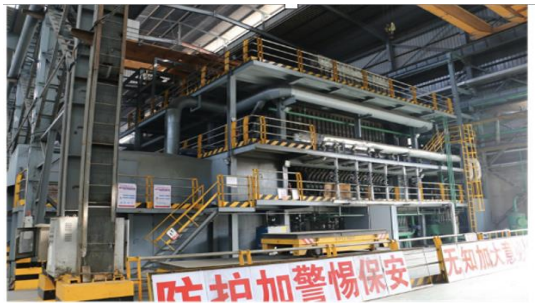
UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China

UNDP/GEF Project

(GEF ID No: 6966 – PIMS+ ID No: 5383)

TERMINAL EVALUATION REPORT



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Acronyms and Abbreviations

BAT	Best Available Technology
BEP	Best Environmental Practice
BRH	Bangkok Regional Hub
CEO	Chief Executive Officer
CO	Country Office
COx	Carbon Oxides
EA	Executing Agency
FECO	Foreign Environmental Cooperation Centre Office
GEF	Global Environment Facility
HxCBz	Hexachlorobenzene
IA	Implementing Agency
MEE	Ministry of Ecology and Environment
MIIT	Ministry of Industry and Information Technology
MOF	Ministry of Finance
NDRC	National Development and Reform Commission
NGO	Non-Governmental Organization
NIP	National Implementation Plan
NOx	Nitrogen Oxides
NPT	National Project Team
NRP	National Replication Plan
NSG	National Steering Group
PCBs	Polychlorinated Biphenyls
PCDD/Fs	Polychlorinated Dibenzo-p-dioxins and Dibenzofurans
PCNs	Polychlorinated Naphthalenes
PeCBz	Pentachlorobenzene
PM	Particulate Matter
PPP	Public Private Partnership
RTA	Regional Technical Advisor
TE	Terminal Evaluation
TEQ	Toxic Equivalents
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNEG	United Nations Evaluation Group
UPOPs	Unintended Persistent Organic Pollutants

Glossary of Evaluation-related Terms

Term	Definition
Baseline data	Data that describe the situation to be addressed by an intervention and serve as the starting point for measuring the performance of the intervention
Beneficiaries	The specific individuals or organizations for whose benefit an intervention is undertaken
Capacity development	The process by which individuals, organizations, institutions and societies develop their abilities individually and collectively to perform functions, solve problems and set and achieve objectives
Conclusion	A reasoned judgement based on a synthesis of empirical findings or factual statements corresponding to a specific circumstance
Effect	Intended or unintended change due directly or indirectly to an intervention
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results
Finding	A factual statement about the programme or project based on empirical evidence gathered through monitoring and evaluation activities
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results-based management) principles
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs
Output	The product, capital goods and/or service which results from an intervention; may also include a change resulting from the intervention which is relevant to the achievement of an outcome
Rating	An instrument for forming and validating a judgement on the relevance, performance and success of a programme or project through the use of a scale with numeric, alphabetic and/or descriptive codes
Recommendation	A proposal for action to be taken in a specific circumstance, including the parties responsible for that action
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies
Risk	Factor, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives

Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed
Stakeholders	The specific individuals or organizations that have a role and interest in the objectives and implementation of a programme or project
Theory of Change	A set of assumptions, risks and external factors that describes how and why an intervention is intended to work.

Acknowledgement

The evaluators would like to express their sincere gratitude to the project management and executive team (i.e. UNDP China, FECO-MEE and Jiangxi EPB) as well as the demonstration companies for their excellent cooperation, commitment and dedicated efforts. Their efforts are acknowledged to collect and provide all the documents demanded, and their meticulous arrangements to meet/interview (both face to face and on-line) all relevant stakeholders and visit all key sites during the mission, and their time and patience in making sure to provide answers to all evaluation questions. Although there was significant influence from the COVID-19, we appreciate the efforts from the project management team to arrange on-site investigation and interview. Special thanks are extended to the two pilot enterprises Jiangxi Zili and Jiangxi Jinhui, the two incentive programme companies Jiangxi Green Recycling and Jiangxi Ruilin for their preparation of the on-site visits and their presentations, their hospitality, time and patience for explanations during and after the site visits. Collectively, this contributed to timely completion of the terminal evaluation.

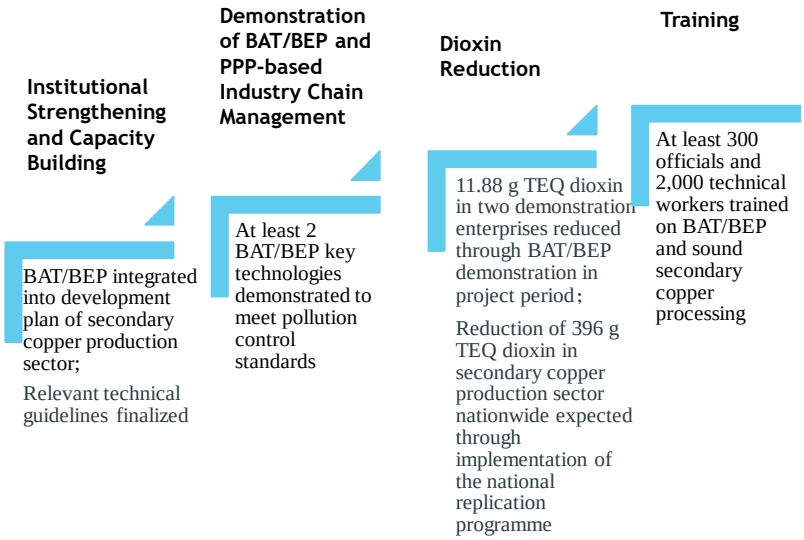
EXECUTIVE SUMMARY

Project Information Table

Project Title	UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China		
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 ID, Proj. ID:	CHN10 00086820 00094023	**Project Document (ProDoc) Signature Date (date project began):**	16 August 2016
Country(ies):	China	**Date project manager hired:**	August 2016
Region:	Asia-Pacific	**Inception Workshop Date:**	12 November 2016
Focal Area:	Chemicals and Waste	**Midterm Review Completion Date:**	23 September 2019
GEF Focal Area Strategic Objective:	Outcome 1.1 and Outcome 3.1	**Planned Operational Closure Date:**	3 August 2021
Trust Fund [indicate GEF TF, LDCF, SCCF, NPIF]:	GEF TF	**If revised, proposed op. closer date:**	N.A.
Executing Agency/Implementing Partner:	Ministry of Ecology and Environment, Foreign Environmental Cooperation Centre (FECO)		
Other execution partners:	N.A.		
NGOs/CBOs involvement:	Non-Ferrous Metal Association of China Chinese Nonferous Metal Association Recycling Metal Branch		
Private sector involvement:	Jiangxi Zili Environmental Protection Technology Co., Ltd. Jiangxi Jinhui Copper Industry Co., Ltd.		
Geospatial coordinates of project sites:	China		
Project Financing	***at CEO endorsement (US$)***	***At Terminal Evaluation (US$)***	
GEF financing:	12,600,000 (cash)	12,600,000 (cash)	
UNDP contribution	100,000 (in-kind)	*100,000 (in-kind)*	
Government	510,000 (cash) 3,750,000 (in-kind) **Total: 4,260,000**	*510,000 (cash)* *3,100,000 (in kind)* ***Total: 3,610,000***	
Other partners	15,000,000 (cash) 33,090,000 (in-kind) **Total: 48,090,000**	*37,929,358 (Cash)* *45,955,714 (in-kind)* ***Total:83,885,072***	
Total co-financing	52,450,000	*87,595,072*	
PROJECT TOTAL COSTS	**65,050,000**	***100,195,072***	

Project Description

The UNDP-GEF project "UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management" is a five-year 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 released 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'. The quantitative objectives of the project are shown below (prepared by the executing agency, MEE/FECO).



The project was designed to strengthen institutional (industry, enterprises, decision-makers) capacities; establish and improve policy and enforcement measures; demonstrate BAT/BEP and PPP-based industry chain management to address and achieve reduction of POPs emissions in the secondary copper production process. The main targets were: 11.88 g TEQ dioxin in two demonstration enterprises reduced through BAT/BEP demonstration; reduction of 396 g TEQ dioxin nationwide expected through implementation of the national replication programme; at least 2 BAT/BEP key technologies demonstrated to meet pollution control standards; at least 300 officials and 2,000 technical workers trained on BAT/BEP and sound secondary copper processing.

Summary of project results

The project was initiated in June 2016. All activities defined in the Project Document, have been successfully finalized and the overall goals achieved. More specifically, activities developing and supporting institutional strengthening and demonstration of best available

techniques at two demonstration enterprises were completed and quantitative targets of the project were achieved. The national standards and BAT/BEP applications are in place and emissions of unintentional POPs (especially PCDD/PCDF) were reduced. As accompanying activity, beneficiaries from various target groups were trained. The experience has already been learned and integrated into the development of secondary copper industry in the demonstration province and extended into the whole industry in China.

Comparison of the targets at level of the Project Objective with actual achievements

Project Target	Actual Achievements
11.88 g TEQ dioxin in two demonstration enterprises reduced through BAT/BEP demonstration in project period	46.20 g TEQ annual dioxin reduction in two demonstration enterprises (43.48 g TEQ reduction in flue gas and 2.72 g TEQ reduction in residues)
BAT/BEP integrated into development plan of secondary copper production sector Reduction of 396 g TEQ dioxin in secondary copper production sector nationwide expected through implementation of the national replication programme	BAT/BEP integrated into emission permit system and as majority of non-ferrous metal enterprises in China applied emission permit according to technical specification formulated under the project 407.69 g TEQ dioxin reduction achieved through NRP (386.35 g TEQ reduction in flue gas and 21.17 g TEQ residues reduction)
At least 2 BAT/BEP key technologies demonstrated to meet pollution control standards Relevant technical guidelines finalized	4 BAT/BEP key technologies demonstrated in 2 enterprises 8 technical guidelines finalized and 2 of them issued
At least 300 officials and 2,000 technical workers trained on BAT/BEP and sound secondary copper processing	1,810 officials, 5,521 technical workers, 8,250 managers and 1,059,480 public trained

(1) Policy and standard development

The project commissioned more than 30 studies for assessment of the existing policies and advance research on (i) pollution prevention and technical as well as economic control policies, (ii) technical standards of indicator system and audit guideline on cleaner production for the secondary copper smelting industry, (iii) application and issuance technical guideline for emission permit on secondary non-ferrous metal industry, and (iv) emission standards applicable to secondary copper, aluminium, lead, and zinc industries.

Specifically, a policy on pollution prevention technology in secondary copper industry was drafted and submitted to MEE and MIIT. The policy constitutes a direct driving force for the executive plan on prevention of solid waste import from foreign countries and one of the main references for setting the standards on secondary copper raw material and secondary brass copper raw material.

At the project closure, total 8 standards related to emission control were promulgated, with 2 additional standards under development. Based on the standards, certificates were issued for more than 400 companies. The standards will play important roles in the sustainable development of secondary metallurgy industry in China and beyond.

(2) Strengthening of the national institutional capacities

Through capacity building activities, the project strengthened relevant agencies of the Government responsible for pollution prevention and control, and for implementing best

available techniques and best environmental practices (BAT/BEP for reduction of releases of unintentional POPs and other pollutants in secondary copper production and other non-ferrous metals production.

The project supported establishment of an information platform for management of emission certificates that serves as a foundation for management of the secondary metals industry in China. A system for annual collection information on unintentional POPs was established to provide quantitative supports to POPs management by the government.

Under cooperation with the China Nonferrous Metals Industry Association, an information exchange platform for secondary metals industry was established and used by more than 1,000 participants from more than 10 countries and almost 100 companies per annum. This platform is an important driver to greening the development of the non-ferrous industry in China. From 2017 onwards, a number of symposiums were organised with more than 100 participants from more than 50 companies each year.

Development and promulgation of specifications for inspection of hazardous waste transport has largely prohibited shipment of low value hazardous waste with high chloride content between provinces. The specifications, together with 2 other local directives for emission control during hazardous waste treatment, contributed to improvements in pollution management effectiveness and environmental quality.

(3) Communications among different conventions

The project contributed to improved communication among different international conventions, including the Basel Convention, Rotterdam Convention, Minamata Convention and SAICM, and relevant ministries in China.

- In 2019, 3 conferences had been organised, including coordinators meeting for the implementation of the Stockholm Convention and Minamata Convention (2019-04-30), the annual POPs forum (2019-05-17) and the annual technical coordination meeting (2019-11-11).
- In 2020, 2 conferences were organised i.e. executive meeting of the Stockholm Convention and Minamata Convention (2020-04-13) and coordinators meeting for the implementation of the Stockholm Convention and Minamata Convention (2020-12-11).

(4) BAT/BEP demonstration

Two secondary copper enterprises directly benefited from the project support and improved their production processes by applying BAT/BEP for reduction of emissions of unintentional persistent organic pollutants (POPs). The project provided support for procurement of equipment for 4 selected technologies that were subsequently installed and commissioned at the two demonstration companies. This enabled to achieve the dioxin content in the emission below 0.1ng TEQ/m3 and treatment of residues with sound manner.

According to the data provided by an independent verifier, the two demonstration companies achieved the total reduction of dioxin emissions of 46.20 g TEQ (43.48 g TEQ from flue gas

emissions and 2.72 g TEQ from residues emissions) and exceeded thus the pre-set objective of 11.88g TEQ.

(5) Demonstration in smart industrial park based on PPP

The project supported demonstration of a management system for smart industrial park at Tongling that includes hazardous waste treatment, water and gas quality inspection, as well as a third party for maintenance of the system. The system offers in-situ inspection of the whole life cycle during hazardous waste treatment. Two additional parks were selected to carry out park management demonstration based on industrial chain, so as to realize the intelligent management and control of raw materials, products and wastes of enterprises in the park, including secondary non-ferrous metal industrial enterprises, and strengthen the supervision ability of pollutant emission and environmental safety of enterprises in the parks. Implementation plans of the two parks have been completed, and the deployment and operation of the intelligent management system are expected to be completed by early 2022.

(6) Incentive programme

In total, 18 incentive programme companies (8 Smelting companies and 10 dismantling companies). For the smelting companies, the flue gas dioxin emission concentrations of the 8 enterprises were all lower than 0.1 ng TEQ/m^3. The reduction of dioxin is 386.52 g TEQ in flue gas and 21.17g TEQ in residues gives the total reduction 407.69 g TEQ. For the disassemble companies, the main objective is to assist them to improve the facility efficiencies to reduce use of organic pollutants. Total 10 dismantling companies passed the acceptance of FECO expert meeting and achieved the planned objectives of the project.

(7) Capacity building and awareness raising

The project organized more than 100 training events for 815 companies, total 1,810 government officers, total 5,521 technical workers, as well as 8,250 managers. More than one million of public participants attended awareness raising events. Furthermore, the project supported production and distribution of more than 300 briefs on unintentional POPs reduction in the secondary copper industry. More than 120 related articles were posted on internet platforms for public awareness on the dioxin reduction efforts. The browsing is recorded as 84,000 times. Several other public awareness materials were developed including movies, cartoons, interviews, and songs. More than 20 movies had been compiled with more than 1250,000 times of broadcasting.

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.

Sustainability and progress to impact

The achievements of the project are not only reflected in the technology improvements in the secondary copper industry in the demonstration in the Jiangxi province but are being replicated to the entire industry in China through the NRP with a potential for extension to processing of hazardous waste from other non-ferrous metal industries. The regulations, standards and directives developed during this project have already been promulgated. The technical specification on application and issuance of pollutant permit for non-ferrous

metallurgy and secondary non-ferrous metal industry was used by more than 400 plants for their pollutants emission certificates. Experience and implementation of the BAT/BEP technologies for dioxin reduction has been included in the NDRC and MEE recommendation technologies. Promotion of technological improvements, and reduction of energy consumption and emissions will be an important element on the route towards achieving the carbon neutral goals in China.

Summary of evaluation ratings

The summary of evaluation ratings[1] according to the required evaluation criteria is displayed in the Box 1 below.

Box 1: Summary of TE ratings

Evaluation Criteria	Evaluators' Rating
Monitoring and evaluation: design at entry	Satisfactory (S)
Monitoring and evaluation: implementation	Satisfactory (S)
Overall quality of monitoring and evaluation	**Satisfactory (S)**
Quality of UNDP Implementation / Oversight	Highly Satisfactory (HS)
Quality of Implementing Partner Execution	Highly Satisfactory (HS)
Overall quality implementation / execution	**Highly Satisfactory (HS)**
Relevance	**Relevant**
Effectiveness	Highly Satisfactory (HS)
Outcome 1	Highly Satisfactory (HS)
Outcome 2	Highly Satisfactory (HS)
Outcome 3	Satisfactory (S)
Outcome 4	Satisfactory (S)
Efficiency	**Satisfactory (S)**
Overall Project Outcome Rating	**Highly Satisfactory (HS)**
Overall likelihood of sustainability	**Likely (L)**
Institutional framework and governance sustainability	Likely (L)
Financial sustainability	Likely (L)
Socio-political sustainability	Likely (L)
Environmental sustainability	Likely (L)

[1] Performance rating of GEF projects is explained in Annex 7.

Summary of recommendations

Recommendations to follow-up and/or reinforce initial benefits from the project

No.	TE Recommendation	Entity responsible	Time frame
1	FECO should consider organization of additional workshops and seminars for dissemination results of the BAT/BEP demonstration, in particular the detailed technical protocols for replication among the companies selected for participation in the National Replication Plan	FECO	Immediately
2	FECO in cooperation with the management of the Anhui Tongling Industrial Park should ensure collection and proper dissemination of experience for the benefit of other secondary non-ferrous metal industrial parks in China	FECO	Immediately

Recommendations to improve programming and preparation of projects

No.	TE Recommendation	Entity responsible	Time frame
3	UNDP in cooperation with FECO should ensure that all necessary documentation is provided by the outsourcing kept on file ensure sufficient flow of information and documents between the project implementing teams and the outsourcing partners.	UNDP CO and FECO	Immediately
4	UNDP CO should ensure that design of future projects on introduction of BAT/BEP are based on a clear theory of change and a related coherent results framework with clear definition of timing for implementation of the individual components	UNDP CO	Immediately
5	UNDP CO should ensure that project indicators and their target values are correctly formulated to measure delivery at the project output and outcome levels and that progress towards achievement of results is regularly assessed	UNDP CO	Immediately
6	UNDP CO in cooperation with FECO should include assessment of effectiveness of capacity building activities in future technology conversion projects	UNDP CO	Immediately
7	For GEF-funded projects, UNDP CO and the national implementing partners should track actual levels of co-financing during implementation and report the actually realized levels of co-financing in annual PIRs	UNDP CO	Immediately
8	For GEF-funded projects, UNDP CO and the national implementing partners should increase the number of outreach activities and enlarge the focus of the trainings and numbers of people to be trained	UNDP CO	Immediately

INTRODUCTION

In line with the GEF Evaluation Policy, a Terminal Evaluation (TE) is undertaken at completion of the GEF-funded projects to assess their performance (in terms of relevance, effectiveness and efficiency), and determine outcomes and impacts (actual and potential) stemming from the project, including their sustainability. It is conducted to provide a comprehensive and systematic account of the performance of a completed project by assessing its design, implementation, and achievement of objectives. TE is also expected to promote accountability and transparency, facilitate synthesis of lessons learned, and provide feedback to allow the GEF to identify issues that are recurrent across the GEF portfolio.

This document presents results of the Terminal Evaluation of the UNDP/GEF project "UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China" (further referred to as the "Secondary Copper project"). As a standard requirement for all projects financed by GEF, this terminal evaluation has been initiated by the Lead Implementing Agency, in this case UNDP Country Office (CO) in China. The evaluation was conducted in accordance with the GEF Monitoring and Evaluation Policy[2], the Guidelines for GEF Agencies in Conducting Terminal Evaluations[3], and the UNDP Evaluation Guidance for GEF Financed Projects[4].

Evaluation purpose

The purpose of TE is to provide the project partners i.e. GEF, UNDP and the Government of China with an independent assessment of the key achievements of the project as compared to the original Project Document for the implementation period of the project. TE will assess the expected outcomes and their sustainability through measurements of the changes in the set indicators, summarize the experiences gained, identify and highlight lessons learned, and make recommendations for the future.

The Terms of Reference for the Terminal Evaluation is provided as Annex 1 to this report.

Scope of the evaluation

The evaluation covers all activities undertaken in the framework of the project. The time focus of the evaluation is the implementation period of the project from August 2016 through August 2021. The geographic focus of the evaluation is China.

The evaluation used a participatory and consultative approach to inform and consult with all key stakeholders associated with the project, in particular the Government counterparts, the GEF

[2] The GEF Monitoring and Evaluation Policy, Global Environmental Facility, November 2010

[3] Guidelines for GEF Agencies in Conducting Terminal Evaluation for Full-sized Projects, GEF, 2017 (http://web.undp.org/evaluation/guideline/index.shtml)

[4] Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects, UNDP, 2020 http://web.undp.org/evaluation/guideline/documents/GEF/TE_GuidanceforUNDP-supportedGEF-financedProjects.pdf

operational focal point, the UNDP Country Office, the National Project Team, the UNDP/GEF Technical Adviser, representatives of the project ultimate beneficiaries, and others.

Methodology

The evaluation used the primary evaluation criteria listed in the Terms of Reference for the evaluation, i.e. relevance, effectiveness, efficiency, sustainability, and impact of interventions. Since it may take some time for the impacts to be realized, the evaluation aimed at determining the level of progress towards realization of planned impacts.

Data collection and analysis

The following text provides a conceptual framework of methodology for data collection and analysis under the evaluation criteria. The methodology includes i) interviewing different stakeholders, ii) reviewing available documents from different project stages, iii) on-site visiting and discussion with people in the plants and around, iv) discussion with government officers and as well as v) round-to-round feedbacks from FECO and demonstration plants. Since many documents were available in Chinese only, the collection of information and the understanding of the linkages to project activities or outputs took much longer than expected.

Relevance

Conceptualization/Design

The evaluation assessed whether the approach used in design and selection of project interventions addressed the root causes and principal threats in the project area. This also included an assessment of the project logical framework and whether the different project components and activities proposed to achieve the objective were appropriate, viable and responded to contextual institutional, legal and regulatory settings of the project. Furthermore, it assessed the indicators defined for guiding implementation and measurement of achievement and whether lessons from other relevant projects (e.g., same focal area) had been incorporated into project design.

Country ownership and stakeholder participation

The evaluation assessed the extent to which the project idea/conceptualization had its origin within national and sectoral development plans and to what extent it focused on national environment and development interests., including changes over time. It also provides assessment of information dissemination, consultation, and stakeholder participation in design stages of the project.

Replication and linkages

The evaluation determined the ways in which lessons and experiences coming out of the project were/are to be replicated or scaled up in the design and implementation of other projects (this is also related to actual practices undertaken during implementation). It looked at linkages between

the project and other interventions within the sector and the definition of clear and appropriate management arrangements at the design stage. This element also addressed the question of to what extent the project addressed UNDP priorities and cross-cutting issues such as gender, south-south cooperation, and poverty-environment linkages (sustainable livelihoods). It also examined linkages between the project and the UNDP normative programming instruments and response of the UN system to national development priorities in the form of UNDAF and CPD for the recipient country.

Effectiveness and efficiency

Implementation approach

This part of the evaluation assessed of the following aspects:

- The use of the logical framework as a management tool during implementation and any changes made to the framework as a response to changing conditions and/or feedback from monitoring and evaluation (M&E) activities if required;
- Other elements that indicate adaptive management such as comprehensive and realistic work plans routinely developed that reflect adaptive management and/or; changes in management arrangements to enhance implementation;
- The project's use/establishment of electronic information technologies to support implementation, participation and monitoring, as well as other project activities;
- The general operational relationships between the institutions involved and others and how these relationships have contributed to effective implementation and achievement of project objectives;
- Technical capacities associated with the project and their role in project development, management and achievements.

Monitoring and evaluation

Under the M&E, the evaluation included an assessment as to whether there has been adequate periodic oversight of activities during implementation to establish the extent to which inputs, work schedules, other required actions and outputs proceeded according to plan; whether formal evaluations have been held and whether action has been taken on the results of this monitoring oversight and evaluation reports.

Stakeholder participation

This included assessments of the mechanisms for information dissemination in project implementation and the extent of stakeholder participation in management, emphasizing the following:

- The production and dissemination of information and lessons generated by the project;
- Local resource users and NGOs participation in project implementation and decision making and an analysis of the strengths and weaknesses of the approach adopted by the project in this field;

• The establishment of partnerships and collaborative relationships developed by the project with local, national and international entities and the effects they have had on project implementation;

• Involvement of governmental institutions in project implementation and the extent of governmental support to the project.

Financial planning and procurement management

The assessment in the field of financial planning looks into the actual project cost by objectives/outputs/activities and the cost-effectiveness of achievements, financial management (including disbursement issues) as well as co-financing of the project. It assessed technical and human resource capacity for procurement, linkage between work programming and procurement planning and budgeting as well as effectiveness of procurement management.

Assessment of project results

The GEF Monitoring and Evaluation Policy (2019[5]) specifies that terminal evaluations will, at the minimum, assess achievement of outputs and outcomes, and report on these. While assessing a project's results, the evaluation determines the extent to which the project objectives – as stated in the documents submitted at the GEF CEO Endorsement stage – have been achieved. The evaluation also indicated any changes in project design and/or expected results after start of implementation.

Attainment of outcomes/ Achievement of objectives

Through review of the project results framework, the evaluation revisited the original outcome model (also known as the results map) in the Project Document and examined the causal logic of the initiative under evaluation and whether and eventually how it developed during the life of the project. The revisited outcome model served as a map that captures knowledge of project stakeholders and boundary partners about how an outcome is intended to be achieved. The model also identified the intended target group of the initiative at the outcome level and the expected changes that the initiatives will contribute to.

Sustainability

The assessment of sustainability included the extent to which benefits continue, within or outside the project domain after GEF assistance/external assistance has come to end as well as eventual development of a sustainability strategy.

