollutant permits for non-ferrous metal, and the evaluation index has been consulted by NDRC. Technical guidelines include pollution control standards, pollution permits, demonstration evaluation manual and indicators, manual on management of hazardous waste in secondary copper.

	Number of officials, decision makers, and workers trained on sound secondary copper processing	None	At least 300 officials and 2,000 technical workers trained on BAT/BEP and sound secondary copper processing	1,608 officials and 1,825 technical workers trained so far.	5	The target is on track and almost completed and set to be exceeded (in numbers). The impacts of these trainings could not be assessed. Proper attention should be given in the second half of the project to insure quality meets quantity.
1.1. Improved legal framework through policy research for the secondary copper production sector	Effectiveness of policy implementation	Lack of specific laws and regulations directed to environmentally sound management of the secondary copper industry	Effectiveness of existing policy implementation evaluated and suggestions for improvement finalized	Effectiveness of policy implementation evaluated and suggestions given.	5	2 policy evaluations have been delivered (on the implementation effectiveness of pollution reduction and on its economic effectiveness) consisting of 9 studies. They have been submitted to MEE, the MoF, and MIIT as reference materials for policy formulation work, with one specification having been officially released by MEE.
	Number of technical standards finalized	No specific technical standard document available for collection, logistics, pre-treatment, material recovery and hazardous waste disposal	At least 4 technical standard documents finalized	2 technical standards have been finalized (on green production evaluation index and on pollutant permit) and 3 additional standards as being finalized.	6	The target is almost completed and should soon be exceeded. Moreover, MEE is reported to have officially released standards on pollutant permits for non-ferrous metal, and the evaluation index has been consulted by NDRC.
	International knowledge and experience gained	None	International exchanges conducted	Over 5 int'l exchanges have been conducted.	5	5 int'l exchanges are reported, namely: (i) 13th Int'l Symposium on PTS; (ii) 17th Int'l Recycling Metal Exhibition; (iii) study visits in Italy and (iv) Germany; (v) annual meeting of the American Waste Industry Association. Other int'l exchanges are also reported under other outputs, namely: 14th Int'l Symposium on PTS; 16th Int'l Forum on Secondary Nonferrous Metal in Guangzhou (Nov 2016 or 2017). Future exchanges should ensure exchange

						on lessons learned from/for the project demonstrations.
1.2. Capacity of enterprises, industries, Local Project Management Office strengthened to facilitate effective management and monitoring of the secondary copper sector	Supervision and management manual developed	None	Manual drafted, reviewed and finalized	The Manual for Environmental Management of Hazardous Waste in the Recycled Copper Smelting Industry in Jiangxi Province has been distributed to the project partners (e.g. LPMO) and is now in the process of being finalized.	5	This manual will guide enterprises in both standardizing the disposal of hazardous waste generated from secondary copper production and provide a reference for local environmental departments managing and inspecting secondary copper enterprises.
	Capacity for supervision and management strengthened	Limited	Local Project Management Office (LPMO) set up 2 times of training and technical exchanges conducted, covering over a total of 50 management officers	The LPMO is set up and active. 1,608 governmental officers are reported to have been trained (16 times above target) and 6 times as many training activities are reported to have been carried out.	5	The LPMO is composed of staff from a Jiangxi EPB affiliated center for waste management. Yet, we could not verify the numbers (e.g. list of participants), the content of the trainings (e.g. PPTs) nor their impacts.
	Industry autonomy capacity building improved	None implemented	Annual training programme and technical exchanges conducted, covering over 30 enterprises and over 2,000 technicians and management personnel	1,825 technical workers (91.25% completion) and 3,285 managers (164.25% completion) from 135 enterprises are reported to have been trained so far.	5	The targets seems highly exceeded already. Yet, we could not verify the numbers (e.g. list of participants), the content of the trainings (e.g. PPTs) nor their impacts.
	Data information management system established	None	Data information management system established and operational	Data IMS established and operational.	5	Data and project progress are reported to having been disseminated via the official China POPs website, and the Jiangxi Province has set up in 2017 the Jiangxi Hazardous Waste Supervision and Management Online Platform, which is integrating the control of unintentional POPs during production.
	Coordination and sustainable development enhanced	None	Multi-stakeholder platform and international communication mechanism established to facilitate inter-agency, industry and international coordination	A multi-stakeholder platform has been established and is used for communication.	5	The platform includes secondary copper smelting companies, universities, research institutes, industry associations and local environmental protection agencies. It is used for regular meetings and knowledge exchange.

1.3. Enhanced cooperation with other international environmental conventions	Synergistic interaction with other conventions	None implemented	Regular communication and updates on progress took place with SAICM and other conventions	Activities to strengthen collaboration among MEAs and Minamata Convention are underway	4	The Basel and Stockholm Convention Regional Centers in China are assisting MEE and others to establishing synergies between the Conventions for efficient chemicals and waste management.
	International exchange meetings	None implemented	Meetings conducted	*Not reported as such*	4	Among the international and national exchanges and the project with the BCCC and SCRC, meetings were reported but not further assessed by the MTR Team. Typically, China participates in international meetings and conferences as well as in Stockholm and Basel Convention working groups or expert meetings.
2.1. BAT/BEP demonstration conducted	Up-to-day and accurate estimation and assessment of UPOPs emission	Incomplete data	National copper sludge investigation report finalized Smelting industry implementation and evaluation planning finalized	The nat'l Cu sludge investigation is still at a starting phase but the smelting industry implementation and evaluation plan has been finalized.	4	This indicator is experiencing a slight delay since the nat'l Cu sludge investigation is reported as 20% completed when it should have been finalized by end of Yr2. We recommend to catch up with workplan for this activity to meet the project's deadline.
	Technological solution and potential providers of technical support identified	Had technological solution and identified some technical support	BAT/BEP for demonstration as well as providers of technical support identified and selected	BAT/BEP and technical support identified and selected.	5	The 2 demonstration enterprises have been selected and their implementation plans have been developed and approved. The implementation is underway.
	Technical documents compilation	None	Smelting process operation manual and dismantling process operation manuals compiled	One manual has started being developed.	4	This target is experiencing a slight delay. Only one manual is reported to have started being developed when actually all manuals should have started by the beginning of Yr2 already. Besides, further details need to be provided regarding the purpose, content and timeline of these manuals. We suggest to speed-up the finalisation of these manuals in order to assist successful demonstration/replication.
	BAT/BEP demonstration	None	BAT/BEP demonstration at two plants implemented and results assessed	A demonstration plan has been developed for the 2 enterprises and is being implemented. No	5	The target is on track.

				results assessment is expected at this stage of the project.		
			Dioxin releases reduced to meet emission standards at two demonstration plants through demonstration activities	N/A (outside the timeframe of the MTR)	N/A	
2.2. Circular economy, PPP and centralized park based approach demonstrated for the secondary copper sector	Management guidelines for circular economy and PPP industrial chain park-based	None	Research and analysis on approach and mechanisms to generate maximum benefits for effective management conducted and documented	Management guidelines for circular economy and PPP are being developed.	5	This target is on track although with a slight delay (it should have started in the beginning of Yr2). The guidelines should be finalised rapidly in order to start the PPP demonstration ASAP.
	Demonstration of circular economy and PPP industrial park-based management	None	PPP and environmental management demonstrated to contribute to both environmental protection and economic development	The industrial park has been selected and is finalizing its implementation plan.	5	The target is on track although with a slight delay. Tongling Economic and Technological Development Zone Management Committee has been selected and just signed an agreement to be the industrial park for the PPP demonstration.
	Results of demonstration activities	None	Demonstration results evaluated, documented and disseminated.	N/A (outside the timeframe of the MTR)	N/A	
2.3. Evaluation and demonstration project acceptance	Demonstration results monitored and reduction measured	None	Self-evaluation indicators and manual designed and established	A manual for evaluation and indicators are being developed.	5	This target seems on track. The manual is being developed and several inspections have been carried out by FECO and the LPMO.
	Acceptance of the results of the demonstration project	None	Demonstration results evaluated and accepted	N/A (outside the timeframe of the MTR)	N/A	
3.1. Replication and promotion of demonstration results and experience	Project experience summary	None	Experience gained and lessons learned documented, evaluated and disseminated	No lessons learned documented yet since the demonstrations just started, but preliminary findings have been shared within China and with other countries.	5	This target is experiening a slight delay (experience gained should have been developed during Yr3 already).
	National replication plan	None	National replication plan incorporating experience gained and lessons learned developed	The NRP has been drafted and will be finalized at the end of the year (2019)	5	This target is on track. If the NRP is open for revision based on the demonstration findings, the fact that it was developed before the demonstration and its lessons learned have been completed might

						affect the quality of the NRP and the replication effort. Hence, proper attention should be given to keep replication tied to the results of the demonstration.
	Promotion plan design and implementation	None	Promotion plan for dismantling and smelting enterprises designed and implemented. BAT/BEP integrated into development plan of secondary copper project	The incentive plan has been drafted and is being finalised.	6	The target is on track.
3.2. Promotional events for public awareness raising	Knowledge products and promotion materials	None	Knowledge products based on lessons learned developed to disseminate demonstration results	N/A (outside the timeframe of the MTR)	N/A	
	Training and promotional activities	None	Training sessions, promotion and public awareness activities awareness conducted, covering over 2,000 technicians and 1,000,000 general public	Over 1,825 technical workers (91.25% completion) and 2,300 people from the general public (0.23% completion) have been reported as being trained.	4	This target seems mostly on track. The target for technicians is almost reached and will most likely be highly exceeded by the end of the project. It is recommended to categorize the trainings according to content and target group and define indicators.
4.1. Project monitoring and evaluation	Timing and quality of annual (APRs, PIRs etc.) and M&E reports	Indicative M&E plan, budget and timeframe	M&E activities implemented as scheduled and on budget, project implementation monitored to achieve project objectives	M&E activities implemented according to plan.	5	M&E activities implemented according to plan.
	Quality appraisal in Mid-Term Review and Terminal Evaluation		Adaptive management undertaken	MTR being done providing recommendations.		
4.2. Knowledge sharing and information dissemination	Lessons learnt and experience documented and disseminated; post-project action plan formulated	None	Lessons and experience documented and disseminated	N/A (beyond the timeframe being evaluated in this MTR, but supposed to start in the beginning of Yr4, in 2019/07/01, so things should be ready).		
5.1. Strengthened Project management	Timely project implementation and disbursement		Capacity of National Project Team strengthened. In additional to existing staff, a	The NPT is complete, staffed, equipped and trained.	5	The project team proved very competent and successfully managed the project according to plan and targets. Some delays in disbursements were

capacities and efficiency		Basic project implementation structure	Project Coordinator and a secretary are recruited National Project Team established, staffed, equipped and trained			experienced and documentation could be more efficient sometimes (e.g. missions), but these elements do not represent a risk for the success of the project and the project team is set to improve them during the second phase.
	Staff of Project Team trained about the Project Implementation Manual and relevant requirements of GEF and UNDP on project management	None	Staff trained and project management capacity strengthened	Ibid.		
	Routine project management activities undertaken to ensure the smooth and timely implementation of the project. The activities include but not limited to: drafting TORs, select and contract with consultants, organize M&E activities, organize the review of substantial report	None	Efficient and effective project management leading to achievement of project objectives	Reporting has been done according to plan and communication seems running.		

N.B.: The column on mid-term targets have been removed from the matrix (below) since there are no mid-term targets reported in the project document.

* The current measurement of the indicator, with color code (Green= Achieved; Yellow= On target to be achieved; Red= Not on target to be achieved)

** 6 = highly satisfactory; 5 = satisfactory; 4 = moderatly satisfactory; 3 = moderately unsatisfatory; 2 = unsatisfactory; 1 = highly unsatisfactory

4.6 Project Implementation and Adaptive Management (i.e. Efficiency)

4.6.1 Management Arrangements

The day-to-day overall management of the project has been carried on by MEE/FECO, the executing agency. Its main activities and responsibilities have been to identify and contract different contractors and experts to carry out most of the project outputs, then to monitor progress and collect and evaluate the deliverables. Experts and research institutions have been contracted to undertake the various studies, whereas local government institutions and private entities have been contracted to implement the pilot demonstrations (*i.e.*, BAT/BEP and PPP). UNDP, who act as the implementing agency, with the guidance of the requirement of GEF, has been providing overall supervision and monitoring, mostly in collecting the different project reports and in communicating progress to the GEF. Besides, UNDP also conducted some site investigation and monitoring, supporting the international experts' recruitment, and study tour abroad as requested by the national implementation Partner.

The implementation of the BAT/BEP demonstration and its day-to-day management at the local level has been done by the local EPB, who acts as the LPMO. The Solid Waste Management Center of Jiangxi Province has been designated to be the representative of the local EPB and has been active in the identification and selection process for the BAT/BEP demonstration enterprises, as well as in the development of the implementation plans and selection of BAT/BEP by the selected enterprises (*i.e.*, Jiangxi Jinhui Environmental Technology Co, Ltd. and Jiangxi Zili Environmental Technology Co, Ltd.). Jiangxi EPB is working closely with the two demonstration enterprises in the adoption of the BAT/BEP and in monitoring progress.

