Facilitating Cleaner and Energy Efficient Phosphate Chemicals Industry in China (PhosChemEE) Project

Part I: Project Information

GEF ID
10722

Project Type
FSP

Type of Trust Fund
GET

CBIT/NGI
CBIT **No**
NGI **No**

Project Title
Facilitating Cleaner and Energy Efficient Phosphate Chemicals Industry in China (PhosChemEE) Project

Countries
China

Agency(ies)
UNDP

Other Executing Partner(s)
Ministry of Industry and Information Technology (MIIT)

Executing Partner Type
Government

GEF Focal Area
Climate Change

Taxonomy
Focal Areas, Climate Change, Climate Change Mitigation, Energy Efficiency, Financing, Influencing models, Strengthen institutional capacity and decision-making, Demonstrate innovative approache, Convene multi-stakeholder alliances, Deploy innovative financial instruments, Transform policy and regulatory environments,

Stakeholders, Indigenous Peoples, Local Communities, Civil Society, Non-Governmental Organization, Academia, Community Based Organization, Type of Engagement, Consultation, Partnership, Information Dissemination, Private Sector, SMEs, Individuals/Entrepreneurs, Large corporations, Communications, Awareness Raising, Education, Public Campaigns, Gender Equality, Gender Mainstreaming, Beneficiaries, Capacity, Knowledge and Research, Knowledge Generation, Capacity Development, Targeted Research

Sector
Energy Efficiency

Rio Markers
Climate Change Mitigation
Climate Change Mitigation 1

Climate Change Adaptation
Climate Change Adaptation 1

Submission Date
12/10/2021

Expected Implementation Start
7/1/2022

Expected Completion Date
6/30/2027

Duration
60In Months

Agency Fee($)
887,621.00

A. FOCAL/NON-FOCAL AREA ELEMENTS

Objectives/Programs	Focal Area Outcomes	Trust Fund	GEF Amount($)	Co-Fin Amount($)
CCM-1-3	Promote innovation and technology transfer for sustainable energy breakthroughs for accelerating energy efficiency adoption	GET	9,343,379.00	97,763,687.00
		Total Project Cost($)	**9,343,379.00**	**97,763,687.00**

B. Project description summary

Project Objective

Enabling the extensive application of low carbon and energy efficient technologies in the phosphate chemicals industry in China.

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
1. Green and Low Carbon Development and Operation of Phosphate Mines	Technical Assistance	1.1. Improved interest and commitment of the phosphate chemical industry in the green, low carbon and energy efficient operations of the phosphate mining sub-sector in China	Output 1.1.1 Formulated, recommended, approved, and enforced policy and institutional frameworks supporting green, energy efficient low carbon development initiatives in phosphate rock (phosrock) mining and refining. Output 1.1.2 Formulated, recommended, and enforced standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in the development and operations of phosphate mines. Output 1.1.3 Documented annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results. Output 1.1.4 Designed, conducted and post-evaluated continuing education program in the PCI mining sub-sector in Weng'an county in Guizhou	GET	436,300.00	4,513,687.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
1. Green and Low Carbon Development and Operation of Phosphate Mines	Investment	1.2. Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosrock mining and refining in China	Output 1.2.1 Completed designs and plans of demonstrations of green, energy efficient and low carbon technologies in phosphate mines development and operations including: (a) Improved design for the mining and refining operations in the demo phosrock mines in Weng'an county in Guizhou province, and Mabian county in Sichuan province; (b) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosrock mining and refining systems; and, (c) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosrock mines. Output 1.2.2 Installed and operational green, energy efficient low carbon technology application demos in phosrock mining and refining in Weng'an county in Guizhou province, Jinning county in Yunnan province, and Mabian	GET	2,055,100.00	21,570,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
2. Green and Low-Carbon Design and Operation of Phosphate Chemicals Production Facilities	Technical Assistance	2.1. Enhanced adoption by the phosphate chemical industry of a green, low carbon and energy efficient development model in phosphate chemicals production.	Output 2.1.1 Formulated, recommended, approved, and enforced policy and institutional frameworks supporting green, energy efficient low carbon technology applications in phosphate chemicals production. Output 2.1.2 Formulated, recommended, and enforced standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in phosphate chemicals production. Output 2.1.3 Documented annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results based on the MRV system (Output 1.1.5) established under Component 1. Output 2.1.4 Designed, conducted and post-evaluated continuing education program in	GET	934,400.00	9,807,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
2. Green and Low-Carbon Design and Operation of Phosphate Chemicals Production Facilities	Investment	2.2. Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production in China	Output 2.2.1 Completed designs and plans of demonstrations of green, energy efficient low carbon technologies in phosphate chemicals production including: (a) Improved design for cleaner production demos; (2) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosphate chemical production systems; and, (3) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosphate chemical companies. Output 2.2.2 Installed and operational green, energy efficient low carbon technology application demos in phosphate chemicals production. Output 2.2.3 Designed and approved pilot financing scheme for small and medium enterprises (SMEs) that manufacture phosphate chemicals.	GET	2,803,000.00	29,196,586.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
3. Green and Low Carbon Design and Operation of Waste Management Systems in the Phosphate Chemicals Industry	Technical Assistance	3.1. Enhanced commitment of, and institutional and technical arrangements for, the phosphate chemical industry in green and low carbon waste management.	Output 3.1.1 Formulated, recommended, approved, and enforced policies and institutional frameworks that support green, low carbon initiatives in waste management in the PCI. Output 3.1.2 Improved existing and new enforced schemes, standards, policies/regulations on the application of green and low carbon waste management technologies in the PCI operations and processes. Output 3.1.3 Documented annual evaluation reports on the energy performance and environmental impacts of each demo based on the MRV system developed under Component 1. Output 3.1.4 Designed, conducted and post-evaluated continuing education program with regular capacity needs assessments in the area of green and low carbon technologies applied in waste	GET	801,000.00	8,409,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
3. Green and Low Carbon Design and Operation of Waste Management Systems in the Phosphate Chemicals Industry	Investment	3.2. Increased confidence in the feasibility of the application of green and low carbon technologies in the management of waste in the phosphate chemicals Industry in China.	Output 3.2.1 Completed designs and plans of demonstrations of the application of green and low carbon technologies/techniques in waste management in the phosphate chemicals industry, including: (a) improved phosrock mining tailings recycling and reuse; and (b) energy efficient processing of phosphogypsum and marketing of the gypsum products. Output 3.2.2 Installed and operational green and low carbon waste management technology application demos in the phosphate chemicals industry. Output 3.2.3 Approved and financed follow-up plan for the replication of the application of demonstrated green, low carbon waste management technologies in the phosphate chemicals industry in other localities.	GET	1,868,656.00	19,612,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
Monitoring and evaluation (M&E)				GET	200,000.00	
			Sub Total ($)		**9,098,456.00**	**93,108,273.00**
Project Management Cost (PMC)						
				GET	244,923.00	4,655,414.00
			Sub Total($)		**244,923.00**	**4,655,414.00**
			Total Project Cost($)		**9,343,379.00**	**97,763,687.00**