Progress to impact

It is often too early to assess long-term impacts of GEF projects at the point of project completion, hence the evaluation assessed whether there is any evidence on progress towards long-term impacts as well as the extent to which the key assumptions of the project's theory of

[5] https://www.gefieo.org/evaluations/gef-me-policy-2019

change hold and the extent to which the eventual progress towards long-term impact may be attributed to the project.

In addition to the analysis of progress to impacts in terms of available qualitative and quantitative evidence on environmental stress reduction, the evaluation also examined the project's contributions to changes in policy/legal/regulatory framework, including reported and/or observed changes in capacities (awareness, knowledge, skills, infrastructure, monitoring systems, etc.) and in access to and use of information (laws, administrative bodies).

Other assessments

The evaluations assessed the following additional topics for which ratings are not required:

- Materialization of co-financing: the evaluation provides information on the extent to which expected co-financing materialized, whether co-financing was cash or in-kind, whether it is in form of grant or loan or equity, whether co- financing was administered by the project management or by some other organization, how short fall in co-financing or materialization of greater than expected co-financing affected project results, etc.

- Gender Concerns: The evaluation makes assessment of the extent to which the gender considerations were taken into account in designing and implementing the project, the extent to which the project was implemented in a manner that ensures gender equitable participation and benefits, and whether gender disaggregated data was eventually gathered and reported on beneficiaries.

Structure of the evaluation report

The structure of the TE report follows the "Evaluation Report Outline" presented in Annex F of the ToR of the assignment (contained in Annex 1 to this report).

The 'Executive Summary' of the report is provided in the beginning of the report. The body of the report starts with introduction and development context of the project and continues with a short project description. This is followed by the chapter that sets out the evaluation findings presented as factual statements based on analysis of the collected data. The findings are structured around the five essential evaluation criteria and include assessment of the project performance against the performance indicators and their target values set out in the project results framework (as provided in the Project Document). This part further includes assessment of the project management arrangements, financing and co-financing inputs, partnership strategies and the project monitoring and evaluation systems.

The final part of the report contains conclusions and recommendations substantiated by the collected evidence and linked to the evaluation findings. While the conclusions provide insights into identification of solutions to important issues pertinent to the project beneficiaries, UNDP and GEF, the recommendations are directed to the intended users in terms of actions to be taken and/or decisions to be made. This part of the report concludes with lessons that can be taken from the evaluation, including best (and worst) practices that can provide knowledge gained

from the particular project circumstances (such as programmatic methods used, partnerships, financial leveraging, etc.) that are applicable to similar UNDP interventions.

Evaluation ethics

The evaluation was conducted in accordance with the ethical principles outlined in the UNEG Ethical Guidelines for Evaluations, namely the four guiding ethical principles for evaluation: Integrity, Accountability, Respect, and Beneficence[6].

Limitations of the evaluation

Since visit of the international consultant was not possible due to the COVID-19 travel restrictions, interviews with selected project stakeholders were conducted remotely through digital platforms. This limited the ability of the evaluation team to use direct observation at the stakeholder and beneficiary institutions for gathering additional information, triangulating previously obtained information, and getting a broader picture of the stakeholders' activities. To minimize this influence, on-site visit by the national consultant was arranged and feedbacks were collected from the demonstration companies.

[6] UNEG Ethical Guidelines for Evaluation, 2020 http://www.unevaluation.org/document/detail/2866

PROJECT DESCRIPTION

Project start and duration

The project was approved by GEF CEO on 5 May 2016, for as a five-year full-size GEF project. The LPAC meeting was held on March 4, 2016 and inception workshop was held on 12 November 2016. The signature of the Project Document by the Government of China on 16 June 2016 officially marked the start of the project implementation. Date of MTR report is 23 September 2019. Mid-term Review was completed on March 30, 2020. The operational closure date was 03 August 2021.

Development Context

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) are listed in the Stockholm Convention Annex C as unintentionally produced Persistent Organic Pollutants (UPOPs). They occur as by-products of many industrial processes, such as metallurgical processes, the incineration of chlorine-containing substances etc.

In addition to UPOPs listed in Annex C of the Stockholm Convention, direct drying or combustion of these raw materials will produce a variety of pollutants, including carbon oxides (CO_x), nitrogen oxides (NO_x), particulate matter (PM) and metal compounds, as well as organic carbon compounds.

Secondary copper smelting involves copper production from sources that may include copper scrap, sludge, computer and electronic scrap, and drosses from refineries. Processes involved in copper production are feed pre-treatment, smelting, alloying and casting. Factors that may give rise to chemicals listed in Annex C of the Stockholm Convention include the presence of catalytic metals (of which copper is a highly effective example); organic materials in feed such as oils, plastics and coatings; incomplete combustion of fuel; and temperatures between 200 °C and 500 °C.

In addition to PCDD/Fs, other UPOPs, such as PCBs, HxCBz, PeCBz and PCNs, are also released from secondary copper production processes. The concentrations of them are generally higher than those of PCDD/Fs, up to several orders of magnitude.

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. As part of the preparation of China's National Implementation Plan on POPs (NIP, 2007), a UPOPs inventory based on the UNEP toolkit estimated total PCDD/Fs emission from secondary copper production sector 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.

According to data from "the China Nonferrous Metals Industry Association[7], the production of secondary copper in China increased rapidly from 2004 to 2017, reaching 2.30 million tonnes in 2017 and accounting for 59% of global production. 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.

Problems that the project sought to address

The Secondary Copper project aimed to address UPOPs emissions in the secondary copper production sector in China through promotion and demonstration of BAT/BEP and development of a National Replication Plan (NRP) for dissemination of demonstration results. The overall project strategy was to blend the GEF funding into the overall national secondary copper production management system development while ensuring that international best practice experience and technology options are considered in the process.

The National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants, completed and approved by the State Council in 2007, is the principle national plan directly pertinent to this project. The action plan placed a high priority on reduction of unintentionally produced POPs (UPOPs) release. The NIP lists the secondary nonferrous metal industry as one of six priority industries to be targeted for control of PCDD/Fs releases. The PCDD/Fs emission by the secondary copper production industry is 70.45% of the total PCDD/Fs emission of the secondary nonferrous metal industry.

In 2010, a national level strategy "Guidance on strengthen dioxin prevention and control " also offers the framework on reduction of PCDD/Fs emission. The Guidance set up a comparatively dioxins pollution control system and long-term supervision mechanism by 2015. Secondary nonferrous metal production industry is listed as one of four key industries and related requirements on strengthen pollution prevention and control is raised in the Guidance. In 2015, a guidance document "Technical Policy on Strengthen Dioxin Prevention and Control in key industries" provides technological route and methods on reduction of dioxin emission in secondary copper production sector, including full process control and encourages research and development of new technology. The project activities will effectively support the implementation of the national strategy.

The project was designed to address major barriers to the adoption of environmental sound management in the secondary copper production sector which include:

- **Regulatory Barriers:** Incomplete legal/regulatory framework and lack of capacity in policy enforcement at national, industrial and local level,

[7] The Yearbook of Nonferrous Metals Industry of China, (2018)

- **Awareness Barrier:** Limited attention paid in the past to proactively support and coaches the existing secondary copper production sector to improve pollution control and environmental management. This has been due to the fact that most of the focus has been on the sector's growth, to operate as a resource renewable industry in China,
- **Technology Barrier:** Limited access to international Best Available Techniques/Best Environmental Practices (BAT/BEP) related to secondary copper processing technologies and limited ability/capacity to pilot and demonstrate it,
- **Private-Sector Barriers:** Limited access to international experience in implementing and sustaining a PPP-based management system both financially and operationally (some secondary smelters are state owned, some by private sector enterprises, and some others with joint ownership by the state and private sector enterprises), and
- **Institutional Barrier:** Insufficient capacity to undertake monitoring of the pollution caused by the secondary copper smelting and dealing with both socio-economic and environmental legacies.

Immediate and development objectives of the project

The project overall objective is stated as follows: "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). In this project, 407.69 g TEQ dioxin reduction has been finally achieved through NRP (386.52 g TEQ reduction in flue gas and 21.17 g TEQ residues reduction). In two demonstration enterprises, 46.20 g TEQ annual dioxin reduction were achieved (43.48 g TEQ reduction in flue gas and 2.72 g TEQ reduction in residues)

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

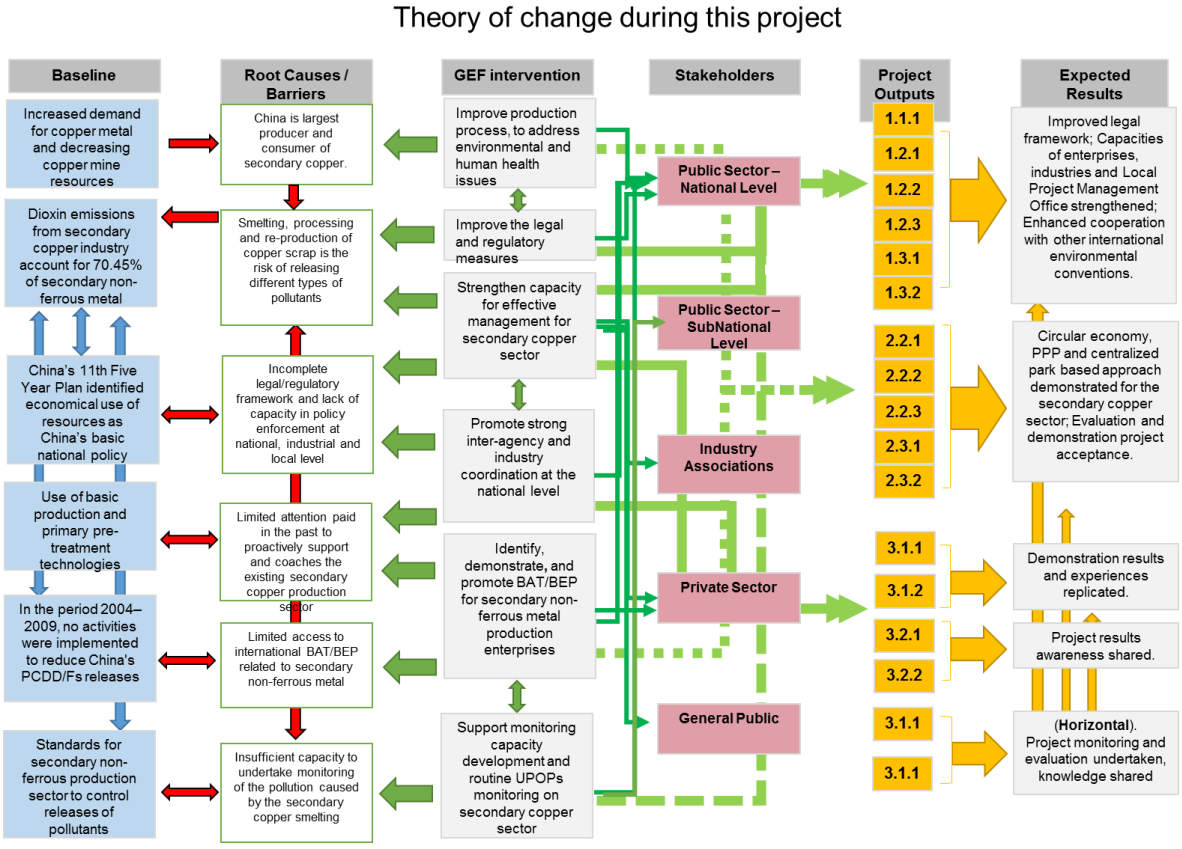
Description of the project's Theory of Change

A project's theory of change provides a basis for evaluation of the project resources, activities and results. The terminal evaluation will assess description of the project's theory of change including description of the project's outputs, outcomes, intended long-term environmental

impacts of the project, causal pathways for the long-term impacts as well as implicit and explicit assumptions.

There is no explicit Theory of Change (ToC) in the Project Document that would demonstrate the relation between the project activities, outputs and outcomes. Instead, the ProDoc contains a graphic display of relations between individual project components[8]. In order to reconstruct the ToC, the evaluation team held consultations with different project stakeholders. The ToC that was developed during the implementation of the project, is shown on Display 1

Display 1: The reconstructed Theory of Change



The project results framework in the approved Project Document consists of 4 Components and total of 10 outcomes and 20 outputs.

Outcome 1.1 was designed for support to development and improvement of a sector-related governance and regulatory framework to increase control and reduce UPOPs emission, e.g. through the development of environmental policy, technical standards and technology management documents, industry entry condition, etc.

Outcome 1.2 focusses on capacity building of enterprises, industries and the Local Project Management Office for effective management and monitoring of the secondary copper sector.

[8] The PRODOC template for GEF-6 projects did not require inclusion of an explicit ToC diagram.

Outcome 1.3 aims at enhancing communication and cooperation with other international environmental conventions.

Outcome 2.1 focusses on demonstration of BAT/BEP technologies in the secondary copper sector.

Outcome 2.2 was designed to demonstrate principles of circular economy and PPP-based industry chain management in the secondary copper production sector.

Outcome 2.3 was designed for evaluation of the demonstration projects and their acceptance.

Outcome 3.1 focusses on development of a national replication plan for BAT/BEP in the smelting and dismantling of secondary copper.

Outcome 3.2 accommodates promotional events for public awareness raising.

Outcome 4.1 focusses on project monitoring and evaluation.

Outcome 4.2 was designed for knowledge sharing and information dissemination.

The complete project results framework is provided as Annex 3.

Expected results

The overall expected results of the project were the reduction and elimination of PCDD/Fs, HCB and PCNs releases through the introduction and demonstration of BAT/BEP in the secondary copper production sector in China. Consistent with this objective, the five-year project aimed at reduction of negative impacts on human health and the environment. In addition, project management capacity was expected to be strengthened to achieve implementation effectiveness and efficiency.

This project was expected to generate multiple benefits for the global environment not only in terms reduced UPOPs releases from the sector but also in terms of reduced energy consumption, and reduced GHG (Greenhouse Gas) emissions from the secondary copper sector.

The direct global environmental benefits result from a significant reduction of UPOPs releases, that would otherwise be released on an ongoing basis if no adoption of sustainable BAT/BEP would take place. At baseline level, the estimated total dioxins releases from the secondary copper sector was estimated at 1,133.8 g TEQ/a, made up of atmospheric emissions of 403 g TEQ/a, and fly ash emissions of 730.8 g TEQ/a, respectively.

Table 1 below provides the expected results as per the approved Project Document.

Table 1: Expected results at the level of the Project Objective

Result	Indicator	End-of-project Targets
Project 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	Quantity of UPOPs reduction at the demonstration locations	11.88 g TEQ dioxin in two demonstration enterprises reduced through BAT/BEP demonstration in project period
	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.
	Number of new technologies demonstrated	At least 2 BAT/BEP key technologies demonstrated to meet pollution control standards Relevant technical guidelines finalized
	Number of officials, decision-makers, and workers trained on sound secondary copper processing	At least 300 officials and 2,000 technical workers trained on BAT/BEP and sound secondary copper processing

Total resources

The GEF project grant approved for the project amounts to US$ 12,600,000 complemented with US$ 52,450,000 expected co-financing by several stakeholders (the Government, private sector, UNDP and institutes). The total resources committed to the project at inception was thus US$ 65,050,000.

Key project stakeholders and partners involved

Key partners involved in the project, include UNDP, other joint implementing partners, executing agencies, country counterparts – including the GEF Operational Focal Point – and other key stakeholders. Stakeholder engagement is an inclusive and continuous process between a project and those potentially impacted that encompasses a range of activities and approaches. It is arguably one of the most important ingredients for a successful project delivery and therefore an essential element of this project.

The Project Document does not contain analysis of the project stakeholders and their roles at the project inception. However, key stakeholders are listed under the Management Arrangement albeit some of them only in generic terms.

Table 2 below provides a detailed list of stakeholders as well as their roles in the project implementation is provided key government agencies important for the project and their respective areas of responsibility.

Table 2: Key project stakeholders and their responsibilities

Stakeholder	Responsibility
Ministry of Environmental Protection (MEP)	National Implementing Agency for this project. As the administrative authority on environmental protection designated by the State Council as the core agency for coordination of all POPs related activities and the focal point for the implementation of the Stockholm Convention in China. Its responsibilities will include (1) responsible for the project in general and ensure its successful implementation and quality; (2) to provide political direction and guidance to FECO; (3) coordination with stakeholders, including GEF, donors, IAs, and relevant domestic ministries and agencies, including the member commissions and ministries of the NCG; (4) development/issuance/implementation of national policy and standards to regulate environmental performance of the secondary copper production management system; (5) Identification of BAT/BEP technology requirements; (6) qualification and permitting of secondary copper production management processing facilities; (7) supervision of the enforcement of environmental policies and performance requirements applied to secondary copper production management; (8) supervision the disclosure of environmental information; and (9) supervision of the day-to-day management of the project.
National Development and Reform Commission (NDRC)	NDRC is responsible for developing macroeconomic plans and pilot projects related to the socially-, economically- and environmentally-responsible treatment of secondary metals production. It issues and enforces overall national industrial policies and undertakes policy level scope definition of secondary copper production industry management.
Ministry of Industry and Information Technology (MIIT)	MIIT provides technical and policy guide to MOF, MOC, NDRC and MEP on development and implementation of the secondary copper production industry management system including identification of technology requirements.
Ministry of Finance (MOF)	As the country's GEF Operational Focal Point, MOF has the overall responsibility for national GEF programme. It reviews, endorses and supervises preparation and implementation of GEF funded projects, receives and supervises use of the GEF grant.
National Steering Group (NSG)	NSG is an inter-ministerial steering group consisting of NDRC, MEP, MIIT, and MOF to provide overall guidance and coordination for the implementation of relevant activities and legislative measures, to ensure the committed inputs and contributions are available as needed.
Foreign Economic Environmental Cooperation Centre Cooperation Office Ministry of Ecology and Environment (FECO/MEE)	FECO is an inter-departmental coordination unit of MEE and acts as the secretariat of the NSG. It is responsible for day-to-day compliance with the Stockholm Convention in China. FECO's responsibilities include: (1) provision of technical support for international negotiations and policy studies on the Stockholm Convention, (2) provision of support to the development and implementation of corresponding policy and regulations, as well as coordination of key governmental stakeholders, (3) mobilize co-financing for the project from bilateral and domestic governmental and private sources, (4) collecting data and information, compiling reports, organizing trainings, and publishing information. In this project, FECO will represent MEE to provide political guidance to the implementation of this project, coordinate with various stakeholders with TCG and other appropriate approaches, and to ensure that the project produces the results specified in the project document, to the required standard of quality and within the specified constraints of time and cost.
China Nonferrous Metals Industry Association	The Association is responsible for coordination and support compliance actions within the secondary copper production sector; as well as for facilitation of information exchanges among the members; and formulation of sector development strategies.
Private sector entities	The private sector entities provide financing, business planning and detailed design on the development and operation of secondary copper production facilities, participate in BAT/BEP identification and the demonstration activities, provide investment in their facilities and comply with national and local environmental policies and standards to achieve UPOPs reduction.
General public, NGOs (International/National/Community levels).	Through public awareness activities on UPOPs issues, general public is informed and exercise consumer's rights to influence environmental performance of the secondary copper production sector. NGO organizations assist in communication activities at the national and local levels support awareness raising on sound management of wastes in secondary copper production and be invited to participate in the assessment of the effect of the implementation of the project.

FINDINGS

Project Design/Formulation

This section provides a descriptive assessment of the achieved results. In addition, several evaluation criteria are rated in line with the requirements for Terminal Evaluations for UNDP/GEF projects.

Analysis of the project results framework

This section makes an assessment of the Project Results Framework （PRF）in terms of clarity, feasibility and logical sequence of the project outcomes/outputs and their links to the project objective. It also examines the specific indicators and their target values in terms of the SMART[9] criteria.

The PRF comprises 5 substantive components and total 11 outcomes and 21 outputs. For measurement of progress towards the planned results, there are 33 indicators and relevant targets, formulated at the level of the project outcomes. However, some of the indicators are purely defined and can't be tracked by the relevant target values.

The evaluators found the PRF well-structured with few inconsistencies in definition of the indicators and their targets as summarized in Table 3 below.

Table 3: Inconsistency in the Project Results Framework

Project result	Indicator/Target	Comments
Project Objective:	Number of facilities replicating or establishing environmentally sound secondary copper production	The target does not measure achievement of the indicator
	BAT/BEP integrated into development plan of secondary copper production sector	
Outcome 1.1 Improved legal framework through policy research for the secondary copper production sector	International knowledge and experience gained	The target is too general without specific measurable value
	International exchanges conducted	
Outcome 1.2 Capacity of enterprises, industries, Local Project Management Office strengthened to facilitate effective management and monitoring of the secondary copper sector	Capacity for supervision and management strengthened	The target measures an activity (training) but not the outcome (improved capacity)
	2 times of training and technical exchanges conducted, covering over a total of 50 management officers	
Outcome 1.3 Enhanced cooperation with other international environmental conventions	International exchange meetings	The target is too general without specific measurable value
	Meetings conducted	
Outcome 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	The target does not measure achievement of the indicator
	Research and analysis on approach and mechanisms to generate maximum benefits for effective management conducted and documented	

[9] SMART stands for Specific, Measurable, Attainable, Relevant, Time-bound.

Assumptions and risks

Identification of risks enables the implementing partners to recognize and address challenges that may limit the ability of the project to achieve the planned performance outcomes.

A preliminary risk analysis was conducted at the Project Identification Form (PIF) preparation stage and identified 2 types of risks preventing successful achievement of the project objectives, namely:

(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.

The PIF also provided corresponding mitigation measures.

This preliminary risk analysis from the PIF stage was in full incorporated into the Project Document. There are additional 12 risks and corresponding assumptions listed in the PRF in relation to individual project outcomes. None of the identified risks were ranked in terms of probability and impact that would allow for classification of critical risks (high in probability and impact) for further monitoring during the project implementation.

The Project Implementation Reviews (PIRs) for 2017 and 2018 do not list any critical risks. However, the 2019 PIR included the risk (2) above as critical. The 2020 PIR reports both the above risks as critical and provides corresponding mitigation measures as summarized in Table 4 below.

Table 4: Critical project risks and corresponding mitigation measures

Risk description	Mitigating actions
Failure to successfully test identified BAT/BEP options for the sector	The project carried out intensive research on BAT in developed countries. Combined with the situation of China's secondary non-ferrous metal industry and referring to the UPOPs pollution prevention technology of other industries such as the domestic waste incineration industry, the feasibility of BAT for the demonstration was systematically studied, and the opinions of technical feasibility, economic efficiency, sustainability, applicability, etc from industry experts and enterprise experts were widely solicited.
Failure to promote sector-wide adoption of tested BAT/BEP options and PPP-based industry chain management.	The project formulated the technical specifications for the application and issuance of pollution emission permit for secondary non-ferrous metals industry. According to BAT/BEP demonstration experience and BAT using in developed countries, feasible pollution control technologies were recommended. In addition, the project has continuously promoted BAT to enterprise managers through NRP publicity and training.

The evaluators conclude that both the risk identification at the project inception as well as the risk reporting and management during the implementation were performed thoroughly and critical risks were monitored and reported in the PIRs in line with the standard requirement for UNDP/GEF projects.

Lessons from other relevant projects incorporated into project design

In the summary of baseline situation, the Project Document does not mention any experience and/or associated interventions relevant for the project design phase.

The most relevant for the Secondary Copper project was the GEF-5 project "Dioxins Reduction from the Pulp and Paper Industry in China", implemented by the World Bank in 2012-2017 that supported developing and adopting a long-term action plan for pulp and paper sector-wide adoption of BAT/BEP. However, no lessons from this or any other SC projects were considered for the design of the Secondary Copper project due to the different technologies used.

Planned stakeholder participation

The Project Document provides an outline of key stakeholders involved in secondary copper production sector management and development in China. At the national level, three governmental agencies play the key roles in legislation, management, monitoring and communication of secondary copper production sector.

The Ministry of Environmental Protection (MEP), today Ministry of Ecology and Environment (MEE), focuses on pollution prevention and control for all kinds of industrial sectors. It is mainly responsible for the development, organization, implementation and supervision of plan, policies, standards and technical guidelines in the environmental protection area. MEE has a designated Foreign Economic Cooperation Office (FECO) as the MEE implementing arm for activities related to China's obligations under multilateral environmental conventions.

The National Development and Reform Commission (NDRC) is responsible for formulation and implementation of strategies for national economic and social development and coordinating major economic operations. The NDRC also plays a leading role in promotion of sustainable development, in terms of formulation of plans for energy saving and emission reduction, recycling, environmental protection, and promotion of cleaner production.

The Ministry of Industry and Information Technology (MIIT) focuses on industrial production management and is mainly responsible for development, organization, implementation and supervision of plan, policies, standards and technical guidelines in the industrial development area.

The industry stakeholders are represented by the China Nonferrous Metals Industry Association Recycling Metal Branch (CMRA) that plays an important role in developing international cooperation and exchanging, promoting the advancement of science and technology as well as commercial exchanges in the secondary metals industry. The main entry point for involvement of key project stakeholders in the project was supposed to be meetings of the Project Board (PB).

Replication approach

The replication approach of the project is embedded in its Component 3 that was designed for development of a national replication plan of BAT/BEP for secondary copper smelting and dismantling. This approach seeks to ensure replicability by promoting and disseminating the project results and lessons learned through involvement of national, provincial and local governmental organizations, institutes and enterprises and dissemination of relevant information.

UNDP comparative advantage

UNDP is well equipped to assist developing countries in addressing their needs and priorities due to its focus on poverty reduction, pro-poor economic policies and environmental sustainability. With its permanent presence in nearly 170 countries and long-term relationships between UNDP and the vast majority of nations, the Organization serves as a key bridge between the world-wide vision of development as a core UN pillar and its sustainable achievement in individual states and lives – offering the global partnership, support, collaboration, expertise, and often funding, required. Hence, the organization has tools to support countries in pursuing balanced inclusive and sustainable growth patterns.

The essence of UNDP's comparative advantage for the GEF-funded projects is embedded in its global network of country offices, its experience in integrated policy development, human resources development, institutional strengthening, and non-governmental and community participation. In addition to UNDP proven track record on promoting, designing and implementing activities consistent with the GEF mandate and national sustainable development plans of the developing countries, UNDP also has extensive inter-country programming and implementation experience.