Regarding the demonstration of the PPP-based industrial park, the Management Committee of Tongling Economic and Technological Development Zone has just been contracted (status: July 2019) to implement the demonstration and undertake its day-to-day management.

A list of the persons and institutions that have contributed to the project at the time of the MTR (August 2019) is provided in the section 7.7.

The management arrangements have proved effective and efficient overall in implementing the project according to plan and has delegated a lot of responsibility for day-to-day management to the provincial partners, especially the LPMO, which is good for ownership and institutional capacity building.

On the other hand, project documentation and reporting, which is a key project management activity which should typically be done by the project team (as a monitoring tool, for instance) has been outsourced (to Beijing Advanced Sciences and Innovation Center of CAS, e.g. for trainings), at least partially. This generated some complications in gathering all the necessary documentation during the MTR, where the provision of all the project documents by UNDP country office and MEP/FECO took several months. We thus strongly recommend to keep such core management activities in-house within the NPT.

In addition, Jiangxi EPB have stricter dioxin regulation (0.1 ng TEQ/Nm^3) than the national regulation (0.5 ng TEQ/Nm^3), but do not document emission measurements. Furthermore, it does not document activities (time, purpose and achievement of frequent site visits) and do not assess/report the results

of the platform. Finally, Jiangxi EPB has dioxin data from the Jiangxi environmental monitoring station, but this data is not project-relevant (ambient air and background soil).

4.6.2 Work Planning

The project management has proved competent in implementing the project according to plan. Project activities have been running smoothly except for some slight delays (i.e. national copper sludge investigation, smelting and dismantling process operation manuals, PPP demonstration) and targets seems on track. However, there has been repeated delays in disbursements throughout the different quarters of project implementation (see Table 9, which seemed mostly attributed to strict acceptance procedures for payments to (sub-)contractors (see QPRs, *e.g.* QPR 2019 Q2). It is thus recommended to evaluate this procedure and see if there might be a need to simplify or streamline it in the future.

Table 9: Accumulated quarterly delivery rate throughout the QPRs (i.e. rate of expenditures in comparison to budget)

Reporting period	% of budget spent
2016 Q3	not provided
2016 Q4	N/A
2017 Q1	19.98%
2017 Q2	17.90%
2017 Q3	20.32%
2017 Q4	N/A
2018 Q1	39.87%
2018 Q2	38.13%
2018 Q3	26.60%
2018 Q4	N/A
2019 Q1	59.80%
2019 Q2	22.70%
Total average	**31%**

It should be noted, moreover, that the selection of the industrial park for demonstration of PPP-based industry chain management and the development of its ToR for contracting has experienced some delays. In addition, the management guidelines for circular economy and PPP are being developed but should have started in the beginning of the second year of the project already. Yet, the PPP-based industrial park has now been selected and contracted, and its implementation plan is being finalised, thus keeping the related targets on track.

4.7 Finance and Co-finance

The financial evaluation of this project was performed against the approval at CEO endorsement, since the budget revision agreed with the GEF was signed on 23 April 2019 and is therefore not reflected in the Annual Progress Reports (APR) analysed here. The budgets for the project at CEO endorsement were shown in Table 1 and Table 2 and for co-finance in Table 3. The total GEF grant is 12,600,000 and the total co-financing is USD 52,450,000, consisting of USD 15,510,000 cash and USD 36,940,000 in-kind.

At approval stage, the project management expenses amount to USD 600,000 for management and oversight of FECO , corresponding to about 4.8% of the project GEF grant. This budget was approved

by GEF, and the budget was managed based on the requirement of the project document. From this amount, USD 8,812 is allocated to the implementing agency (*i.e.*, UNDP) and USD 591,188 to the executing agency (*i.e.*, MEP/FECO). The total amount that is to be transferred to the executing agency from the GEF grant is USD 12,591,188, 89% of which (USD 11,255,000) is to be transferred to (sub-)contractors.

The source of information is the reporting by MEP/FECO in annual reports (*i.e.*, APRs and Project Implementation Reviews (PIR)) and quarterly reports (*i.e.*, Quarterly Progress Reports (QPR) and Combined Delivery Report (CDR)). A detailed list of all these reports can be found in section 7.6.

For this MTR evaluation, we decided to focus on the Annual Progress Reports (APR), since they appear to have the most accurate numbers, as was confirmed during the interviews with UNDP CO and MEP/FECO. We compared the actual expenditures reported in the APRs to the budget exposed in the Two-Years Work Plans (TYWP), the TYWPs being the budget lines used by the project management team in their reports for financial monitoring. Table 10 gives an overview of the comparison between planned budgets (in the project document and the TYWPs) and actual expenditures. It should be noted that TYWPs are internal revisions agreed between the different actors of the project implementation (at the Annual Review Meetings). Table 11 shows the budget revisions reported in the TYWPs.

Table 10: Overview on expenditures from the GEF grant by year (disbursements by UNDP) and balances

Outcome	2016				2017				2018			
	Prodoc	APR			Prodoc	APR			Prodoc	APR		
		Annual budget	Annual Exp	Balance		Annual budget	Annual Exp	Balance		Annual budget	Annual Exp	Balance
1	171,000	33,500	27,370	6,129	192,000	452,900	255,885	197,015	332,000	503,200	212,399	290,800
2	593,000	3,000	4,062	-1,062	1,126,000	739,000	1,004,585	-265,585	2,126,000	3,497,000	2,878,656	618,343
3	5,000			-	10,000	15,000	-	15,000	430,000	25,000	16,784	8,215
4	13,500	13,500	14,906	-1,405	39,000	36,500	38,598	-2,098	154,000	53,500	42,991	10,508
5	73,750	14,750	6,165	8,585	114,500	107,400	92,656	14,744	118,906	109,000	150,147	-41,147
	856,250	64,750	53,748	12,247	1,481,500	1,350,800	1,391,724	-40,924	3,160,906	4,187,700	3,321,407	886,720

Table 11: Budget revisions as reported in the TYWP and the GEF approved revision

Year	Prodoc	TYWPs	Revision (23/04/2019)
2016	856,250.00	97,250.00	53,748.42
2017	1,481,500.00	1,352,603.00	1,350,219.09
2018	3,160,906.00	3,032,703.00	3,321,407.53
2019	3,206,500.00	2,665,200.00	2,665,200.00
2020	3,090,906.00	2,625,500.00	2,625,500.00
2021	803,938.00	n.d.	2,583,924.96
Total	**12,600,000.00**	**n.d.**	**12,600,000.00**

As shown in Table 12, most (USD 3,887,304 or 71%) of the GEF funds (USD 5,498,656 for 2016-2018) was spent to achieve outcome 2 ´Demonstration of BAT/BEP and PPP-based Industry Chain Management´. As can be seen, the project finance has a total surplus of USD 753,449 as compared to the budget endorsed for that period (USD 858,043 compared to TYWPs). This is explained by some delays in contracting and is planned (in the budget revision) to be compensated in the coming years, which will focus on demonstration activities (the budget largest component). We did not see any

indication that the GEF Secretariat had any comment in relation to these variations and how cost-effective the project has been. As to auditing, none has been undertaken so far. We were informed by UNDP CO that annual auditing within UNDP is based on selection. Each year, the evaluation office of UNDP decides which projects to audit. It is anticipated that the project will have an audit this year (2019).

Table 12: Total expenditures and balances for the period 2016 to 2018

Outcomes	**Total (2016-2018)**		
	Total expenditures	**Total balance *vs.* TYWPs**	**Total balance *vs.* prodoc**
Outcome 1	495,654.61	493,945.39	199,345.39
Outcome 2	3,887,304.22	351,695.78	- 42,304.22
Outcome 3	16,784.47	23,215.53	428,215.53
Outcome 4	96,495.50	7,004.50	110,004.50
Outcome 5	248,967.78	- 17,817.78	58,188.22
Total	**4,745,206.58**	**858,043.42**	**753,449.42**

4.8 The co-finance at mid-term stage is compiled in section 7.8Annex 8: Co-financing Tables

Table 23, detailing cash and in-kind co-finance in USD (Table 24). The cash co-finance is provided by three project partners, namely MEE/FECO, and the two demonstration enterprises (Jingxi Zili and Jiangxi Jinhui). The other institutional partners contribute with in-kind co-finance, which at this stage could not be accessed. The details of the cash and in-kind co-finance by the three main partners are shown in Table 24.

The status of co-financing is shown in Table 13 with planed and actual amounts. In summary, roughly half of the co-financing has been contributed during the first half of the project.

Table 13: Co-financing at project approval and at time of mid-term review (November 2019)

Source of co-financing	Grants (USD)		In-kind (USD)		**Total (USD)**	
	Planned	Actual	Planned	Actual	**Planned**	**Actual**
UNDP			100,000		**100,000**	
Government	510,000	318,857	3,750,000	150,000	**4,260,000**	**468,857**
FECO	360,000	318,857	2,250,000	150,000	**2,610,000**	**468,857**
Jiangxi EPB	150,000		1,500,000		**1,650,000**	
Private sector	15,000,000	15,442,414	33,090,000	9,580,000	**48,090,000**	**25,022,414**
Demonstration enterprises and industrial parks	12,000,000	15,442,414	25,000,000	9,580,000	**37,000,000**	**25,022,414**
Stakeholders relating to demon-stration enterprises and industrial park	3,000,000		8,090,000		**11,090,000**	
Total co-financing	15,510,000	15,761,271	36,940,000	9,730,000	**52,450,000**	**25,491,271**

4.8.1 Project-level Monitoring and Evaluation Systems

A M&E plan was implemented according to GEF and UNDP guidelines including:

- Project reports (MEP/FECO to UNDP) – annually and quarterly
- Project implementation reviews (UNDP to GEF) – annual
- Financial reports – regularly at quarterly basis
- Technical reports – according to workplan
- Missions and on-site inspections – according to annual workplan

M&E reports were prepared and provided according to plan, although they often repeated the same information that were already reported in the previous period and could have been more concrete at times.

On the other hand, missions/inspections by UNDP CO, MEP/FECO and the LPMO have not been thoroughly documented. Only UNDP China wrote mission reports (*i.e.* Back-To-Office reports), which consisted of a brief summary. Neither MEP/FECO nor the LPMO wrote mission plans and mission reports. We recommend UNDP China, MEP/FECO and the LPMO to properly document their mission

and activities, with proper plans, reports and mission documents and evidences (e.g. photos, programmes, presentations). We think, this would reinforce good monitoring of the project progress.

4.8.2 Stakeholder Engagement

The project has taken a multi-stakeholder approach and has reached strong participation by the government (at the national and especially at the provincial level) and the private sector. A major component of the project is to adopt a PPP-based approach for an industry chain management in secondary copper production. A similar approach was undertaken in the development of the BAT/BEP demonstration, where the private sector (the demonstration enterprises) were actively involved alongside the local government. This approach has allowed for a strong ownership of the project by the stakeholders, which was confirmed during the MTR field mission (in the interviews with the focal points of Jiangxi EPB and the demonstration enterprises as well as in the site visits). Such a commitment was actually one of the selection criteria for the demonstration sites.

With regards to involvement of the civil society, extensive awareness raising activities has been carried out among the general public, reaching some 2,300 people. Yet, engagement of the civil society remains weak in the project, as it was not represented in the design nor in the implementation of the project (*e.g.*, in developing the demonstration plans and the NRP). More could have been done in involving the local communities near the demonstration sites, for instance. A community meeting could have been organised once the demonstration sites were selected to inform the local communities about the issue of unintentional POPs emissions, the project and the demonstration of BAT/BEP, as well as to collect their feedback in developing the demonstration/implementation plans. Such community meetings could have allowed to increase the number of people trained among the general public, especially since the project target of 1 million people trained is far from being on track. This might be compensated in the second phase of the project, where ambitious public awareness activities are planned.

4.8.3 Reporting

Reporting has been done according to plan, for the most part. Quarterly and annual M&E reports as well as financial reports have been done by the project team. M&E reports consisted of Quarterly Project Progress Reports (QPRs), Annual Project Reports (APRs) and Project Implementation Reviews (PIRs), whereas financial reports consisted of the QPRs, Combined Delivery Reports (CDRs), APRs and Two Years Work Plans (TYWPs). Of these reports, only the TYWP for 2018 was missing. In addition, UNDP CO also prepared the mission reports (called Back To Office Reports) for the annual work plan meetings, but these provide a brief and quite generic content only, lacking some substantial descriptions.

An unknown but assumed quite large number of missions were undertaken by MEE/FECO and UNDP but also by the LPMO. This assumption is based on reports about inspections to the pilot plants, dissemination activities and project meetings. The project does not have any requirement on documentation for rationale and approval of a planned mission nor delivery of a substantive mission report. Therefore, no documentation on satisfactory progress or implementation of project activities can be retrieved. Accordingly, a mission is considered completed when the travel expenditures were reimbursed.

It is highly recommended to install a reporting system that includes approvals and financial implications as well substantive technical reports that can be attributed to project outcomes. It shall be noted that the reporting cycles with quarterly reports is too short and generate inconsistencies and delays due to bureaucracy. It is recommended to change to half-yearly reports.