Please provide justification

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

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Ministry of Industry and Information Technology	Grant	Investment mobilized	3,000,000.00
Recipient Country Government	Ministry of Industry and Information Technology	In-kind	Recurrent expenditures	900,000.00
Recipient Country Government	Ministry of Natural Resources	Grant	Investment mobilized	2,000,000.00
Recipient Country Government	Ministry of Natural Resources	In-kind	Recurrent expenditures	650,000.00
Recipient Country Government	Guizhou Provincial Department of Industry and Information Technology	Grant	Investment mobilized	1,590,000.00
Recipient Country Government	Guizhou Provincial Department of Industry and Information Technology	In-kind	Recurrent expenditures	397,500.00
Recipient Country Government	Hubei Provincial Department of Economy and Information Technology	Grant	Investment mobilized	1,590,000.00
Recipient Country Government	Hubei Provincial Department of Economy and Information Technology	In-kind	Recurrent expenditures	397,500.00
Recipient Country Government	Sichuan Provincial Department of Economy and Information Technology	Grant	Investment mobilized	1,590,000.00
Recipient Country Government	Sichuan Provincial Department of Economy and Information Technology	In-kind	Recurrent expenditures	397,500.00

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Yunnan Provincial Department of Economy and Information Technology	Grant	Investment mobilized	1,590,000.00
Recipient Country Government	Yunnan Provincial Department of Economy and Information Technology	In-kind	Recurrent expenditures	397,500.00
Recipient Country Government	Guizhou Provincial Department of Natural Resources	Grant	Investment mobilized	1,272,000.00
Recipient Country Government	Guizhou Provincial Department of Natural Resources	In-kind	Recurrent expenditures	318,000.00
Recipient Country Government	Yunnan Provincial Department of Natural Resources	Grant	Investment mobilized	1,272,000.00
Recipient Country Government	Yunnan Provincial Department of Natural Resources	In-kind	Recurrent expenditures	318,000.00
Recipient Country Government	Sichuan Provincial Department of Natural Resources	Grant	Investment mobilized	1,696,000.00
Recipient Country Government	Sichuan Provincial Department of Natural Resources	In-kind	Recurrent expenditures	424,000.00
Private Sector	Sichuan Wengfu Group Co.,Ltd	Grant	Investment mobilized	6,938,827.00
Private Sector	Sichuan Wengfu Group Co.,Ltd	In-kind	Recurrent expenditures	731,173.00
Private Sector	Sichuan Leibo Huarui Mining Co.,Ltd	Grant	Investment mobilized	6,338,765.00

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Private Sector	Sichuan Leibo Huarui Mining Co.,Ltd	In-kind	Recurrent expenditures	667,942.00
Private Sector	Guizhou Kalin Mining and Fertilizer Co.,Ltd	Grant	Investment mobilized	8,208,315.00
Private Sector	Guizhou Kalin Mining and Fertilizer Co.,Ltd	In-kind	Recurrent expenditures	864,033.00
Private Sector	Hubei Xiangyun (Group) Chemical Co.,Ltd	Grant	Investment mobilized	5,416,665.00
Private Sector	Hubei Xiangyun (Group) Chemical Co.,Ltd	In-kind	Recurrent expenditures	570,175.00
Private Sector	Sichuan Lomom Phosphorus Chemical Co.,Ltd	Grant	Investment mobilized	6,966,667.00
Private Sector	Sichuan Lomom Phosphorus Chemical Co.,Ltd	In-kind	Recurrent expenditures	733,333.00
Private Sector	Sichuan Zhonglicheng Co.,Ltd	Grant	Investment mobilized	9,615,531.00
Private Sector	Sichuan Zhonglicheng Co.,Ltd	In-kind	Recurrent expenditures	1,012,161.00
Private Sector	Yunnan Xiangfeng Industrial Group Co.,Ltd	Grant	Investment mobilized	9,463,810.00
Private Sector	Yunnan Xiangfeng Industrial Group Co.,Ltd	In-kind	Recurrent expenditures	996,190.00
Private Sector	Yunnan Phosphate Chemical Group Co.,Ltd	Grant	Investment mobilized	9,552,302.00
Private Sector	Yunnan Phosphate Chemical Group Co.,Ltd	In-kind	Recurrent expenditures	1,006,565.00
Private Sector	Sichuan Mabian Fuma Phosphate Chemical Co.,Ltd	Grant	Investment mobilized	4,540,273.00

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Private Sector	Sichuan Mabian Fuma Phosphate Chemical Co.,Ltd	In-kind	Recurrent expenditures	478,427.00
Private Sector	Sichuan Development Tianrui Mining Co.,Ltd	Grant	Investment mobilized	3,313,388.00
Private Sector	Sichuan Development Tianrui Mining Co.,Ltd	In-kind	Recurrent expenditures	349,145.00
GEF Agency	UNDP	In-kind	Recurrent expenditures	200,000.00
			Total Co-Financing($)	**97,763,687.00**

Describe how any "Investment Mobilized" was identified

The implementing partner for this project (MIIT) have been developing and implementing projects (including those funded by the GEF). The MIIT and one of the responsible parties (MNR) are ministries that are also mobilizing counterpart funding to such projects. They work with multi-lateral and bilateral donor agencies for funding projects that especially are geared towards development of the industry and information technology sectors, and the development and conservation of the country?s natural resources. The respective local departments of these ministries will work together with the local governments of the provinces that will be involved in the project, and also doing their own financial mobilization efforts for provincial socio-economic development. The partner PCI companies that are involved in the project, particularly in hosting the demonstration activities, are also by themselves mobilizing investment for plant facilities upgrade and expansions to improve productivity, save on energy and process raw material inputs, reduce production losses and waste, and for environmental regulations compliance. These local government and private sector entities have committed co-financing for specific activities of the project. In that regard, the project development team has leveraged some of the ongoing and planned investments and initiatives in the project partners.

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

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNDP	GET	China	Climate Change	CC STAR Allocation	9,343,379	887,621	10,231,000.00
			Total Grant Resources($)		**9,343,379.00**	**887,621.00**	**10,231,000.00**

E. Non Grant Instrument

NON-GRANT INSTRUMENT at CEO Endorsement

Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

F. Project Preparation Grant (PPG)

PPG Required **true**

PPG Amount ($)

200,000

PPG Agency Fee ($)

19,000

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNDP	GET	China	Climate Change	CC STAR Allocation	200,000	19,000	**219,000.00**
				Total Project Costs($)	**200,000.00**	**19,000.00**	**219,000.00**

Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO?e (direct)	35961000	35987000	0	0
Expected metric tons of CO?e (indirect)	0	0	0	0

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

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO?e (direct)	0			
Expected metric tons of CO?e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

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

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO?e (direct)	35,961,000	35,987,000		
Expected metric tons of CO?e (indirect)				
Anticipated start year of accounting		2024		
Duration of accounting		4		

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

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)	173,000,000,000	433,100,000,000,000		

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

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

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

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	600,000	600,000		
Male	600,000	600,000		
Total	1200000	1200000	0	0

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

Part II. Project Justification

1a. Project Description

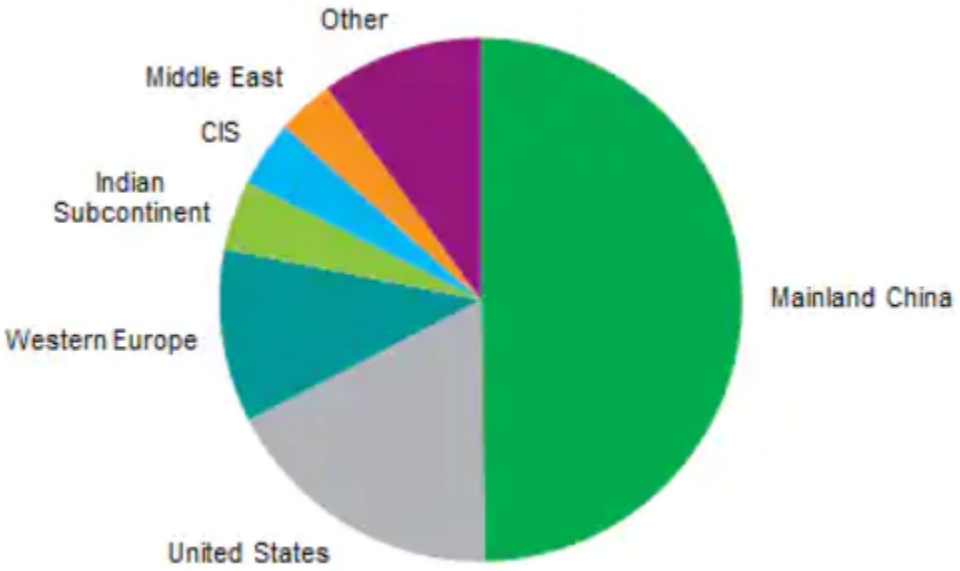
1a.1) *Global environmental problems, root causes and barriers that need to be addressed (systems description):*