Since 2004, UNDP has been assisting dozens of developing countries and countries with economies in transition in their efforts to sustainably manage the use, disposal, and destruction of POPs, working with private sector partners and NGOs. A key part of UNDP's comparative advantage is the role of knowledge management broker, i.e. in accumulation of first-hand experience from implementation of projects in this specific technical area. UNDP has built on its long-standing experience in developing and implementing coherent packages of "hard" and "soft" interventions that make technology transfer successful when complemented by targeted strengthening of relevant human and institutional capacities.

Linkages between the project and other interventions within the sector

The Project Document does not mention any previous or parallel interventions within the secondary metals sector. No links of the SCP to other interventions within the sector were identified during the data collection for the Terminal Evaluation.

Gender responsiveness of the project design

The project gender approach was based on a plan to establish occupational health and safety management system for strengthening corporate operational capabilities and enhance environmental awareness of personnel. This includes training of female workers at the demonstration enterprises and undertaking actions for enhanced occupational and health protection and emission exposure management.

The BAT/BEP replaced 25 jobs including two for women, while the enterprises created 86 new employment opportunities from expanding their operations. Both, women and men, equitably participated in the project BAT/BEP selection in the replication enterprises, 21.3% of women

members in the BAT/BEP selection teams, which is more than women's share in the total employees (8.7%); application of the BAT/BEP did not lead to job-lose of any staff because the enterprise created more jobs from enlarging their production scale, while it resulted in job adjustment for both men and women. In order to equitably engage women and men in the project, and make the project benefit the both equally, a gender mainstreaming action plan (GMAP) has been developed in early 2020. The GMAP proposes actions mainly to the consulting teams who evaluate the demonstration enterprises and publicize experience from the demonstration enterprises, and to the replication enterprises. The objective of the GMAP is to empower women and promote gender equality. Both women and men highly and positively appraised the project in terms of the results of implementation of the project introduced BAT/BEP, and thought that the BAT/BEP not only advanced the technologies, also reduced risk of UPOPs emission and pollution.

The gender mainstreaming comprises two overarching interventions – awareness raising and multi-stakeholder's participation for developing measures for reduced exposure to dioxins and heavy metal emissions during secondary copper smelting process, including conduct of periodic occupational medical examinations to minimize adverse impact on human health. The project ultimate goal, reduction of UPOPs releases from the secondary copper smelting processing, reduces the health risks for female workers that constitute a sizeable proportion of the work force.

Upon the on-site observations in the demonstration plants, the working conditions have been improved with this project. Employment of female workers have been more favourable and their numbers have been increasing.

Social and environmental safeguards

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 UPOPs in China. Such releases are not only impacting the workers in this sector, but also surrounding communities, impacting the environment and human health at local as well as global level.

During social and environmental screening, both the benefits and risks can be identified. The benefits are clear and obvious with technology improvement, public awareness improvement, infrastructure improvement and standards/policy improvement. With the operation of this project, it is believed to enhance the social and environmental sustainability by initiating UPOPs reduction in secondary copper industry and beyond. In two demonstration plants, 11.88 g TEQ dioxin reduction has been observed through BAT/BEP demonstration in project period. Reduction of 396 g TEQ dioxin in secondary copper production sector nationwide is expected through implementation of the national replication programme. The environmental risks have

been proved to be low through observation and interview as well as the production results. The working environment has been improved during this project, that the awareness of UPOPs reduction and environmental protection from workers and the public around the plants has been largely improved.

Management arrangements

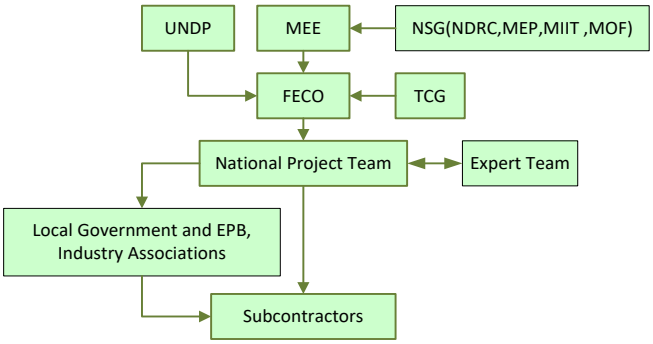
The project was designed for implementation according to the National Implementation Modality (NIM) in line with the Standard Basic Assistance Agreement between UNDP (the GEF Implementing Agency for the project) and the Government of China (GoC) with the Ministry of Ecology and Environment (MEE) designated as the institution of the GoC responsible for the daily execution and coordination of the project.

MEE has appointed FECO as the entity in the implementation of activities relating to fulfilling China's obligations under multilateral environmental conventions.

Under the management arrangements outlined in the Project Document, MEE responsibilities included overall responsibility for the project implementation and quality of results, coordination with various project stakeholders, including relevant GoC ministries and agencies, and oversight of the day-to-day management of the project.

The project management structure outlined in the Project Document is in Display 2 below.

Display 2: The project management structure (as outlined in the Project Document)



The actual overall management of the project was carried on by the FECO who identified and appointed various contractors for delivery of the project outputs, monitored progress in implementation and evaluated the deliverables. It also contracted national experts and research institutions to undertake the various studies and local government institutions and private entities to implement the pilot demonstrations.

A National Project Team (NPT) was established for day-to-day management of the project consisting of a Project Manager and two Project Coordinators. A technical expert and a policy expert were hired to provide technical support and strengthen the capacity of the NPT.

In addition to the above, the Project Document envisaged establishment of a Local Project Management Office (LPMO) for management of the project demonstration activities in the selected province. under this project. The responsibility of the LPMO included organization and implementation of the project demonstration activities implementation, development of annual work plans and budgets and the submission to FECO; coordination with local stakeholders and collection of information for preparation of the required reports.

The LPMO function was assumed by the Solid Waste Management Centre of the Jiangxi Province that performed a key role in identification and selection of the enterprises for BAT/BEP demonstration and in selection of concrete BAT/BEP and development of implementation plans by the selected enterprises (Jiangxi Jinhui Environmental Technology Co, Ltd. and Jiangxi Zili Environmental Technology Co, Ltd.).

The Management Committee of Tongling Economic and Technological Development was contracted to implement the demonstration of the PPP-based industrial park and undertake day-to-day management of the park.

UNDP as the project Implementing Agency provided overall supervision consisting in collection of reports on the delivered results and communication the progress to the GEF.

Project Steering Committee

The Project Document envisaged establishment of a National Steering Group (NSG) consisting of the National Development and Reform Commission (NDRC), MEE, the Ministry of Industry and Information Technology (MIIT) and the Ministry of Finance (MOF). The NSG provided overall guidance and coordination for the implementation of relevant activities and legislative measures

Overview of the NSG meetings is in Table 5 below.

Table 5: List of meetings of the National Steering Group

No.	Date	Description
1	12 November 2016	70 representatives from GEF, UNDP, MoF, MIIT, MEE, Development Research Center of State Council, environmental protection department and industry associations, scientific research institutions and related enterprises of demonstration provinces attended the meeting
2	25 January 2018	30 representatives from UNDP, MEE/FECO, EPA of Jiangxi province, scientific research institutions and related enterprises of demonstration provinces attended
3	28 March 2019	20 representatives from UNDP, MEE/FECO, EPA of Jiangxi province, CMRA, scientific research institutions and demonstration enterprises attended the meeting
4	17 June 2020	16 representatives from MEE/FECO, EPA of Jiangxi province, and demonstration enterprises attended the meeting
5	3 March 2021	20 representatives from UNDP, MEE/FECO, EPA of Jiangxi province, CMRA, Management committee for Tongling economic development zone, scientific research institutions and demonstration enterprises attended the meeting

The Project Document stipulated that the NSG would meet twice a year or as needed. It follows from Table 5 that the NSG met approximately once a year. Meeting minutes of the NSG meetings are available in Chinese with the exception of the first meeting that was the project Inception Workshop attended by more than 70 representatives from GEF, UNDP, MOF, MIIT, MEP, the Development Research Centre of the State Council, environmental protection departments of the demonstration province, industry associations, scientific research institutions and related enterprises. The participants reached a consensus to promote the coordinated emission reduction of POPs by adopting a "from point to area" method and carried out project implementation plans, clarified project timetables and roadmaps as well as project training activities.

The NSG ensured inter-institutional coordination and engagement of various levels of public administration. This proved to be important for involvement of a variety of national experts and scientific institutions and delivery of high-quality technical inputs

The evaluators found the actual project management arrangements in line with the Project Document and consider them adequate for the size and complexity of the project.

Project Implementation

Adaptive management

GEF evaluations assess adaptive management in terms of the ability to direct the project implementation through adapting to changing political, regulatory, environmental, and other conditions outside of control of the project implementing teams. The adaptive approach involves exploring alternative ways to navigate the projects towards meeting the planned objectives using one or more of these alternatives. 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). 1 demonstration province, 2 demonstration companies, 3 demonstration parks and 18 incentive programme companies (8 Smelting companies &10 dismantling companies) were selected, and they are under the management of FECO. The local EPB which is the solid waste management centre of Jiangxi province (LPMO), shares the role of project management in the province.

Actual stakeholder participation and partnership arrangements

The project is based on a multi-stakeholder approach and strong participation by the government (at the national level as well as at the level of the demonstration province), research and scientific institutions and the private sector.

The stakeholder participation was particularly important for establishment of a PPP for industry chain management in secondary copper production through the development of the BAT/BEP demonstration under active involvement of the private sector (the demonstration enterprises) and the local government. This approach has ensured a strong ownership of the project by the stakeholders that was confirmed during the MTR field mission and interviews of the MTR consultants with the focal points of Jiangxi EPB and the demonstration enterprises as well as in the site visits).

Project finance and co-finance

The GEF grant for this project was approved at US$ 12,600,000 and together with expected co-financing of US$ 52,450,000 the total cost of the project at inception was US$ 65,050,000. Table 6 below displays the breakdown of expenditures from the GEF grant by the years of the project implementation period.

Table 6: Actual expenditures by years of implementation (as of 20 September 2021)

Project Component	Actual Expenditures (US$)						
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2016-2021**
Outcome 1	27,370.16	251,597.50	212,399.45	358,061.13	463,539.54	48,942.4	1,361,910.18
Outcome 2	4,062.41	986,751.70	2,878,657.16	269,733.29	452,463.94	704,393.36	5,296,061.86
Outcome 3	0	0.00	16,784.47	212.49	383,331.80	91,207.43	491,536.19
Outcome 4	14,905.87	38,043.08	42,991.63	47,098.17	27,067.52	91,746.21	274,688.67
Project Management	6,164.52	89,849.26	150,147.26	121,954.34	185,276.4	0	553,391.78
Total Expenditures	**54,518.96**	**1,366,241.54**	**3,300,979.97**	**797,059.42**	**1,511,679.20**	**936,289.40**	**7,990,703.6**
Exchange gain/loss	1245.46	-16,022.45	20,427.56	10,046.26	-56,522.86	-15,163.73	-56,079.28
Total	**53,748.42**	**1,350,219.09**	**3,321,407.53**	**807,105.68**	**1,455,066.34**	**921,125.67**	**7,934,624.32**

It follows from Table 6 that the total expenditure from the GEF funds at the project closure was US$ 7,990,703.6 that is 63,4% of the total GEF grant. Furthermore, the data in Table 6 demonstrate slow implementation particularly in 2019 when the delivery reached only 6.3% of the total GEF grant. This is due to strict financial regulations that payments are monitored through the whole life cycle. Therefore, the payment was delayed and split into different payment stages as the contract for carrying out the project is signed with different stakeholders. Although the overall payment rate of the project so far is low, all contracts have been signed, majority of activities completed and their products accepted, and payments are expected to be completed by the end of 2021. The evaluators found strong financial control over the project expenditures.

Table 7 below provides comparison of the planned and actual expenditures by the project components.

Table 7: Planned and actual disbursement of the GEF funds by components (as of 20 September 2021)

Project Component	Budget (US$)	Expenditures (US$)	%
Outcome 1	1,500,000	1,361,910.18	90.79%
Outcome 2	8,500,000	5,296,061.86	62.31%
Outcome 3	1,500,000	491,536.19	32.77%
Outcome 4	500,000	274,688.67	54.94%
Project Management	600,000	553,391.78	92.23%
Total	**12,600,000**	**7,990,703.6**	**63.42%**

The figures in Table 7 show uneven delivery under individual components of the project. While the expenditures under Outcome 1 reached 90.79%, the expenditures under Outcomes 3 and 4 were 32.77% and 54.94% of the planned budget, respectively. Outcome 3 was for replication of the demonstration activities hence the low delivery was caused by the fact that implementation of this component started effectively only in 2020 as can be seen from Table 6 above.

The data in Table 7 further show that the planned budget for project management is 4.8% of the total GEF grant. Such financial allocation is reasonable for the project of this size and complexity. However, actual expenditures on project management were about 8.8% of the total project expenditures but was still within the planned allocation for this budget line.

The project was designed to attract co-financing from several stakeholders. Therefore, the figures from Section III of the Project Document are taken further for analysis of the co-financing. Table 8 below compares the planned co-funding at the project inception with the actually realized co-financing at the completion of the project.

Table 8: Comparison of planned and actual co-financing by source in 2015-2021 (US$)

Source of co-financing	In-cash (US$)		In-kind (US$)		Total (US$)	
	Planned	Acutal	Planned	Acutal	Planned	Acutal
UNDP			100,000	100,000	100,000	100,000
Government (FECO)	510,000	510,000	3,750,000	3,100,000	4,260,000	3,610,000
Jiangxi jinhui		10,860,000		12,510,000	-	
Jiangxi zili		21,320,000		14,600,000	-	
Tongling		2,850,000		4,560,000	-	
Smelting companies (8)		2,899,358		14,285,714	-	
Sub-total private sector	12,000,000	37,929,358	25,000,000	45,955,714	37,000,000	83,885,072
Institutes	3,000,000		8,090,000		11,090,000	-
Total co-financing	**15,510,000**	**38,439,358**	**36,940,000**	**49,155,714**	**52,450,000**	**87,595,072**

While the GEF grant was dedicated to the production of technical reports and procurement of equipment, project meetings and technical input by national experts was funded in-kind by

FECO to a significant degree and thus contributed to the successful achievement of the project targets.

It can be seen from the above table that the actual co-financing of the project exceeded the planned USD 52,450,000 in the project documents, which mainly comes from the in-cash contribution of the private enterprises to the BAT/BEP demonstration. The actual project co-financing ratio (project co-financing/GEF financing) reached 6.95 and exceeded thus the planned ratio of 4.16 in the Project Document.

Monitoring and evaluation: design at entry and implementation

M&E design at project entry

The Monitoring & Evaluation (M&E) Framework was in details described in the Project Document and is provided as a separate Component 4 of the project. Apart from standard M&E items such as the Inception Workshop (IW), meetings of the National Steering Committee, annual Project Implementation Reviews (PIRs), the Mid-Term Review (MTR) and the Terminal Evaluation, the framework also comprises annual financial audits, organization of Annual Review Meetings (ARW, verification of impact indicators, compilation of a Terminal Report with a socio-economic assessment, as well as preparation and sharing of project knowledge products.

The total indicative cost for the M&E plan (outlined above) is (excluding NPT staff time and UNDP travel expenses) was US$ 500,000, i.e. 4% of the GEF grant with the traditional M&E items constituting a minor portion (125,000 US$) of the allocated amount (about 1% of the GEF grant).

The design of M&E framework followed the standard M&E template for projects of this size and complexity. Overall, the evaluators found the M&E design adequate for monitoring the project results and tracking the progress toward achieving the objectives, with the exception of minor deficiencies in the project results framework discussed in the section “Analysis of the project results framework”.

Therefore, the M&E design is rated **Satisfactory (S).**

M&E at implementation

The main subject of the discussion here is the implementation of the originally planned components of the M&E plan. For the assessment of the M&E implementation, the evaluators reviewed some of the project documentation related to monitoring and reporting, including the Inception report, Quarterly Progress Reports, records/minutes on the Annual Review Meetings (ARM), reports on project financial audits, the annual CDRs and annual Project Implementation Reviews (PIRs).

Inception Workshop

The Project Document stipulated that a project Inception Workshop (IW) is organized to assist the project team to understand and take ownership of the projects goal and objective, as well as to finalize preparation of the project's first annual Work Plan (AWP) based on the project results framework with concise and measurable performance indicators in a manner consistent with the expected outcomes of the project.

The IW was organized on 12 November 2016 with participation of more than 70 representatives from relevant national ministries and agencies, industry associations, scientific research institutions and enterprises from the demonstration provinces.

The IW meeting summary suggested that the workshop fulfilled its expected functions through addressing the following issues:

- Detailing the roles and responsibilities of the Implementing Partners and the project governance, including reporting and communication lines,
- Discussing the Implementation Plan for the demonstration activities in the Jiangxi Province,
- Approval of the first Annual Work Plan (AWP) based on the project results framework,
- Providing a detailed overview and reach consensus on M&E requirements, including the M&E plan and budget;

Overall, the IW assisted the key project stakeholders to fully understand and take ownership of the project.

Annual Project Reports/Project Implementation Reviews (APRs/PIRs): Quarterly and annual progress reports as well as minutes of the annual review meetings were reviewed (some of the documents are in Chinese). 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 has been reflected in the Annual Progress Reports (APR).

The most important instrument in the monitoring process were the Project Implementation Reports (PIRs) prepared regularly with annual periodicity at the end of each GEF fiscal year (July to June). Total 4 PIRs were prepared for the GEF fiscal years 2017 to 2020. The PIRs were elaborated in a standard uniform structure and contain detailed reporting on progress towards performance targets at outcomes as well as the project objective levels. In line with the requirements, PIRs contain ratings and comments on project progress provided by NPM, UNDP CO, the project Implementing Partner and the UNDP RTA. The ratings of progress towards the Development Objective were consistent by all reporting partners while the UNDP RTA gave lower ratings of Implementation Progress than the other partners, reflecting low level of the project financial delivery. The PIR self-evaluation ratings were also found consistent with the ratings given at the MTR and also the ratings given in the TE report.

The evaluators found the PIRs compliant with the standard UNDP/GEF project cycle reporting tools and particularly detailed. Apart from a large section on development progress provided by the Project Manager, the reviews also contained and concise summaries on implementation

progress, management of critical risks, adjustments to project implementation plans and description of cross-cutting issues. Numbering of the project outcomes in the PIRs (1 through 11) was the main insufficiency of the PIRs as it is not consistent with the numbering of the outcomes in the Project Document (1.1through 5.1). Such inconsistency complicates easy reference of the deliverables reported in the PIRs to the ProDoc.

Other project monitoring reports reviewed were found satisfactory in terms of information contents. Data and information related to the performance indicators in the PRF were systematically collected by the project team through field visits, questionnaires, and meetings with project stakeholders. The information gathering included also monitoring of environmental and social risks s well as collection of basic data on gender mainstreaming. The various project monitoring reports were used for continued improvement of the project performance.

The evaluators noted satisfactory involvement of the NSG in the project implementation, through which the NSG discharged both the project oversight as well as the strategic project positions functions.

Mid-Term Review (MTR): The Project Document required the MTR to take place at a mid-point of the project lifetime and determine progress made towards the achievement of the project outcomes, make assessment of efficiency and timeliness of project implementation as well as highlight issues requiring decisions and corrective actions.

The MTR was conducted from 20 June 2019 to 10 December 2019 by a team of two international and one national consultants, including evaluation field mission to China in August 2019. The MTR report dated 30 March 2020 comprises 11 recommendations from the evaluation team during the mid-term review. They had been fully considered during completion of the project.

Terminal Evaluation (TE): The Project Document stipulated that the TE to be conducted three months prior to the project completion date. TE was finally commissioned by the UNDP CO and conducted in May-December 2021.

The Project Document assigned US$ 1,500,000 (excluding the project staff time) with sizeable contribution through co-financing. Overall, the evaluators consider the budget allocation for the M&E sufficient for the project of this complexity and found that enough funding was provided for implementation of the M&E plan.

Feedback from M&E activities used for adaptive management

The primary feedback from the M&E activities was provided through the Annual Project Report (APR) prepared by the Project Manager and shared with the NSC. Five APRs were prepared for the years 2016-2020 in a standard format following the UNDP Atlas Project Progress Reports (PPR) with updated information for each outcome as well as a summary of financial management of the project. The APRs were discussed at the NSC meetings.

The MTR produced 11 recommendations summarized in Table 9 below.

Table 9: Summary of MTR recommendations

Recommendations Related to Project Management and Plan		
#	**Recommendation**	**Summary of management response**
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.	This has been considered and the outputs in the second phase the reduction of UPOPs had been numerically reported.
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.	The documents for the training and outreach activities had been provided as attachments for the TE report.
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.	The POPs statistical report system provides technical support for the statistical data of the recycled copper industry for international implementation reports for the parties; the pollutant discharge permit regulation under the project provide technical support for the promotion and application of BAT/BEP technology.
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.	In order to achieve the goals for much broader demonstration for instance in the level of an industrial park, smart and online monitoring system had been developed in Tongling park. With this measure, the government's ability to regulate companies in the park has been improved and the emission of UPOPs has been reduced..
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.	With the practice for UPOPs reduction in secondary copper industry, the experience will and has already been implemented in different industries: 1) technologies and facilities for UPOPs reduction 2) principles for UPOPs prevention 3) project management and selection of BAT/BEP technologies to reduce total cost of the project

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.	The social plan including proper training and improvement of working conditions has been considered and given in the TE report.
Recommendations Related to Technical Issues		
7	Distinction should be made with respect to measures towards existing sources (copper plants) and new plants;	This has been considered: different measures had been taken during the implementation of BAT/BEP technologies. For in an existing plant need to consider the old facilities and the implementation should not influence too much the regular production.
8	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).	
9	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;	The data are included in the PIR reports.
10	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).	According to the UNEP Dioxin Toolkit and the measured data of the company, the data on the reduction of dioxin emissions was calculated under the project. It has been considered during the second phase of this project.
11	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.	According to "Ambient air and flue gas Determination of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) Isotope dilution HRGC-HRMS" (HJ 77.2-2008), seventeen PCDD/Fs isomers substituted at 2,3,7,8-positions are detected by isotope dilution HRGC-HRMS. The sampling method is regulated by "Environmental Dioxins monitoring technical specification" (HJ 916-2017). No less than 3 samples are collected at each sampling point, and the collection time of a single sample is no less than 2 hours.

The guidance for undertaking Midterm Reviews (MTRs) of GEF projects UNDP-supported projects requires that MTR recommendations are provided as succinct suggestions for interventions that are specific, measurable, achievable, and relevant. Some recommendations are vague in description of required actions and none of them identifies the target group expected to implement the recommendations.

As per the standard procedures, UNDP CO prepared a management response to the MTR recommendations that contains key actions, responsible party, and implementation timeframe. This document in sufficient details identifies the response to the MTR as an agreement of the project Implementing Partners. In terms of the recommendations, they had been fully adopted

and implemented during completion of this project. Actions are provided in the above table and the results are reflected in the second project phase and annual reports.

Evaluation reports from UNDP projects should be uploaded on the UNDP electronic Evaluation Resource Centre (ERC) together with the management response.

Below is the summary of ratings for individual components of the M&E.

Monitoring & Evaluation (M&E)	Rating
M&E design at entry	Satisfactory (S)
M&E Plan Implementation	Satisfactory (S)
Overall Quality of M&E	Satisfactory (S)

The M&E individual stages were implemented correctly, the adequacy in the use of M&E as a monitoring tool and sufficient feedback from MTR for adaptive management are basis for the rating of the quality of M&E implementation as **Satisfactory (S).**

UNDP and implementing partner implementation / execution

The project followed the management arrangements presented in the Project Document that were based on a common scheme for project management arrangements under the UNDP National Implementation Modality.

The project management by the implementing partner (PMU) consisted of periodic meetings, on-site visits, preparation of annual work plans, monitoring and reporting.

The UNDP CO in Beijing provided quality assurance in line with standard UNDP procedures and the Regional Technical Advisor (RTA) provided advisory and technical backstopping of the project. RTA for the entire period of the project implementation was based in the UNDP Bangkok Regional Hub (BRH). The RTA support was provided through remote monitoring and input into the PIRs.

UNDP and implementing partner implementation / execution	Rating
Quality of UNDP Implementation / Oversight	Highly Satisfactory (HS)
Quality of Implementing Partner Execution	Highly Satisfactory (HS)
Overall quality of Implementation / Oversight and Execution	Highly Satisfactory (HS)

Based on the above findings, the overall quality of UNDP and implementing partners implementation/execution is rated Highly Satisfactory (HS).

Risk Management

The Project Document identified two types of risks that could prevent achievement of the project objectives, namely failure to successfully test the identified BAT/BEP options for the sector, and

failure to promote sector-wide adoption of tested BAT/BEP options and PPP-based industry chain management.

The first risk was addressed through the conduct of a national level study of the sector with a carefully review of technical and financial feasibility of various BAT/BEP options and ensure applicability to the Chinese secondary copper production sector. In addition, a set of selection criteria was developed and agreed upon among all stakeholders to ensure that participating enterprises have sufficient financial resources and technical capacity to carry out investment activities.

The second risk was managed through extensive stakeholder consultation, coordination and participation. The project supported capacity development for building effective support for enforcement of national industrial and environmental policies. In addition, the project assisted with formulation of new policies. Related financial incentives under the national replication plan provided motivation to the secondary copper production enterprises to comply with the national policies.

The MTR report identified financial, socio-economic, institutional framework and governance, and environmental risks to the project sustainability.

Financial risks were controlled by following strict financial management rules by Ministry of Finance in China. The funding at each stage was used through strict evaluation from third parties and experts. The demonstration companies/plants have been selected based on their strong commitment, which has been demonstrated in their important co-financing of the project in terms of direct self-investment in adoption of new technologies and infrastructures to apply the BAT/BEP. To ensure proper usage of the funding, supervision from local government was also ensured. The environmental risks had been proved to be low through observation during on-site visiting.