GEF-6 approved projects are required to transition towards the new GEF guidelines on core indicators and sub-indicators (see section 7.11). It is recommended that during the 2nd phase of the project these core indicators and sub-indicators are implemented to facilitate the terminal evaluation.

4.8.4 Communications

Communication routes and regular reporting has been carried out between the UNDP CO and MEP/FECO, as well as between MEP/FECO and the LPMO. Moreover, annual review meetings have taken place to discuss the project status and progress as well as the annual work plan, among others. In addition, a multi-stakeholder communication mechanism has been set up and is up and running among secondary copper smelting companies, universities, research institutes, industry associations and local environmental protection agencies. The platform is used for regular meetings (every 2 months or so), mutual visits, site visits, document sharing, and knowledge exchange. Yet, it is not an official, web-supported platform for pollution control in secondary copper production that can survive management changes once the project is finished.

There is still room for improvements, however, as the different project actors were not always aware of all the project's components and achievements or outputs. The Jiangxi LPMO, for instance, was not aware of the PPP-based industry chain management demonstration. It didn't seem aware of all the studies delivered by the project as well. We would thus recommend to increase the communication link between the different project components, especially between the BAT/BEP demonstration and the PPP demonstration, as both can learn from each other in the process to improve pollution prevention and control in secondary copper production.

4.8.5 Gender Mainstreaming

With regards to gender equality, the project is trying its best to promote it as much as a technological project can do. In secondary copper production, a sector that is highly physically demanding, women constitute only a small percentage (around 20%) of the workforce. The project plan to establish occupational health and safety management system and establish personal health records and database. Furthermore, the project includes workers' trainings targeted to that issue. The project will ensure female participation in training and capacity building activities. Measures are set to be instituted to reduce exposure to dioxins and heavy metal emissions during secondary copper smelting process. Periodic occupational medical examinations are to be conducted to minimize adverse impact on human health. In addition, the project intends to undertake gender behaviours and impact studies. By reducing unintentional POPs releases from the secondary copper smelting processing, health risks for female workers and their children will be reduced.

This project paid attention to the gender dimensions by paying attention to the potential differences in occupational roles and other social factors. Among IA and EA project partners, the majority of staff were female.

Among the people trained in this secondary copper project, 15 % of the participants are females as reported in the 2018 UNDP Portfolio Indicator Report (800 governmental officials, 875 technical workers, 141 enterprise managers from 10 enterprises and 1,000 general public participated in the trainings).

4.9 Sustainability

The project document includes a risk mitigation plan, with two risks identified (*i.e*. (1) failure to successfully test identified BAT/BEP options for the sector; and (2) failure to promote sector-wide

adoption of tested BAT/BEP options and PPP-based industry chain management) and proposed countermeasures to mitigate them (see project document p. 18).

The MTR assessment on the project's sustainability in terms of exogenous or endogenous risks to the project outcomes that will affect continuation of benefits after the GEF project ends. This assessment include: financial risks, socio-economic risks, institutional framework and governance risks, and environmental risks. During the evaluation, MTR also took reference of the SESP, which identifies 3 risks.

4.9.1 Financial Risks to Sustainability

Financial sustainability of the project is assessed to be likely, with no significant financial risks identified. The demonstration companies have been selected based on their strong commitment, which has been demonstrated in their important co-financing of the project in terms of direct investment in the adoption of new technologies and infrastructures to apply the BAT/BEP. During the interviews, the representatives of the companies expressed their ambition to have a leading position within their industry in terms of cleaner production. Such leadership would strengthen their comparative advantage in being ahead of the new legislation and policies around unintentional POPs reduction and pollution prevention and control, as well as in enjoying a positive, eco-friendly image/reputation. Hence, both companies expect good returns on investment in adopting the BAT/BEP. The BAT/BEP and related technologies and infrastructures are becoming intrinsic elements of the production process once in place and would thus continue to operate after the project ends. Financial sustainability is thus guaranteed by the business incentive to boost return on investment.

4.9.2 Socio-economic Risks to Sustainability

Socio-economic sustainability of the project outcomes is moderately likely. The project respond to the country's priorities, plans and associated new legislation/policies. POPs emissions reduction has been integrated into the 12th and 13th Five Years Plans (FYP), which is the highest political document in the country setting the overall political and economic strategies. Given such priorities, government ownership has been high. China's commitment to environmental protection and cleaner production has increased exponentially over the years and is expected to keep growing along these lines in the coming decades. Environmental protection as become an increasingly important topic within the general public, who worry about the health impacts on themselves and their children. Local communities to pollution sites are increasingly aware and worried about pollution issues and are consequently strongly supportive of pollution prevention and control. Pollution prevention and control has thus reached a strong political and social momentum which is predicated to only grow in the future. Public awareness efforts is planned to continue and increased in the second part of the project. Moreover, the project is developing a national replication plan which should capture and institutionalise/officialise the lessons learned from the project demonstrations. The NRP will set the standards and replicate the BAT/BEP for the whole secondary copper production industry. The social impacts on all employees/workers in the old/existing plants (all that were covered in the 2007 NIP; see section 4.2 therein) from the replication plan and implementation of the standards and pollution permits cannot be estimated.

4.9.3 Institutional Framework and Governance Risks to Sustainability

Institutional and governance sustainability is considered likely. Capacities for effective pollution prevention and control in the secondary copper industry have been strengthened within MEE/FECO and the Jiangxi EPB, and management manuals and technical guidelines has been developed for future guidance. Moreover, the Jiangxi Hazardous Waste Supervision and Management Online Platform has

been established and is being used as a general monitoring tool for pollution prevention and control, including for reduction of dioxin emissions in the secondary copper industry. Furthermore, since POPs emissions reduction and pollution management in non-ferrous metal are in the priorities of the government (see section 4.4) and since policies are now being adopted in this regards (partly supported by this project), proper incentives are in place to sustain these institutional and governance progresses.

4.9.4 Environmental Risks to Sustainability

As this is an environmental prevention and control project, environmental sustainability is considered likely. As explained above (in section 4.4), China has placed POPs emissions reduction within its core pollution prevention and control priorities. Such priorities are captured in its FYP. Institutional and governance sustainability are therefore also likely.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

On project overall objective: The project progress is in good shape and go beyond its immediate objective, thus increasing its benefits and impacts, but details are missing on the baseline and methodology for measuring dioxin emissions reduction.

Project implementation is mostly on track according to the workplan, and many project targets are either close to be achieved or exceeded already. The project activities so far go beyond the copper sector and reduction of unintentional POPs emissions but include also other secondary non-metal industries as well as pollution prevention and control in a more general sense, which avoids duplication and help adapt to new legislation/standards. However, the project document was approved by the GEF Secretariat with the quantitative dioxin reduction objectives but without any details on practical implementation, milestones, methodology how to quantify, or measure progress. A model baseline calculation relevant to PCDD/PCDF releases was developed by the MTR Team for this report and can be used for the assessment of the dioxin reduction towards the terminal evaluation (and the quantitative target). Moreover, it was recognized that the project is implemented mainly through a large number of sub-contracts, which were difficult to monitor, and at present, their impact could not be evidenced for all of them. Despite this, sub-contracted reports were prepared by (Chinese) experts and appear at high quality. The PCDD/PCDF measurements provided were made by experienced and accredited laboratories, which were selected through open tenders.

On project design: The project enjoys a comprehensive and coherent structure, covering policy, BAT/BEP, guidance and capacity building, as well as information and dissemination.

The project design is smart and comprehensive, covering the different components needed to address reduction of POPs emissions in the secondary copper industry, namely: policy development, BAT/BEP adoption, technical guidance and capacity building, as well as awareness raising, information and experience exchange, and dissemination of results. The project is designed to reduce dioxin emissions as well as to improve cleaner production and pollution prevention and control in secondary copper production in China, on the one hand, and to foster their replication for the whole secondary copper industry as well as for other secondary non-ferrous metal industries at national level, on the other. For this purpose, the project aims at identifying (through demonstrations) not only effective dioxin reduction technologies at company level but also smart environmental management and monitoring systems for industrial parks. The link between the different project components is well established, although the link between the demonstration of BAT/BEP and the demonstration of PPP-approach is not fully clear and would need further attention to ensure good experience exchange on lessons and outputs/results that could be beneficial to each other.

On component 1: Policies are being developed for reduction of dioxin emissions and pollution prevention and control in secondary copper industry based on extensive research.

Extensive research has been carried out, with about 80 reports produced to date, which are meant to guide policy development. These studies cover: (1) assessment of current policies and research on pollution prevention and control technical policy; (2) research on pollution prevention and control economic policy; (3) research on technical standards of assessment indicator system and audit guideline on cleaner production for secondary copper smelting industry; (4) research on application and issuance technical guideline for emission permit on secondary non-ferrous metal industry; and (5) research for emission standard for secondary copper, aluminium, lead, and zinc industries. Among them, MEE is reported to have officially released standards on pollutant permits for non-ferrous metal,

and the evaluation index has been consulted by NDRC. The two policy evaluations have been delivered (on the implementation effectiveness of pollution reduction and on its economic effectiveness, consisting of 9 studies in total) and submitted to MEE, MoF, and MIIT as reference materials for policy formulation work, with one specification having been officially released by MEE. Moreover, the Manual for Environmental Management of Hazardous Waste in the Recycled Copper Smelting Industry in Jiangxi Province has been distributed to the project partners (e.g. LPMO) and is now in the process of being finalized. However, most studies are rather theoretical and could have been more practical (technical guidelines in particular). Further, we think it would have been better to build these standards and guidelines on the findings and lessons learned of the demonstrations in order for them to be tested and based on practical experience, thus guarantying relevance and feasibility.

On outcome 2: Strong BAT/BEP have been selected and are being demonstrated, yet they would only fit exemplary plants.

BAT/BEP demonstration enterprises and technologies have been selected carefully and are set to meet the strictest standards. Yet, they are not representative of the current secondary copper industry and would only be able to be replicated by new/exemplary plants. It remains unclear what will happen to the old plants and their workers.

On outcome 3: Despite demonstrations still being at an early phase, the national replication plan (NRP) is being developed to allow for timely application of the standards but will be fine-tuned based on demonstrations findings.

The NRP has been drafted and is being finalised but it is a general plan for managing the replication rather than a concrete plan. Moreover, it can only build on research at that stage rather than on the results of the demonstration and will thus have to wait for the end of the demonstration to incorporate technical details. The project team is planning to go ahead with implementation of the plan and fine-tune it when the demonstration results will be available. Technology-related aspects will wait for that period. This approach allows for timely application of the standards for POPs reduction and pollution prevention and control, but it remains to be seen if this approach proves correct rather than building the NRP only once demonstrations have been completed and lessons learned have been drawn.

On components 4 and 5, project implementation and adaptive management: The project team (at MEE/FECO and UNDP China Office) as well as the LPMO are well established, collaborates on a regular basis and are dedicated and competent in ensuring the project success, but there is still room for improvement in documentation and communication of project activities and outputs in order to ensure good synergies between the different project components and help independent evaluations (MTR and terminal evaluation).

The project team at MEE/FECO and UNDP China Office is well established and collaborates almost on day-to-day basis. The team –whereby it has to be mentioned that all officers have to cover several projects besides this secondary copper project - was found to be highly dedicated towards success of the project. Each of the two follows the established rules and guidelines of their respective institutions. The project team proved competent in implementing the project and have reached good progress in order to meet the project objective and targets. However, the MTR discovered some discrepancies in the reporting for both financial and technical achievements, which seem to be caused by the different reporting formats, reporting dates or reporting institutions. Besides, further documentation procedures and efforts are needed. The project team is aware of these and will look into steps to remediate that. As expected at mid-term evaluation, organization and transfer of all documents required by the GEF or UNDP from the implementing and executing agencies to the mid-term review (MTR) Team took longer than expected but communication and delivery of all requested information

was achieved at full satisfaction of the MTR Team. Moreover, although there has active and regular communication between the project team and the project partners, there is still some room for improvement in communicating on other project activities and results not directly related to day-to-day management and implementation of responsible activities. Good communication should take place between the BAT/BEP demonstration and the PPP demonstration, for instance.

On sustainability: The project results are likely to be sustainable overall.

Financial sustainability of the project is assessed to be likely. Socio-economic sustainability of the project outcomes is moderately likely but would require proper assessment and planning of what would happen to the plants that might be closed and to their workers. Institutional and governance as well as environmental sustainability are also considered likely. It should be noted that, due to the lack of mid-term targets, it is impossible to make a profound assessment on replication or sustainability of interventions.

5.2 Recommendations

5.2.1 Recommendations Related to Project Management and Plan

1. The global Environment Facility has issued guidelines on core indicators and sub-indicators and recommends that GEF-6 approved projects transition to core indicators and sub-indicators at the next available opportunity in the project cycle (CEO Endorsement/Approval, mid-term or completion). For this secondary copper project it is recommended to have the outputs prepared during the 2nd phase of the project targeted at these indicators and sub-indicators (shown in section 7.11). In practical terms, this means that the outputs must be much closer related to numerical reductions in the unit of reporting (note: for PCDD/PCDF should be gram of toxic equivalents (g TEQ) and not tons as for other POPs) rather than to textual milestones.