Phosphorus is essential to life and the functioning of our society. Phosphorus is present in all living things and is required for cell growth. Together with nitrogen and potassium, phosphorus is one of the most important elements for plant life. In agriculture, the growth of crops is dependent on the phosphorus content of soil. There is no substitute for phosphorus and there will never be. Soil is often depleted of phosphorus by the plants that use it for their growth, or it is partially washed away by rain. Modern farming is therefore reliant on phosphate-derived fertilizers to enrich the soil in order to produce sufficient quantities of food. About 90% of global phosphate rock demand is used in the food production chain.

Phosphate rocks are used as raw material for manufacturing phosphoric acid, phosphate fertilizers and other phosphate chemicals. Phosphate rocks can be used directly in some applications, whereas beneficiation is required to upgrade the P_2O_5 ore to a concentration higher than 29% when used as a raw material for the production of fertilizers, phosphoric acid and many other phosphate compounds.

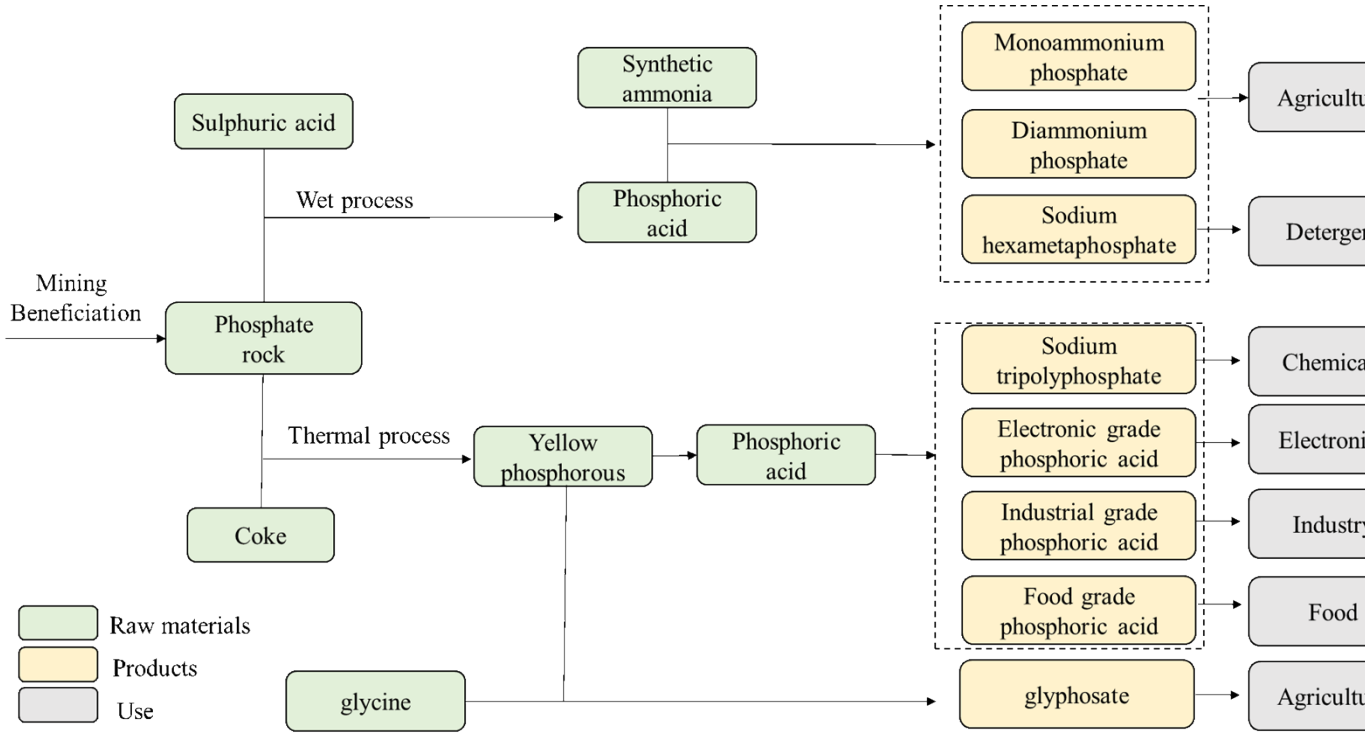
From 2015 to 2019, the industrial phosphates market experienced steady growth, but the recession resulting from the COVID-19 pandemic led to minimal growth in 2020, with some regions experiencing declines as large as 8%, also depending on the end-use applications. China is the largest consumer of phosphorus products, accounting for nearly half of the global market (Figure 1). Many of the markets for industrial phosphates were less-affected by the downturn, or have even grown year-over-year in 2020, including food and beverages, detergents, specialty agricultural products, and pharmaceuticals. Overall growth for industrial phosphates is expected to resume worldwide in line with average gross domestic product growth between 2020 and 2025.

Figure 1. **Phosphorus Products Consumption in the World**



The phosphate chemical industry (PCI) is an important sub-sector of China?s industry sector. Figure 2 shows the flowchart of the PCI chain in China. At present, the PCI is a relatively mature industry, which covers phosphate mining and refining and the production of phosphate chemical products. There are about 100 different phosphate chemical products that are produced by the industry, which can basically meet the domestic demand, and a large portion of the production is exported. The current trend of phosrock production and phosphate fertilizer consumption in China are expected to continue to grow at the same rates in the past 5 years and are expected to peak during the period 2020-2025 where the demand for phosrock is estimated to reach 100 million tons/year.

Figure 2. Flowchart of PCI in China



The PCI in China faces several challenges in the process in its three main sub-sectors including phosphate mining, chemical production process, and utilization of the industry by-products. The carbon emission in the PCI in China is manifested in three aspects, which are also the key problems to be solved in this project.

Phosphate rock mining is facing severe challenges because of its ecological environment impact. China's phosphate rock resource purity is poor, and consequently its extraction and utilization requires high energy consumption, and the resource utilization rate is low. Collophanite is the main phosphate rock in China. This kind of resource is produced in layers, which has the characteristics of thin ore body, low grade of raw ore, high impurity content and difficult separation. Moreover, the phosrock mining areas are typically large, the land surface damage is serious, and the comprehensive utilization rate of waste rock and tailings is low. By end 2019, the phosrock mines in Yunnan, Guizhou, and Sichuan discharged 104.7 million tons of waste rock, and about 41.4 million tons of that will be used,

with an average utilization rate of 39.5%. Large quantities of waste rocks and tailings are just stacked in the waste rock dump and tailings in tailings ponds for long periods of a long time.