The environmental performance of the beneficiary plants was largely improved during this project. Awareness of UPOPs reduction and environmental protection by the workers of the demonstration plants and communities in the vicinity of the plants was largely improved. During the interviews, the representatives of the companies expressed their confidence and showed the results from the demonstration project that ensure continued commitment to cleaner production. The unintentional POPs reduction and pollution prevention technologies, as well as standards at company and industrial levels together with a range of local legislation provide significant explicit progress to secondary copper industry in Jiangxi province and beyond. The socio-economic risks and institutional risks were managed by responding to the country's priorities, plans and associated new legislation/policies.

The social and environmental screening procedure (SESP) was completed at the project inception and the SESP Report was included as Annex 3 of the Project Document. No revision of the original (CEO Endorsement-stage) SESP was conducted during the project implementation.

Project Results and Impacts

This part of the TE report includes assessment of results in terms of the main evaluation criteria, such as relevance, effectiveness, efficiency, sustainability, and progress to impact, as well as broader aspects of country ownership, gender equality and other cross-cutting issues,

Progress Towards Objective and Expected Outcomes

Further text in this part of the TE report provides assessment of the achievement of project outcomes against indicators individually for each outcome and its outputs. Wherever necessary, the text also provides insight about factors influencing the actual achievement, such as project design, extent of stakeholder involvement and co-financing contributions.

Relevance

The questions discussed under this section are to what extent is the project linked to the national development priorities of China, the relevant GEF Operational Programme and strategic priorities of UNDP in the country and region.

In China, in addition to governmental agencies, there are various key stakeholders who are involved in secondary copper production sector management and development. The key stakeholders include civil society organizations, institutions, agencies, researchers, private sector, industrial groups, local and indigenous communities. The respective roles of key stakeholders and their areas of expertise are described below.

1. At the national level, three governmental agencies play the key roles in legislation, management, monitoring and communication of secondary copper production sector, namely, Ministry of Ecology and Environment (MEE), National Development and Reform Committee (NDRC), and Ministry of Industry and Information Technology (MIIT). MEE focuses on pollution prevention and control for all kinds of industrial sectors, covering secondary copper production sector. It is mainly responsible for the development, organization, implementation and supervision of plan, policies, standards and technical guidelines in the environmental protection area. NDRC focuses on overall national and regional industry development strategy and plan. It is mainly responsible for the general industrial policy, industrial structure adjustment and cleaner production promotion. MIIT focuses on industrial production management. It is mainly responsible for development, organization, implementation and supervision of plan, policies, standards and technical guidelines in the industrial development area.

2. In the industry, the responsible parties are copper-contained waste providers, secondary copper producers, and association. The current dominated association is China Nonferrous Metals Industry Association and China Nonferrous Metals Industry Association Recycling Metal Branch (CMRA).

3. Then, there are the research institutions which comprise of Chinese Research Academy of Environmental Sciences, Chinese Academy of Science, Tsinghua University, Beijing Science

and Technology University, Beijing General Research Institute of Mining & Metallurgy, other domestic research institutes, and overseas researchers.

The project is supporting the objective of the 13th Five-Year Plan (2016–2020) to control emissions from key industrial pollution sectors and overall strengthening of environmental management governance in China for prevention and control on industries in key industries including the secondary nonferrous metal production by strengthen supervision and management, phase out outdated capacity, implementation of technological upgrading etc.

Furthermore, the project is aligned with the guidance document "Technical Policy on Strengthen Dioxin Prevention and Control in key industries" that provides technological route and methods on reduction of dioxin emission in the secondary copper production sector, including full process control and encourages research and development of new technologies. The project activities effectively support the implementation of the national strategy.

In relation to the Stockholm Convention, the project helps the GoC to fulfil the country's commitment under Article 5 of the SC that requires that each Party to take measures to reduce the releases from anthropogenic sources of unintentional persistent organic pollutants (UPOPs).

The project is consistent with the Action Plan of China's National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (NIP) that placed a high priority on reduction of UPOPs releases. A national level strategy "Guidance on Control and Prevention for PCDD/F Release" also offers the framework on environmentally sound management of PCDD/Fs emission. The NIP lists the regeneration of metallurgical industry as one of six priority sectors to be targeted for control of UPOPs releases.

In the period up to 2015, the planned actions focused on first-stage interventions to initiate control of PCDD/Fs sources by means of technical evaluation, environmental impact assessment, revised release standards, monitoring capacity building, and BAT/BEP demonstration. With this focus, two GEF-5 projects were approved in two priority source sectors, namely municipal solid waste management and pulp and paper sector with the World Bank as the Implementing Agency. Another industry-related project for electrical and electronic equipment focusing on UP-POPs releases was approved for GEF-5 funding for implementation by UNDP.

The project is well aligned with the GEF-6 Focal Area Chemicals and Waste where GEF plays a catalytic role in leveraging budgetary resources from national governments and incentivizing the private sector to contribute more to the achievement of elimination and reduction of harmful chemicals and waste. Specifically, the project is in line with the following elements of the GEF-6 Chemicals and Waste Focal Area Strategy:

Objective CW-1: Develop the enabling conditions, tools and environment to manage harmful chemicals and wastes'

Programme 1: Develop and demonstrate new tools and regulatory along with economic approaches for managing harmful chemicals and waste in a sound manner

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

Objective CW-2: Reduce the prevalence of harmful chemicals and waste and support the implementation of clean alternative technologies/substances

Programme 3: Reduction and elimination of POPs

Outcome 3.1: Quantifiable and verifiable tonnes of POPs eliminated or reduced

The project is also in line with the overall objective of the Strategic Approach to International Chemicals Management (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.

These projects are linked to SDG #3: good health and well-being; SDG #5: gender equality;

SDG #8: decent work and economic growth; SDG #9: industry, innovation and infrastructure; and

SDG #12: responsible consumption and production.

It is also directly linked to UNDP Strategic Plan Output 1.3. "Solutions developed at national and sub-national levels for sustainable management of natural resources, ecosystem services, chemicals and wastes."

Since 2004, UNDP has been assisting more than 80 developing countries and countries with economies in transition in their efforts to sustainably manage the use, disposal, and destruction of POPs, working with private sector partners and NGOs. Through the introduction of life cycle management of POPs and affordable alternative approaches and technologies, 18,203 tonnes of POPs were safely disposed of, reducing the risk of direct exposure to POPs for 2.5 million people.

The project is also well aligned with the United Nations Development Assistance Framework (UNDAF) for the People's Republic of China 2016-2020, namely its Priority Area 2 – Improved and Sustainable Environment that supports China's adherence to national and multilateral environmental and disaster-related commitments and conventions. Outcome 2 calls for the UN to provide:

…."*high-quality input into the development and strengthening of national policies, legislation and regulatory frameworks which include support to the institutional innovation and exploration of new modes for the establishment of ecological civilization, so as to improve and protect the environment, reduce climate and disaster risks and their effects on the population, build community resilience, and promote sustainable environmental practices and use of resources.*

In relation to the UN Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, energy is being recognized as a key enabler for development through establishment of SDG Goal 7: *Ensure access to affordable, reliable, sustainable and modern energy for all.* Its indicator 7.3 calls to double the global rate of improvement in energy efficiency by 2030. Universal access to energy, a higher share of renewable energy and massive improvements in energy efficiency are now part of the top global priorities for sustainable development. In addition to direct relation to SDG7, energy efficiency is indirectly related to other SDGs as summarized in Table 10 below.

Table 10: Relation of energy efficiency to UN SDGs[10]

Sustainable Development Goals	**Targets linked with chemicals and waste**
12 Ensure sustainable consumption and production patterns	12.4 Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment 12.5 Substantially reduce waste generation through prevention, reduction, recycling and reuse
Other SDGs:	
3 Ensure healthy lives and promote well-being for all at all ages	3.9 Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
5 Achieve gender equality and empower all women and girls	5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels
6 Ensure availability and sustainable management of water and sanitation for all	6.3 Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.4 Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
11 Make cities and human settlements inclusive, safe, resilient and sustainable	11.6 Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development	14.1 Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Based on the above, relevance of the project is rated Relevant (R) for the recipient country, as well as the donor and implementing agencies.

Effectiveness

The information presented in this section was sourced from the various project implementation reports and verified with information collected through interviews with key informants. Additional sources of information were various studies and technical reports produced by the project. The list of documents consulted is provided as Annex 4 to this report.

[10] Compiled from Waste and the Sustainable Development Goals, WasteAid, 2016

The evaluators consider the strategy chosen for the project implementation as reasonable and clearly leading towards the planned results.

The project contributed to the UNDP Country Programme (2016-2020), namely to Output 2.1 that required funding and implementation of China's actions on climate change mitigation, biodiversity and chemicals across sectors, and to Output 2.3 that called for effective institutional, legislative and policy frameworks to be in place for assessment of natural and man-made risks and for implementation of disaster and climate risk management at national and sub-national (province) levels.

Tables 11–17 list the PRF indicator targets for the individual outputs, summarize the delivery status at the Terminal Evaluation and provide rating for the Outputs' delivery. Each table contains an overview of the actually achieved project results in bullet points followed by a narrative with additional insight and details on how and why the results have or have not been achieved. At the end, the narrative also explains the basis for rating of each project outcomes. The text following each table summarizes some important facts related to the project results that could not be captured in the tables but were considered important for the justification of the rating of the project outcomes.

Table 11: Deliverables for Component 1

Result	Indicators	EOP Targets	Status at TE	Rating
Component 1: Institutional Strengthening and Capacity Building				
Outcome 1.1 Improved legal framework through policy research for the secondary copper production sector	Effectiveness of policy implementation	Effectiveness of existing policy implementation evaluated and suggestions for improvement finalized	2 policy research/evaluations on pollution prevention technologies and associated economic policies of secondary copper industry	HS
	Number of technical standards finalized	At least 4 technical standard documents finalized	8 technical standards and 2 guidelines prepared and launched	HS
	International knowledge and experience gained	International exchanges conducted	3 International conferences and 2 study visits	S
Outcome 1.2 Capacity of enterprises, industries, Local Project Management Office (LPMO) strengthened to facilitate effective management and monitoring of the secondary copper sector	Supervision and management manual developed	Manual drafted, reviewed and finalized	Manual for Environmental Management of Hazardous Waste in the Secondary Copper Smelting Industry in Jiangxi Province Handbook of Environmental Management of Hazardous Waste in the Secondary Copper Smelting Industry in Jiangxi Province Manual for Scrap Copper Smelting Operation	HS
	Capacity for supervision and management strengthened	LPMO set up, 2 times of training and technical exchanges conducted, covering over a total of 50 management officers	LPMO set up, 30 trainings on pollution control covering management officers and manager of secondary copper enterprises in Jiangxi, 5631 trained, including 1258 officials and 2373 managers	S
	Industry autonomy capacity building improved	Annual training programme and technical exchanges conducted, covering over 30 enterprises and over 2,000 technicians and management personnel	84 training sessions covering, 5877 enterprise managers from 797 enterprises and 5521 technical workers, 552 officers	HS
	Data information management system established	Data information management system established and operational	Regular updates on China's official POPs website Pollutant discharge permit system for four industries (Secondary copper, aluminium, lead and zinc) Pollutant permits issued for more than 400 companies. The POPs statistical report system supporting compilation of national reports for the annual statistical emission	HS
	Coordination and sustainable development enhanced	Multi-stakeholder platform and international communication mechanism established to facilitate inter-agency, industry and international coordination	Jiangxi Hazardous Waste Supervision and Management Online Platform International Forum on Recycling Metals, as a communication platform	HS
Outcome 1.3 Enhanced cooperation with other international environmental conventions	Synergistic interaction with other conventions	Regular communication and updates on progress took place with SAICM and other conventions	Communication and coordination with other international conventions the Basel Convention, the Rotterdam Convention, the Minamata Convention, and SAICM	S
	International exchange meetings	Meetings conducted	Regular meetings involving various stakeholders for the implementation of various environmental Conventions An intra-ministerial coordination mechanism established within the Ministry of Ecology and Environment for the implementation of the Stockholm Convention and the Minamata Convention.	HS

Outcome 1.1: Two policy research/evaluations on pollution prevention technologies and associated economic policies were conducted, namely:

- *" Technology policy for pollution prevention in the secondary copper smelting industry "*;
- *" Economic policy for pollution prevention in Secondary non-ferrous metal industry ".*

The following 4 technical standards were completed:

- "*Technical specification for application and issuance of pollutant emission permit for non-ferrous metal metallurgy industry - secondary non-ferrous metal"* as the primary technical document to lead issuance of pollutant discharge permits by local governments (issued by the MEE in August 2018);
- *"Cleaner production evaluation index system for secondary copper industry"* to provide technical support and assessment standards for mandatory clean production in a secondary copper industry (issued jointly by the MEE, MIID and NDRC in December 2018);
- *"Cleaner production audit guide for secondary copper industry";*
- "*Emission standards of pollutants for secondary copper, aluminium, lead and zinc industry*".

In addition, for additional technical standards, namely *"BAT guideline for pollution prevention and control of comprehensive utilization of polymetallic hazardous wastes", "Emission standards of pollutant for secondary copper dismantling enterprises" , "Determination of dioxins and dioxin-like polychlorinated biphenyls in feeds Luciferase expression gene method"* and *"Technical specifications for the supervision and management of the operation of environmental protection facilities in the secondary copper smelting industry"* were prepared and submitted to the Government regulatory agencies for promulgation as national standards.

Development of the technical specifications and standards was inspired by the European BAT Reference Document[11] that advocated for adoption of a holistic approach towards copper smelters retrofitting in line with integrated pollution prevention and control.

In 2017, the project staff reported participation at the 14th International Symposium on Persistent Toxic Substances and at the International Forum on Secondary Nonferrous Metal Industry Exhibition in Guangzhou.

In 2018, the project team visited recycling plants in Germany and Italy to exchange experience in reducing UPOPs emissions and learn about advanced UPOPs emission reduction technologies in the secondary non-ferrous metal sectors.

In August 2019, the project manager from FECO attended the 39th International Symposium on Halogenated Persistent Organic Pollutants (Dioxin 2019) in Kyoto, Japan and presented the research results and experience from the SCP.

In October 2019, FECO delegation visited Singapore and Japan for exchange of experience in pollution prevention and management policies in secondary non-ferrous metal industry. The delegation discussed with Singapore's Ministry of Environment and Water Resources and visited a secondary non-ferrous metal smelting company to see recycled metal recycling models and

[11] European Commission, Reference Document on Best Available Techniques in the Non-ferrous Metals Industries, BAT Reference Document (BREF). European IPPC Bureau, 2001 (eippcb.jrc.es).

separation, smelting process, processing and disposal, as well as application of pollution control technologies and management policies.

In November 2019, the China Nonferrous Metals Industry Association Secondary Metals Branch organized a conference on the prevention and control of dioxin pollution in recycled nonferrous metals in Ningbo with participation of more than 1,000 people.

In November 2020, the Project Manager participated at the 20th International Forum on Recycling Metals.

Outcome 1.2: The Manual for Environmental Management of Hazardous Waste in the Seoncdary Copper Smelting Industry in Jiangxi Province was prepared and distributed to the project partners (e.g. LPMO). It serves as a guidance to enterprises in both standardizing the disposal of hazardous waste generated from the secondary copper production and provide a reference for local environmental departments for conduct of inspections in the secondary copper enterprises.

In 2017, the Jiangxi province started the Jiangxi Hazardous Waste Supervision and Management Online Platform for integration of the province's hazardous waste management work with the control of dioxins during production. The platform facilitated management of fly ash from secondary copper enterprises in the province for reducing the release of dioxin caused by improper disposal of fly ash. The experience of dioxin control in the hazardous waste supervision and management platform in Jiangxi Province was made available for sharing with other provinces with secondary copper enterprises.

The activities in the Jiangxi province were supported by 30 trainings on pollution control in secondary copper sector with participation of total 5,631 people including 1,258 officials, 2,373 enterprise managers. Additionally, the Jiangxi LPMO carried out two publicity activities with participation of about 2,000 publics.

Updates on project progress and management of secondary copper smelting enterprises were regularly provided for the China's official POPs website.

The project supported establishment of a multi-stakeholder platform for facilitation of regular meetings (every two months), site visits, document sharing, and knowledge exchange amongst secondary copper smelting companies, universities, research institutes, industry associations, and local environmental protection agencies. This facility includes a management information platform for emission permits of secondary non-ferrous metal industry. More than 400 enterprises have applied for emission permits through the platform.

By December, 2021, total 114 training sessions were conducted on prevention and control measures for PCDD/F and BAT/BEP with participation of 1,810 governmental officials, 5,521 technical workers, 8,250 enterprise managers and 1,059,480 general public.

Outcome 1.3: Based on the experience from the project, FECO, in cooperation with the Solid Waste and Chemicals Management Centre (SCC) and Basel Convention Regional Centre for

Asia and the Pacific (BCRC China), jointly developed the project *"Strengthening institutional capacity for the implementation of the Basel, Rotterdam, Stockholm and Minamata conventions and SAICM"*, which was launched in 2018 under UN Environment Special Programme Trust Fund. Through the implementation of the project, FECO established and maintained a regular communication and coordination mechanism with the SCC and BCRC China that serve as the two technical support agencies for implementation of the Basel Convention in China.

Early in 2020, regular communication with the conventions had to be moved into on-line space due to introduction of COVID-19 physical meeting and travel restrictions. In June 2020, a branch session “Zero-waste City High Level Forum” was held online on the margins of the 15th International Conference on Solid Waste Management and Technology jointly by the FECO, SCC, and BCRC. More than 70 representatives from various countries and regions and more than 400 people from live broadcasting platform participated in the meeting online. FECO shared China's experience in POPs waste management through a presentation "POPs waste management in China: current practices and research results".

Overall Assessment of Component 1:

Through elaboration of technical standards and guidelines, the project enhanced the legislative frameworks for the secondary copper sector and strengthened capacities of relevant governmental institutions for pollution prevention and control. It also improved competences of management personnel and technical workers in more than 30 secondary copper enterprises for implementing BAT/BEP in reducing unintentional POPs and other pollutants.

The project promoted the national emission permit management information system that enables all China's secondary copper enterprises annual reporting of dioxin monitoring data in line with the requirements of the emission permit system. This will play an important role for estimation of the dioxin emissions from China's secondary copper industry. Establishment of the on-line multi-stakeholder platform enabled exchange of experience within the secondary copper production sector in China as well as communication with other countries in the region.

FECO established linkages with the two technical support agencies for implementation of the Basel Convention in China and jointly developed a project for strengthen national institutional capacity for the sound management of chemicals and waste and enhancement of synergy between the Basel, Rotterdam, Stockholm and Minamata Conventions and SAICM.

The project supported participation in conferences, study tours and consultation meetings for capacity building and exchange of experience in secondary non-ferrous metal industry. This last activity is expected to still be fostered until the completion of the project to improve the industry level expertise in China.

Based on the above, the achievement of Outcome 1 is rated Highly Satisfactory (HS).

Table 12: Deliverables for Component 2

Result	Indicator	EOP Targets	Status at TE	Rating
Component 2: Demonstration of BAT/BEP and PPP-based Industry Chain Management				
Outcome 2.1 BAT/BEP demonstration conducted	Up-to-day and accurate estimation and assessment of UPOPs emission	National copper sludge investigation report finalized Smelting industry implementation and evaluation planning finalized	National copper sludge investigation finalized Smelting industry implementation and evaluation planning finalized Evaluation of the BAT/BEP demonstration completed	HS
	Technological solution and potential providers of technical support identified	BAT/BEP for demonstration as well as providers of technical support identified and selected	2 demonstration enterprises selected and their implementation plans developed and approved	HS
	Technical documents compilation	Smelting process operation manual and dismantling process operation manuals compiled	Technical specification for operation supervision and management of environmental protection facilities. One manual on secondary copper industry completed 2021 Dismantling process operation manual finalized.	S
	BAT/BEP demonstration	BAT/BEP demonstration at two plants implemented and results assessed Dioxin releases reduced to meet emission standards at two demonstration plants through demonstration activities	**4** BAT/BEP technologies demonstrated in 2 plants, Completed engineering transformations and final acceptance meetings in the two enterprises. The dioxin test results show compliance with the project requirements	HS
Outcome 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	Research and analysis on approach and mechanisms to generate maximum benefits for effective management conducted and documented	Research and analysis on PPP based smart park conducted Implementation plan finalized and approved.	S
	Demonstration of circular economy and PPP industrial park-based management	PPP and environmental management demonstrated to contribute to both environmental protection and economic development	Demonstration of smart industrial park management based on PPP mode in Tongling park conducted Intelligent environmental management platform for industrial parks established. 2 demonstrations on industrial chain in Yingtan and Hengfeng parks conducted	HS
	Results of demonstration activities	Demonstration results evaluated, documented and disseminated.	Intelligent environmental management platform for industrial parks established. The demonstration results have met the requirements of the project. Formal meeting for evaluation was conducted in December, 2021	S
Outcome 2.3 Evaluation and demonstration project acceptance	Demonstration results monitored and reduction measured	Self-evaluation indicators and manual designed and established	Self-evaluation indicators for evaluation of demonstration enterprises established Smelting and dismantling operation manuals completed	HS
	Acceptance of the results of the demonstration project	Demonstration results evaluated and accepted	Demonstration results have met the requirements of the project. The formal meeting for evaluation was conducted in December, 2021	S

Outcome 2.1: At the end of 2019, a number of copper sludge production enterprises were selected to examine the sludge composition and production process. However, completion of this exercise was delayed due to the negative impact of the COVID-19 epidemic.

The project produced 500 copies of an introduction and management guidance material for secondary copper enterprises and local environmental agencies, as well as a notice on the adjustment of the Catalogue of Imported Waste Management that put copper waste and scrap in the list of restricted solid wastes. The latter document was jointly issued by the NDRC, MEE and MIIT and about 500 copies of were shared with enterprises, customs and environmental agencies.

The project commissioned evaluation of the BAT/BEP demonstration in two selected enterprises. The selection was based on a tendering process organized by FECO that invited submission of proposals as well as executive plans. Following evaluation of the submitted proposals, two companies were selected as the demonstration enterprises. Each of the enterprises prepared a BAT/BEP technology plan for demonstration of processing of high-grade copper Scrap and copper sludge.

The technological interventions supported by the project is a combination of bag filter, activated carbon adsorption and flue gas quenching for rebuilding of the gas treatment systems of the four production lines in the two demonstration enterprises. The BAT/BEP measures introduced for demonstration at the demonstration enterprises are summarized in the Box 1 below.

Box 1: Summary of the measures for BAT/BEP demonstration at the selected enterprises

Jiangxi Zili Environmental Protection Technology Co.	**Jiangxi Jinhui Copper Industry Co.**
Building of new oxygen enriched smelting furnace	Building of a quench system of No.3 anode furnace and transformation of the pulse dedusting room of three anode furnaces and of the environmental smoke and dust collection rooms
Reconstruction of two waste heat boilers and quench towers	Installation of two sets of oxygen enriched smelting furnace vaporization water jacket
Upgraded of the existing activated carbon injection device and desulfurization system	Building of the pulse bag dust collection system of No.2 oxygen enriched smelting furnace
Building of a new wet electric mist eliminator	Completion of a flue gas treatment and desulfurization system
Building of new vertical and horizontal dryers	Debugging of the central distributed control system

The pictures of the installed BAT/BEP equipment installed at the two companies are on Displays 3 and 4 below.

Display 3: Pictures of BAT/BEP equipment installed at Jiangxi Zili

Oxygen-enriched furnace with casting

Wet electric mist eliminator with And SOx treatment system

Quenching tower

Display 5: Pictures of BAT/BEP equipment installed at Jinagxi Jinhui

The enterprises produced smelting and dismantling operation manuals. Health and safety performance of the engineering transformations were certified by the OHSAS [12] 18001 certificate.

FECO commissioned monitoring of the dioxin emission concentrations of three major processes of secondary copper and elaboration of reference technical parameters for the evaluation of emission reduction results of demonstration enterprises. LPMO in Jiangxi province also organized a monitoring of the exhaust gas emission and research into dioxin life cycle in fly ash research project of secondary copper smelting enterprises during the project reporting period and conducted a special inspection on the prevention and control of dioxin pollution in the secondary copper industries. Evaluation of demonstration of BAT/BEP are summarized in Table 13 below.

[12] Occupational Health and Safety Assessment Series

Table 13: Dioxin reduction from demonstration of BAT/BEP

Factory	Dioxin source	Annual Output (t)	Detected content of dioxins (ng TEQ/m^3)	Emission factor	Calculated Dioxin Emission Reduction (g)
Jiangxi Zili	Anode furnace flue gas	100,000	0.02	0.05	4.995
	Oxygen-enriched furnace flue gas	30,000	0.057	0.057	24
	Anode furnace residues*				1.5
	Oxygen-enriched furnace residues*				0.002
	Sub-Total				***30.497***
Jiangxi Jinhui	Anode furnace flue gas	50,000	0.086	0.215	2.489
	Oxygen-enriched furnace flue gas	15,000	0.042	0.42	11.994
	Anode furnace residues*				0.75
	Oxygen-enriched furnace residues*				0.473
	Sub-Total				***15.706***
Grand Total for 2 enterprises					**46.20**

*Residue calculated at 5% of production

Outcome 2.2: In December 2018, the project titled "Environmental Management Demonstration of Recycled Non-Ferrous Metal Industrial Parks Based on the Industrial Chain" was launched for demonstration of a smart secondary copper industrial park management based on the PPP model.

After public bidding and price negotiation, FECO signed a cooperation agreement with the Tongling Economic and Technological Development Zone to carry out a demonstration project of the smart secondary copper industrial park in Tongling City, Anhui province. After the Tongling park completed the deployment and operation of intelligent management information system, FECO organized acceptance meeting at the end of 2021.

In December 2020, bidding was launched for construction of an online smart environmental management platform to monitor, analyze and manage air pollution, wastewater and solid waste generated by the industrial park.

In 2019, guidelines on circular economy were issued and piloted in the Tongling Industrial Park. The COVID-19 epidemic slowed down the process of formulation of procurement plan for Smart Park. Additional two secondary non-ferrous metal industrial parks were selected and procurement initiated for demonstration on the management system.

Outcome 2.3: Implementation of this outcome was delayed as it had to wait until completion of delivery under the previous Outcome 2.2. In 2020, the project commissioned work on establishment of self-evaluation indicators for evaluation of the demonstration enterprises. At the time of preparation of the TE report, the evaluation was still on-going hence the results were not available.