2. Since there is no scale to measure the impact on training activities, it is recommended to develop a scheme or at least a categorization as to the targeted groups of training; *e.g.,* government officials, workers at the enterprises but also their line management and the industry associations, industrial park management (which is very specific to China and this project), and the general public. It should be noted that people or groups that have been trained may be trainers for others. Therefore, the training plans, the contents and the actors should be detailed and documented.

3. A communication and transfer of any result from this project with relevance to article 5 and annex C but also articles 6 on national implementation plan and article 15 on national reporting to the Conference of the Parties to the Stockholm Convention should be pursued with high priority.

4. The much broader goals on development goals of China and the causality between unintentional POPs emissions, environmental monitoring systems, using a public private partnership model in industry-chain management should be clearer explained and linked to the project outcomes and outputs.

5. The benefits to other non-ferrous metal industries such as aluminium, nickel, lead, zinc, should be highlighted and but also taken into account especially for sustainability aspects but also for financial implications to avoid duplication in the future and be more cost-efficient.

6. A social plan for the workers on workplaces lost and new workplaces created should be developed in the second phase of this project and reported for the terminal evaluation.

7. Strengthen the project management, especially the outputs under each contract are accepted and submitted to the project office ,then the project office is documented on the basis of different types

5.2.2 Recommendations Related to Technical Issues

8. Distinction should be made with respect to measures towards existing sources (copper plants) and new plants;

9. It is not recommended to use the term "UPOPs" since "UPOPs" is not used in any of the official documents generated through the Stockholm Convention (U is the chemical symbol for uranium).

10. It is recommended to compile quantitative information systematically and assess it at least on annual basis to justify interventions and if they are positive or negative or inefficient;

11. The direct impact on the PCDD/PCDF release inventory (aimed reduction of 396 g TEQ) should be established in a clear methodological approach to allow the national reporting under article 15 of the Stockholm Convention reporting (this is a quantitative table). A great success at the end of the project and a direct contribution from this project to the Stockholm Convention would be achieve – in line with the GEF-indicator on "g TEQ reduced". The model baseline calculation relevant to PCDD/PCDF releases developed by the MTR Team could be used for the assessment of the dioxin reduction towards the terminal evaluation (and the quantitative target).

12. Whereas the MTR Team found the PCDD/PCDF measurement of high quality, there should be a plan which PCDD/PCDF measurements would be undertaken and at which intervals. It shall be clarified if such requirements are laid down in the national or technical standards.

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7 ANNEXES

7.1 Annex 1: MTR ToR (excluding ToR annexes)

7.1.1 ToRs International Consultant

TERMS OF REFERENCE FOR INTERNATIONAL CONSULTANT TO CARRY OUT MID-TERM

REVIEW AND TERMINAL EVALUATION OF TWO CHEMICALS PROJECTS IN THE UNDP CHINA GEF PORTFOLIO

INTRODUCTION

As an implementing agency of the Global Environment Facility (GEF), UNDP oversees a portfolio of GEF projects in the Chemicals and Waste Focal Area, which are implemented through UNDP's network of Country Offices located in developing countries, as well as numerous UN and other agency partners.

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP supported GEF financed projects are required to undergo a Terminal Evaluation (TE) upon completion of implementation. All fullsized UNDP supported GEF financed projects are required to undergo a Midterm Review (MTR).

Specifically, under this TOR, the UNDP China CO has to undertake the following evaluations:-

1. Mid Term Review for the USD 12.6 million project "UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China", and
2. Terminal Evaluation for USD 11.6 million project "Reduction of POPs and PTS release by environmentally sound management throughout the life cycle of electrical and electronic equipment and associated wastes in China"

The UNDP Global Environmental Finance (UNDP-GEF) Unit is seeking the services of one international consultant to work as part of a team with a national consultant that will undertake the above-captioned MTR and TEs during 2019. The specific responsibilities of the international consultant are detailed later in the Annex of this Terms of Reference.

The international consultant will work in concert with then national consultant, assisting in compiling the relevant information for the report, but more importantly objectively analyzing the data and information collected, and ensuring that the final reports meet with the quality standards as per UNDP Evaluation guidance.

OBJECTIVE AND SCOPE

A. Project-level UNDP-GEF Midterm Reviews

In accordance with UNDP and GEF M&E policies and guidelines, some GEF-financed projects are required to undergo a Midterm Review (MTR) at the mid-point of project implementation. This review must follow detailed guidance outlined in the *UNDP Guidance for Conducting Midterm Reviews of UNDP-supported GEF-financed Projects*.

The objectives of the MTR are to: assess progress towards the achievement of the project objectives and outcomes as specified in the Project Document; and assess early signs of project success or failure

with the goal of identifying the necessary changes to be made in order to set the project on-track to achieve its intended results.

The MTR must provide evidence-based information that is credible, reliable and useful. The MTR team will review all relevant sources of information including documents prepared during the preparation phase (i.e. PIF, UNDP Initiation Plan, UNDP Environmental & Social Safeguard Policy, the Project Document, project reports including

Annual Project Review/PIRs, project budget revisions, lesson learned reports, national strategic and legal documents, and any other materials that the team considers useful for this evidence-based review). The MTR team will review the baseline GEF focal area Tracking Tool submitted to the GEF at CEO endorsement, and the midterm GEF focal area Tracking Tool that must be completed before the MTR field mission begins (if applicable).

The MTR team is expected to follow a collaborative and participatory approach[2] ensuring close engagement with the Project Team, government counterparts (the GEF Operational Focal Point), the UNDP Country Office(s), UNDPGEF Regional Technical Advisers, and other key stakeholders.

Engagement of stakeholders is vital to a successful MTR.[3] Stakeholder involvement should include interviews with stakeholders who have project responsibilities, including but not limited to International Environmental Cooperation Center of Ministry of Ecology and Environment, Solid Waste Management Center of Jiangxi Provincial Bureau of Ecology and Environment, Jiangxi Zili Environmental Technology Co. Ltd, executing agencies, senior officials and task team/ component leaders, key experts and consultants in the subject area, Project Board, project stakeholders, academia, local government and CSOs, etc. Additionally, the MTR team is expected to conduct field missions to Jiangxi Province including the following project sites Nanchang, Shangrao and Fuzhou.

The final MTR report should describe the full MTR approach taken and the rationale for the approach making explicit the underlying assumptions, challenges, strengths and weaknesses about the methods and approach of the review.

For details on the scope of the MTR, please see Appendix 1.

B. Project-level Terminal Evaluations (not included in this report since MTR)

IMPLEMENTATION ARRANGEMENTS

The principal responsibility for managing these evaluations resides with the UNDP China Country Office, Beijing. The UNDP China office will contract the consultants, and ensure the timely provision of per diems and travel arrangements within the country, provision of documentation and support of logistics for on-site meetings, interviews (in person or remote), access to Government and private stakeholders, and field visits for the evaluation team. The Project Teams will be responsible for liaising with the consultant teams to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

[2] For ideas on innovative and participatory Monitoring and Evaluation strategies and techniques, see UNDP Discussion Paper: Innovations in Monitoring & Evaluating Results, 05 Nov 2013.

[3] For more stakeholder engagement in the M&E process, see the UNDP Handbook on Planning, Monitoring and Evaluating for Development Results, Chapter 3, pg. 93.

TIMEFRAME

The overall duration of service for the selected team leader will be approximately 45 days including at least 7-day specific project evaluation visits per project. The timeframe for TEs, MTRs is from June 1, 2019 – December 1, 2019, It is broken down as follows (only shown is information in relation to the mid-term review):

A. Midterm Reviews

The total duration of each Midterm Review will be approximately *22* days over a time period of 10-12 weeks according to the following plan:

Activity	Number of Working days	Completion Date
Document review and preparing MTR Inception Report (MTR Inception Report due no later than 2 weeks before the MTR mission)	3 days	20 June 2019
MTR mission: stakeholder meetings, interviews, field visits	5 days	8-12 July 2019
Presentation of initial findings- last day of the MTR mission	1 day	13 July 2019
Preparing draft report (due within 3 weeks of the MTR mission)	9 days	3 August 2019
Finalization of MTR report/ Incorporating audit trail from feedback on draft report (due within 2 weeks of receiving UNDP comments on the draft	3 days	17 August 2019

TEAM COMPOSITION

The consultant teams will be composed of one lead international consultant, who will work with a national consultant. Experience with GEF financed projects is an advantage. The selected consultants should not have participated in the project preparation and/or implementation of particular projects they evaluate, and should not have conflict of interest with project related activities.

The International Consultant must present the following qualifications:

- Recent experience with result-based management evaluation methodologies (10 marks);
- Experience applying SMART indicators and reconstructing or validating baseline scenarios for at least 7 years (10 marks);
- Competence in adaptive management, especially on hazardous chemicals or Persistent Organic Pollutants (POPs) (10 marks);
- Experience working with the GEF or GEF-evaluations for at least 5 years (5 marks);
- Experience working in Asian countries preferably in China for at least 3 years (5 marks)
- Work experience in relevant technical areas for at least 10 years including experience on project monitoring and evaluation (10 marks);
- Demonstrated understanding of issues related to gender and *hazardous chemicals*; experience in gender sensitive evaluation and analysis (10 marks);
- Excellent communication skills (10 marks);
- Demonstrable analytical skills (10 marks);
- Project evaluation/review experiences within United Nations system will be considered an asset (10 marks);
- A Master's degree in chemical science, chemical engineering, natural science, environment science, environmental engineering, or other closely related field (10 marks);

It should be noted that for the team leader, there will be added emphasis on the following experience and skills:

- Demonstrable skills in coordination with country offices, project teams and consultants;
- Strong writing ability in English
- Strong ability to analyze and present results in a logical and easy to follow way within the specific constructs of the UNDP reporting formats

CONSULTANT ETHICS

Consultants will be held to the highest ethical standards and are required to sign a Code of Conduct (Appendix 1, Annex D for MTR; Appendix 2, Annex E for TE) upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluations'.

PAYMENT MODALITIES AND SPECIFICATIONS

Mid Term Review and Terminal Evaluation

%	Milestone
20%	At submission and approval of inception report
40%	Following submission and approval of the 1st draft terminal evaluation report
40%	Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report

7.1.2 ToRs National Consultant

Same ToRs as for the international consultant but for implementation at national level (China) and in a supportive role to the international evaluation consultant.

7.2 Annex 2: MTR Evaluative Matrix

Table 14: MTR Evaluative Matrix (evaluation criteria with key questions, indicators, sources of data, and methodology)

Evaluative Questions	Indicators	Sources	Methodology
Project Strategy: To what extent is the project strategy relevant to country priorities, country ownership, and the best route towards expected results?			
To what extent and how did the project suited to local and national development priorities and organizational policies, including changes over time?	Amount of priorities of the PRC National Implementation Plan (NIP) for the Stockholm Convention and other key national priorities (e.g. Five-Year Plan and national and local laws and regulations) addressed by the project, and degree of relevance and effectiveness.	Project document; NIP 2007, FYP as well as national and local laws/regulations; Project team and relevant stakeholders.	Documentation analysis; Interviews with project team and stakeholders.
To what extent and how did the project was in line with the GEF Operational Programs?	Amount of GEF Chemicals Focal Area outcomes and indicators addressed by the project, and degree of relevance and effectiveness.	Project document; GEF-5 Chemicals Focal Area Strategy and Objective; Project team and relevant stakeholders.	
To what extent and how did the project was in line with UNDP mission and objectives?	Amount of UNDAF priorities and UNDP Country Programme Action Plan (CPAP) (and its evaluation plan) strategies addressed by the project, and degree of relevance and effectiveness.	Project document; UNDAF and CPAP; Project team and relevant stakeholders.	
Did the project undertake a solid needs assessment, problem analysis and theory of change? If yes, how did the project addressed these needs/problems?	Degree of effectiveness of the project outcomes in addressing identified needs/problems.	Project document; Background documentation; Project team and relevant stakeholders; Expertise of the national consultant and other key informants.	Documentation analysis; Desk search; Interviews with project team and stakeholders; Site visits.
To what extent and how did the project objectives were still appropriate given changed circumstances?	Degree of relevance of the project after changes.		
Progress Towards Results: To what extent have the expected outcomes and objectives of the project been achieved this far?			
To what extent have the project targets been achieved?	Percentage of achievement of the overall objective and targets (see indicators/targets in prodoc logframe).	Project document;	Documentation analysis;

To what extent do the project results achieve the project outcomes and overall objective?	Degree of achievement of the outcomes (see indicators/ targets in prodoc logframe).	Project reports; GEF Tracking Tools and UNDP Portfolio Indicators; Poject team and relevant stakeholders; Bookkeeping and other supporting evidences; Direct observation on site.	Interviews with project team and stakeholders; Site visits.
Project Implementation and Adaptive Management: Has the project been implemented efficiently, cost-effectively, and been able to adapt to any changing conditions thus far? To what extent are project-level monitoring and evaluation systems, reporting, and project communications supporting the project's implementation?			
Were there changes in the environmental and development objectives of the project during implementation? If they were external, were there effective corrective actions taken to keep objectives on track? If they were internal, were they justified, properly processed and effective for the project objective and results? Were these changes and related measures properly communicated, discussed and approved by the project steering committee?	Level of accomplishment of project objective and targets despite eventual changes. Level of consultation with project steering committee over changes.	Project document; Project reports.	Document analysis; Interviews with UNDP, FECO and NSG.
Did the project achieve its results in the most cost-effective way, or to what extent did it surpass (or not) targets with the financial resources provided?	Cost-efficiency of the financial management.	Project document; Project reports; Audit reports; Project team and relevant stakeholders; Bookkeeping and other supporting evidences.	Documentation analysis; Interviews with project team and stakeholders.
Were the project activities, outputs and targets achieved according to plan and schedule?	Timeliness of project deliverables.		
To what extent did the project demonstrated sound prioritisation, methodology, organisation and management skills in implementing the project and in facing assumption changes and risks/challenges?	Level of management skills in implementation.		