Phosphate chemicals production is facing severe challenges because of high energy consumption and CO_2 emission. In terms of production capacity and output, China is the largest producer, exporter, and consumer of phosphate chemical products in the world, accounting for more than 80% of the world's total production capacity. In 2019, the national phosphate fertilizer production capacity was 22.5 million tons of P_2O_5. In 2019, the carbon emission for the production of phosphate chemicals was about 59 million tons CO_{2eq}, accounting for about 4.3% of the carbon emission of the chemical industry. The extensive production mode of the PCI causes a lot of energy waste.

The utilization of the industry by-products, particularly phosphogypsum, is insufficient. At present, the annual output of phosphogypsum in China is about 85 million tons. The comprehensive utilization rate of this byproduct is about 40%, and the annual additional storage of phosphogypsum is 51 million tons. The historical storage of phosphogypsum in China is more than 800 million tons, and the problems of environmental pressure and safety risks are increasingly prominent. Among them, nearly 650 million tons of phosphogypsum piles exist along the main stream and upstream tributaries of the Yangtze River in the provinces of Hubei, Yunnan, Guizhou, Sichuan, etc., which is the key and difficult problem in the ecological environment restoration of the Yangtze River economic belt. In addition, the low quality of phosphate concentrate leads to high energy consumption in the downstream phosphoric acid production, and the disposal of by-product phosphogypsum is difficult. Phosphate rock needs to be enriched to obtain the proper phosphate concentrate before it can be used to produce phosphate fertilizer. At present, the grade of phosphate concentrate in China is about 28-30%, and the main impurity is silica. In other countries, phosphate concentrate is mainly extracted from apatite, and the highest grade of phosphate concentrate can reach 40%. When the grade of phosphate concentrate is increased by one percentage point, the consumption of sulfuric acid and phosphogypsum production can be reduced by 17.2 kg and 10.0 kg, respectively.

In this context, the green development of the PCI in China is based on higher penetration of low-carbon technologies in the three sub-sectors mentioned above. This shift towards green development in PCI the will contribute to the achievement of China's National Determined Contributions (NDCs) targets under the Paris Agreement.

The implementation of PhosChemEE project will contribute to the achievement of several Sustainable Development Goals (SDGs) as set by the United Nations General Assembly, specifically: SDG 7: ?Ensure access to affordable, reliable, sustainable and modern energy for all?, SDG 9: " Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation"; SDG 12: ?Ensure sustainable consumption and production patterns?; SDG 13: "Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy ?, and to a lesser extent SGD 8: ?Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all?.

Barrier Analysis

The approach taken for the design of the PhosChemEE project is barrier removal. The barriers hindering the transition towards a cleaner and more energy efficient phosphate chemical industry in China have been identified in the PhosChemEE Project Information Form (PIF). The Logical Framework Analysis (LFA) Workshop was held virtually, because of the travel restrictions due to the outspread of the Covid-19 pandemic, in two sessions, on March 5, 2021 and on March 25-26, 2021, respectively. During the workshop the participant stakeholders have reassessed the validity of the identified barriers. The major identified barriers include:

Policy Barriers: ***The industry standards, systems and related policies are not sufficient.*** Like in any mineral resource development in China, the PCI involves many processes and operations such as phosrock extraction, enrichment/refining, phosphate product (chemicals) manufacturing, and waste management (e.g., recycling, reprocessing, reuse). The relatively low quality phosrock leads to higher energy consumption, and larger amounts of waste products, as compared to other countries where the

phosrock quality is better. The waste produced in the downstream production processes is more difficult to use, resulting in large amounts of stacking, which poses a direct threat to the natural environment in the phosrock mining areas and in the phosphate, chemicals manufacturing enterprises. There are some standards for the utilization of the phosphogypsum by-product, but these are only limited to the building materials industry. Because of that, the market recognition for the large scale applications of this by-product as a low carbon building material is low.

Technology Barriers: ***Technology innovations in the PCI in China are insufficient.*** At present, there is a lack of technological innovation in improving the operations and processes in the PCI in China. There are limited innovation efforts geared towards technologies on the phosrock resource development and utilization technology, including research and application of new, more energy efficient and less polluting processes, systems and equipment for phosrock mining and refining that reduce the discharge of solid waste such as waste rock and tailings, reduce energy consumption in the mining operations, improve the quality of refined phosrock and reduce the energy consumption and waste generation in the phosphate chemicals production. There are also limited applications of cleaner production technologies and by-product treatment technologies in the PCI. As the disposal of phosphogypsum has not been given enough attention, the current phosphogypsum disposal and utilization rates are relatively low. The current technologies that are applied do not help in further exploiting the high value-added utilization of the PCI?s phosphogypsum by-product while at the same time reducing the environment risks that the ever-growing stacks of phosphogypsum poses to the surrounding areas of PCI enterprises. Technological innovations must be carried out by the industry in areas such as on-line quality control technology of phosphogypsum production and discharge, and pretreatment technology of low-cost secondary pollution.

Infrastructure Barriers: ***Inadequate transportation systems between the different phosphate products producing regions and the phosphate products consuming regions in China***. Due to the geographical distribution of regional phosrock resources and transportation requirements, the production, storage, and comprehensive utilization of phosphogypsum vary greatly in different regions. The discharge and storage of phosphogypsum are mainly concentrated in Yunnan, Guizhou, Sichuan, and parts of the southwest region of the country, while the consumption of gypsum is mainly concentrated in areas with large demand for building gypsum and cement, such as the eastern provinces and cities with developed economy. Due to the existing transportation infrastructure, the supply of gypsum in areas with large amount of gypsum is in short supply, while the area with concentrated emission can only be stored in large quantities. The obstacles due to the spatial mismatch between the areas where there is demand for gypsum and areas where there is gypsum production (from phosphogypsum) is worsened by insufficient coordination and promotion efforts to devise and implement a comprehensive phosphogypsum utilization policy among the different regional governments.

Financial Barriers: ***The existing extensive development mode of PCI chain.*** At present, China?s phosphate chemical industry is geared towards extensive production in pursuit of economic benefits. Most enterprises within the industry do not take reducing carbon emissions and achieving cleaner production as their social responsibility, but to maximize their economic benefits while complying with industry regulations. This general attitude of enterprises pursuing short-term interests makes it difficult to implement and realize green and low-carbon development objectives. The financial barriers are coupled and exacerbated by a concurrent lack of awareness and inadequate capacity of the PCI companies? management teams concerning environmental issues and sustainable production.

The abovementioned barriers, if not properly and adequately addressed/removed will continue to prevent the transition towards a cleaner and more energy efficient PCI in China.

1a.2) *Baseline scenario and any associated baseline projects*

Business-As-Usual (BAU) Scenario

China possesses about 4.5% of the world?s 71 billion tons total proven phosphate reserves, based on 2019 data[1][1], trailing by a long distance Morocco that has over 70% of the total phosphate resources. However, the situation completely reverses when it comes to phosphate production, with China firmly ranking at number one with an annual production of 95 Mton of phosphate in 2019, or nearly 42% of the total, which is about 2.7 times larger than Morocco?s production of 35 Mton ranked at number two[2][2].

Since China?s average phosphate reserves have a low quality in terms of phosphate concentration compared to other countries, it requires to mining a larger quantity of phosrock to obtaining a ton of product, which also produces more by-products, such as phosphogypsum, as well as more waste, especially rock tailings. Currently only 40% of the 85 million tons of phosphogypsum produced annually is utilized, with the balance simply disposed of in piles, which have reached a total accumulated storage of over 800 million tons posing serious environmental hazards to the land and water basins and wasting valuable resources. Similarly, waste tailings are not recycled or reused, and they are largely discharged untreated in open landfills with the risk of polluting not only the air, but also the soil and water resources. In addition, the mined phosrock requires higher energy consumption per unit of product, and consequently cause larger GHG emissions, when compared to developed countries, because it needs to be enriched to achieve the proper concentration required for most phosphate chemicals production. Therefore, China?s sizable phosphate production combined with the large energy consumption, GHG emissions, and by-products and waste generation per unit of product, assign an extremely high priority to the greening of the entire PCI value chain.