Overall Assessment of Component 2: As a result of the project, the two secondary copper demonstration enterprises commissioned new lines based on 4 selected BAT/BEP and put them into production. Analysis of dioxin emissions at the two enterprises confirmed that the

demonstration enterprises have improved their processes and have reduced emissions of unintentional persistent organic pollutants. The manuals on smelting and dismantling process operations were developed. The dioxin content, analysed by an independent accredited body, was below 0.1ng TEQ/m^3 the emissions.

The demonstration of the smart industrial park management at the Tongling industrial park was advanced during the last two years of the project. The demonstrated management system includes video and screen facilities, as well as water quality and gas quality monitoring and is able to provide in-situ inspection of the whole life cycle during hazardous waste treatment. The system also includes a third party for maintenance. The final evaluation of this demonstration sub-component was conducted on December 2021. The successful implementation of the project realizes the government's intelligent control of pollutant emissions and environmental safety of enterprises in the park.

In addition to the Tongling industrial park, the project initiated basic construction works in two other demonstration industrial parks (Yingtan and Hengfeng parks). The construction is expected to be finalised in early 2022.

Based on the above, the achievement of Outcome 2 is rated Highly Satisfactory (HS).

Table 14: Deliverables for Component 3

Result	Indicator	EOP Targets	Status at TE	Rating
Component 3: National Replication Programme				
Outcome 3.1 Replication and promotion of demonstration results and experience	Project experience summary	Experience gained and lessons learned documented, evaluated and disseminated	3 Brochures prepared, and the video is also being produced by CEEC 3 promotional videos also produced by LMPO and CEEC 3 books in preparation, to be published before the end of 2021	S
	National replication plan	National replication plan incorporating experience gained and lessons learned developed	Incentive plans for 20 smelting enterprises and dismantling enterprises. Applications from more than 400 enterprises for pollutant discharge permits	HS
	Promotion plan design and implementation	Promotion plan for dismantling and smelting enterprises designed and implemented. BAT/BEP integrated into development plan of secondary copper project	Applications from 31 companies for participation in the NRP The BAT/BEP technologies recommended in the corporate incentive plans for 20 enterprises	S
Outcome 3.2 Promotional events for public awareness raising	Knowledge products and promotion materials	Knowledge products based on lessons learned developed to disseminate demonstration results	Internet and wechat (more than 120 related articles for public training) with 84,000 visits Other types of publicity including movie, cartoon, interview, song etc. More than 20 movies compiled with more than 1,250,000 times of broadcasting.	HS
	Training and promotional activities	Training sessions, promotion and public awareness activities awareness conducted, covering over 2,000 technicians and 1,000,000 general public	Total 100 training sessions (as of June 2021)	S

Outcome 3.1: In May 2020, work was commenced on promotion and dissemination of experience and achievements of the secondary copper project. The resulting publicity brochures

and manuals summarize the research results, demonstration experience, and the latest industrial policies and pollution prevention policies of the secondary copper industry. Further outreach channels include internet platforms (e.g. WeChat) for online training for industry employees on prevention and control of POPs pollution.

In addition, the project supported preparation of a video on the secondary copper for sensitization of the general public and enhanced awareness about recycling of secondary non-ferrous metals.

The National Replication Programme (NRP) was drafted in 2019 to set out a detailed approach for the secondary copper sector to achieve reduction of dioxin emissions through sector-wide BAT/BEP adoption. For smooth implementation of the NRP, an application guide as well as an activity plan of NRP were prepared based on the project demonstration experience and widely distributed amongst the secondary copper enterprises.

Applications from 31 companies were received for participation in the NRP implementation. A corporate incentive plan on promotion of BAT/BEP technology management experience and models nationwide was prepared and offered to 18 enterprises (10 disassembly and another 8 smelting companies). Estimated dioxin reductions from 8 companies are summarized in Table 15 below.

Table 15: Estimated dioxin reductions from the NRP

Company/Output	**Estimated annual dioxin reductions (g)**		
	Flue gas	**Residues**	**Total**
Rui Lin (80,000 t)	63.9728	2.52	66.4928
Jiang Wu (120,000 t)	5.9784	1.8	7.7784
Xin Fa (120,000 t)	95.95	3.78	99.66
Xin Haotai (15,000 t Copper sludge)	11.9895	0.4725	12.4575
Xin Haotai (66,000 t Copper scrap)	3.2835	0.99	4.2735
He Feng (170,000 t)	8.466	2.55	10.9905
Hui Ying (120,000 t)	95.9124	3.78	99.66
Zhi Yuan (100,000 t)	4.9905	1.5	6.4575
Yong Xing (120,000 t)	95.9772	3.78	99.7512
Total for 8enterprises	**386.5223**	**21.1725**	**407.6948**

Outcome 3.2: The project supported preparation of a management guidance brochure and more than 500 copies of the brochure were distributed amongst the secondary copper enterprises and local environmental agencies. Furthermore, about 500 copies of the standards for importing non-ferrous metals wastes were shared with enterprises, customs and local environmental agencies.

The government of Jiangxi Province commissioned preparation of a video on the prevention and control of dioxin pollution. The video provides background of the SCP, overview of the

secondary copper industry in the province, the hazards of dioxin and summarizes progress in the two demonstration enterprises under the SCP.

By December 2021, 114 training sessions has been conducted with participation of 1,810 governmental officials, 5,521 technical workers, 8,250 enterprise managers and more than 1 million of general public.

Overall assessment of Outcome 3: This component created an enabling environment for replication and upscaling of the BAT/BEP techniques through implementation of the National Replication Plan (NRP). Due to delays in implementation of the technology demonstration, finalization of technical details of the NRP was postponed until evaluation of the BAT/BEP demonstration at the two demonstration enterprises (Outcome 2.3). Through the implementation of the incentive plan, the project not only completed the dioxin emission reduction target set by the project, but also incorporated BAT/BEP into the policy standard system, which will guide the dioxin pollution prevention and control of China's secondary non-ferrous metal industry enterprises and promote the emission reduction of dioxin and other POPs in China's secondary non-ferrous metal industry.

In addition, the project publicity and promotion activities have greatly improved the awareness and ability of dioxin emission reduction of China's secondary non-ferrous metal industry enterprises and improved the public's awareness of dioxin. However, the report on experience gained and lessons learned from the project implementation was not prepared as planned.

Based on the above findings, the overall achievement of Outcome 3 is rated Satisfactory (S).

Table 16: Deliverables for Component 4

Result	Indicator	EOP Targets	Status at TE	Rating
Component 4: Monitoring and Evaluation				
Outcome 4.1 Project monitoring and evaluation	Timing and quality of annual (APRs, PIRs etc.) and M&E reports Quality appraisal in Mid-Term Review and Terminal Evaluation	M&E activities implemented as scheduled and on budget, project implementation monitored to achieve project objectives Adaptive management undertaken	APRs, QPRs, PIRs regularly submitted MTR mission (August 2019) MTR report completed (November 2019) TE (April 2021) TE report completed in September 2021	S
Outcome 4.2 Knowledge sharing and information dissemination	Lessons learnt and experience documented and disseminated; post-project action plan formulated	Lessons and experience documented and disseminated	Promotional videos of the annual meeting, CMRA Convention; New media methods for publicity. a total of 20 videos were produced and released, with a total of 1.25 million views. " Publicity Manual for "UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China" distributed in more than 300 copies;	HS

Outcome 4.1: The MTR was commenced in August 2019 and the finalized MTR report was submitted to UNDP in November 2019. The TE was initiated in April 2021 and the final TE report submitted in December 2021[13].

[13] The prolonged duration of the TE is due to delays in completion of activities under Outcome 3.

Outcome 4.2: Knowledge sharing and information dissemination

In May 2020, the work was commenced on promotion and dissemination of experience and achievements of the secondary copper project. This is expected to summarize the research results, demonstration experience, and the latest industrial and pollution prevention policies relevant for the secondary copper industry and prepare publicity brochures.

During the project, a total of 20 videos were produced and released, with a total of 1.25 million views. "Publicity Manual for "UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China" has been distributed in a total of more than 300 copies.

Overall assessment of Outcome 4: A range of knowledge sharing activities had been carried out through various media and channels, such as internet, WeChat, etc., that included online and offline training for industry employees and the public on POPs pollution prevention and control, as well as make available the achievements and implementation experience from the project. Nevertheless, the lessons learned report as planned in the Project Document was not available at the preparation of this report and completion of the TE.

Based on the above findings, the achievement of Outcome 4 is rated **Satisfactory (S).**

Efficiency

The main issues examined in relation to efficiency were the length of the project implementation period and to what extent the results have been achieved with the least costly GEF and other resources possible.

The Project was approved for implementation by GEF CEO on 5 May 2016 for a period of 60 months. The signature of the Project Document by the Government on 03 August 2016 officially marked start of the project implementation. The original project closure date of August 2021 was not extended.

The evaluation team consider the allocation and use of financial and human resources (funds, human resources, time, expertise, etc.) efficient and economical for achievement of the project outcomes. As discussed above, there were delays in implementation of some outcomes. There were no explicit costs allocated to integration of gender equality and human rights, but these cross-cutting issues were implicitly included in addressing the planned results of the project.

The project management structure was in line with the Project Document and was found efficient for achievement of the expected results. Financial aspects were well controlled in line with the strict financial management rules by Ministry of Finance in China. The funding for procurement of goods and services was issued upon strict evaluation of technical and financial proposals by panels of experts. To ensure sound usage of the funding, advice from the local government was also included.

Implementation of the project was affected by COVID-19 restrictions on business trips and meetings that also prolonged the transformation of the demonstration enterprises. However,

FECO and UNDP actively communicated with the project implementers through on-line meetings and telephone and reduced the negative impact of the COVID-19 restrictions to a minimum.

Based on the above findings, the efficiency in terms of the project timeline and use of resources is rated **Satisfactory (S).**

Overall project outcome

The primary objective of the project was to achieve reduction of POPs emissions in the secondary copper production sector in China through development of a NRP and roll-out BAT/BEP through dissemination of demonstration results and promotional activities for national replication.

Status of achievement of the Project Objective is summarized in Table 17 below.

Table 17: Status of achievement of the Project Objective

Project Objective	Indicator	EOP Targets	Status at TE	Rating
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	11.88 g TEQ dioxin in two demonstration enterprises reduced through BAT/BEP demonstration in project period	46.20 g TEQ annual dioxin reduction in two demonstration enterprises (43.475 g TEQ reduction in flue gas and 2.724 g TEQ reduction in residues - Table 13)	HS*
	Number of facilities replicating or establishing environmentally sound secondary copper production Estimated reduction quantity through implementation of the national replication programme	BAT/BEP integrated into development plan of secondary copper production sector Reduction of 396 g TEQ dioxin in secondary copper production sector nationwide expected through implementation of the national replication programme	BAT/BEP integrated into emission permit system and as majority of non-ferrous metal enterprises in China applied emission permit according to technical specification formulated under the project 407.69 g TEQ dioxin reduction achieved through NRP (386.52 g TEQ reduction in flue gas and 21.17 g TEQ residues reduction - Table 15)	S*
	Number of new technologies demonstrated	At least 2 BAT/BEP key technologies demonstrated to meet pollution control standards Relevant technical guidelines finalized	4 BAT/BEP key technologies demonstrated in 2 enterprises 8 technical guidelines finalized and 2 of them issued	HS
	Number of officials, decision-makers, and workers trained on sound secondary copper processing	At least 300 officials and 2,000 technical workers trained on BAT/BEP and sound secondary copper processing	1,810 officials, 5,521 technical workers, 8,250 managers trained	HS

* The emission reductions are calculated annual post-project reductions

The project aimed at demonstrating that the technology for reducing UPOPs, would be economically viable while meeting the strict environmental requirements. This involved technical assistance to the two demonstration factories for adopting the new technology and monitoring the performance through independent verification.

The project adopted an integrated approach to removal of several barriers to the adoption of BAT/BEP technologies for the reduction of dioxins in the secondary production sector. The essence of this approach was based on simultaneous addressing the four domains critical for the sector-wide transformation to environmentally sound practices, namely policy and regulatory frameworks, BAT/BEP technologies, institutional and human capacities, as well as information dissemination and awareness raising.

The BAT/BEP renovations in the two demonstration enterprises consisted of process improvements tailored to the specific conditions and requirements of the enterprises. The concentration of dioxins at various sampling points was assessed independently through an accredited laboratory. Based on the results, annual reduction

The fact that the selected BAT/BEP technologies were ready for testing and subsequent adaptation in an industrial setting allowed the project to engage with the business community through the NRP.

Based on the above findings, the overall achievement of the Project Objective is rated Highly Satisfactory (HS).

Assessment of Outcomes	Rating
Relevance	**R**
Effectiveness	**HS**
Efficiency	**S**
Overall Project Outcome Rating	**HS**

Sustainability

Sustainability of the project is judged by the commitment of the beneficiary country to continue and replicate the project activities beyond the project completion date. The evaluation identifies key risks to sustainability and explains how these risks may affect continuation of the project benefits after the project closes. The assessment covers institutional/governance risks, financial, socio-political, and environmental risks.

Institutional framework and governance: The Government has established a legal and regulatory framework that specifies reporting responsibilities of UPOPs from secondary copper industries that include emission standards comparable to the standards in developed countries. The project has conducted extensive training of government officials, enterprise managers and workers to improve the knowledge of UPOPs pollution prevention of UP-POPs and heavy metals. As a result, the existing institutional regulatory and enforcement capacity has been enhanced at the national level as well as in the demonstration province.

The demonstrated technological innovations when replicated and upscaled are likely to require significant oversight from relevant agencies and levels of the Government. Given experiences from previous interventions for replication and scaling up of tested approaches in China, it could be expected that institutional constrains will not represent major concerns.

Based on the above, the institutional framework and governance sustainability is rated: **Likely (L).**

Financial sustainability: The financial sustainability is judged by the commitment of the project stakeholders for continued support for sustaining the already realized project benefits and their replication to new additional locations.

At the time of the TE, a corporate incentive plan was offered for 18 secondary copper smelting and disassembly companies out of total 31 applications. This clearly shows the strong potential for use of the BAT/BEP selected and demonstrated under the project and replication to other industries in the sector.

Nevertheless, both companies reported 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. However, the financial sustainability is also somewhat affected by availability of the copper sludge for processing at the two demonstration enterprises as there is a number of companies processing this kind of waste in the Jiangxi province. This can be demonstrated for one of the demonstration enterprises that processed 5,181 tonnes of low-grade copper sludge in 2020 while it did not get any sludge for processing in the first 6 months of 2021. Lack of copper sludge for processing could have a negative effect on willingness of other companies to follow the example of the two demonstration enterprises and invest in the technology conversion. It will be desirable to available instruments for distribution of copper sludge to recycled copper enterprises from a nation-wide perspective.

Based on the above, financial sustainability is rated **Likely (L).**

Socio-political sustainability: The socio-political sustainability depends on the stance of the employees of the secondary copper industries and the public at large towards the operation of the industry. The project also attached importance to the public awareness promotion, 3 Brochures prepared, and the video is also being produced by CEEC. 3 promotional videos also produced by LMPO and CEEC. 3 books are in preparation, and will be published before the end of 202. The evaluators did not find serious social or political risks that can undermine the longevity of project outcomes. In general, there seems to be a strong support for addressing pollution in metropolitan areas and improving hazardous waste management across the country. The factories have a strong incentive to demonstrate their ability to manage well the technological process including disposal of fly ashes containing dioxins and other UPOPs. Additional socio-economic benefits

from the project include enhanced recycling and material efficiency, and improved copper sludge management.

Based on the above socio-economic sustainability is rated **Likely (L).**

Environmental sustainability: The project generates a positive environmental effect through demonstration, replication and upscaling of BAT/BEP measures for treatment and control of air releases from copper smelters. However, results of research studies indicated that fly ash and smelting slag from secondary copper smelting has a high PCDD/F formation potential and could contain significant amounts of lead and cadmium. The main concern is for the fate of PCDD/Fs and risk of human exposure to the landfilled ashes and solid residues from the technological processes. Therefore, secondary copper smelting enterprises should consider the potential of leaching and biohazardous potential of the fly ash and smelting slag[14].

Based on the above, the environmental sustainability is rated **Likely (L).**

Overall likelihood of sustainability: Since overall rating for sustainability should not be higher than its lowest rated dimension, the overall rating for sustainability is rated **Likely (L).**

Sustainability	**Rating**
Financial resources	**Likely (L)**
Socio-political	**Likely (L)**
Institutional framework and governance	**Likely (L)**
Environmental	**Likely (L)**
Overall Likelihood of Sustainability	**Likely (L)**

Country ownership

In order to examine country ownership, GEF evaluations are required to find evidence that the project fits within stated sector development priorities, and also that outputs, such as new environmental laws, have been developed with involvement from the governmental officials and have been adopted into national strategies, policies and legal codes.

The project was designed upon extensive consultations with an array of public stakeholders, including extensive inputs from the key agencies of the Government. A high level of country ownership of the project was one of the key assumptions made during the project design phase. The strong buy-in at the beginning of the project was documented by the co-financing letters and related commitments. Ownership by the different governmental stakeholders and the

[14] Jiancheng Shu et al., "Metal mobility and toxicity of reclaimed copper smelting fly ash and smelting slag", RSC Adv., 11 (2021), 6877

participating demonstration enterprises was sustained throughout the project implementation and proved to be one of the critical factors behind the project accomplishments. Under the project, Ministry of Finance, Ministry of Industry and Information Technology, National Development and Reform Commission are involved in the implementation of the project, which the National Development and Reform Commission, as the policy issuing unit, issued the cleaner production evaluation index system for the recycled copper industry; representatives from the Ministry of Industry and Information Technology and Ministry of Finance participated in the project kick-off meeting. FECO consults with ministries from time to time during the implementation of the project. The project under the Ministry of Industry and Information Technology to participate in the development of the declaration and verification of industry specification.

As shown in under the section Relevance above, the project has direct linkages to national development plans. A strong factor for country ownership was the demand for assistance in the process of development technical specifications and emission standards for the secondary copper industries.

Gender equality and women's empowerment

The focus of this section is to discuss to what extent was the project mainstreaming UNDP priorities such as poverty alleviation, improved governance, and women's empowerment**,** i.e. whether it is possible to identify and define positive or negative effects of the project on local populations**,** whether gender issues had been taken into account in project design and implementation and in what way has the project contributed to greater consideration of gender aspects.

The project was prepared after the issuance of the GEF Policy on Gender Mainstreaming[15] that expresses GEF's commitment to enhancing the degree to which the GEF and its implementing agencies promote the goal of gender equality through GEF-funded projects. Although there was no specific gender strategy, the project did make basic efforts to include gender perspectives. During project implementation, attention was given to inclusion of women in various capacity building activities, training workshops on RE and EE for the health sector.

In addition, the two demonstration enterprises introduced some measures for improvement of rights and interests of female employees. This included establishment of occupational protection management system for female workers based on regular health check-up for female workers with the aim to minimize adverse impact on female workers' health. The two demonstration enterprise had invited students to visit the enterprise through summer camp. Visiting and training in the production line as well as the gender equality regulations in the plants was included to improve both environmental protection and safety awareness. By reducing UPOPs releases from the secondary copper processing, health risks for female workers and their children has been

[15] Policy on Gender Mainstreaming, Global Environmental Facility, May 2012

reduced. This also addressed concerns of vulnerable and high-risk groups in the communities surrounding the demonstration enterprises.

In addition, the project engaged gender mainstreaming experts with the aim to formulate gender mainstreaming action plan for secondary copper industry and disseminate gender equality knowledge. The project also triggered assessment of the gender ratio of China's secondary copper enterprises through industry associations to support implementation of the gender mainstreaming action plan.

The project has a positive gender impact because the BAT/BEP introduction improved environment protection through the reduction of dioxin emissions, thus minimizing potential health impacts associated with such pollutants, including potential for prenatal exposure of children of women exposed to the pollution. With the improvement of working conditions, some roles not suitable for women are now carried out by female staff.

Cross-cutting issues

Apart from mainstreaming of the gender issues discussed above, there were no other cross-cutting issues incorporated in this project.

GEF additionality

The traditional concept of additionality in the GEF projects as based on the incremental cost approach to ensure that GEF funds do not substitute for existing development finance but provide additional resources to produce global environmental benefits. This concept presents the additionality as a narrow focus on specific environmental benefits from the GEF funding but does not recognize other objectives that support the achievement of the global environmental benefits over a longer term.

The special environmental benefits from this project are examined under the assessment of the Project Objective. In line with recent developments of evaluation methodology of GEF projects, the GEF additionality is examined in terms of changes in the attainment of direct project outcomes at project completion that can be attributed to GEF's interventions[16].

The project provided a legal/regulatory additionality through its support for development of legal or regulatory reforms and their accelerated adoption into practice. Institutional additionality was provided through strengthening of relevant national institutions for conduct and evaluation of accurate measurement of dioxin emissions. The GEF funding also facilitated faster adoption of BAT/BEP technologies and thus provided an important innovation additionality. Through promotion of technological innovations and targeted financial support to the demonstration enterprises, the project rendered important financial additionality in terms of reduction of financial risk for the private sector enterprises A pollutant discharge permit system has been established under the recycled copper project and the recommended BAT technology will

[16] An Evaluative Approach to Assessing GEF's Additionality, GEF/ME/C.55/inf. 01

promote the technological upgrading of the recycled copper industry and the reduction of dioxin emissions.

Catalytic/Replication effect

An exit strategy is explicitly linked to sustainability in that it considers means of ensuring sustainability of the project achievements after the end of the technical and financial support by the donor. A sound exit strategy should be planned early in the project implementation and should be based on established partnerships and local linkages, on developed local organizational and human capacities and on mobilization of local and external resources.

The project does not have a written exit strategy that would outline steps and activities to ensure sustainable management of the achieved results by the project stakeholders after the end of the donor support. However, an exit strategy of its own is the National Replication Programme for the secondary copper industry embedded in the project. Through compilation and publication of studies from the demonstration enterprises and setting of standards for adoption of the BAT/BEP, the project and the NRP in particular will have a strong catalytic effect for replication and eventual upscaling of the demonstrated BAT/BEP for the entire secondary copper sector in China. Moreover, experience and data collected within this project could be useful for developing and transition economies.

In particular, knowledge, implementation experience and results will be gathered, documented, managed and disseminated through the following activities that either act as source of, or contribute to, and which will capture lessons-learned and experiences gained, and will publish them in publications, lessons-learned reports and promotional materials that will be used in training, seminars and workshops to facilitate the National Replication Programme for transformation effort, promoting the rippling effects of attract and encourage other enterprises to follow suit.

Progress to impact

Besides the obvious environmental stress reduction that will show up in the future, the main immediate impact of the project lies in broader adoption and transformational change, i.e. the Government and other stakeholders adopt, expand, and build on this initiative in the future.

As direct result of the implementation of the GEF project, the secondary copper industry is gradually promoting regulatory improvements and technology upgrades to reduce dioxin emissions. However, other secondary non-ferrous metal industries also produce large dioxins emissions due to their rapid growth and large scale. Relevant process technologies and management models can be used for reference in other secondary metal smelting. The experience from the secondary copper project provided valuable reference for the upgrading innovation of other secondary metal smelting and flue gas purification processes and equipment and enabled the Government in cooperation with UNDP to develop and submit a GEF project concept for

reduction of UPOPs and introduction of BAT/BEP in the secondary aluminum and zinc production.

Mandatory TE ratings

The summary of ratings of the mandatory evaluation criteria is in the Table 18 below.

Table 18: Overall Project Rating

Evaluation Criteria	Evaluators' Rating
Monitoring and evaluation: design at entry	Satisfactory (S)
Monitoring and evaluation: implementation	Satisfactory (S)
Overall quality of monitoring and evaluation	**Satisfactory (S)**
Quality of UNDP Implementation	Highly Satisfactory (HS)
Quality of Execution - Executing Agency	Highly Satisfactory (HS)
Overall quality implementation / execution	**Highly Satisfactory (HS)**
Relevance	**Relevant**
Effectiveness	Highly Satisfactory (HS)
Outcome 1	Highly Satisfactory (HS)
Outcome 2	Highly Satisfactory (HS)
Outcome 3	Satisfactory (S)
Outcome 4	Satisfactory (S)
Efficiency	**Satisfactory (S)**
Overall Project Objective	**Highly Satisfactory (HS)**
Overall likelihood of sustainability	**Likely (L)**
Institutional framework and governance	Likely (L)
Financial	Likely (L)
Socio-economic	Likely (L)
Environmental	Likely (L)

MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This section contains conclusions as judgements based on the findings provided in the previous section. A short summary of relevant finding precedes each conclusion that is followed by a recommendation as a corrective action proposed to be taken by relevant project stakeholders to address the deficiencies identified in the findings and conclusions.

This Terminal Evaluation makes two types of recommendations. Recommendations on substantive matters are provided for consideration of the national project partners in order to ensure the project results are consolidated and sustained by relevant project stakeholders. These recommendations are suggested for implementation as soon as possible using the existing institutional capacities and frameworks that have been created by the current project.

Main Findings

The project commissioned more than 30 studies for assessment of the existing policies and advance research on (i) pollution prevention and technical as well as economic control policies, (ii) technical standards of indicator system and audit guideline on cleaner production for the secondary copper smelting industry, (iii) application and issuance technical guideline for emission permit on secondary non-ferrous metal industry, and (iv) emission standards applicable to secondary copper, aluminium, lead, and zinc industries.

Specifically, a policy on pollution prevention technology in secondary copper industry was drafted and submitted to MEE and MIIT.

At the project closure, total 8 standards related to emission control were promulgated, with 2 additional standards under development. Based on the standards, certificates were issued for more than 400 companies. The standards will play important roles in the sustainable development of secondary metallurgy industry in China and beyond.

Through capacity building activities, the project strengthened relevant agencies of the Government responsible for pollution prevention and control, and for implementing best available techniques and best environmental practices (BAT/BEP for reduction of releases of unintentional POPs and other pollutants in secondary copper production and other non-ferrous metals production.

The project supported establishment of an information platform for management of emission certificates that serves as a foundation for management of the secondary metals industry in China. A system for annual collection information on unintentional POPs was established to provide quantitative supports to POPs management by the government.