Did the M&E implementation follow the plan (i.e. methods, activities, schedule and log-frame) and how effective was the M&E at tracking progress and developing timely and effective corrective actions, and how were stakeholders consulted?	Level of compliance of the M&E activities compared to plans, and degree of its effectiveness in tracking progress towards objectives.	Project document; Project reports (incl. MTR); Project team and relevant stakeholders; Bookkeeping and other supporting evi-dences.	Document analysis; Interviews with project team and stakeholders; Bookkeeping review.
Sustainability: To what extent are there financial, institutional, socio-economic, and/or environmental risks to sustaining long-term project results?			
Overall sustainability: Did the project developed and implemen-tated a sustainability strategy and how likely the project results will continue to deliver environmental and social benefits in the long term after the project's completion, and to what dregree (i.e. decreasing or growing benefits over time)?	Likelihood and degree of overall sustainability of project envi-ronmental and social benefits in the next 10-15 years.	Project document; Project reports; Poject team and relevant stakeholders; Bookkeeping and other supporting evi-dences; Direct observation on site.	Documentation analy-sis; Interviews with project team and stakeholders; Site visits.
Financial risks: Did the project established financial and eco-nomic instruments and mechanisms to ensure the ongoing flow of benefits once the GEF assistance ends (e.g. public/private in-vestment, income generation, market trans-formations)?	Likelihood of financial sustainability in the next 10 years.		
Socio-economic and political risks: Are there social, economic or political risks (e.g. crisis) that may threaten the project outcomes, and did the project established safeguards mechanisms, regulatory/policiy frameworks, profitable economic activities and condusive social conditions (e.g. involvment of "champions") to maintain or further the project objectives?	Likelihood of socio-economic and political sustainability in the next 10 years.		
Institutional framework and governance risks:	Likelihood of institutional and governance sustainability in the next 10 years.		

Did the project developed suitable and lasting/systemic institutional capacity and organizational arrangements (public and/or private) to survive changes in personnel and governance processes?			
<u>Environmental risks:</u> Did the project established sufficient safeguards to guarantee that project outcomes will not be afftected by nor will affect environmental and ecological factors?	Likelihood of environmental sustainability in the next 10 years.		
<u>Catalytic role:</u> Have the lessons learned from the project been collected, consolidated and disseminated for replication and/or scaling up, and to what extent?	Scope (e.g. geographic and/or population reach) of the dissemination and replication / scaling up of the lessons learned.		

7.3 Annex 3: Example Questionnaire or Interview Guide used for data collection

Questions for the project management team (i.e. UNDP and MEP/FECO)

- To what extent and how did the project suited to national development priorities and organizational policies, including changes over time?
- What was the calculation basis for the baseline total PCDD/Fs emission from secondary copper production and for the reduction in g TEQ during the project? How was the reduction measured since the introduction of the BAT/BEP?
- To what extent have the project objectives and targets been achieved this far? What are the key achievements to date and what are their drivers?
- Could you please describe the BAT/BEP that have been selected for demonstration?
- What is the link between the demonstration of BAT/BEP for reducing unintentional POPs and the demonstration of PPP-based industry chain management? How have the two demonstrations been coordinated to benefit from each other's lessons and findings/results in order to meet the project objective? What have been the lessons learned so far and how were they reflected in the national replication plan?
- What activities have been conducted so far to communicate and disseminate the demonstration results and other outputs (e.g. studies) and outcomes of the project?
- How did the project studies were incorporated into policy development or influenced it?
- What were the reasons behind some of the delays in the project (e.g. selecting the demonstration companies and industrial park; financial disbursements)?
- What changes and challenges did you meet in implementing the project, and how did you address them (e.g. corrective actions)? Were these changes and related measures properly communicated, discussed and approved by the project steering committee?
- How would you assess the level of participation from the project partners and how did they demonstrate commitment and ownership? What have been their reasons/drivers to participate in this project, and how will you guarantee the continuation of the project's results?
- Are there any social, economic or political risks to the project's success and sustainability that have been arising or that you can foresee? If so, what safeguards mechanisms have you established?
- How do you guarantee that institutional capacity and organizational arrangements (public and/or private) will survive changes in personnel and governance processes?
- Have the lessons learned from the project been collected, consolidated and disseminated for replication and/or scaling up? If so, how?

Questions for the LPMO

- To what extent and how did the project suited to local development priorities and organizational policies, including changes over time?
- To what extent have the project objectives and targets been achieved this far in the province?
- What changes and challenges did you meet in implementing the project, and how did you address them (e.g. corrective actions)? Were these changes and related measures properly communicated, discussed and approved by the project steering committee?

- How would you assess the level of participation from the project partners and how did they demonstrate commitment and ownership? What have been their reasons/drivers to participate in this project, and how will you guarantee the continuation of the project's results?
- Are there any social, economic or political risks to the project's success and sustainability that have been arising or that you can foresee? If so, what safeguards mechanisms have you established?
- How do you guarantee that institutional capacity and organizational arrangements (public and/or private) will survive changes in personnel and governance processes?
- Have the lessons learned from the project been collected, consolidated and disseminated for replication and/or scaling up? If so, how?

Questions for the demonstration enterprises

- Could you please describe the BAT/BEP that have been selected for demonstration and explain the reason and process for selecting them?
- How have you implemented the BAT/BEP so far? What results have you obtained/observed to date? Did you meet any challenges, and if so which ones and how did you address them?
- What is your plan for implementing the rest of the BAT/BEP demonstration?
- Has the project helped your company so far? Please describe how it has (or has not) done so.
- What are your reasons/drivers to participate in this project, and how will you guarantee the continuation of the project's results?

7.4 Annex 4: Ratings Scales

Table 15: Scales for ratings for progress results

Ratings for Progress Towards Results: (one rating for each outcome and for the objective)		
6	Highly Satisfactory (HS)	The objective/outcome is expected to achieve or exceed all its end-of-project targets, without major shortcomings. The progress towards the objective/ outcome can be presented as "good practice".
5	Satisfactory (S)	The objective/outcome is expected to achieve most of its end-of-project targets, with only minor shortcomings.
4	Moderately Satisfactory (MS)	The objective/outcome is expected to achieve most of its end-of-project targets but with significant shortcomings.
3	Moderately Unsatisfactory (HU)	The objective/outcome is expected to achieve its end-of-project targets with major shortcomings.
2	Unsatisfactory (U)	The objective/outcome is expected not to achieve most of its end-of-project targets.
1	Highly Unsatisfactory (HU)	The objective/outcome has failed to achieve its midterm targets, and is not expected to achieve any of its end-of-project targets.

Table 16: Scales for ratings for project implementation and adaptive management

Ratings for Project Implementation & Adaptive Management: (one overall rating)		
6	Highly Satisfactory (HS)	Implementation of all seven components – management arrangements, work planning, finance and co-finance, project-level monitoring and evaluation systems, stakeholder engagement, reporting, and communications – is leading to efficient and effective project implementation and adaptive management. The project can be presented as "good practice".
5	Satisfactory (S)	Implementation of most of the seven components is leading to efficient and effective project implementation and adaptive management except for only few that are subject to remedial action.
4	Moderately Satisfactory (MS)	Implementation of some of the seven components is leading to efficient and effective project implementation and adaptive management, with some components requiring remedial action.
3	Moderately Unsatisfactory (MU)	Implementation of some of the seven components is not leading to efficient and effective project implementation and adaptive, with most components requiring remedial action.
2	Unsatisfactory (U)	Implementation of most of the seven components is not leading to efficient and effective project implementation and adaptive management.
1	Highly Unsatisfactory (HU)	Implementation of none of the seven components is leading to efficient and effective project implementation and adaptive management.

Table 17: Scales for ratings for sustainability

Ratings for Sustainability: (one overall rating)		
4	Likely (L)	Negligible risks to sustainability, with key outcomes on track to be achieved by the project's closure and expected to continue into the foreseeable future
3	Moderately Likely (ML)	Moderate risks, but expectations that at least some outcomes will be sustained due to the progress towards results on outcomes at the Midterm Review
2	Moderately Unlikely (MU)	Significant risk that key outcomes will not carry on after project closure, although some outputs and activities should carry on
1	Unlikely (U)	Severe risks that project outcomes as well as key outputs will not be sustained

All other ratings will be on the GEF six point scale:

HS	= Highly satisfactory	Excellent
S	= Satisfactory	Well above average
MS	= Moderately satisfactory	Average
MU	= Moderately unsatisfactory	Below average
U	= Unsatisfactory	Poor
HU	= Highly unsatisfactory	Very poor (appalling)

7.5 Annex 5: MTR Mission Itinerary

Table 18: Agenda of the MTR Team for field trip to China, August 8-15, 2019

Time	Time	Arrangements	Accommo-dation
8 August (Thursday)	09:00-17:00	Morning: Internal meeting of the MTR team – Location: hotel Afternoon: Document check with UNDP (Location: UNDP office)	Beijing
9 August (Friday)	09:00-17:00	Meeting with key partners of project in FECO Location: conf. room 818, FECO/MEE AM: 09:00- 12:00 1) *Introduction of project progress* ---Ms. Jiang Chen, Senior Project Manager, FECO 2) *Study on permit system of sewage discharge in recycled non-ferrous metal Industry* --China Non-ferrous Metals Industry Association Recycling Metal Branch/ Chinese Research Academy of Environmental Sciences 3) *Study on Evaluation Index System and Audit Guidelines of Cleaner Production in Recycled Copper Smelting Industry* --Chinese Research Academy of Environmental Science 12:00-14:00 Lunch PM: 14:00-17:00 4) Study on UPOPs Emission Cooperative Control and Emission Standard in Recycled Copper Smelting Industry --Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences 5) Demonstration of Intelligent Recycled Copper Industrial Park Based on PPP Model --Management Committee of Tongling Economic and Tech-nological Development Zone 6) Chen Yang, Beijing Advanced *Sciences* and Innovation Center of Chinese Academy of Sciences 7) Q& A	Beijing
10 August (Saturday)		MTR team: Internal discussion (Location: Hotel)	Beijing
11 August (Sunday)	12:00-19:30	Morning: free Travel by air: Depart from Beijing at 15:45 with CA1577; arrive at Nanchang at 18:15	Nanchang, Jiangxi
12 August (Monday)	09:00-12:00	1. Implementation and progress by Jiangxi Solid Waste Manage-ment Office (government-sponsored institution) 2. Q&A	Fuzhou Shi, Jiangxi Pro-vince
	13:30-14:30	Work Summary	
	14:30-17:30	Travel by car from Nanchang to Fuzhou	
13 August (Tuesday)	09:00-12:00	1. Implementation of the technological upgrading in demonstra-tion site by Jiangxi Zi Li Environmental Protection Technology Co., Ltd. 2. Visit the site of technological upgrading; 3. Q&A	Shangrao Shi, Jiangxi Province
	14:00-17:00	Travel by car from Fuzhou to Shangrao	
14 August (Wednesday)	09:00-12:00	1. Introduce the implementation of the technological upgrading by Jiangxi Jin Hui Environmental Protection Technology Co., Ltd (enterprise #1/#2?)Jiangxi Jin Hui	Beijing

Time	Time	Arrangements	Accommo-dation
		2. Visit the site of technological upgrading; 3. Q&A	
	13:00-16:15	Travel by car Shangrao-Nanchang	
	17:40-20:05	Travel by air Nanchang-Beijing by Jiangxi Air RY8887	
15 August (Thursday)	09:30-16:00	Debriefing (location: UNDP small conf. room) and documents review	Beijing

7.6 Annex 6: List of Documents Reviewed

7.6.1 Administrative Documents Accessed and Reviewed

Project design and approval documents

Project documents prepared by UNDP to the GEF for approval:.