In 2016 the Government of China (GOC) has submitted its Nationally Determined Contributions (NDC) to the UNFCCC, which contains several climate change mitigation targets for 2030, and specifically:

1. Peaking CO_2 emissions by no later than 2030.

2. Lower CO_2 emissions per unit of gross domestic product (GDP) by 60-65% compared to the 2005 levels.

3. Increase the share of non-fossil fuels in primary energy consumption to approximately 20% (in 2019, the share of non-fossil fuel energy consumption was about 14.9%, including 2.2% of nuclear energy[1]).

4. Improve the CO_2 sink potential by increasing the forest stock volume by around 4.5 billion m^3 compared to the 2005 levels.

Although the GOC has not submitted its updated NDC yet, in his 2020 address to the United Nations General Assembly, President Xi has pledged that China will achieve carbon neutrality by 2060. The current NDC does not contain specific targets for the PCI, but it does set qualitative energy efficiency and low-carbon objectives for the entire industrial system, most notably:

a. Develop a circular economy while accelerating the elimination of inefficient production capacity.

b. Effectively control emissions from key industrial sectors, including the chemical industries.

c. Promote and increase recycling in the industrial system as well as utilization of renewable resources.

d. Promote low-carbon development of industrial sectors.

The pace and scale of initiatives devoted to the achievement of these goals have not reached yet a satisfactory level and more efforts are required to drift away from the current BAU scenario. The holistic approach proposed in this project, which starts from improvements of the policy and regulatory frameworks, the strengthening of the technical capacity of key stakeholders and includes the demonstration of state-of-the-art energy efficient and low-carbon technologies will trigger a transformational shift towards a green and environmentally sustainable phosphate chemical industry.

Baseline Initiatives

The GOC as well as the private sector have embarked in several projects and initiatives aligned with China?s objective of a cleaner and more energy efficient PCI. Table 1 summarizes the projects and programs that will be the baseline of the activities designed under this proposed PhosChemEE Project. These baseline projects and programs not only have been already approved and budgeted, but their execution is either ongoing or planned and they will be completed over the PhosChemEE Project implementation period.

Table 1. Ongoing and Planned Baseline Projects and Initiatives

Baseline Project/Program	Description	Available Budget, USD
MIIT: Green, low-carbon technology development and large-scale applications	The Ministry of Industry and Information Technology (MIIT) of the People?s Republic of China attaches great importance to the promotion and implementation of green development in the phosphorus chemical industry. In recent years, funds have been invested in projects supporting green manufacturing. In the ?14th five-year plan for Industrial Green Development?, the GOC has devised a road map leading to the peaking of carbon emissions in the industrial system, promoting the reduction, intensification and greening of the chemical industry, including the PCI. The plan also aims at accelerating the comprehensive utilization of industrial solid waste on a large scale, such as tailings, and industrial by-products like phosphogypsum, particularly in the middle and upper reaches of the Yangtze River Economic Belt. The MIIT will support this green, low-carbon transformation of the PCI by providing an annual investment of USD 780,000 for a total of USD 3,900,000 over the five years of PhosChemEE implementation period. The activities that will be designed under this government program will include the introduction of relevant policies, and promotion and demonstration of key clean technologies. The proposed PhosChemEE project will also cooperate in the formulation of relevant policies, technical specifications, and demonstration of key low-carbon technologies to support the green transformation of the phosphorus chemical industry. **Timeline of Implementation: 2022-2027**	3,900,000

Baseline Project/Program	Description	Available Budget, USD
Hubei Province: Phosphate chemicals production optimization and comprehensive utilization of phosphogypsum	Hubei province attributes great importance to the green and low-carbon development of the phosphorus chemical industry. In particular great efforts have been made to optimize the manufacturing of phosphorus chemical products and the province is targeting, by 2025, the achievement of a world renowned phosphate industrial cluster with a market share of USD 50 billion (RMB 300 billion). Additionally, Hubei?s efforts are focusing on accelerating the comprehensive utilization of phosphogypsum resources and the province is aiming to achieve a balance between phosphogypsum production and consumption by the end of 2025. Hubei province will disburse USD 1,987,500 over the next five years to support a number of low-carbon comprehensive phosphogypsum utilization projects as well as the construction of harmless phosphogypsum treatment facilities, other than that, Yichang, Xiangyang, Jingmen, Huanggang, Jingzhou, Xiaogan and other cities and towns will invest additional budget in this regard to jointly reach the target of 25 million tons of phosphogypsum utilization. **Timeline of Implementation: 2022-2027**	1,987,500
Yunnan Province: Develop Green and low-carbon technology in phosphate chemical industry	In the ?14th five-year development plan for the petrochemical and chemical industry?, Yunnan Province is proposing to improve safety in the phosphorus chemical industry, strengthen environmental protection, and promote green and low-carbon development of chemical enterprises and industrial parks. Over the next five years Yunnan will support technological research and development demonstration projects by investing a total budget of USD 1,987,500. Manufacturers of phosphorus compound fertilizers and fine phosphorous chemicals will be encouraged by the local government of Yunnan to develop and implement new energy-saving technologies, as well as to adopt technologies that will allow to providing a more effective protection of the environment. These initiatives will include the demonstration of these green, low-carbon technologies for the advancement of the entire provincial phosphorus chemical industry. ***Timeline of Implementation: 2022-2027***	1,987,500

Baseline Project/Program	Description	Available Budget, USD
Guizhou Province: Formulation of green industry standards, and R&D of key low-carbon technologies	Guizhou Province is planning to: 1) strengthen the standardization of the specialty chemical industry, including the phosphorus chemical industry; 2) support the formulation of standards for new modern chemical and phosphogypsum products; and 3) promote the design and implementation of evaluation standards for green enterprises and green industrial parks. Concomitantly, significant efforts will be made to develop high-efficiency fertilizers suitable for modern agricultural development. The introduction of new standards for phosphogypsum products will be integrated with research and development activities concerning the application of key low-carbon technologies to produce high-purity phosphoric acid and improve the efficient utilization of phosphogypsum produced with the wet process phosphoric acid (WPA) method. Over the next five years, the provincial government of Guizhou will contribute a total of USD 1,987,500 co-financing for this green, low-carbon PCI development. ***Timeline of Implementation: 2022-2027***	1,987,500
Sichuan Province: Support green, low-carbon technological transformation of phosphorus chemical industry	Sichuan Province has integrated the greening of the chemical industry into one of the 16 key areas of the province?s ?5 + 1? modern industrial system, including the accelerated development of the phosphate chemicals manufacturing. The initiative aims at upgrading traditional enterprises and building green chemical industrial parks. To support these efforts, Sichuan Province will provide a budget of USD 1,987,500 over the next five years. The financed initiatives will include the implementation of projects and R&D activities in the following areas: a) energy savings and GHG emissions reduction; b) clean production; c) comprehensive utilization of resources; and d) other technical innovation projects. ***Timeline of Implementation: 2022-2027***	1,987,500
MNR and Provincial DNRs: Green, Low-carbon technology development and large-scale application	The Ministry of Natural Resources (MNR) of the People?s Republic of China and provincial local governments are the promoters of green mine construction[1]. A total of USD 7,950,000 will be invested over the next five years for green phosphorus mine construction. This budget includes USD 2,650,000 provided by MNR and USD 5,300,000 funded by the local governments of the participating provinces. These activities will be implemented in the next five years will be the baseline for PhosChemEE project activities, including the introduction of relevant policies, demonstration projects, and key technology promotion. The proposed PhosChemEE project will also cooperate in the formulation of relevant policies, technical specifications, and demonstration of key low-carbon technologies to support the green transformation of the phosphorus chemical industry. **Timeline of Implementation: 2022-2027**	7,950,000