Under cooperation with the China Nonferrous Metals Industry Association, an information exchange platform for secondary metals industry was established and used by more than 1,000 participants from more than 10 countries and almost 100 companies per annum. This platform is an important driver to greening the development of the non-ferrous industry in China. From 2017

onwards, a number of symposiums were organised with more than 100 participants from more than 50 companies each year.

Development and promulgation of specifications for inspection of hazardous waste transport has largely prohibited shipment of low value hazardous waste with high chloride content between provinces. The specifications, together with 2 other local directives for emission control during hazardous waste treatment, contributed to improvements in pollution management effectiveness and environmental quality.

Through organisation of 5 conferences, the project contributed to improved communication between secretariats of different international conventions and relevant ministries in China.

Two secondary copper enterprises directly benefited from the project support and improved their production processes by applying BAT/BEP for reduction of emissions of unintentional persistent organic pollutants (POPs). The project provided support for procurement of equipment for 4 selected technologies that were subsequently installed and commissioned at the two demonstration companies. This enabled to achieve the dioxin content in the emission 0.1ng TEQ/m^3 in flue gas.

According to the data provided by an independent verifier, the two demonstration companies achieved the total reduction of dioxin emissions of 46.20 g TEQ (43.48 g TEQ from gaseous emissions and 2.72 g TEQ from residues emissions) and exceeded thus the pre-set objective of 11.88g TEQ.

The project supported demonstration of a management system for smart industrial park at Tongling that includes hazardous waste treatment, water and gas quality inspection, as well as a third party for maintenance of the system. Two additional parks were selected to carry out park management demonstration based on the industrial chain, so as to realize the intelligent management and control of raw materials, products and wastes of enterprises in the park, and strengthen the pollutant emission control and environmental safety of enterprises in the parks.

Incentives for application of BAT/BEP were provided through the National Replication Programme to 20 companies (8 smelting companies and 10 dismantling companies). The achieved reduction of dioxin is 386.52 g TEQ in flue gas and 21.17g TEQ in residues gives the total reduction 407.69 g TEQ. The dismantling receive assistance for reduced use of organic pollutants. All 10 dismantling companies passed the acceptance of FECO expert meeting and achieved the planned objectives of the project.

The project organized more than 100 training events for 815 companies, total 1,810 government officers, total 5,521 technical workers, as well as 8,250 managers. More than one million of public participants attended awareness raising events. Furthermore, the project supported production and distribution of more than 300 briefs on unintentional POPs reduction in the secondary copper industry. More than 120 related articles were posted on internet platforms for public awareness on the dioxin reduction efforts. The browsing is recorded as 84,000 times. Several other public awareness materials were developed including movies, cartoons, interviews,

and songs. More than 20 movies had been compiled with more than 1250,000 times of broadcasting.

Recommendations to follow-up and/or reinforce initial benefits from the project

Conclusion 1: The research studies and technical reports produces with the support of the project will be an important source of information for the contemplated project on promotion of BAT/BEP in the secondary aluminium and zinc industries. Access to the knowledge products from this project could avoid unnecessary repetition and/or duplication of efforts.

Recommendation 1: FECO should complete the compilation of lessons learned and best practices from this project and together with other research studies and post it at an electronic document repository together with all research studies and technical reports from the project.

Conclusion 2: The measurement of the PCDD/PCDF emissions is an important input into preparation of obligatory reporting under the Stockholm Convention.

Recommendation 2: FECO together with the institutional stakeholders should incorporate collection of data on PCDD/PCDF measurements into the National Replication Plan in order to facilitate compulsory reporting under the Stockholm Convention. Optimization of the feedback and management scheme during the project execution is necessary and beneficial for follow-up projects on other non-ferrous metal industries.

Conclusion 3: One of the assumptions in the project is the correct application of the demonstrated BAT/BEP under the National Replication Plan. Given the risks of producing of high quantities of dioxins during the smelting and dismantling processes, it is critical to properly inform and guide the technology replication.

Recommendation 3: *For the update of the National Replication Plan, FECO with the demonstration enterprises should develop detailed technical protocols for use of the demonstrated BAT/BEP and laboratory verification of dioxin releases after the BAT/BEP renovations.*

Conclusion 4: Extensive stakeholder awareness will be critical for successful replication of the experience from BAT/BEP demonstrations.

Recommendation 4: FECO should consider organization of additional workshops and seminars for dissemination results of the BAT/BEP demonstration, in particular the detailed technical protocols for replication among the companies selected for participation in the National Replication Plan.

Conclusion 5: The implementation of the sub-component on demonstration of circular economy and PPP industrial park-based management was delayed and therefore not completed at the

project closure. It is critical to collect and disseminate the experience acquired under this project for future reference.

Recommendation 5: FECO in cooperation with the management of the Anhui Tongling Industrial Park should ensure collection and proper dissemination of experience for the benefit of other secondary non-ferrous metal industrial parks in China.

Recommendations to improve the design and monitoring of future projects on technology conversion

Conclusion 6: The project outsourced management of some parts to external partners. Outsourcing of management responsibilities for some components of the projects could improve efficiency of implementation of large scale and complex projects, particularly in the Chinese context. However, in such cases it is important to develop a proper outsourcing model based on full sharing of information and documentation between the project team and the outsourcing partners.

Recommendation 6: UNDP in cooperation with FECO should ensure that all necessary documentation is provided by the outsourcing kept on file ensure sufficient flow of information and documents between the project implementing teams and the outsourcing partners.

Conclusion 7: Demonstration of technology conversion and introduction of BAT/BEP is a complicated process involving a number of steps from identification of the participating beneficiaries through development of technical specifications for equipment and technical services, procurement, installation of equipment and gradual production start , to collection of data for evaluation of the demonstration. Elements of the projects that depend on the results of technology demonstration should be carefully planned in terms of timing of their implementation.

Recommendation 7: UNDP CO should ensure that design of future projects on introduction of BAT/BEP are based on a clear theory of change and a related coherent results framework with clear definition of timing for implementation of the individual components.

Conclusion 8: A coherent project results framework with correctly defined indicators and their targets is a key element for effective monitoring of progress towards planned results. Monitoring of progress should be done at the level of project outputs to inform the project implementation teams about lack of progress on delivery of the project outputs.

Recommendation 8: UNDP CO should ensure that project indicators and their target values are correctly formulated to measure delivery at the project output and outcome levels and that progress towards achievement of results is regularly assessed.

Conclusion 9: The project provided capacity building for a number of direct beneficiaries, including government officials, workers and line management at the enterprises, members of the industry associations, management of the industrial park. Measurement of effectiveness of the CB activities would inform what has been achieved, identify areas where still persist gaps in skills and knowledge, an outline the path needed to get to the next level.

Recommendation 9: UNDP CO in cooperation with FECO should include assessment of effectiveness of capacity building activities in future technology conversion projects.

Conclusion 10: Lack of monitoring of the extent of actual co-financing for the project does not allow the evaluators to assess the effect of co-financing or the lack of thereof on achievement of project outcomes and on sustainability of project results.

Recommendation 10: For GEF-funded projects, UNDP CO and the national implementing partners should track actual levels of co-financing during implementation and report the actually realized levels of co-financing in annual PIRs.

Conclusion 11: Trainings and outreach activities including improving public awareness of the importance to prevent UPOPs emission are to large extent protecting people from UPOPs hazards and therefore ensure long-term establishment of the project outcomes.

Recommendation 11: For GEF-funded projects, UNDP CO and the national implementing partners should increase the number of outreach activities and enlarge the focus of the trainings and numbers of people to be trained.

Lessons learned and good practices

The project design was based on combination of interventions for strengthening of institutions and regulatory frameworks and demonstration of a new technology as the two principal components. The takeaway lesson from this project is that the coherence and combination of enabling environment with pilot technology demonstration is an effective tool for achievement of sector-wide transformation, especially in situations where there is lack of experience with new technologies that are required for the transformation.

Integrated approaches, although complicated, are effective tools to build solid fundaments for transformation.

China's commitment to the Stockholm Convention was a very important driver in the preparatory as well as the implementation phase of this project and facilitated development of a strong ownership of the project both by the public and private sector stakeholders. The country ownership was further strengthened by ensuring that the project also addressed national priorities, including the reduction of negative effects of dioxins on human health and the environment. Designation of FECO as the GoC Execution Agency for the project guaranteed the necessary institutional commitment and political guidance by the national agency with a strong mandate for support to the development and implementation of SC-related policies and

regulations, collection and publication of data and reports, as well for coordination with key governmental stakeholders.

The focus on industrial application of a new technology provides an effective framework to catalyse transformation at scale. Raising awareness among decision makers was also key to build the political will to adopt new regulations and commence the sector-wide transformation through implementation of the NRP.

As the project addressed the secondary copper industrial sector, there was a certain number of stakeholders that had to be engaged, both from the Government and from the industry side. The project benefitted from close collaboration with the industry through the China Non-Ferrous Metals Industry Association. The latter provided valuable assistance in a number of tasks including selection of the demonstration enterprises, outreach to the industry and organizing training. Consequently, the project was very inclusive and can be presented as an example of a successful public-private partnership with the central, provincial, and local environmental authorities the industry association, private enterprises and their experts and academia.

Given the complexity of the technological processes, it is reasonable to expect unforeseen developments that would require some level of flexibility and adaptive management. Extensive upgrading and modifications of production lines also require a significant amount of enterprise co-financing. While the project was designed to conduct analysis of the technical aspects of the demonstrations, it is equally important to collect data on the financial requirements for the technology retrofits and upgrades, in particular on the level of co-financing by the beneficiary enterprises and their options for access to finances (own funds, commercial loans, eventually government subsidies).

Evaluation of the demonstration technologies must be conducted from the technological as well as the financial point of view and incorporated in the project design. Collection of such information is critical for financial sustainability of projects promoting technology conversions.

Annex 1: Evaluation Terms of Reference

International Consultant-Terminal Evaluation

Location :	CHINA
Application Deadline :	05-Mar-21 **(Midnight New York, USA)**
Additional Category :	Sustainable Development and Poverty Reduction
Type of Contract :	Individual Contract
Post Level :	International Consultant
Languages Required :	English
Starting Date : (date when the selected candidate is expected to start)	19-Mar-2021
Duration of Initial Contract :	3 months
Expected Duration of Assignment :	3 months

UNDP is committed to achieving workforce diversity in terms of gender, nationality and culture. Individuals from minority groups, indigenous groups and persons with disabilities are equally encouraged to apply. All applications will be treated with the strictest confidence.

UNDP does not tolerate sexual exploitation and abuse, any kind of harassment, including sexual harassment, and discrimination. All selected candidates will, therefore, undergo rigorous reference and background checks

Introduction

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) at the end of the project. This Terms of Reference (ToR) sets out the expectations for the TE of the *full-sized* project titled *UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China* (PIMS *#5383*) implemented through the FECO/*Ministry of Ecology and Environment of China*. The project started on the *3rd August 2016* and is in its *5* year of implementation. The TE process must follow the guidance outlined in the document 'Guidance For Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects' http://web.undp.org/evaluation/guideline/documents/GEF/TE_GuidanceforUNDP-supportedGEF-financedProjects.pdf

Project Description

Project period:	60 months
Allocated resources from GEF:	US$12,600,000
Co-financing:	
• UNDP:	US$100,000
• Government:	US$4,260,000
• Private Sector:	US$37,000,000
• Others:	US$11,090,000

The project will achieve its objectives through the introduction and demonstration of BAT/BEP technologies and sound process control, to increase China's capability in meeting its obligations under the Stockholm Convention. The overall project strategy is to blend GEF funding into the overall national secondary copper production management system development process to address the issues and barriers, specifically ensuring that international best practice experience and technology options are considered. At the macro level, it will take in international experience to develop and improve the national management and supervision system for the secondary copper production sector. National technical standards will be adopted and implemented, particularly on UPOPs emission. Public awareness activities will be conducted to promote implementation of full process UPOPs reduction system. Through demonstration activities at two selected locations in Jiangxi Province and actions to be taken at selected enterprises, pre-treatment, smelting, alloying, casting, electrolysis, gas treatment and fly ash disposal will be conducted in an environmentally sound manner utilizing demonstrated BAT/BEP that will result in achieving reduction of UPOPs release.

In detail, the project will achieve reduction of UPOPs release through four comprehensive and targeted components. The project as outlined is structured with four components:

Component 1 will support the development and improvement of regulatory framework, strengthen institutional and management capacities, and enhance coordination with other multilateral environmental conventions;

Component 2 covers the development of the required infrastructure and the demonstration of BAT/BEP technologies and PPP-based industry chain management with the UNDP-GEF support focused on introduction of international technology;

Component 3 will develop a national replication plan of BAT/BEP for the secondary copper smelting industry on the demonstration results and experience gained, with PPP joint governance and management structure established;

Component 4 supports the monitoring and evaluation of the project and dissemination of experience and lessons learned, something that is seen as useful for other developing countries dealing with the issue globally. In addition; project management capacity will be strengthened to achieve implementation effectiveness and efficiency.

TE Purpose

The TE report will assess the achievement of project results against what was expected to be achieved, and draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming. The TE report promotes accountability and transparency, and assesses the extent of project accomplishments.

Duties and Responsibilities

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects. The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

TE Approach & Methodology

The TE must provide evidence-based information that is credible, reliable and useful.

The TE team will review all relevant sources of information including documents prepared during the preparation phase (i.e. PIF, UNDP Initiation Plan, UNDP Social and Environmental Screening Procedure/SESP) the Project Document, project reports including annual 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 evaluation. The TE team will review the baseline and midterm GEF focal area Core Indicators/Tracking Tools submitted to the GEF at the CEO endorsement and midterm stages and the terminal Core Indicators/Tracking Tools that must be completed before the TE field mission begins.

The TE team is expected to follow a participatory and consultative approach ensuring close engagement with the Project Team, government counterparts (the GEF Operational Focal Point), Implementing Partners, the UNDP Country Office(s), the Regional Technical Advisors, direct beneficiaries and other stakeholders.

Engagement of stakeholders is vital to a successful TE. Stakeholder involvement should include interviews with stakeholders who have project responsibilities, including but not limited to the Implementing Partner, Local PMO and the demonstration enterprises*;* executing agencies, senior officials and task team/component leaders, key experts and consultants in the subject area, Project Board, project beneficiaries, academia, local government and CSOs, etc.

Considering the COVID outbreak, evaluation will take place through virtual interviews.

The specific design and methodology for the TE should emerge from consultations between the TE team and the above-mentioned parties regarding what is appropriate and feasible for meeting the TE purpose and objectives and answering the evaluation questions, given limitations of budget, time and data. The TE team must, however, use gender-responsive methodologies and tools and ensure that gender equality and women's empowerment, as well as other cross-cutting issues and SDGs are incorporated into the TE report.

The final methodological approach including interview schedule, field visits and data to be used in the evaluation should be clearly outlined in the inception report and be fully discussed and agreed between UNDP, stakeholders and the TE team.

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

As of 11 March 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic as the new coronavirus rapidly spread to all regions of the world. Travel to the country has been restricted. If it is not possible to travel to or within the country for the TE mission then the TE team should develop a methodology that takes this into account the conduct of the TE virtually and remotely, including the use of remote interview methods and extended desk reviews, data analysis, surveys and evaluation questionnaires. This should be detailed in the TE Inception Report and agreed with the Commissioning Unit.

If all or part of the TE is to be carried out virtually then consideration should be taken for stakeholder availability, ability or willingness to be interviewed remotely. In addition, their accessibility to the internet/computer may be an issue as many government and national counterparts may be working from home. These limitations must be reflected in the final TE report.

If a data collection/field mission is not possible then remote interviews may be undertaken through telephone or online (skype, zoom etc.). International consultants can work remotely with national evaluator support in the field if it is safe for them to operate and travel. No stakeholders, consultants or UNDP staff should be put in harm's way and safety is the key priority.

A short validation mission may be considered if it is confirmed to be safe for staff, consultants, stakeholders and if such a mission is possible within the TE schedule. Equally, qualified and independent national consultants can be hired to undertake the TE and interviews in country as long as it is safe to do so.

Detailed Scope of the TE

The TE will assess project performance against expectations set out in the project's Logical Framework/Results Framework (see TOR Annex A). The TE will assess results according to the criteria outlined in the Guidance for TEs of UNDP-supported GEF-financed Projects *(*http://web.undp.org/evaluation/guideline/documents/GEF/TE_GuidanceforUNDP-supportedGEF-financedProjects.pdf

The Findings section of the TE report will cover the topics listed below.

A full outline of the TE report's content is provided in ToR Annex C.

The asterisk "(*)" indicates criteria for which a rating is required.

Findings

1. Project Design/Formulation

- National priorities and country driven-ness
- Theory of Change
- Gender equality and women's empowerment
- Social and Environmental Safeguards
- Analysis of Results Framework: project logic and strategy, indicators
- Assumptions and Risks
- Lessons from other relevant projects (e.g. same focal area) incorporated into project design
- Planned stakeholder participation
- Linkages between project and other interventions within the sector
- Management arrangements

Project Implementation

- Adaptive management (changes to the project design and project outputs during implementation)
- Actual stakeholder participation and partnership arrangements
- Project Finance and Co-finance
- Monitoring & Evaluation: design at entry (*), implementation (*), and overall assessment of M&E (*)
- Implementing Agency (UNDP) (*) and Executing Agency (*), overall project oversight/implementation and execution (*)
- Risk Management, including Social and Environmental Standards

Project Results

- Assess the achievement of outcomes against indicators by reporting on the level of progress for each objective and outcome indicator at the time of the TE and noting final achievements
- Relevance (*), Effectiveness (*), Efficiency (*) and overall project outcome (*)
- Sustainability: financial (*) , socio-political (*), institutional framework and governance (*), environmental (*), overall likelihood of sustainability (*)
- Country ownership
- Gender equality and women's empowerment
- Cross-cutting issues (poverty alleviation, improved governance, climate change mitigation and adaptation, disaster prevention and recovery, human rights, capacity development, South-South cooperation, knowledge management, volunteerism, etc., as relevant)
- GEF Additionality
- Catalytic Role / Replication Effect
- Progress to impact

Main Findings, Conclusions, Recommendations and Lessons Learned

- The TE team will include a summary of the main findings of the TE report. Findings should be presented as statements of fact that are based on analysis of the data.
- The section on conclusions will be written in light of the findings. Conclusions should be comprehensive and balanced statements that are well substantiated by evidence and logically connected to the TE findings. They should highlight the strengths, weaknesses and results of the project, respond to key evaluation questions and provide insights into the identification of and/or solutions to important problems or issues pertinent to project beneficiaries, UNDP and the GEF, including issues in relation to gender equality and women's empowerment.
- Recommendations should provide concrete, practical, feasible and targeted recommendations directed to the intended users of the evaluation about what actions to take and decisions to make.

The recommendations should be specifically supported by the evidence and linked to the findings and conclusions around key questions addressed by the evaluation.

- The TE report should also include lessons that can be taken from the evaluation, including best and worst practices in addressing issues relating to relevance, performance and success that can provide knowledge gained from the particular circumstance (programmatic and evaluation methods used, partnerships, financial leveraging, etc.) that are applicable to other GEF and UNDP interventions. When possible, the TE team should include examples of good practices in project design and implementation.
- It is important for the conclusions, recommendations and lessons learned of the TE report to include results related to gender equality and empowerment of women.

The TE report will include an Evaluation Ratings Table, as shown in the ToR Annex.

Competencies

Expected Outputs and Deliverables

The TE *consultant/team* shall prepare and submit:

- TE Inception Report: TE team clarifies objectives and methods of the TE no later than *2 weeks* before the TE mission. TE team submits the Inception Report to the Commissioning Unit and project management. Approximate due date: *5 April 2021*
- Presentation: TE team presents initial findings to project management and the Commissioning Unit at the end of the TE mission. Approximate due date: *19 April 2021*
- Draft TE Report: TE team submits full draft report with annexes *within 3 weeks* of the end of the TE mission. Approximate due date: *14 May 2021*
- Final TE Report* and Audit Trail: TE team submits revised report, with Audit Trail detailing how all received comments have (and have not) been addressed in the final TE report, to the Commissioning Unit *within 1 week* of receiving UNDP comments on draft. Approximate due date: *28 May 2021*

*The final TE report must be in English. If applicable, the Commissioning Unit may choose to arrange for a translation of the report into a language more widely shared by national stakeholders.

All final TE reports will be quality assessed by the UNDP Independent Evaluation Office (IEO). Details of the IEO's quality assessment of decentralized evaluations can be found in Section 6 of the UNDP Evaluation Guidelines.[1]

TE Arrangements

The principal responsibility for managing the TE resides with the Commissioning Unit. The Commissioning Unit for this project's TE is *UNDP Country Office in China.*

The Commissioning Unit will contract the consultants and ensure the timely provision of per diems and travel arrangements within the country for the TE team. The Project Team will be responsible for liaising with the TE team to provide all relevant documents, set up stakeholder interviews, and arrange field visits.

Duration of the Work

The total duration of the TE will be approximately *(average 25-35 working days)* over a time period of *(12 of weeks)* starting 19 March 2021 and shall not exceed five months from when the TE team is hired. The tentative TE timeframe is as follows:

- *5 March:* Application closes
- *8 March:* Selection of TE Team
- *10 March:* Prep the TE team (handover of project documents)

- *15 March: 5* days: Document review and preparing TE Inception Report
- *24 March: 3* days: Finalization and Validation of TE Inception Report- latest start of TE mission
- *16 April: 6* days: TE mission: stakeholder meetings, interviews, field visits
- *19 April:* Mission wrap-up meeting & presentation of initial findings- earliest end of TE mission
- *14 May: 13* days: Preparation of draft TE report
- *28 May:* Circulation of draft TE report for comments
- *31 May: 1* day: Incorporation of comments on draft TE report into Audit Trail & finalization of TE report
- *1 June:* Preparation & Issue of Management Response
- *11 June:* Expected date of full TE completion

The expected date start date of contract is *19 March 2021*.
[1] Access at: http://web.undp.org/evaluation/guideline/section-6.shtml

Required Skills and Experience

A team of *two independent evaluators* will conduct the TE – *one team leader (with experience and exposure to projects and evaluations in other regions) and one team expert, usually from the country of the project*. The team leader will *be responsible for the overall design and writing of the TE report, etc.* The team expert will *assess emerging trends with respect to regulatory frameworks, budget allocations, capacity building, work with the Project Team in developing the TE itinerary, etc.*
The evaluator(s) cannot have participated in the project preparation, formulation and/or implementation (including the writing of the project document), must not have conducted this project's Mid-Term Review and should not have a conflict of interest with the project's related activities.
The selection of evaluators will be aimed at maximizing the overall "team" qualities in the following areas:
Education

- Master's degree in chemical science, chemical engineering, natural science, environment science, environmental engineering, or other closely related field;

Experience

- Relevant experience with results-based management evaluation methodologies;
- Experience applying SMART indicators and reconstructing or validating baseline scenarios;
- Competence in adaptive management, especially on hazardous chemicals or Persistent Organic Pollutants (POPs)*;*
- Experience in evaluating projects;
- Experience working in *China;*
- Experience in relevant technical areas for at least *10 years;*
- Demonstrated understanding of issues related to gender and *Hazardous chemicals;* experience in gender responsive evaluation and analysis;
- Excellent communication skills;
- Demonstrable analytical skills;
- Project evaluation/review experience within United Nations system will be considered an asset;
- *Experience with implementing evaluations remotely will be considered an asset.*

Language

- Fluency in written and spoken English.

Evaluator Ethics
The TE team will be held to the highest ethical standards and is required to sign a code of conduct upon acceptance

of the assignment. This evaluation will be conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluation'. The evaluator must safeguard the rights and confidentiality of information providers, interviewees and stakeholders through measures to ensure compliance with legal and other relevant codes governing collection of data and reporting on data. The evaluator must also ensure security of collected information before and after the evaluation and protocols to ensure anonymity and confidentiality of sources of information where that is expected. The information knowledge and data gathered in the evaluation process must also be solely used for the evaluation and not for other uses without the express authorization of UNDP and partners.

Payment Schedule

- 20% payment upon satisfactory delivery of the final TE Inception Report and approval by the Commissioning Unit
- 40% payment upon satisfactory delivery of the draft TE report to the Commissioning Unit
- 40% payment upon satisfactory delivery of the final TE report and approval by the Commissioning Unit and RTA (via signatures on the TE Report Clearance Form) and delivery of completed TE Audit Trail

Criteria for issuing the final payment of 40%

- The final TE report includes all requirements outlined in the TE TOR and is in accordance with the TE guidance.
- The final TE report is clearly written, logically organized, and is specific for this project (i.e. text has not been cut & pasted from other MTR reports).
- The Audit Trail includes responses to and justification for each comment listed.

In line with the UNDP's financial regulations, when determined by the Commissioning Unit and/or the consultant that a deliverable or service cannot be satisfactorily completed due to the impact of COVID-19 and limitations to the TE, that deliverable or service will not be paid.

Due to the current COVID-19 situation and its implications, a partial payment may be considered if the consultant invested time towards the deliverable but was unable to complete to circumstances beyond his/her control.

APPLICATION PROCESS

Scope of Price Proposal and Schedule of Payments

Financial Proposal:

- Financial proposals must be expressed in a lump-sum for the total duration of the contract including the professional fees, living allowances etc.; travel expenses will be reimbursed based on actual cost.
- The lump sum is fixed regardless of changes in the cost components.

1. **Recommended Presentation of Proposal**
2. **Letter of Confirmation of Interest and Availability** using the template provided by UNDP;
3. **CV** and a **Personal History Form** (P11 form);
4. **Brief description of approach to work/technical proposal** of why the individual considers him/herself as the most suitable for the assignment, and a proposed methodology on how they will approach and complete the assignment; (max 1 page)
5. **Financial Proposal** that indicates the all-inclusive fixed total contract price and all other travel related costs (such as flight ticket, per diem, etc.), supported by a breakdown of costs, as per template attached to the Letter of Confirmation of Interest template. If an applicant is employed by an organization/company/institution, and he/she expects his/her employer to charge a management fee in the process of releasing him/her to UNDP under Reimbursable Loan Agreement (RLA), the applicant must indicate at this point, and ensure that all such costs are duly incorporated in the financial proposal submitted to UNDP.