- Initial Plan for a GEF Project Preparation Grant
- GEF Project Identification Form
- UNDP Project Document (for Project Endorsement)
- Request to the GEF CEO for Project Endorsement

Project Implementation Review (PIR)

Project Implementation Review (PIR) prepared by UNDP to the GEF Secretariat. Period covered:

- PIR 2017
- PIR 2018

Combined Delivery by Activity (CDR)

Project Implementation Review (PIR) prepared by UNDP to the GEF Secretariat. Period covered:

- CDR 2016
- CDR 2017
- CDR 2018
- CDR 2019

Two-Year Work Plans (TYWP)

Two-Year Work Plans; prepared by UNDP CO to UNDP Regional Office. Periods covered:

- TYWP for 2016-2017
- TYWP for 2017-2018
- TYWP for 2019-2020

Annual Project Report (APR)

Annual Progress Report; prepared by MEP/FECO to UNDP. Periods covered:

- APR 2016
- APR 2017
- APR 2018

Quarterly Project Progress Reports (QPR)

Quarterly Project Progress Report; prepared by MEP/FECO to UNDP. Periods covered:

- QPR 2017 Q1 (January to March 2017)
- QPR 2017 Q2 (April to June 2017)
- QPR 2017 Q3 (July to September 2017)
- QPR 2018 Q1 (January to March 2018)
- QPR 2018 Q2 (April to June 2018)
- QPR 2018 Q3 (July to September 2018)
- QPR 2019 Q1 (January to March 2019)
- QPR 2019 Q2 (April to June 2019)

Back To Office Reports (*i.e.* mission reports)

Back To Office Reports; prepared by UNDP CO to UNDP Regional Office. Periods covered:

- Mission of 8-10 August 2017 (Ms HAN Yang)
- Mission of 24-25 January 2018 (Ms WANG Jingjing)
- Mission of 24-26 April 2019 (Mr WU Guanglong)

UNDP Annual Portfolio Indicators

UNDP Annual Portfolio Indicators; prepared by UNDP to the GEF Secretariat. Periods covered:

- Portfolio Indicators 2017
- Portfolio Indicators 2018 (see Table 27)

Budget revision

Budget revision prepared by UNDP to the GEF Secretariat. Date of signature:

- 23 April 2019

Other documents

- National Implementation by the Government of UNDP Supported Projects: Guidelines and Procedures

7.6.2 Technical Documents Accessed and Reviewed

- Guidelines and standards (as described during the seminar at MEE/FECO and in Jiangxi province); example "Standard GB 31574-2015 – Emission standards of pollutants for secondary copper, aluminium, lead and zink industry"
- Technical documentation at Pilot Enterprises; *e.g.*, measurement reports
- Publicity/diffusion materials

7.7 Annex 7: List of Persons Interviewed

Table 19: Persons met and Interviewed during field mission in China

Institution	Name	Title
Implementing/executing agency		
UNDP (IA)	1. Yang Han	Programme Manager
	2. Wang Jingjing	Programme Assistant
MEE/FECO (EA)	3. Jiang Chen	Senior Project Manager
	4. Wu Guanglong	Project Manager
	5. Xie Jiahong	Project Assistant
Local EPB		
Solid Waste Management Center of Jiangxi Province (LPMO)	6. Zou Xin	Director
	7. Liu Yongxuan	Project Officer
Demonstration Plants		
Jiangxi Jinhui Environmental Technology Co, Ltd.	8. Ren Guangfeng	General Manger
	9. Dong Minxiang	Vice Manager
Jiangxi Zili Environmental Technology Co, Ltd.	10. Lu Yongsuo	Chief Engineer
	11. Bai Ya	Engineer
	12. Le Lan	Engineer
Industrial Parks		
Management Committee of Tongling Economic and Technological Development Zone	13. Wang Ke	Director
	14. Cui Mengqi	Engineer
Sub-contractors present at MEE/FECO seminar on 9 August 2019 are written in bold letters		
Beijing Advanced Sciences and Innovation Center of CAS	15. Chen Yang	Professor
University of Science and Technology Beijing	16. Wang Chengyan	Professor
Beijing Renmin University	17. Lan Hong	Professor
Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences (RCEES/CAS)	18. Zheng Minghui	Professor
	19. Liu Guorui	Associate Professor
China Non-ferrous Metals Industry Association Recycling Metal Branch	20. Wang Jiwei	President
	21. Zhang Xizhong	Vice-President
	22. Liu Wei	Vice-President
Chinese Research Academy of Environ-mental Sciences (CRAES)	23. Li Yanping	Professor
CSD IDEA(Beijing) Environmental Test & Analysis Co., Ltd.	24. Wu Changmin	Associate Professor
Experts present at MEE/FECO seminar on 9 August 2019 are written in bold letters		
Chinese Academy of Engineering (CAE)	25. Qiu Dingfan	Academician, Professor
Tsinghua University	26. Yu Gang	Professor
Peking University	27. Mei Fengqiao	Professor
National Research Center for Environmental Analysis and Measurement	28. Liu Aimin	Professor

Table 20: Participants' List for Meeting at Jiangxi EPB on 12 August 2019

全球环境基金"再生铜冶炼行业 UPOPs 减排示范项目"
中期考核签到表

江西省固管中心会议室 **2019 年 8 月 12 日**

序号	姓 名	单 位	签 名
1	王京京	联合国开发计划署	
2	谢佳宏	生态环境部对外合作与交流中心	
3	Heidelore Fiedler	专 家	
4	Fabrice Clavien	专 家	
5	王景伟	专 家	
6	鲁 晖	翻 译	
7	朱向彬	江西省生态环境厅固体处	
8	邹 新	江西省固体废物管理中心	
9	冷劲松	江西省固体废物管理中心	
10	刘永轩	江西省固体废物管理中心	
11	凌 杭	江西省固体废物管理中心	
12	卢 丁	江西省固体废物管理中心	

Table 21: Participants' List for Meeting at ZiLi Demontration Plant on 13 August 2019

全球环境基金"再生铜冶炼行业 UPOPs 减排示范项目"

中期考核签到表

江西自立环保科技有限公司 2019 年 8 月 13 日

序号	姓 名	单位	签 名
1	王京京	联合国开发计划署	
2	谢佳宏	生态环境部对外合作与交流中心	
3	Heidelore Fiedler	专 家	
4	Fabrice Clavien	专 家	
5	王景伟	专 家	
6	刘俪媛	专 家	
7	鲁 晖	翻 译	
8	邹 新	江西省固体废物管理中心	
9	刘永轩	江西省固体废物管理中心	
10	凌 杭	江西省固体废物管理中心	
11	卢 丁	江西省固体废物管理中心	
12	马 颖	抚州市生态环境局	
13	龚 敏	抚州市生态环境局	
14	彭 彧	抚州市生态环境局	
15	阮海丰	浙江申联环保集团有限公司	
16	于龙宇	浙江申联环保集团有限公司	

17	许来平	江西自立环保科技有限公司	
18	路永锁	江西自立环保科技有限公司	
19	明桥生	江西自立环保科技有限公司	
20	白　娅	江西自立环保科技有限公司	
21	乐　兰	江西自立环保科技有限公司	

Table 22: Participants' List for Meeting at Jinhui Demonstration Plant on 14 August 2019

全球环境基金"再生铜冶炼行业 UPOPs 减排示范项目"

中期考核签到表

江西金汇环保科技有限公司　　2019 年 8 月 14 日

序号	姓 名	单 位	签 名
1	王京京	联合国开发计划署	
2	谢佳宏	生态环境部对外合作与交流中心	
3	Heidelore Fiedler	专　家	
4	Fabrice Clavien	专　家	
5	王景伟	专　家	
6	刘俐媛	专　家	
6	鲁　晖	翻　译	
7	刘永轩	江西省固体废物管理中心	
8	卢　丁	江西省固体废物管理中心	
9	凌　航	江西省固体废物管理中心	
10	任广锋	江西金汇环保科技有限公司	
11	董明祥	江西金汇环保科技有限公司	
12	王小城	江西金汇环保科技有限公司	
13	李正军	江西金汇环保科技有限公司	

7.8 Annex 8: Co-financing Tables

Table 23: Overview on co-financing at mid-term by partner

	Cash (USD)	In kind (USD)
FECO	318,857	150,000
Jiangxi Zili	12,742,414	4,301,429
Jiangxi Jinhui	2,700,000	5,278,571
Subtotal	15,761,271	9,730,000
Total	**25,491,271**	

Table 24: Detailed information on co-finance contributions at mid-term – MEE/Feco

No	Activity	Details	Cash (USD)	In kind (USD)
1	Synergistic interaction research	Synergistic interaction research for Basel, Rotterdam, Stockholm and Minamata conventions and SAICM	14,286	14,286
2	Dioxin emission monitor for Jiangxi Zili	Dioxin emission monitor for different feed material in Jiangxi Zili	42,857	21,429
3	Propaganda for Stockholm convention implementation	Organize and carry out publicity activities for convention implementation, and make publicity materials such as souvenirs, posters and brochures	14,286	14,286
4	Propaganda for Stockholm convention implementation	Series of books for dioxin	26,714	28,571
5	Study on dioxin emission reduction	Study on dioxin emission reduction	10,000	21,429
6	Synergistic interaction research	2018 annual study on the synergy process of Basel, Rotterdam and Stockholm conventions	14,286	14,286
7	Sample collection in 2018 for China's implementation of Stockholm Convention	Sample collection in 2018 for China's implementation of Stockholm Convention	125,714	21,429
8	Effectiveness evaluation of China's implementation of Stockholm Convention sample pretreatment, analysis and test and report preparation in 2018	Effectiveness evaluation of China's implementation of Stockholm Convention sample pretreatment, analysis and test and report preparation in 2018	70,714	14,286
	Subtotal		318,857	150,000
	Total		468,857	

Table 25: Detailed information on co-finance contributions at mid-term – Jiangxi Zili demonstration enterprise

No	Activity	Details	Cash (USD)	In kind (USD)
1	Raw material pretreatment	New drying system	848,114	0
		High moisture content and low melting point material dryer	0	192,857
		Rotary kiln	0	107,857
		Batching system	2,104,586	0
2	Construction of anode furnace	Oxygen enriched combustion system of anode furnace	491,529	0
		Construction for furnace	967,986	0

		Disc casting machine	767,300	0
		Waste heat boiler and quench tower	1,124,414	0
		Oxygen generation station	343	2,400,000
3	Oxygen enriched smelting furnace	New oxygen enriched smelting furnace	505,943	0
4	end-of-pipe treatment	Activated carbon injection system	36,857	0
		Dust collecting system	658,657	535,000
		Desulfurization system	1,094,143	0
		Wet electric demister	914,000	0
5	Others	Civil engineer	2,441,543	1,065,714
		Laboratory construction	118,486	0
		Other auxiliary public facilities	668,514	0
	Subtotal		12,742,414	4,301,429
	Total		17,043,843	

Table 26: Detailed information on co-finance contributions at mid-term – Jiangxi Jinhui demonstration enterprise

No	**Activity**	**Details**	**Cash (USD)**	**In kind (USD)**
1	Raw material pretreatment	Raw material sorting, briquetting and packing system	0	57,143
		Dry oven	428,571	0
2	Smelting process control system of oxygen enriched smelting furnace	Dust removal flue gas system	71,429	0
		Construction of oxygen enriched smelting furnace	0	1,571,429
3	Control system of anode furnace smelting process	Reconstruction of oil supply system and relocation of oil depot	500,000	0
		Construction of anode furnace	0	3,650,000
4	end-of-pipe treatment	Secondary combustion chamber and combustion control system	214,286	0
		Flue gas quench HRSG system	185,714	0
		High efficiency dedusting system with back blowing	657,143	0
		New anode furnace desulfurization system	642,857	0
	Subtotal		2,700,000	5,278,571
	Total		7,978,571	

7.9 Annex 9: Signed UNEG Code of Conduct form

The following form from was used http://www.unevaluation.org/document/detail/100

Evaluators/Consultants:

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study limitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

MTR Consultant Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN System:

Name of Consultant: _____ChemAnalytics Örebro AB_____

Name of Consultancy Organization (where relevant): _____

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at ____Örebro, Sweden_____ on __2020-03-08_____

Signature: _____*Dr. H. Fiedler* (signed)_____

7.10 Annex 10: Signed MTR Final Report Clearance Form

Midterm Review Report Reviewed and Cleared By:

Commissioning Unit

Name: Dr. Yun Hong

Signature: _____ Date: 19/03/2021

UNDP-GEF Regional Technical Advisor

Name: Anderson Alves

Signature: _____ Date: 19-March-2021

7.11 Annex 11: GEF 7 Core Indicators

Since the present project is a GEF-5 project, the GEF-7 indicators were not available at the time of the project approval or signature of the project document and largely not at the date when sub-contracts were made. Here we show the sub-indicators and

Indicators and Sub-indicators for GEF-financed Projects

The following is an excerpt of the GEF Guidelines relevant for POPs projects to set out clear technical definitions and methodological guidance for each core indicator and sub-indicator, thereby facilitating their consistent application across all GEF projects and programs, and across the GEF Partnership (4).

Directly relevant for this secondary copper project are the GEF-7 core indicators 9 and 10 (indicator 8 is also related to POPs but to intentional production):

9. Reduction, avoidance of emissions of POPs to air from point and non-point sources (grams of toxic equivalent g TEQ)
   Contextual Sub-Indicators:
   - Number of countries with legislation and policies implemented to control emissions of POPs to air
   - Number of emission control technologies/practices implemented

10. Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment

Sub-indicator 10. Reduction, avoidance of emissions of POPs to air from point and non-point sources (grams of toxic equivalent g TEQ)

Definition: This indicator captures the reduction in emissions of POPs to air. An estimated reduction target is required at the time the project is proposed. The target is based on the baseline calculation of the emissions against the expected reductions that will result from the implementation of the project. At project completion, a final emissions number — in grams of toxic equivalent (g TEQ) — should be subtracted from the baseline emissions number to determine the reduction.