Baseline Project/Program	Description	Available Budget, USD
Private Sector: develop green, low-carbon phosphate mining & refining, phosphate chemicals production, and waste management demo projects	The private sector will participate in the design and demonstration of green, energy-saving and low-carbon technology projects in the entire PCI value chain, namely: a) phosrock mining and refining; b) phosphate chemicals production; and c) waste management. The demo projects, which are annexed to this project proposal, will include: construction, installation and operation of equipment and facilities to showcase green, low-carbon technology applications; and capacity building and training programs for key technical/design personnel and stakeholders, which will accelerate the promotion and development of a green PCI. **Timeline of Implementation: 2022-2027**	77,763,687

Baseline Project/Program	Description	Available Budget, USD
MIIT: Green, low-carbon technology development and large-scale applications	The Ministry of Industry and Information Technology (MIIT) of the People?s Republic of China attaches great importance to the promotion and implementation of green development in the phosphorus chemical industry. In recent years, funds have been invested in projects supporting green manufacturing. In the ?14th five-year plan for Industrial Green Development?, the GOC has devised a road map leading to the peaking of carbon emissions in the industrial system, promoting the reduction, intensification and greening of the chemical industry, including the PCI. The plan also aims at accelerating the comprehensive utilization of industrial solid waste on a large scale, such as tailings, and industrial by-products like phosphogypsum, particularly in the middle and upper reaches of the Yangtze River Economic Belt. The MIIT will support this green, low-carbon transformation of the PCI by providing an annual investment of USD 780,000 for a total of USD 3,900,000 over the five years of PhosChemEE implementation period. The activities that will be designed under this government program will include the introduction of relevant policies, and promotion and demonstration of key clean technologies. The proposed PhosChemEE project will also cooperate in the formulation of relevant policies, technical specifications, and demonstration of key low-carbon technologies to support the green transformation of the phosphorus chemical industry. **Timeline of Implementation: 2022-2027**	3,900,000

Baseline Project/Program	Description	Available Budget, USD
Hubei Province: Phosphate chemicals production optimization and comprehensive utilization of phosphogypsum	Hubei province attributes great importance to the green and low-carbon development of the phosphorus chemical industry. In particular great efforts have been made to optimize the manufacturing of phosphorus chemical products and the province is targeting, by 2025, the achievement of a world renowned phosphate industrial cluster with a market share of USD 50 billion (RMB 300 billion). Additionally, Hubei?s efforts are focusing on accelerating the comprehensive utilization of phosphogypsum resources and the province is aiming to achieve a balance between phosphogypsum production and consumption by the end of 2025. Hubei province will disburse USD 1,987,500 over the next five years to support a number of low-carbon comprehensive phosphogypsum utilization projects as well as the construction of harmless phosphogypsum treatment facilities, other than that, Yichang, Xiangyang, Jingmen, Huanggang, Jingzhou, Xiaogan and other cities and towns will invest additional budget in this regard to jointly reach the target of 25 million tons of phosphogypsum utilization. **Timeline of Implementation: 2022-2027**	1,987,500
Yunnan Province: Develop Green and low-carbon technology in phosphate chemical industry	In the ?14th five-year development plan for the petrochemical and chemical industry?, Yunnan Province is proposing to improve safety in the phosphorus chemical industry, strengthen environmental protection, and promote green and low-carbon development of chemical enterprises and industrial parks. Over the next five years Yunnan will support technological research and development demonstration projects by investing a total budget of USD 1,987,500. Manufacturers of phosphorus compound fertilizers and fine phosphorous chemicals will be encouraged by the local government of Yunnan to develop and implement new energy-saving technologies, as well as to adopt technologies that will allow to providing a more effective protection of the environment. These initiatives will include the demonstration of these green, low-carbon technologies for the advancement of the entire provincial phosphorus chemical industry. ***Timeline of Implementation: 2022-2027***	1,987,500

Baseline Project/Program	Description	Available Budget, USD
Guizhou Province: Formulation of green industry standards, and R&D of key low-carbon technologies	Guizhou Province is planning to: 1) strengthen the standardization of the specialty chemical industry, including the phosphorus chemical industry; 2) support the formulation of standards for new modern chemical and phosphogypsum products; and 3) promote the design and implementation of evaluation standards for green enterprises and green industrial parks. Concomitantly, significant efforts will be made to develop high-efficiency fertilizers suitable for modern agricultural development. The introduction of new standards for phosphogypsum products will be integrated with research and development activities concerning the application of key low-carbon technologies to produce high-purity phosphoric acid and improve the efficient utilization of phosphogypsum produced with the wet process phosphoric acid (WPA) method. Over the next five years, the provincial government of Guizhou will contribute a total of USD 1,987,500 co-financing for this green, low-carbon PCI development. ***Timeline of Implementation: 2022-2027***	1,987,500
Sichuan Province: Support green, low-carbon technological transformation of phosphorus chemical industry	Sichuan Province has integrated the greening of the chemical industry into one of the 16 key areas of the province?s ?5 + 1? modern industrial system, including the accelerated development of the phosphate chemicals manufacturing. The initiative aims at upgrading traditional enterprises and building green chemical industrial parks. To support these efforts, Sichuan Province will provide a budget of USD 1,987,500 over the next five years. The financed initiatives will include the implementation of projects and R&D activities in the following areas: a) energy savings and GHG emissions reduction; b) clean production; c) comprehensive utilization of resources; and d) other technical innovation projects. ***Timeline of Implementation: 2022-2027***	1,987,500
MNR and Provincial DNRs: Green, Low-carbon technology development and large-scale application	The Ministry of Natural Resources (MNR) of the People?s Republic of China and provincial local governments are the promoters of green mine construction[4]. A total of USD 7,950,000 will be invested over the next five years for green phosphorus mine construction. This budget includes USD 2,650,000 provided by MNR and USD 5,300,000 funded by the local governments of the participating provinces. These activities will be implemented in the next five years will be the baseline for PhosChemEE project activities, including the introduction of relevant policies, demonstration projects, and key technology promotion. The proposed PhosChemEE project will also cooperate in the formulation of relevant policies, technical specifications, and demonstration of key low-carbon technologies to support the green transformation of the phosphorus chemical industry. **Timeline of Implementation: 2022-2027**	7,950,000

Baseline Project/Program	Description	Available Budget, USD
Private Sector: develop green, low-carbon phosphate mining & refining, phosphate chemicals production, and waste management demo projects	The private sector will participate in the design and demonstration of green, energy-saving and low-carbon technology projects in the entire PCI value chain, namely: a) phosrock mining and refining; b) phosphate chemicals production; and c) waste management. The demo projects, which are annexed to this project proposal, will include: construction, installation and operation of equipment and facilities to showcase green, low-carbon technology applications; and capacity building and training programs for key technical/design personnel and stakeholders, which will accelerate the promotion and development of a green PCI. **Timeline of Implementation: 2022-2027**	77,763,687

[1] https://www.eia.gov/international/analysis/country/CHN

[1] https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-phosphate.pdf

[2] The same USGS (U.S. Geological Survey) document from the previous footnote reports preliminary data for 2020 and it show that although still firmly ranked number one in the world, China?s phosphate production declined to 90 Mton largely due to the impact of the COVID-19 pandemic.