All application materials should be submitted online through the link attached in the advertisement by *5 March 2021* Incomplete applications will be excluded from further consideration.

Criteria for Selection of the Best Offer

Only those applications which are responsive and compliant will be evaluated. Offers will be evaluated according to the Combined Scoring method – where the educational background and experience on similar assignments will be weighted at 70% and the price proposal will weigh as 30% of the total scoring. The applicant receiving the Highest Combined Score that has also accepted UNDP's General Terms and Conditions will be awarded the contract.

Annexes to the TE ToR

- ToR Annex A: Project Logical/Results Framework
- ToR Annex B: Project Information Package to be reviewed by TE team
- ToR Annex C: Content of the TE report
- ToR Annex D: Evaluation Criteria Matrix template
- ToR Annex E: UNEG Code of Conduct for Evaluators
- ToR Annex F: TE Rating Scales and TE Ratings Table
- ToR Annex G: TE Report Clearance Form
- ToR Annex H: TE Audit Trail template

Terms of Reference
National Consultant- Terminal Evaluation

BASIC CONTRACT INFORMATION

Location: China
Application Deadline: 5 March 2021
Category: Chemicals and Waste
Type of Contract: Individual contract
Assignment Type:
Languages Required: English
Starting Date: 19 March 2021
Duration of Initial Contract: 3 months

BACKGROUND

1. Introduction

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) at the end of the project. This Terms of Reference (ToR) sets out the expectations for the TE of the *full-sized* project titled *UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China* (PIMS *#5383*) implemented through the FECO/*Ministry of Ecology and Environment of China*. The project started on the *3rd August 2016* and is in its *3* year of implementation. The TE process must follow the guidance outlined in the document 'Guidance For Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects'.http://web.undp.org/evaluation/guideline/documents/GEF/TE_GuidanceforUNDP-supportedGEF-financedProjects.pdf

2. Project Description

Project period:	60 months
Allocated resources from GEF:	US$12,600,000
Co-financing:	
• UNDP:	US$100,000
• Government:	US$4,260,000
• Private Sector:	US$37,000,000
• Others:	US$11,090,000

The project will achieve its objectives through the introduction and demonstration of BAT/BEP technologies and sound process control, to increase China's capability in meeting its obligations under the Stockholm

Convention. The overall project strategy is to blend GEF funding into the overall national secondary copper production management system development process to address the issues and barriers, specifically ensuring that international best practice experience and technology options are considered. At the macro level, it will take in international experience to develop and improve the national management and supervision system for the secondary copper production sector. National technical standards will be adopted and implemented, particularly on UPOPs emission. Public awareness activities will be conducted to promote implementation of full process UPOPs reduction system. Through demonstration activities at two selected locations in Jiangxi Province and actions to be taken at selected enterprises, pre-treatment, smelting, alloying, casting, electrolysis, gas treatment and fly ash disposal will be conducted in an environmentally sound manner utilizing demonstrated BAT/BEP that will result in achieving reduction of UPOPs release.

In detail, the project will achieve reduction of UPOPs release through four comprehensive and targeted components. The project as outlined is structured with four components:

Component 1 will support the development and improvement of regulatory framework, strengthen institutional and management capacities, and enhance coordination with other multilateral environmental conventions;

Component 2 covers the development of the required infrastructure and the demonstration of BAT/BEP technologies and PPP-based industry chain management with the UNDP-GEF support focused on introduction of international technology;

Component 3 will develop a national replication plan of BAT/BEP for the secondary copper smelting industry on the demonstration results and experience gained, with PPP joint governance and management structure established;

Component 4 supports the monitoring and evaluation of the project and dissemination of experience and lessons learned, something that is seen as useful for other developing countries dealing with the issue globally. In addition; project management capacity will be strengthened to achieve implementation effectiveness and efficiency.

3. TE Purpose

The TE report will assess the achievement of project results against what was expected to be achieved, and draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming. The TE report promotes accountability and transparency, and assesses the extent of project accomplishments.

DUTIES AND RESPONSIBILITIES

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects.

The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

4. TE Approach & Methodology

The TE must provide evidence-based information that is credible, reliable and useful.

The TE team will review all relevant sources of information including documents prepared during the preparation phase (i.e. PIF, UNDP Initiation Plan, UNDP Social and Environmental Screening Procedure/SESP) the Project Document, project reports including annual 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 evaluation. The TE team will review the baseline and midterm GEF focal area Core Indicators/Tracking Tools submitted to the GEF at the CEO endorsement and midterm stages and the terminal Core Indicators/Tracking Tools that must be completed before the TE field mission begins.

The TE team is expected to follow a participatory and consultative approach ensuring close engagement with the Project Team, government counterparts (the GEF Operational Focal Point), Implementing

Partners, the UNDP Country Office(s), the Regional Technical Advisors, direct beneficiaries and other stakeholders.
Engagement of stakeholders is vital to a successful TE. Stakeholder involvement should include interviews with stakeholders who have project responsibilities, including but not limited to *the implementing partner, Local PMO, demonstration enterprises,* executing agencies, senior officials and task team/component leaders, key experts and consultants in the subject area, Project Board, project beneficiaries, academia, local government and CSOs, etc. Additionally, the national consultant is expected to conduct field missions to the project sites and provide an overview of the mission to the international consultant.
The specific design and methodology for the TE should emerge from consultations between the TE team and the above-mentioned parties regarding what is appropriate and feasible for meeting the TE purpose and objectives and answering the evaluation questions, given limitations of budget, time and data. The TE team must, however, use gender-responsive methodologies and tools and ensure that gender equality and women's empowerment, as well as other cross-cutting issues and SDGs are incorporated into the TE report.
The final methodological approach including interview schedule, field visits and data to be used in the evaluation should be clearly outlined in the inception report and be fully discussed and agreed between UNDP, stakeholders and the TE team.

The final TE report should describe the full TE approach taken and the rationale for the approach making explicit the underlying assumptions, challenges, strengths and weaknesses about the methods and approach of the evaluation.
As of 11 March 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic as the new coronavirus rapidly spread to all regions of the world. Domestic travel may get restricted if there will be new case appear in project sites. If it is not possible to travel to or within the country for the TE mission then the TE team should develop a methodology that takes this into account the conduct of the TE virtually and remotely, including the use of remote interview methods and extended desk reviews, data analysis, surveys and evaluation questionnaires. This should be detailed in the TE Inception Report and agreed with the Commissioning Unit.
If all or part of the TE is to be carried out virtually then consideration should be taken for stakeholder availability, ability or willingness to be interviewed remotely. In addition, their accessibility to the internet/computer may be an issue as many government and national counterparts may be working from home. These limitations must be reflected in the final TE report.
If a data collection/field mission is not possible then remote interviews may be undertaken through telephone or online (skype, zoom etc.). International consultants can work remotely with national evaluator support in the field if it is safe for them to operate and travel. No stakeholders, consultants or UNDP staff should be put in harm's way and safety is the key priority.

5. Detailed Scope of the TE

The TE will assess project performance against expectations set out in the project's Logical Framework/Results Framework (see TOR Annex A). The TE will assess results according to the criteria outlined in the Guidance for TEs of UNDP-supported GEF-financed Projectshttp://web.undp.org/evaluation/guideline/documents/GEF/TE_GuidanceforUNDP-supportedGEF-financedProjects.pdf

The Findings section of the TE report will cover the topics listed below.

A full outline of the TE report's content is provided in ToR Annex C.

The asterisk "(*)" indicates criteria for which a rating is required.

Findings

i. Project Design/Formulation

- National priorities and country driven-ness
- Theory of Change
- Gender equality and women's empowerment
- Social and Environmental Safeguards
- Analysis of Results Framework: project logic and strategy, indicators
- Assumptions and Risks
- Lessons from other relevant projects (e.g. same focal area) incorporated into project design
- Planned stakeholder participation
- Linkages between project and other interventions within the sector
- Management arrangements

ii. Project Implementation

- Adaptive management (changes to the project design and project outputs during implementation)
- Actual stakeholder participation and partnership arrangements
- Project Finance and Co-finance
- Monitoring & Evaluation: design at entry (*), implementation (*), and overall assessment of M&E (*)
- Implementing Agency (UNDP) (*) and Executing Agency (*), overall project oversight/implementation and execution (*)
- Risk Management, including Social and Environmental Standards

iii. Project Results

- Assess the achievement of outcomes against indicators by reporting on the level of progress for each objective and outcome indicator at the time of the TE and noting final achievements
- Relevance (*), Effectiveness (*), Efficiency (*) and overall project outcome (*)
- Sustainability: financial (*) , socio-political (*), institutional framework and governance (*), environmental (*), overall likelihood of sustainability (*)
- Country ownership
- Gender equality and women's empowerment
- Cross-cutting issues (poverty alleviation, improved governance, climate change mitigation and adaptation, disaster prevention and recovery, human rights, capacity development, South-South cooperation, knowledge management, volunteerism, etc., as relevant)
- GEF Additionality
- Catalytic Role / Replication Effect
- Progress to impact

iv. Main Findings, Conclusions, Recommendations and Lessons Learned

- The TE team will include a summary of the main findings of the TE report. Findings should be presented as statements of fact that are based on analysis of the data.
- The section on conclusions will be written in light of the findings. Conclusions should be comprehensive and balanced statements that are well substantiated by evidence and logically connected to the TE findings. They should highlight the strengths, weaknesses and results of the

project, respond to key evaluation questions and provide insights into the identification of and/or solutions to important problems or issues pertinent to project beneficiaries, UNDP and the GEF, including issues in relation to gender equality and women's empowerment.

- Recommendations should provide concrete, practical, feasible and targeted recommendations directed to the intended users of the evaluation about what actions to take and decisions to make. The recommendations should be specifically supported by the evidence and linked to the findings and conclusions around key questions addressed by the evaluation.
- The TE report should also include lessons that can be taken from the evaluation, including best and worst practices in addressing issues relating to relevance, performance and success that can provide knowledge gained from the particular circumstance (programmatic and evaluation methods used, partnerships, financial leveraging, etc.) that are applicable to other GEF and UNDP interventions. When possible, the TE team should include examples of good practices in project design and implementation.
- It is important for the conclusions, recommendations and lessons learned of the TE report to include results related to gender equality and empowerment of women.

The TE report will include an Evaluation Ratings Table, as shown in the ToR Annex.

6. Expected Outputs and Deliverables

The TE *consultant/team* shall prepare and submit:

- TE Inception Report: TE team clarifies objectives and methods of the TE no later than *2 weeks* before the TE mission. TE team submits the Inception Report to the Commissioning Unit and project management. Approximate due date: *5 April 2021*
- Presentation: TE team presents initial findings to project management and the Commissioning Unit at the end of the TE mission. Approximate due date: *19 April 2021*
- Draft TE Report: TE team submits full draft report with annexes *within 3 weeks* of the end of the TE mission. Approximate due date: *14 May 2021*
- Final TE Report* and Audit Trail: TE team submits revised report, with Audit Trail detailing how all received comments have (and have not) been addressed in the final TE report, to the Commissioning Unit *within 1 week* of receiving UNDP comments on draft. Approximate due date: *28 May 2021*
-

*The final TE report must be in English. If applicable, the Commissioning Unit may choose to arrange for a translation of the report into a language more widely shared by national stakeholders.

All final TE reports will be quality assessed by the UNDP Independent Evaluation Office (IEO). Details of the IEO's quality assessment of decentralized evaluations can be found in Section 6 of the UNDP Evaluation Guidelines.[17]

7. TE Arrangements

[17] Access at: http://web.undp.org/evaluation/guideline/section-6.shtml

The principal responsibility for managing the TE resides with the Commissioning Unit. The Commissioning Unit for this project's TE is *UNDP Country Office in China*.

The Commissioning Unit will contract the consultants and ensure the timely provision of per diems and travel arrangements within the country for the TE team. The Project Team will be responsible for liaising with the TE team to provide all relevant documents, set up stakeholder interviews, and arrange field visits.

8. Duration of the Work

The total duration of the TE will be approximately *(average 25-35 working days)* over a time period of *(12 of weeks)* starting 19 March 2021 and shall not exceed five months from when the TE team is hired. The tentative TE timeframe is as follows:

- *5 March:* Application closes
- *8 March:* Selection of TE Team
- *10 March:* Prep the TE team (handover of project documents)
- *15 March: 5* days: Document review and preparing TE Inception Report
- *24 March: 3* days: Finalization and Validation of TE Inception Report- latest start of TE mission
- *16 April: 6* days: TE mission: stakeholder meetings, interviews, field visits
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- *28 May:* Circulation of draft TE report for comments
- *31 May: 1* day: Incorporation of comments on draft TE report into Audit Trail & finalization of TE report
- *1 June:* Preparation & Issue of Management Response
- *11 June:* Expected date of full TE completion

The expected date start date of contract is *19 March 2021*.

9. Duty Station

Travel:

- The BSAFE course must be successfully completed prior to commencement of travel;
- Individual Consultants are responsible for ensuring they have vaccinations/inoculations when travelling to certain countries, as designated by the UN Medical Director.
- Consultants are required to comply with the UN security directives set forth under: https://dss.un.org/dssweb/
- All related travel expenses will be covered and will be reimbursed as per UNDP rules and regulations upon submission of an F-10 claim form and supporting documents.

REQUIRED SKILLS AND EXPERIENCE

10. TE Team Composition and Required Qualifications

A team of *two independent evaluators* will conduct the TE – *one team leader (with experience and exposure to projects and evaluations in other regions) and one team expert, usually from the country of the project*. The team leader will *be responsible for the overall design and writing of the TE report, etc.* The team expert will

assess emerging trends with respect to regulatory frameworks, budget allocations, capacity building, work with the Project Team in developing the TE itinerary, etc.

The evaluator(s) cannot have participated in the project preparation, formulation and/or implementation (including the writing of the project document), must not have conducted this project's Mid-Term Review and should not have a conflict of interest with the project's related activities.

The selection of evaluators will be aimed at maximizing the overall "team" qualities in the following areas:

Education

- Master's degree in chemical science, chemical engineering, natural science, environment science, environmental engineering, or other closely related field;

Experience

- Relevant experience with results-based management evaluation methodologies;
- Experience applying SMART indicators and reconstructing or validating baseline scenarios;
- Competence in adaptive management, especially on hazardous chemicals or Persistent Organic Pollutants (POPs)*;*
- Experience in evaluating projects;
- Experience working in *China;*
- Experience in relevant technical areas for at least *8 years;*
- Demonstrated understanding of issues related to gender and *Hazardous chemicals;* experience in gender responsive evaluation and analysis;
- Excellent communication skills;
- Demonstrable analytical skills;
- Project evaluation/review experience within United Nations system will be considered an asset;
- *Experience with implementing evaluations remotely will be considered an asset.*

Language

- Fluency in written and spoken English.

11. Evaluator Ethics

The TE team will be held to the highest ethical standards and is required to sign a code of conduct upon acceptance of the assignment. This evaluation will be conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluation'. The evaluator must safeguard the rights and confidentiality of information providers, interviewees and stakeholders through measures to ensure compliance with legal and other relevant codes governing collection of data and reporting on data. The evaluator must also ensure security of collected information before and after the evaluation and protocols to ensure anonymity and confidentiality of sources of information where that is expected. The information knowledge and data gathered in the evaluation process must also be solely used for the evaluation and not for other uses without the express authorization of UNDP and partners.

12. Payment Schedule

- 20% payment upon satisfactory delivery of the final TE Inception Report and approval by the Commissioning Unit
- 40% payment upon satisfactory delivery of the draft TE report to the Commissioning Unit
- 40% payment upon satisfactory delivery of the final TE report and approval by the Commissioning Unit and RTA (via signatures on the TE Report Clearance Form) and delivery of completed TE Audit Trail

  Criteria for issuing the final payment of 40%

- The final TE report includes all requirements outlined in the TE TOR and is in accordance with the TE guidance.
- The final TE report is clearly written, logically organized, and is specific for this project (i.e. text has not been cut & pasted from other MTR reports).
- The Audit Trail includes responses to and justification for each comment listed.

In line with the UNDP's financial regulations, when determined by the Commissioning Unit and/or the consultant that a deliverable or service cannot be satisfactorily completed due to the impact of COVID-19 and limitations to the TE, that deliverable or service will not be paid.

Due to the current COVID-19 situation and its implications, a partial payment may be considered if the consultant invested time towards the deliverable but was unable to complete to circumstances beyond his/her control.

APPLICATION PROCESS

13. Scope of Price Proposal and Schedule of Payments

Financial Proposal:

- Financial proposals must be expressed in a lump-sum for the total duration of the contract including the professional fees allowances etc.; travel cost will be reimbursed based on actual cost.
- The lump sum is fixed regardless of changes in the cost components.

14. Recommended Presentation of Proposal

a) **Letter of Confirmation of Interest and Availability** using the template provided by UNDP;
b) **CV** and a **Personal History Form** (P11 form);
c) **Brief description of approach to work/technical proposal** of why the individual considers him/herself as the most suitable for the assignment, and a proposed methodology on how they will approach and complete the assignment; (max 1 page)
d) **Financial Proposal** that indicates the all-inclusive fixed total contract price and all other travel related costs (such as flight ticket, per diem, etc.), supported by a breakdown of costs, as per template attached to the Letter of Confirmation of Interest template. If an applicant is employed by an organization/company/institution, and he/she expects his/her employer to charge a management fee in the process of releasing him/her to UNDP under Reimbursable Loan Agreement (RLA), the applicant must indicate at this point, and ensure that all such costs are duly incorporated in the financial proposal submitted to UNDP.

All application materials should be submitted online through the link attached in the advertisement or by email at the following address ONLY: *jingjing.wang@undp.org* by *5 March 2021*. Incomplete applications will be excluded from further consideration.

15. Criteria for Selection of the Best Offer

Only those applications which are responsive and compliant will be evaluated. Offers will be evaluated according to the Combined Scoring method – where the educational background and experience on similar assignments will be weighted at 70% and the price proposal will weigh as 30% of the total scoring. The applicant receiving the Highest Combined Score that has also accepted UNDP's General Terms and Conditions will be awarded the contract.

Annex 2: Evaluation Matrix

Evaluative Criteria Questions	Indicators	Sources	Methodology
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?			
• Does the project relate to the GEF Chemicals focal area and has it been designed to deliver global environmental benefits in line with relevant international climate change objectives?	• The project includes the relevant GEF outcomes, outputs and indicators • The project makes explicit links with global climate action goals	• Project Document • GEF 6 Focal Area Strategy	• Desk Review of Documents
• Is the project aligned to national development objectives, broadly, and to national energy transition priorities specifically?	• The project design includes explicit links (indicators, outputs, outcomes) to the national development policy/national energy policies	• Project Document • National development strategy, energy policies, etc.	• Desk Review of Documents
• Is the project's Theory of Change relevant to addressing the development challenge(s) identified?	• The Theory of Change clearly indicates how project interventions and projected results will contribute to the reduction of the three major barriers to low carbon development (Policy, institutional/ technical capacity and financial)	• Project Document • PIF	• Desk Review of Documents
• Does the project directly and adequately address the needs of beneficiaries at local and regional levels?	• The Theory of Change clearly identifies beneficiary groups and defines how their capabilities will be enhanced by the project	• Project Document • PIF	• Desk Review of Documents
• Is the project's results framework relevant to the development challenges have the planned results been achieved?	• The project indicators are SMART • Indicator baselines are clearly defined and populated and milestones and targets are • The results framework is comprehensive and demonstrates systematic links to the theory of change	• Project Document • PIF	• Desk Review of Documents
• Have the relevant stakeholders been adequately identified and have their views, needs and rights been considered	• The stakeholder mapping and associated engagement plan includes all relevant stakeholders	• Project Document • Inception report	• Desk Review of Documents

	during design and implementation?	and appropriate modalities for engagement. • Planning and implementation have been participatory and inclusive	• Stakeholder mapping/engagement plan and reporting • Quarterly Reports • Annual Reports (PIR)	• Stakeholder Interviews
	• Have the interventions of the project been adequately considered in the context of other development activities being undertaken in the same or related thematic area?	• A partnership framework has been developed that incorporates parallel initiatives, key partners and identifies complementarities	• Project Document • Quarterly Reports • Annual Reports (PIR) • Stakeholder mapping/engagement plan and reporting	• Desk Review of Documents • Stakeholder Interviews
	• Did the project design adequately identify, assess and design appropriate mitigation actions for the potential social and environmental risks posed by its interventions?	• The SES checklist was completed appropriately and all reasonable risks were identified with appropriate impact and probability ratings and risk mitigation measures specified	• Project Document • SES Annex	• Desk Review of Documents
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?				
	• Has the project achieved its output and outcome level targets?	• The project has met or exceeded the output and outcome indicator end-of-project targets	• Quarterly Reports • Annual Reports (PIR) • Site visit/field reports	• Desk Review of Documents • Interviews with project staff, stakeholders and beneficiaries
	• Have lessons learned been captured and integrated into project planning and implementation?	• Lessons learned have been captured periodically and/or at project end	• Validation Workshop Minutes *(if available)* • Quarterly Reports • Annual Reports (PIR)	• Desk Review of Documents • Interviews with project staff, stakeholders and beneficiaries
	• Has the M&E plan been well-formulated, and has it served as an effective tool to support project implementation?	• The M&E plan has an adequate budget and was adequately funded • The logical framework was used during	• Project Document • M&E Plan • AWPs	• Desk Review of Documents • Interviews with project

		implementation as a management and M&E tool • There was compliance with the financial and narrative reporting requirements (timeliness and quality) • Monitoring and reporting has been at both the activity and results levels	• FACE forms • Quarterly Narrative Reports • Site visit reports	staff and government stakeholders
	• Were relevant counterparts from the Government and civil society involved in project implementation, including as part of the Project Board?	• The Project Board participation included representatives from key project stakeholders	• Project Board Minutes *(if available)*	• Interviews with project staff, stakeholders and beneficiaries
	• How effective were the partnership arrangements under the project and to what extend did they contribute to achievements of the project results?	• A partnership framework has been developed that ensured coordination of parallel initiatives, involvement of key partners and identification of complementarities	• Annual Reports (PIR) • Quarterly reports	• Desk Review of Documents • Interviews with project staff, stakeholders and other donors
	• How well were risks (including those identified in the Social and Environmental Screening (SES) Checklist), assumptions and impact drivers being managed?	• A clearly defined risk identification, categorization and mitigation strategy (updated risk log in ATLAS)	• UNDP ATLAS Risk Log • M&E Reports	• Desk Review of Documents • Interviews with project staff, stakeholders and beneficiaries
• Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?				
	• Did the project adjust dynamically to reflect changing national priorities/external evaluations during implementation to ensure it remained relevant?	• The project demonstrated adaptive management and changes were integrated into project planning and implementation through adjustments to annual work plans, budgets and activities • Changes to AWP/Budget were made based on mid-term or other external evaluation • Any changes to the project's planned activities were approved by the Project Board • Any substantive changes (outcome-level changes) approved by the Project Board and donor, as	• Annual Work Plans • Validation Workshop Minutes • Quarterly Reports • Annual Reports (PIR) • Project Board meeting minutes *(if available)*	• Desk Review of Documents • Interviews with project staff, stakeholders and beneficiaries

		required		
	• Was the process of achieving results efficient? Did the actual or expected results (outputs and outcomes) justify the costs incurred? Were the resources effectively utilized?	• The project achieved the planned results in an efficient manner • Funds used for project implementation were utilized affectively and contributed to achievement of project results	• Annual Workplans • Quarterly Reports • Project document	• Desk Review of Documents • Interviews with project staff, stakeholders, beneficiaries
	• What were the strengths and weaknesses of the implementation modality?	• The project implementation followed the division of responsibilities between the project implementing partners in an efficient manner	• Annual Reports (PIR) • Quarterly reports	• Desk Review of Documents • Interviews with project staff, stakeholders, beneficiaries
	• Was co-financing adequately estimated during project design (sources, type, value, relevance), tracked during implementation and what were the reasons for any differences between expected and realised co-financing?	• Co-financing was realized in keeping with original estimates • Co-financing was tracked continuously throughout the project lifecycle and deviations identified and alternative sources identified • Co-financiers were actively engaged throughout project implementation	• Annual Work Plans (AWPs) • Validation Workshop Minutes *(if available)* • Quarterly Reports, including financial reports • Annual Reports (PIR)	• Desk Review of Documents • Interviews with project staff, stakeholders, other donors and beneficiaries
	• Was the level of implementation support provided by UNDP adequate and in keeping with the implementation modality and any related agreements?	• Technical support to the Executing Agency and project team were timely and of acceptable quality. • Management inputs and processes, including budgeting and procurement, were adequate	• UNDP project support documents (emails, procurement/ recruitment documents) • Quarterly Reports • Annual Reports (PIR)	• Desk Review of Documents • Interviews with project staff, UNDP personnel
	• Were financial audit/spot check findings adequately addressed and relevant changes made to improve financial management?	• Appropriate management responses and associated actions were taken in response to audit/spot check findings. • Successive audits demonstrated improvements in financial management practices	• Project Audit Reports	• Desk Review of Documents

• Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?			
• Are there political, social or financial risks that may jeopardize the sustainability of project outcomes?	• The exit strategy includes explicit interventions to ensure sustainability of relevant activities	• Program Framework Document • Risk Log	• Desk Review of Documents
• What are the factors that will require attention in order to improve prospects of sustainability and potential for replication?	• The exit strategy includes explicit interventions to ensure sustainability of relevant activities and identifies relevant factors requiring attention in the future	• Program Framework Document	• Desk Review of Documents
• Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits?	• The exit strategy identifies relevant socio-political risks and includes explicit interventions to mitigate same	• Program Framework Document • Risk Log	• Desk Review of Documents
• Have key stakeholders identified their interest in project benefits beyond project-end and accepted responsibility for ensuring that project benefits continue to flow?	• Key stakeholders are assigned specific, agreed roles and responsibilities outlined in the exit strategy	• Program Framework Document • Risk Log	• Desk Review of Documents
• Are there ongoing activities that may pose an environmental threat to the sustainability of project outcomes?	• The exit strategy identifies relevant environmental risks and includes explicit interventions to mitigate same	• Program Framework Document • Risk Log	• Desk Review of Documents
Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?			
• Are there verifiable improvements in ecological status, or reductions in ecological stress, that can be linked directly to project interventions?	• The project has contributed directly to improved ecological conditions, including through reduced GHG emissions for energy generation	• Quarterly Reports • Annual Reports (PIR)	• Desk Review of Documents