Details: Projects should report the amount of emissions of POPs to air, together with details of the approach used to calculate the figure and the scale at which the figure is reported (e.g., project site, city, province). Project leads should provide information on the amount of emissions from different chemicals listed in Annex C of the Stockholm Convention, as well as an aggregate figure of overall POPs g TEQ reduced.

Note that two additional Sub-Indicators are available to provide context in case they are relevant to the project.

Type: Outcome Indicator

Unit of measurement: Weight (grams of toxic equivalent [g TEQ])

10.1. Number of countries with legislation and policy implemented to control emissions of POPs to air

Definition: This indicator captures the number of countries targeted in the project that have legislation and policies implemented to control emissions of POPs to air.

Details: In projects that are developing new or improved legislation to control POPs emissions to air from unintentional sources, the project leads should indicate legislation being contemplated and its intended impact.

Type: Output Indicator

Unit of measure: Quantity (number of countries) and description of the legislation.

10.2. Number of emission control technologies/practices implemented

Definition: This indicator captures the number of emission control technologies or practices implemented as a direct result of the GEF project.

Details: In projects that are reducing POPS emissions to air through implementation of best available techniques (BAT)/best environmental practices (BEP), the project proponents will provide information on the type and number of these technologies or practices proposed in the project and the expected impact.

Type: Output Indicator

Guidelines on Indicators (ME/GN/01)

Unit of measure: Quantity (number of technologies or practices) and description of the technologies or practices.

Table 27: UNDP Annual Portfolio Indicator for 2018

Indicator	Result	MPU guidance on how to calculate result	Country's explanation on how result was calculated
1. Policy regulatory aspects adopted in this reporting period			
Number of national overarching POPs or sector regulations adopted	2	Please provide the number of national POPs regulations and/or sector regulations that have been adopted in the current reporting period (July of prior year to June this year).	
2. Number of people trained in this reporting period			
Total number of people trained in POPs/mercury management or the use of POPs/Hg free alternatives (gender disaggregated).	2816	Please provide the number of people trained in POPs and/or mercury management and/or alternatives in the current reporting period (July of prior year to June this year) by gender. This includes any training workshops that took place. This will populate automatically based on the inputs provided in the two lines below.	800 governmental officials, 875 technical workers, 141 enterprise managers from 10 enterprises and 1,000 general public participated in the trainings (15 % of the participants are females)
Number of men trained	2,394		
Number of women trained	422		
3. Number of people safeguarded in this reporting period			
Number of people for which high risk of POPs/ mercury exposure has been reduced (gender disaggregated).	2816	We suggest this indicator includes: (a) all people trained by the project during this reporting period + (b) people indirectly trained (e.g. if the project trains an electricity company, the company may train its maintenance personnel in turn) + (c) number of people living in communities close to a priority site or hot spot from which a hazard has been removed during this reporting period. This will populate automatically based on the inputs provided in the two lines below.	The same with trained people
Number of men trained	2,394		
Number of women trained	422		

Indicator	Result	MPU guidance on how to calculate result	Country's explanation on how result was calculated
4. Amount of chemicals eliminated/reduced in this reporting period			
Amount of POPs eliminated or reduced (in metric tonnes)	PCDD/PCDF: 25.6 g TEQ	Please provide the amount of POPs chemicals eliminated/ reduced in metric tonnes in the current reporting period (July of prior year to June this year). This info should match the last PIR and should be easily obtainable.	2 demonstration enterprises which the total product is about 200,000 t/a, the elimination of PCDD/PCDF is about 1.6 g in flue gas and 24 g in dust.
Amount of Mercury reduced (in metric tonnes).		Please provide the amount of mercury reduced in metric tonnes in the current reporting period (July of prior year to June this year). This info should match the last PIR and should be easily obtainable.	Not applicable (from MTR team)

Table 28: Tracking table of financial delivery rate reported in quarterly reports (QPRs)

Quarterly report	Percent of expenditure compared to budget for that period
2016 Q3	QPR not provided
2017 Q1	19.98%
2017 Q2	17.90%
2017 Q3	20.32%
2018 Q1	39.87%
2018 Q2	38.13%
2018 Q3	26.60%
2019 Q1	59.80%
2019 Q2	22.70%
Total average	**31%**

The technical documents were largely from sub-contractors commissioned to write a report on a specific output topic (see Table 29), presentations, flyers.

7.12 Annex 12: Other Materials Used or Prepared in the MTR

Table 29: Subcontracts issued by MEE/FECO in relation to output

#	Sub-contracts	Titles	Related Outputs
1	Sub-project 1	Assessment of current policies and research on pollution prevention and control technical policy	Output 1.1, Output 1.2, Output 1.3, Output 1.4, Output 1.5, Output 1.6
2	Sub-project 2	Research on pollution prevention and control economic policy	Output 1.7, Output 1.8, Output 1.9
3	Sub-project 3	Research on technical standards of assessment indicator system and audit guideline on cleaner production for secondary copper smelting industry	Output 1.10, Output 1.11, Output 1.12, Output 1.13, Output 1.14, Output 1.15, Output 1.16
4	Sub-project 4	Research on application and issuance technical guideline for emission permit on secondary non-ferrous metal industry	Output 1.17, Output 1.18, Output 1.19, Output 1.20, Output 1.21, Output 1.22, Output 1.23, Output 1.24, Output 1.25, Output 1.26, Output 1.27, Output 1.28
5	Sub-project 5	Research for emission standard for secondary copper, aluminium, lead, and zinc industries	Output 1.29, Output 1.30, Output 1.31, Output 1.32
6	Sub-project 6	Contract with Demo Province	Output 1.46, Output 1.47
7	?		Output 1.48, Output 1.49, Output 1.50, Output 1.51, Output 1.52
8	?		Output 1.53
9	Sub-project 7	Research for emission data of Demo enterprise	Output 2.1, Output 2.2, Output 2.3, Output 2.4, Output 2.5
10	Sub-project 8	Research for emission standard of UPOPs in secondary copper industry	Output 2.6, Output 2.7, Output 2.8
11	?		Technological solutions, economic and technical feasibility analysis were conducted through expert discussion and sorts of meeting. The details are showed in implementation plan of demo enterprises.
12	Sub-project 9	BAT/BEP demonstration in Jiangxi Jinhui	Output 2.9, Output 2.10
13	Sub-project 10	BAT/BEP demonstration in Jiangxi Zili	Output 2.11, Output 2.12
14	Sub-project 11	Policy expert for PPP mode	Output 2.13
15	Sub-project 12	Smart industrial park demo based on PPP mode	Output 2.14
16	Sub-project 13	Contract for 2017 technical expert	Output 1.54, Output 1.55, Output 1.56
17	Sub-project 14	Contract for 2018 technical expert	Output 1.57, Output 1.58, Output 1.59, Output 1.60, Output 1.61
18	?		Output 1.33, Output 1.34, Output 1.35, Output 1.36, Output 1.37, Output 1.38, Output 1.39, Output 1.40, Output 1.41, Output 1.42, Output 1.43, Output 1.44, Output 1.45
19	?		Output 1.62, Output 1.63
21	?		Output 3.1 National replication plan
23	**?**		Output 5.1, Output 5.2

#	Sub-contracts	Titles	Related Outputs
24		Guideline for NPR of Secondary coper project	
25		Introduction of Smart Management Demonstration for Secondary Copper Industrial Park Based on PPP Mode	
26		Work plan for demonstration of PPP-based smart industrial park	
27		PCDD/PCDF monitoring (test report)	
28		PCDD/PCDF monitoring (exhaust dioxins)	
29		PCDD/PCDF monitoring (solid waste dioxins)	
30		PCDD/PCDF monitoring reports for remaining sites	
31		PeCB, HCB and PCN tests	
32		dioxin like PCB (exhaust gas)	
33		dioxin like PCB (solid waste)	

Table 30: Project-related personnel, affiliations and roles

Institution	Name	Title	Outputs
Implementing/executing agency			
UNDP	29. Yang Han	Programme Manager	Project manager – IA
	30. Wang Jingjing	Programme Assistant	Assistant to the project manager - IA
MEE/FECO	31. Jiang Chen	Senior Project Manager	Project Coordinator - EA
	32. Wu Guanglong	Project Manager	Assistant Coordinator - EA
	33. Xie Jiahong	Project Assistant	Support Staff - EA
Local EPB			
Solid Waste Mangement Center of Jiangxi Province	34. Zou Xin	Director	Project manager – LPMO Outputs 1.46 and 1.47
	35. Liu Yongxuan	Project Officer	Assistant to the project manager – LPMO
Demonstration Plants			
Jiangxi Jinhui Environmental Technology Co, Ltd.	36. Ren Guangfeng	General Manger	Application of BAT/BEP Outputs 2.9 and 2.10
	37. Dong Minxiang	Vice Manager	
Jiangxi Zili Environmental Technology Co, Ltd.	38. Lu Yongsuo	Chief Engineer	Application of BAT/BEP Outputs 2.11 and 2.12
	39. Bai Ya	Engineer	
	40. Le Lan	Engineer	
Industrial Parks			
Management Commit-tee of Tongling Econo-mic and Technological Development Zone	41. Wang Ke	Director	Implementation of the PPP Output 2.14
	42. Cui Mengqi	Engineer	
Contractors			
Beijing Advanced Sciences and Innovat-ion Center of CAS	43. Chen Yang	Professor	Outputs 1.57, 1.58, 1.59, 1.60 and 1.61
University of Science and Technology Beijing	44. Wang Chengyan	Professor	Outputs 1.54, 1.55 and 1.56
Beijing Renmin University	45. Lan Hong	Professor	Output 2.13
Research Center for Eco-Environmental Sciences,	46. Zheng Minghui	Professor	Outputs 1.29, 1.30, 1.31, 1.32, 2.6, 2.7 and 2.8
	47. Liu Guorui	Associate Professor	

Institution	Name	Title	Outputs
Chinese Academy of Sciences (RCEES/CAS)			
China Non-ferrous Metals Industry Association Recycling Metal Branch	48. Wang Jiwei	President	Outputs 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.17, 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.24, 1.25, 1.26, 1.27, 1.28, 1.29, 1.30, 1.31 and 1.32
	49. Zhang Xizhong	Vice-President	
	50. Liu Wei	Vice-President	
Chinese Research Academy of Environ-mental Sciences (CRAES)	51. Li Yanping	Professor	Outputs 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.24, 1.25, 1.26, 1.27 and 1.28
CSD IDEA(Beijing) Environmental Test & Analysis Co., Ltd.	52. Wu Changmin	Associate Professor	Dioxin analysis Outputs 2.1, 2.2, 2.3, 2.4 and 2.5
China National Resources Recycling Association	53. ?		Outputs 1.7, 1.8 and 1.9
Experts			
Chinese Academy of Engineering (CAE)	54. Qiu Dingfan	Academician, Professor	
Tsinghua University	55. Yu Gang	Professor	
Peking University	56. Mei Fengqiao	Professor	Output 1.53
National Research Center for Environmen-tal Analysis and Measurement	57. Liu Aimin	Professor	

Table 31: Present status of subcontracts (according to outcome, activity, planned and disbursed budget)