[4] Green mine refers to a mine that implements efficient mining in the whole process of mineral resources development, monitors and reduces the impact of the mining activities on the environment within a controllable range, and implements environmental ecology, scientific mining methods, efficient resource utilization, and digitization of management information, with minimal impact over the mining area community. The specific requirements include nine aspects: running mines according to law, standardized management, comprehensive utilization of resources, technological innovation, energy conservation and emission reduction, environmental protection, land reclamation, community harmony and corporate culture.

The successful completion of all the baseline projects and programs listed in Table 1 will bring China closer to enabling the extensive application of low carbon and energy efficient technologies in the phosphate chemicals industry in China and transitioning towards to achieving China dual-carbon target, but still they will not be enough to fully realize these goals. Improvements in the baseline efforts of the country are necessary. Such improvements call for the removal of the identified existing barriers. The removal of such barriers will not only achieve the desired transformation of the PCI development, but also contribute to the realization of the climate change mitigation NDC targets of the country.

The projects identified as baseline initiatives in the PIF have been replaced by several projects funded by both the national and provincial governments. More specifically, The Ministry of Industry and Information Technology and the Ministry of natural Resources each will fund projects supporting large-scale implementation of green and low carbon technologies in the phosphate chemicals industry (PCI). In addition, the provincial governments of Guizhou, Hubei, Sichuan and Yunnan will finance projects that will strengthen the utilization of by-product phosphogypsum, support the greening of the phosphate chemicals industry and advance research and development of key low carbon technologies.

All these GOC funded projects are described in Table 1 of the Project Document (ProDoc). Finally, there will be a number of private sector funded projects that will be the baseline for the demonstration activities (illustrated in the demo descriptions annexed to the ProDoc). As evidenced by the co-financing table in Part I, Section C of this CEO Endorsement Request Document (CERDoc), the new baseline projects will provide a volume of co-financing even higher than initially pledged in the approved PIF. Please refer to Annex K.

1a.3) *Proposed alternative scenario with a brief description of expected outcomes and components of the project.*

Alternative Scenario: With the forecast growth rate of phosrock production, phosphate chemicals and phosphate fertilizer production, it is expected that additional production capacities will be installed, or the productivity rates will be improved with existing installed capacities. In that regard, the alternative scenario in the PCI features the application of new improved production technologies in the new plants that will be built and in existing facilities that will be retrofitted. These improvements are mainly in line with the achievement of the envisioned alternative scenario, whereby the productivity rates are improved, and at the same time the specific energy consumption in the phosrock mining and refining operations/processes, and phosphate chemicals and the management of PCI waste. The alternative scenario is also characterized by the widescale application of circular economy initiatives that will feature waste recovery, recycling and utilization, which will bring about improved resource conservation, reduced production losses and process wastage, and reduced accumulation of PCI mining and refining waste, as well as the phosphate chemicals production waste by-products. Such scenario will feature lesser energy consumption as the specific energy consumption for the PCI operations and processes will be reduced, with the corresponding reduction in GHG emissions from the PCI, as well as lesser environmental footprint, with the minimization of the generation of solid, liquid, and gaseous wastes from the industry.

To enable the realization of the envisioned alternative scenario, the widespread application of several potential green, energy efficient and low carbon technologies in the 3 major sub-sectors of the PCI (phosrock mining and refining; phosphate chemicals production; and waste management) is very essential. This however is not straightforward since there are also enabling conditions that must be in place to facilitate the widespread application of these technologies, and there are also some challenges/barriers in the creation of such enabling environment.

The PhosChemEE Project is designed based on a barrier removal approach. The proposed strategy calls for the design of *ad-hoc* incremental activities that by building on, and complementing, supplementing, or augmenting, the aforementioned baseline projects aim to remove all identified barriers. A barrier removal approach is the best available strategy because of its sustainability long after the implementation of the PhosChemEE project has been completed. The strategy is illustrated in the Theory of Change (ToC) diagram illustrated below. The ToC visually show how the identified barriers lead to the main problem for China?s PCI industry (yellow section of the figure), while the implementation of the PhosChemEE incremental activities will allow the removal of the barriers and the achievement of the main Project Objective: ***?Enabling the extensive application of low carbon and energy efficient technologies in the phosphate chemicals industry in China?*** (purple section of the figure). The following are the expected outcomes of the project and the proposed ways in which the barrier removal strategy will be carried out to realize them.

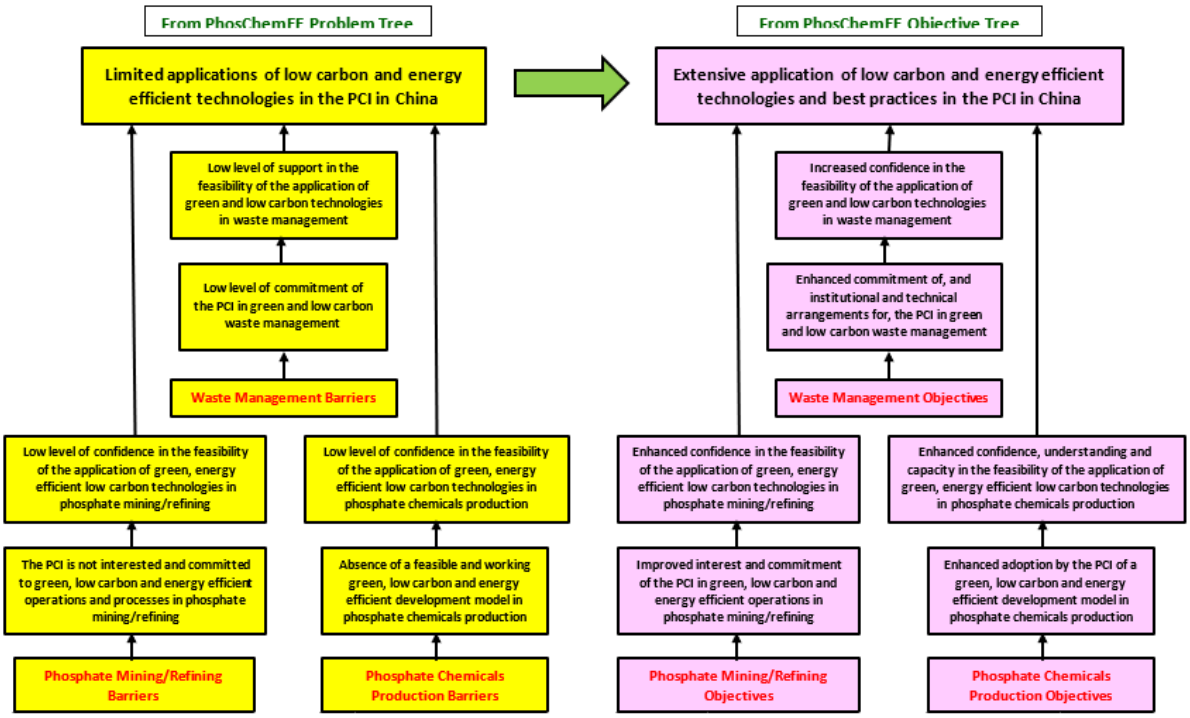
The project Log Frame is organized in three components, one for each sub-sector. Each of the three components is structured in a similar way and is made of two Outcomes, the first concerns provision of technical assistance while the second focuses on investment type activities. Therefore, the entire PhosChemEE project has a total of six Outcomes.