Annex 3：Field visits agenda

Time	Time	Arrangements	Accommodation
17 July (Saturday)	9:00-11 :20	Morning: Depart from Beijing at 9:00 with KN5815; arrive at Shangrao at 11:20	Shangrao, Jiangxi
	13 :30-18 :00	Introduce the implementation of the technological upgrading by Jiangxi Jin Hui Environmental Protection Technology Co., Ltd. 2. Visit the site of technological upgrading; 3. Q&A	
18 July (Sunday)	08:30-11:30	Travel by car from Shangrao to Fuzhou	Fuzhou City, Jiangxi Province
	13:30-18:00	1. Implementation of the technological upgrading in demonstration site by Jiangxi Zi Li Environmental Protection Technology Co., Ltd. 2. Visit the site of technological upgrading; 3. Q&A	
19 July (Monday)	08:30-10:00	Travel by car from Fuzhou to Yichun	Nangchang City , Jiangxi Province
	11:30-17:00	1. Implementation of the technological upgrading in demonstration site by Jiangxi Huagan Nerin Precious Metals Technology Co.,Ltd. & Jiangxi Green Recycling Co.,Ltd. 2. Visit the site of technological upgrading; 3. Q&A	
	17 :00-19 :00	Travel by car from Yichun to Nanchang	
20 July (Tuesday)	08:30-12:00	1. Implementation and progress by Jiangxi Solid Waste Management Office (government-sponsored institution) 2. Q&A	Beijing

Time	Time	Arrangements	Accommodation
	13:35-18:00	Travel by air Nanchang-Beijing by Jiangxi Air CA1512	

Annex 4: List of People Interviewed

Persons met and Interviewed during field mission in China

Institution	Name	Title
Implementing/executing agency		
UNDP (IA)	1. Hong Yun	Programme Manager
	2. Wang Jingjing	Programme Assistant
MEE/FECO (EA)	3. Wu Guanglong	Project Manager
	4. Yu Shuibo	Project Assistant
Local EPB		
Solid Waste Management Center of Jiangxi Province (LPMO)	5. Tanbin	Division Director
	6. Leng Jinsong	Senior engineer
	7. Sun Juan	Senior engineer
	8. Tan Yixin	Senior engineer
	9. Zeng Min	Senior engineer
	10. Wen Chen	Senior engineer
	11. Luo Jiaosheng	Senior engineer
Demonstration Plants		
Jiangxi Jinhui Environmental Technology Co, Ltd.	12. Ren Guangfeng	General Manger
	13. Dong Minxiang	Vice Manager
Jiangxi Zili Environmental Technology Co, Ltd.	14. Lu Yongsuo	Chief Engineer
	15. Li Peng	Engineer
	16. Le Lan	Engineer
Incentive programme		
Jiangxi Huagan Nerin Precious Metals Technology Co., Ltd	17. Le Hailong	General Manager
	18. Zhou Ruisheng	Engineer
	19. Wang Hongjun	Asisitant to GM
Jiangxi Green Recycling Co. Ltd.	20. Liu Junqing	Technical Director
	21. Li Zhizhuan	Vice General Manager
	22. He Chaochao	Division Director
	23. Dai Zhi	Asisitant
	24. Li Kun	Market Director

Annex 5: List of Documents Consulted

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
- PIR 2019
- PIR 2020

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
- CDR 2020
- CDR 2021

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
- TYWP for 2020-2021

Annual Project Report (APR)

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

- APR 2016
- APR 2017
- APR 2018
- APR 2019
- APR 2020

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)
- QPR 2019 Q3 (July to September 2019)
- QPR 2020 Q1 (January to March 2020)
- QPR 2020 Q2 (April to June 2020)
- QPR 2020 Q3 (July to September 2020)

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)
- Mission of 22-26 March 2021(Mr Wuguanglong)

UNDP Annual Portfolio Indicators

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

- Portfolio Indicators 2017
- Portfolio Indicators 2018 (see **Error! Reference source not found.**)

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

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

Annex 6: Project Results Framework (at the Project Inception)

Intended Outcome as stated in the Country Programme Results and Resource Framework: CPD Outcome 9: Key United Nations conventions promoted through improved capacity to fulfill their obligations
Outcome indicators as stated in the Country Programme Results and Resources Framework, including baseline and targets. **Outcome indicators and Targets:** Implementation of the Stockholm Convention supported through strengthened capacities and policies, especially in the area of reduction of POPs emissions
Applicable Key Result Area (from 2014-2017 Strategic Plan): Area of Work 1 Sustainable Development Pathways IRRF Indicator 1.3.1
Partnership Strategy: UNDP will be the GEF Implementing Agency, responsible for monitoring and evaluating project objectives, activities, output and emerging issues. UNDP will manage the GEF fund based on the UNDP established procedures on GEF-funded projects.
Project title and ID (ATLAS Award ID): UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China (00086820)
Applicable GEF Expected Outcomes: GEF-6 Chemicals and Waste Focal Area Expected Outcomes: 1) 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; 2) Outcome 1.2: Innovative technologies are successfully demonstrated, deployed and transferred; 3) Outcome 3.1: Quantifiable and verifiable tonnes of POPs eliminated or reduced.
Applicable GEF Outcome Indicators: GEF-6 Chemicals and Waste Focal Area Outcome Indicators: 1) Indicator 1.1.2: Prioritized list of actions for reducing/eliminating chemicals and waste; 2) Indicator 1.2: Number of technologies demonstrated, deployed and transferred; 3) Indicator 3.1: Amount and type of POPs eliminated or reduced.

	Indicator	Baseline	End of Project Target	Source of Verification	Risks and Assumptions
Project Objective 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	Monitoring report of PCDD/PCDFs	Risks: Insufficient funds generated to adequately attract process facilities and associated infrastructure investment Technology limited in eliminating POPs release Assumptions: Prior commitments secured during project formulation and design BAT/BEP technologies suitable and applicable to context of Chinese secondary copper industry
	Number of facilities replicating or establishing environmentally sound secondary copper production Estimated reduction quantity through implementation of the national replication programme	Same as above	BAT/BEP integrated into development plan of secondary copper production sector Reduction of 396 g TEQ dioxin in secondary copper production sector nationwide expected through implementation of the national replication programme	Verification reports	
	Number of new technologies demonstrated	None	At least 2 BAT/BEP key technologies demonstrated to meet pollution control	BAT/BEP demonstration reports	

	Indicator	Baseline	End of Project Target	Source of Verification	Risks and Assumptions
			standards Relevant technical guidelines finalized	Finalized guidelines	
	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	Workshop and training reports	
Component 1: Institutional Strengthening and Capacity Building					
Outcome 1.1 Improved legal framework through policy research for the secondary copper production sector	**Expected Outputs:** 1.1.1 Sector-related governance and regulatory framework evaluated and developed				
	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	Evaluation report, policy drafts, circulars/directives	Risks: Resistance in compliance and inadequate enforcement effort Assumptions: Standards guiding proper secondary copper production to reduce POPs release
	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	Technical standards documents	
	International knowledge and experience gained	None	International exchanges conducted	Mission reports	
Outcome 1.2 Capacity of enterprises, industries, Local Project Management Office strengthened to facilitate effective management and monitoring of the secondary copper sector	**Expected Outputs:** 1.2.1 Supervision and management measures and methods are established for each relevant stakeholder 1.2.2 Supervision and monitoring capacity at local level is improved. 1.2.3 Inter-agency and industry coordination for enhanced sustainable development within the sector is strengthened				
	Supervision and management manual developed	None	Manual drafted, reviewed and finalized	Manual	Risks: Continued illegal enterprises activities due economic considerations Inefficient supervision and management efforts Assumptions: Established infrastructure and strengthened capacity for effective enforcement efforts
	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	Training and technical exchange reports	
	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	Training and technical exchange reports	
	Data information management system established	None	Data information management system established and operational	Data information management system, reports	
	Coordination and sustainable development enhanced	None	Multi-stakeholder platform and international communication mechanism established to facilitate inter-agency, industry and	Meeting and mission reports	

	Indicator	Baseline	End of Project Target	Source of Verification	Risks and Assumptions
			international coordination		
Outcome 1.3 Enhanced cooperation with other international environmental conventions	**Expected Outputs:** 1.3.1 Communication and coordination with relevant international environmental convention secretariats on POPs management and pollution control is strengthened 1.3.2 Coordination with Basel Convention and SAICM is promoted and strengthened				
	Synergistic interaction with other conventions	None implemented	Regular communication and updates on progress took place with SAICM and other conventions	Reports and communication exchanges	Risks: Difficult in coordination and collaboration Assumptions: Multi- and inter-ministerial interactions will facilitate consensus in legislative and technology improvement
	International exchange meetings	None implemented	Meetings conducted	Meeting reports	
Component 2: Demonstration of BAT/BEP and PPP-based Industry Chain Management					
Outcome 2.1 BAT/BEP demonstration conducted	**Expected Outputs:** 2.1.1 A more up-to-date and accurate estimation and assessment of UPOPs emissions is conducted 2.1.2 Best available technologies for demonstration enterprises are selected and detailed implementation plans for demonstration activities are developed 2.1.3 BAT/BEP is demonstrated to achieve an effective reduction in UPOPs emissions in two demonstration plants				
	Up-to-date and accurate estimation and assessment of UPOPs emission	Incomplete data	National copper sludge investigation report finalized Smelting industry implementation and evaluation planning finalized	Inventory and investigation reports	Risks: Technologies not directly targeting POPs sensitive release Assumptions: BAT/BEP are suitable for application to Chinese processing enterprises to reduce POPs release
	Technological solution and potential providers of technical support identified	None	BAT/BEP for demonstration as well as providers of technical support identified and selected	Evaluation report, project progress and completion reports	
	Technical documents compilation	None	Smelting process operation manual and dismantling process operation manuals compiled	Manuals	
	BAT/BEP demonstration	None	BAT/BEP demonstration at two plants implemented and results assessed Dioxin releases reduced to meet emission standards at two demonstration plants through demonstration activities	Progress and completion reports	
Outcome 2.2 Circular economy, PPP and centralized park-based approach demonstrated for the secondary copper sector	**Expected Outputs:** 2.2.1 Implementation scheme for the circular economy and PPP industrial chain park-based secondary smelter industry arrangements for application of sustainable industrial development are developed 2.2.2 Industrial park-based demonstration (Circular economy, PPP and smart environment management) is conducted to support China in achieving its national policy 2.2.3 Establishment of exchange platform based on circular economy and PPP industrial chain-based				
	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	Research report findings and recommendations	Risks: PPP solution not suitable for all kinds of enterprises or industrial park

	Indicator	Baseline	End of Project Target	Source of Verification	Risks and Assumptions
	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	Progress and completion reports	Assumptions: PPP model is highly promoted in China, especially given that the demonstration solution is quite suitable for the industrial chain park
	Results of demonstration activities	None	Demonstration results evaluated, documented and disseminated.	Demonstration progress and completion report; meeting and workshop reports	
Outcome 2.3 Evaluation and demonstration project acceptance	Expected Outputs: 2.3.1 Process inspection is conducted and demonstration activities are evaluated 2.3.2 Acceptance of the results of the demonstration project is ensured				
	Demonstration results monitored and reduction measured	None	Self-evaluation indicators and manual designed and established	Set of indicators and manual	Risks: Monitoring results may not reflect the real situation of the demonstration activities in a fair and objective way Assumptions: Monitoring and evaluation plan to be reviewed by expert group to ensure every point of demonstration activities can be evaluated in appropriate way
	Acceptance of the results of the demonstration project	None	Demonstration results evaluated and accepted	Acceptance report	
Component 3: National Replication Programme					
Outcome 3.1 Replication and promotion of demonstration results and experience	**Expected Outputs:** 3.1.1 A national replication plan of BAT/BEP for secondary copper smelting and dismantling is developed and related activities are conducted 3.1.2 A PPP joint governance and management structure is established				
	Project experience summary	None	Experience gained and lessons learned documented, evaluated and disseminated	Publications and evaluation report	Risks: The promotion plan not directly targeting POPs sensitive release Assumptions: Through promotion, replication can reach expected target successfully
	National replication plan	None	National replication plan incorporating experience gained and lessons learned developed	National replication plan	
	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	Activities and verification report	
Outcome 3.2 Promotional events for public awareness raising	**Expected Outputs:** 3.2.1 A training course for full production process management in the secondary copper industry supporting BAT/BEP is established 3.2.2 Extensive stakeholder awareness raising is conducted				
	Knowledge products and promotion materials	None	Knowledge products based on lessons learned developed to disseminate demonstration results	Training materials	Risks: Lack of interest of enterprises and general public on sound

	Indicator	Baseline	End of Project Target	Source of Verification	Risks and Assumptions
	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	Training and workshop reports	management and prevention and control of chemicals and wastes Low participation rate on training and public awareness activities Assumptions: Careful design of knowledge products, promotional and training activities; professional organization and promotion of events
Component 4: Monitoring and Evaluation					
Outcome 4.1 Project monitoring and evaluation	**Expected Outputs:** 4.1.1 M&E activities undertaken with annual review, mid-term review, social and economic assessment, and terminal evaluation conducted and project performance evaluated				
	Timing and quality of annual (APRs, PIRs etc.) and M&E reports Quality appraisal in Mid-Term Review and Terminal Evaluation	Indicative M&E plan, budget and timeframe	M&E activities implemented as scheduled and on budget, project implementation monitored to achieve project objectives Adaptive management undertaken	Various M&E and substantial reports Mid-Term Review, Final Project Report and Terminal Evaluation reports	Risks: Failure to exercise timely and effective M&E activities due to capacity issue Assumptions: Efficient M&E to facilitate achievement of project outcomes and objectives
Outcome 4.2 Knowledge sharing and information dissemination	**Expected Outputs:** 4.2.1 Knowledge products on best practices, experience and lessons learned documented and shared nationally and internationally				
	Lessons learnt and experience documented and disseminated; post-project action plan formulated	None	Lessons and experience documented and disseminated	Knowledge products; post-project action plan	Risks: Failure to exercise timely and effective M&E activities due to capacity issue Assumptions: Efficient M&E to facilitate achievement of outcomes and project objectives
Component 5: Project Management					
Outcome 5.1 Strengthened Project management capacities and efficiency	**Expected Outputs:** 5.1.1 Strengthened institutional capacities for effective project management to achieve results				
	Timely project implementation and disbursement	Basic project implementation structure	Capacity of National Project Team strengthened. In additional to existing staff, a Project Coordinator and a secretary are	Project APRs, PIRs, CDRs	Risks: Inadequate capacity and insufficient coordination will

	Indicator	Baseline	End of Project Target	Source of Verification	Risks and Assumptions
			recruited National Project Team established, staffed, equipped and trained		impact project implementation <u>Assumptions</u>:
	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	Training reports	Efficient project management will lead to timely achievement of outcomes and project objectives
	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	Progress and annual reports, mission reports and achieved outcomes	

Annex 7: Performance Rating of GEF Projects

The main dimensions of project performance on which ratings are provided in terminal evaluation are outcomes, sustainability, quality of monitoring and evaluation, quality of implementation, and quality of execution.

Outcome ratings

The overall ratings on the outcomes of the project will be based on performance of the criteria of relevance, effectiveness and efficiency. A six-point rating scale is used to assess overall outcomes.

Highly Satisfactory (HS)	Level of outcomes achieved clearly exceeds expectations and/or there were no short comings
Satisfactory (S)	Level of outcomes achieved was as expected and/or there were no or minor short comings
Moderately Satisfactory (MS)	Level of outcomes achieved more or less as expected and/or there were moderate short comings
Moderately Unsatisfactory (MU)	Level of outcomes achieved somewhat lower than expected and/or there were significant shortcomings
Unsatisfactory (U)	Level of outcomes achieved substantially lower than expected and/or there were major short comings
Highly Unsatisfactory (U)	Only a negligible level of outcomes achieved and/or there were severe short comings
Unable to Assess (UA)	The available information does not allow an assessment of the level of outcome achievements

Sustainability Ratings

The sustainability will be assessed taking into account the risks related to financial, sociopolitical, institutional, and environmental sustainability of project outcomes. The evaluator may also take other risks into account that may affect sustainability. The overall sustainability will be assessed using a four-point scale.

Likely (L)	There is little or no risks to sustainability
Moderately Likely (ML)	There are moderate risks to sustainability
Moderately Unlikely (MU)	There are significant risks to sustainability
Unlikely (U)	There are severe risks to sustainability
Unable to Assess (UA)	Unable to assess the expected incidence and magnitude of risks to sustainability

Monitoring and Evaluation Ratings

Quality of project M&E are assessed in terms of design and implementation on a six point scale:

Highly Satisfactory (HS)	There were no short comings and quality of M&E design / implementation exceeded expectations
Satisfactory (S)	There were no or minor short comings and quality of M&E design / implementation meets expectations
Moderately Satisfactory (MS)	There were some short comings and quality of M&E design/implementation more or less meets expectations
Moderately Unsatisfactory (MU)	There were significant shortcomings and quality of M&E design / implementation somewhat lower than expected
Unsatisfactory (U)	There were major short comings and quality of M&E design/implementation substantially lower than expected
Highly Unsatisfactory (U)	There were severe short comings in M&E design/ implementation

Unable to Assess (UA)	The available information does not allow an assessment of the quality of M&E design / implementation

Implementation and Execution Rating

Quality of implementation and of execution will be rated separately. Quality of implementation pertains to the role and responsibilities discharged by the GEF Agencies that have direct access to GEF resources. Quality of Execution pertains to the roles and responsibilities discharged by the country or regional counterparts that received GEF funds from the GEF Agencies and executed the funded activities on ground. The performance will be rated on a six-point scale.

Highly Satisfactory (HS)	There were no short comings and quality of implementation / execution exceeded expectations
Satisfactory (S)	There were no or minor short comings and quality of implementation / execution meets expectations
Moderately Satisfactory (MS)	There were some short comings and quality of implementation / execution more or less meets expectations
Moderately Unsatisfactory (MU)	There were significant shortcomings and quality of implementation / execution somewhat lower than expected
Unsatisfactory (U)	There were major short comings and quality of implementation / execution substantially lower than expected
Highly Unsatisfactory (U)	There were severe short comings in quality of implementation / execution
Unable to Assess (UA)	The available information does not allow an assessment of the quality of implementation / execution

Annex 8: Evaluation Report Outline[18]

i. Opening page:

- Title of UNDP supported GEF financed project
- UNDP and GEF project ID#s.
- Evaluation time frame and date of evaluation report
- Region and countries included in the project
- GEF Operational Program/Strategic Program
- Implementing Partner and other project partners
- Evaluation team members
- Acknowledgements

ii. Executive Summary

- Project Summary Table
- Project Description (brief)
- Evaluation Rating Table
- Summary of conclusions, recommendations and lessons

iii. Acronyms and Abbreviations

1. Introduction

- Evaluation purpose
- Scope & Methodology
- Data collection and analysis
- Evaluation ethics
- Limitations

2. Project description and development context

- Project start and duration
- Development context
- Problems that the project sought to address
- Immediate and development objectives of the project
- Description of the project's Theory of Change
- Expected results
- Total resources
- Main stakeholders and key partners involved

3. Findings

(In addition to a descriptive assessment, all criteria marked with (*) must be rated)

[18] The presented TE Report outline is based on the 2020 UNDP/GEF TE guidelines that reflect the GEF-7 project development template. However, the project was prepared according to the GEF-6 project development template that was not identical with the GEF-7 template.

3.1 Project Design / Formulation

- Analysis of LFA/Results Framework (Project logic /strategy; Indicators)
- Assumptions and Risks
- Lessons from other relevant projects (e.g., same focal area) incorporated into project design
- Planned stakeholder participation
- Replication approach
- UNDP comparative advantage
- Linkages between project and other interventions within the sector
- Gender responsiveness of the project design
- Social and environmental safeguards

3.2 Project Implementation

- Adaptive management
- Actual stakeholder participation and partnership arrangements
- Project Finance and co-finance
- Monitoring & Evaluation: design at entry (*), implementation (*), overall assessment of M&E (*)
- UNDP implementation/oversight (*), Implementing Partner execution (*) and overall assessment of implementation/oversight and execution (*)
- Risk Management

3.3 Project Results and Impacts

- Progress towards objective and expected outcomes
- Relevance (*)
- Effectiveness
- Efficiency (*)
- Overall Project Outcome (*)
- Sustainability: financial(*), socio-political(*), institutional framework and governance(*), environmental(*), overall likelihood of sustainability(*)
- Country ownership
- Gender equality and women's empowerment
- Cross-cutting issues
- GEF additionality
- Catalytic/Replication effect
- Progress to impact

4. Main Findings, Conclusions, Recommendations, Lessons Learned

- Main Findings
- Conclusions
- Recommendations
- Lessons learned

5. Annexes

- Terms of Reference
- Evaluation Question Matrix
- List of persons interviewed
- List of documents reviewed
- Project results framework
- Performance ratings of GEF projects
- Evaluation Consultant Agreement Form
- *Annexed in a separate file:* TE audit trail

Annex 9: Questionnaire

1. How **was your company selected as the demonstration company** for the new BAT/BEP technology? How was the new BAT/BEP technology selected?
   详细写明示范工程的企业的投标程序，详细写明最佳技术的评选过程，提供专家组名单，评审意见和批复文件

2. When was **the demonstration plan developed and approved** for your company?
   企业详细列明示范工程计划和落实推进情况，包括企业内部批复、政府批复、环评文件、Feco/UNDP的批复等

3. How was the procurement and delivery of the equipment procured from the project? Were they any delays in procurement?请给出整个项目的设备清单和采购及安装时间

4. What **challenges did you have in the process of conversion** to the new technology and how did you address them? Was it necessary to adopt any corrective actions?
   详细列明工程实施过程中的技术和工程难点，说明技术先进性和具体技术指标，列明工程建设过程中，污染物减排情况、企业效益增长情况、周边环境影响情况

5. When was **the acceptance meeting for confirmation of successful commissioning** of the new technology?列明工程技术指标实施论证会的情况，提供专家组名单和第三方检测报告

6. It was reported to us that the project commissioned **evaluation of the BAT/BEP demonstration in the two selected enterprises** and that it was completed in January 2021. Can you give more details on the evaluation (parameters, process etc.)? Was it self-evaluation by your company or external evaluation conduczed by someone from outside? What are the results of this evaluation and if there is any document summarizing the results, can you share with the evaluators?
   给出项目实施效果评价会的详细情况及评价标准、评价结论等

7. Did your company have to request **certification of safety for the use of the new technology**? If so when was it conducted and did the UNDP project pay for the safety certification?
   提供安全生产方面的详细情况，包括政府批复/评价、企业标准、新增安全设备设施、安全员名单、企业管理架构等

8. How was the **production output of your company** (monthly or annual) before the technology conversion and with the new technology provided under the
   project?详细说明工程实施过程企业产能变化情况表，详细到月度（2016~2020），对比出技术采用前后的产能变化，物料适应情况等

9. Were there any **changes in employment as a result of the conversion** to the new demonstration technology? Any changes in employment of women? 给出项目实施前后员工结构，尤其是女性员工比例变化

10. Are there **any risks to sustainable use of the new technology** in your company (financial, technological, environmental, socio-economic,
political)?详细阐明新技术在企业运行过程中的潜在风险，包括成本、技术、环境、政策等

11. It was reported that the two demonstration enterprises have drafted **a smelting and dismantling operation manual.** Is it two separate manuals for smelting and another for dismantling or one manual for both? What is the status of the operation manual(s) and their use?
提供企业的操作指导手册，阐明手册的使用情况和带来的成效

12. We understand that **measurement of dioxin emissions** by the Chinese Academy of Sciences was initiated after the commissioning of the new technology. At which point(a) in the technological processes was the measurement conducted and what were the results? Is the monitoring of dioxin emissions still continued? What quantities of dioxins were reduced after the technology conversion in your company (amount and period)?
列明各节点二噁英的检测情况和检测结果，项目实施过程中企业总体减排二噁英的数据（以年为单位）

13. Did your company had any **link to the demonstration of the industry chain management** based on the public-private partnerships that was initiated by the project?
详细列举企业在项目实施过程中与项目管理部门、产业链对接平台等的互动情况

14. How would you rate **cooperation of your company with the local project management office and UNDP** as the implementing agency for the project?
列举企业与江西省项目管理部门、环境部项目管理部门及UNDP等部门之间的互动和合作情况

15. Based on your experience from this project, what would be your **advice to other companies** that decide to adopt the new technology for dioxin emission reduction? 给出新技术推广的实质建议

Annex 10: Evaluation Consultant Agreement Forms

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

Evaluators:

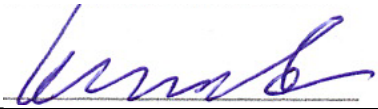
1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation 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 imitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Name of Consultant: Dalibor Kysela

Name of Consultancy Organization (where relevant)**:** _____N.A._____

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

Signed at Vienna 15 March 2021

Signature: _____  _____

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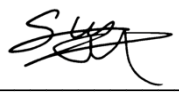
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Name of Consultant: Sun Zhi

Name of Consultancy Organization (where relevant)**:** _____N.A._____

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

Signed at

Signature: 

TE Report Clearance Form

Terminal Evaluation Report for *"PIMS5383- UPOPs Reduction through BAT/BEP and PPP-based Industry Chain Management in Secondary Copper Production Sector in China"*
Reviewed and Cleared By:

Commissioning Unit (M&E Focal Point)

Name: Qian Sun

Signature: _____ Date: 17-Jan-2022

Regional Technical Advisor (Nature, Climate and Energy)

Name: Anderson Alves

Signature: DocuSigned by: _____ Date: 24-Jan-2022

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Annex 12: Audit Trail (submitted as separate annex)

Annex 13: relevant terminal GEF Core Indicators or Tracking Tools (submitted as separate annex)

Annex 14: Terminal Evaluation Management Response (submitted as separate annex)

Annex 15: GEF Co-financing Template (submitted as separate annex)