Project Activities	Activity	Sub-projects	Contractor	Contractor Number	Outputs	Budget ($)	Contract Amount(¥)	Contract Amount ($)	Actual (USD)	Expenditure Ratio	Actual expenditure/ Budget
Component 1: Institutional Strengthening and Capacity Building											
1.1, 1.1.1	Activity 1.1.1	Sub-project 1: Assessment of current policies and research on pollution prevention and control technical policy	China Non-ferrous Metals Industry Association Recycling Metal Branch	C/V/S/16/344	1.1, 1.2, 1.3, 1.4, 1.5, 1.6	170,000	549,970	78,567	121,255	100%	71%
		Sub-project 2: Research on pollution prevention and control economic policy	China National Resources Recycling Association	C/V/S/17/118	1.7, 1.8, 1.9		298,813	42,688		100%	
	Activity 1.1.2	Sub-project 3: Research on technical standards of assessment indicator system and audit guideline on cleaner production for secondary copper smelting industry	Chinese Research Academy of Environmental Sciences	C/V/S/17/150	1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16	340,000	450,000	64,286	236,000	100%	76%
		Sub-project 4: Research on application and issuance technical guideline for emission permit on secondary non-ferrous metal industry	China Non-ferrous Metals Industry Association Recycling Metal Branch and Chinese Research Academy of Environmental Sciences	C/V/S/17/288	1.17, 1.18, 1.19, 1.20, 1.21, 1.22, 1.23,1.24, 1.25, 1.26, 1.27, 1.28		586,000	83,714		100%	
		Sub-project 5: Research for emission standard for secondary copper, aluminum, lead, and zinc industries	China Non-ferrous Metals Industry Association Recycling Metal Branch and Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences	C/V/S/18/235	1.29, 1.30, 1.31, 1.32		616,000	88,000		30%	
		Sub-project 12: Contract for 2017 technical expert	Professor Wang Chengyan, University of Science and Technology Beijing	C/V/S/16/354	1.54, 1.55, 1.56		85,000	12,143		100%	
		Sub-project 13: Contract for 2018 technical expert	Professor Chen Yang, Beijing Advanced Sciences and Innovation Center of CAS	C/V/S/18/141	1.57, 1.58, 1.59,1.60, 1.61		80,000	11,429		100%	
	Activity 1.1.3				1.33, 1.34, 1.35, 1.36, 1.37, 1.38, 1.39, 1.40, 1.41, 1.42, 1.43, 1.44, 1.45						
1.2. 1.2.1	Activity 1.2.1				1.62, 1.63						
1.2. 1.2.2	Activity 1.2.2	Sub-project 6: Contract with Demo Province	EPB of Jiangxi province	C/V/S/16/326	1.46, 1.47	650,000 towards Component 2, total is ca. 1,000,000	6,760,000	965,714		20%	
1.2. 1.2.3	Activity 1.2.3				1.48, 1.49, 1.50, 1.51, 1.52						
1.3, 1.3.1	Activity 1.3.1		Professor Mei Fengqiao, Peking University	Cofinance	1.53						
Sub-total Component 1											
Component 2: Demonstration of BAT/BEP Technologies and PPP-based Industry Chain Management in the secondary copper production sector											
2.1, 2.1.1	Activity 2.1.1	Sub-project 7: Research for emission data of Demo enterprise	CSD IDEA(Beijing) Environmental Test & Analysis Co.,Ltd.	C/V/S/17/316	2.1, 2.2, 2.3, 2.4, 2.5	400,000	260,400	37,200	120,057	100%	30%
		Sub-project 8: Research for emission standard of UPOPs in secondary copper industry	Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences	C/V/S/18/209	2.6, 2.7, 2.8		580,000	82,857		70%	
2.1, 2.1.2	Activity 2.1.2				see implementation at demonstation enterprises						
2.1, 2.1.3	Activity 2.1.3	Sub-project 9: BAT/BEP demonstration in Jiangxi Jinhui	Jiangxi Jinhui Environmental Technology Co, Ltd.	C/V/S/18/303	2.9, 2.10	6,000,000	12,970,000	1,852,857	4,567,143	80%	76%
		Sub-project 10: BAT/BEP demonstration in Jiangxi Zili	Jiangxi Zili Environmental Technology Co, Ltd.	C/V/S/18/304	2.11, 2.12		19,000,000	2,714,286		80%	
2.2, 2.2.1	Activity 2.2.1	Sub-project 11: Policy expert for PPP mode	Professor Lan Hong, Beijing Renmin University	C/V/S/16/358	2.13	80,000	80,000	11,429		30%	14%
2.2, 2.2.2	Activity 2.2.2	Sub-project 12: Smart industrial park demo based on PPP mode	Management Committee of Tongling Economic and Technological Development Zone	IECO/LY3/S/19/014	2.14	1,170,000	6,500,000	928,571		20%	79%
Sub-total Component 2											
Component 3: National Replication Programme											
Component 4: Monitoring and evaluation											
4.1, 4.1.1	Activity 4.1.1.					500,000		115,941			23%
	Activity 4.2.1										
Sub-total Component 4											
Component 5: Project management											
5.1	Undertake day-to-day project management				5.1, 5.2	600,000		284,910			47.49%

Table 32: Comparative Table of Financial Reporting

		Other	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Total
				2016*				
Prodoc			171,000.00	593,000.00	5,000.00	13,500.00	73,750.00	856,250.00
TYWP			64,000.00	3,000.00	-	15,500.00	1,750.00	84,250.00
	Annual budget		33,500.00	3,000.00	-	13,500.00	14,750.00	64,750.00
APR	Annual Exp		27,370.16	4,062.41	-	14,905.87	6,164.52	52,502.96
CDR	Total EXP	1,245.46	27,370.16	4,062.41	-	14,905.87	6,164.52	53,748.42
				2017				
Prodoc			192,000.00	1,126,000.00	10,000.00	39,000.00	114,500.00	1,481,500.00
TYWP			452,900.00	739,000.00	15,000.00	36,500.00	109,203.00	1,352,603.00
	Annual budget		452,900.00	739,000.00	15,000.00	36,500.00	107,400.00	1,350,800.00
APR	Annual Exp		255,885.00	1,004,585.00	-	38,598.00	92,656.00	1,391,724.00
CDR	Total EXP	- 16,022.45	251,597.50	986,751.70	-	38,043.08	89,849.26	1,350,219.09
	Annual budget		452,900.00	739,000.00	15,000.00	36,500.00	107,400.00	1,350,800.00
QPRs	Accumulated Exp (in Q3)		4,692.00	2,046.00	-	26,565.00	49,571.00	82,874.00
				2018				
Prodoc			332,000.00	2,126,000.00	430,000.00	154,000.00	118,906.00	3,160,906.00
TYWP**			534,000.00	2,282,000.00	70,000.00	37,000.00	109,703.00	3,032,703.00
	Annual budget		503,200.00	3,497,000.00	25,000.00	53,500.00	109,000.00	4,187,700.00
APR	Annual Exp		212,399.45	2,878,656.81	16,784.47	42,991.63	150,147.26	3,300,979.62
CDR	Total EXP	20,427.56	212,399.45	2,878,657.16	16,784.47	42,991.63	150,147.26	3,321,407.53
	Annual budget		503,200.00	3,497,000.00	25,000.00	53,500.00	109,000.00	4,187,700.00
QPRs	Accumulated Exp (in Q3)		2,056.00	29,945.00	16,784.00	21,029.00	93,065.00	162,879.00
				2019***				
Prodoc			332,000.00	2,126,000.00	510,000.00	124,000.00	114,500.00	3,206,500.00
TYWP			600,200.00	1,172,000.00	660,000.00	124,000.00	109,000.00	2,665,200.00
CDR	Total EXP	- 10,379.43	- 53.16	630.31	-	5,753.45	26,903.10	22,854.27
	Annual budget		600,200.00	1,172,000.00	660,000.00	124,000.00	109,000.00	2,665,200.00
QPRs***	Accumulated Exp (in Q2)		3,000.00	-	-	6,000.00	25,000.00	34,000.00

* No QPRs were provided to us for 2016

** Taken from the TYWP 2017 for the year 2018, as the TYWP for 2018 was not provided to us

*** The APR for 2019 will only be provided after the end of the year and only QPRs for Q1 and Q2 are available at that stage

Table 33: Summary of training activities at mid-term

Number	Date	Meeting	Number	Number of Enterprises	Number of governmental officers	Number of technical workers	Number of managers	Number of general public	Organizer	Training Contents
1	2017.2.15	Training for dioxin pollution prevention management in Jiangxi province	1	0	10	0	20	0	LPMO	dioxin pollution prevention management, introduction of BAT/BEP demonstration and NPR for sencondary copper project
2	2017.5	Seminar for Secondary copper industry in Jiangxi province	1	10	0	0	20	0	LPMO	hazard wastes management policy, dioxin pollution prevention management policy
3	2017.6.5	Publicity Activities for 6.5 World Environmental Day	1	0	0	0	0	1000	LPMO	introduction of sencondary copper project, dioxin pollution prevention management
4	2017.11	Annual meeting of China Non-ferrous Metals Industry Association Recycling Metal Branch	1	0	0	0	0	300	China Non-ferrous Metals Industry Association Recycling Metal Branch	policy for non-ferrous metal industry
5	2017.7-2018.6	Internal trainging for Jiangxi Jinhui Environmental Technology Co., Ltd	8	1	0	297	95	0	Jiangxi Jinhui Environmental Technology Co., Ltd.	safty, pollution prevention technology, introduction of dioxin, introducion of secondary copper project, policy for non-ferrous metal industry
6	2017.7-2018.6	Internal trainging for Jiangxi Zili Environmental Technology Co., Ltd	8	1	0	578	46	0	Jiangxi Zili Environmental Technology Co., Ltd.	safty, pollution prevention technology, introduction of dioxin, introducion of secondary copper project, policy for non-ferrous metal industry
7	2018.6.5	Publicity Activities for 6.5 World Environmental Day	1	0	0	0	0	1000	LPMO	introduction of sencondary copper project, dioxin pollution prevention management
8	2017.7-2018.6	Hazard wastes management training for Jiangxi province	12	8	800	0	0	0	LPMO	Hazard wastes management, dioxin pollution prevention management
11	2018.9-11月	Emission permit training for secondary non-ferrous metal industry	7	70	350	0	350	0	FECO	Technical specification for application and issuance of pollutant permit for secondary non-ferrous metal industry
12	2018.7-2019.6	Hazard wastes management training for Jiangxi province	14		448	0	2333	0	LPMO	Hazard wastes management, dioxin pollution prevention management
13	2018.8-2019.6	Emission permit training for secondary copper,aluminum, and lead industry	3	45	0	0	280	0	China Non-ferrous Metals Industry Association Recycling Metal Branch	Technical specification for application and issuance of pollutant permit for secondary non-ferrous metal industry
14	2018.7-2019.6	Internal trainging for Jiangxi Jinhui Environmental Technology Co., Ltd	25	0	0	297	46	0	Jiangxi Jinhui Environmental Technology Co., Ltd.	safty, pollution prevention technology, introduction of dioxin, introducion of secondary copper project, policy for non-ferrous metal industry
15	2018.7-2019.6	Internal trainging for Jiangxi Zili Environmental Technology Co., Ltd	12	0	0	653	95	30	Jiangxi Zili Environmental Technology Co., Ltd.	safty, pollution prevention technology, introduction of dioxin, introducion of secondary copper project, policy for non-ferrous metal industry
Total			**94**	**135**	**1608**	**1825**	**3285**	**2330**		
Goal				**30**	**300**	**2000**	**2000**	**1000000**		
Degree of completion				**450.00%**	**536.00%**	**91.25%**	**164.25%**	**0.23%**		

Table 34: Overview of legislative framework in China in relation to unintentional POPs releases from production of secondary copper

No	Year	File name	Auditing File No
1	2005	Guiding Catalogue of Industrial Structure Adjustment (2005 version)	NDRC No.40 of 2005
3	2006	The issuance of the "Eleventh Five-Year" comprehensive utilization of resources guidance notice	Development and Reform Commission, Central Information
8	2008	National Mineral Resources Plan (2008-2015)	MLR [2008] No. 309
10	2009	Non-ferrous metals industry restructuring and revitalization plan	State council
11	2010	The State Council on ´Notice on Further strengthening the elimination of backward production capacity´	State council notice No. 7, 2010
12	2010	National environmental standards	Lead, zinc and industrial pollutant emission standards
13	2011	Non-ferrous metal industry, "second five" development plan	MIIT
18	2013	Industrial Restructuring Catalog (2011); 2013 version	NDRC, No. 21, 2013
19	2014	Industrial Restructuring Catalog（2011）	NDRC, No. 21, 2014

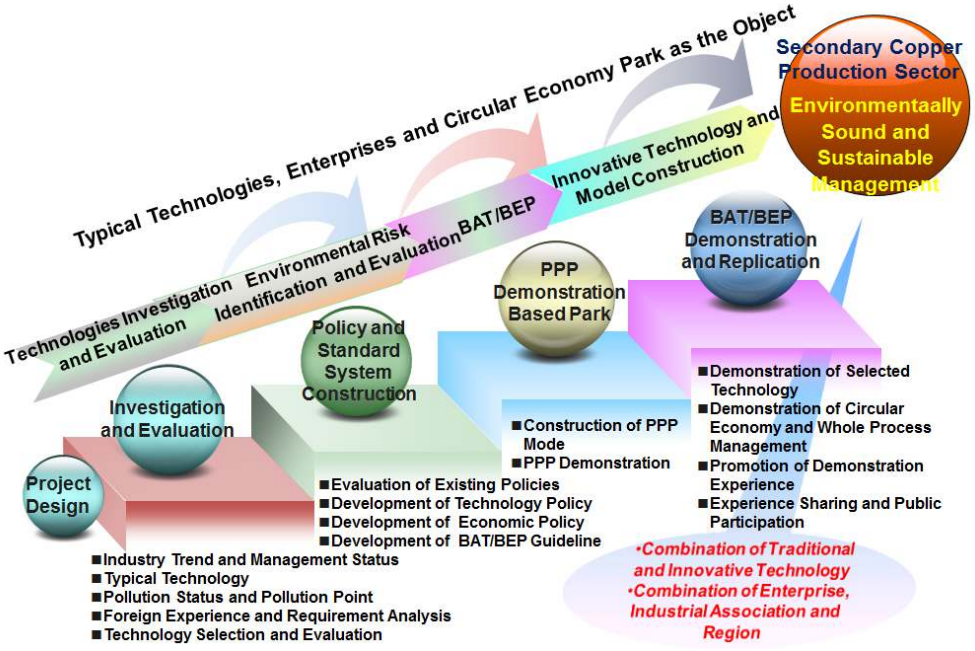

Figure 6: Causal chain of the project's intervention

7.13 *Annexed in a separate file:* Audit trail from received comments on draft MTR report

7.14 *Annexed in a separate file:* Relevant Midterm Tracking Tools