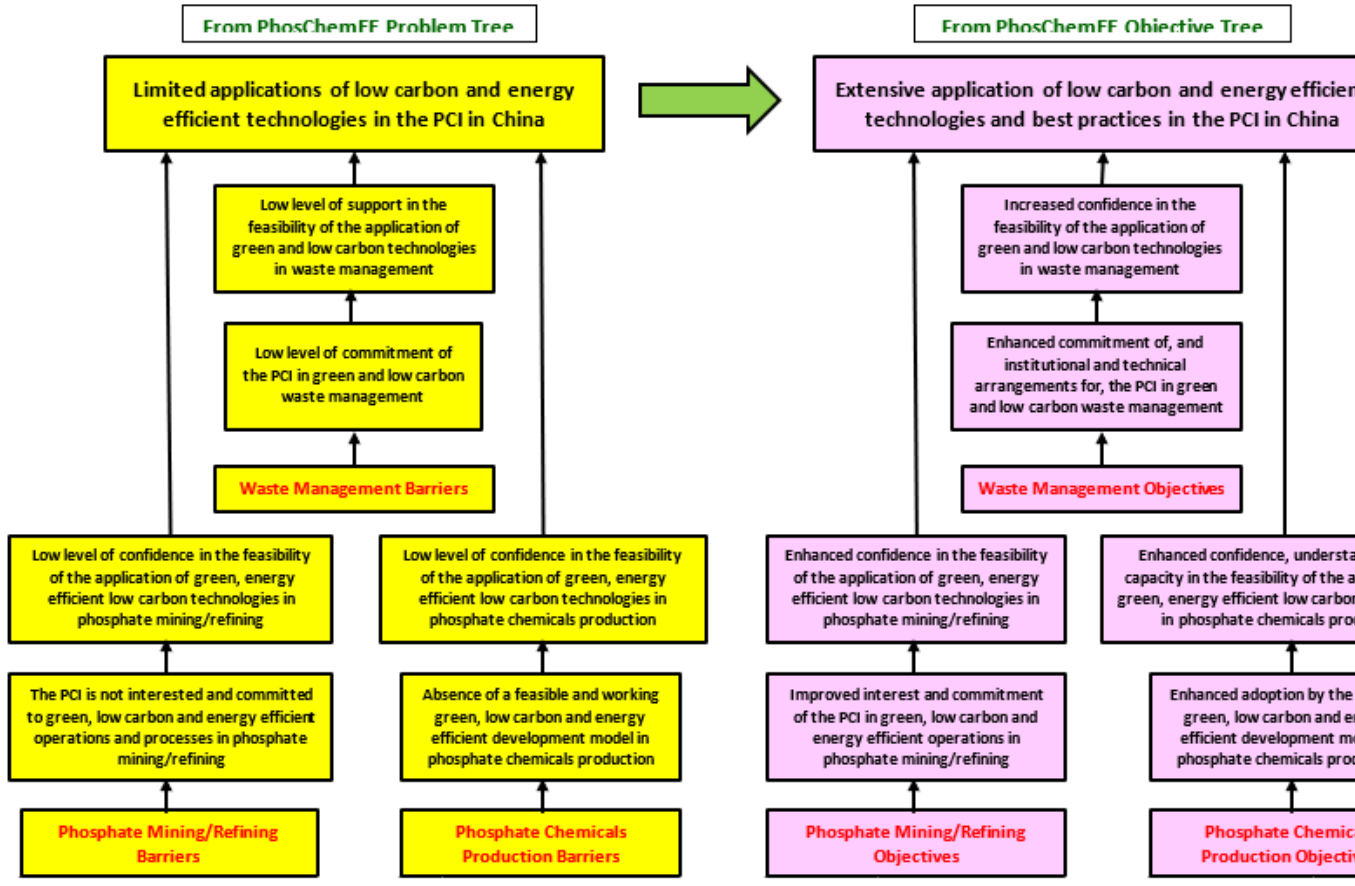
Component 1 ? Green and Low Carbon Development and Operation of Phosphate Mines:

This project component is intended for the removal of barriers to the application of green, energy efficient low carbon technologies/techniques and practices in the mining and refining of phosphate ore. The delivery of the envisioned outputs from this project component will bring about two main outcomes: (1) Improved interest and commitment of the phosphate chemical industry in the green, low carbon and energy efficient operations of the phosphate mining sub-sector in China; and, (2) Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate ore mining and refining in China.

Outcome 1.1: Improved interest and commitment of the phosphate chemical industry in the green, low carbon and energy efficient operations of the phosphate mining sub-sector in China. This outcome is expected to be realized through the implementation of six sets of activities involving the: (1) Formulation and enforcement of policy and institutional frameworks supporting green, energy efficient low carbon development initiatives in phosphate ore mining and refining; (2) Formulation and enforcement of standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in the development and operations of phosphate mines; (3) Documentation of annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results; (4) Design, conduct and post-evaluation of continuing education program in the PCI mining sub-sector in selected provinces, with regular capacity needs assessment in the area of green, energy efficient low carbon technologies applied in phosphate mining and refining; (5) Establishment of online monitoring, reporting and verification (MRV) system for energy-saving and GHG emission reduction from the application green, energy efficient low-carbon technologies in the PCI including information sharing scheme; and (6) Establishment and operationalization of an up-to-date information management and exchange system for all aspects of green, energy efficient low carbon phosphate mining and refining technologies and best practices.

PhosChemEE Project: Theory of Change


From PhosChemFF Problem Tree
Limited applications of low carbon and energy efficient technologies in the PCI in China
Low level of support in the feasibility of the application of green and low carbon technologies in waste management
Low level of commitment of the PCI in green and low carbon waste management
Waste Management Barriers
Low level of confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate mining/refining
Low level of confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production
The PCI is not interested and committed to green, low carbon and energy efficient operations and processes in phosphate mining/refining
Absence of a feasible and working green, low carbon and energy efficient development model in phosphate chemicals production
Phosphate Mining/Refining Barriers
Phosphate Chemicals Production Barriers
From PhosChemFF Objective Tree
Extensive application of low carbon and energy efficient technologies and best practices in the PCI in China
Increased confidence in the feasibility of the application of green and low carbon technologies in waste management
Enhanced commitment of, and institutional and technical arrangements for, the PCI in green and low carbon waste management
Waste Management Objectives
Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate mining/refining
Enhanced confidence, understanding and capacity in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production
Improved interest and commitment of the PCI in green, low carbon and energy efficient operations in phosphate mining/refining
Enhanced adoption by the PCI of a green, low carbon and energy efficient development model in phosphate chemicals production
Phosphate Mining/Refining Objectives
Phosphate Chemicals Production Objectives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Low level of commitment of the PCI in green and low carbon waste management
Waste Management Barriers
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Low level of confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production
The PCI is not interested and committed to green, low carbon and energy efficient operations and processes in phosphate mining/refining
Absence of a feasible and working green, low carbon and energy efficient development model in phosphate chemicals production
Phosphate Mining/Refining Barriers
Phosphate Chemicals Production Barriers
From PhosChemFF Objective Tree
Extensive application of low carbon and energy efficien
technologies and best practices in the PCI in China
Increased confidence in the feasibility of the application of green and low carbon technologies in waste management
Enhanced commitment of, and institutional and technical arrangements for, the PCI in green and low carbon waste management
Waste Management Objectives
Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate mining/refining
Improved interest and commitment of the PCI in green, low carbon and energy efficient operations in phosphate mining/refining
Phosphate Mining/Refining Objectives

Outcome 1.2: Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosrock mining and refining in China. This outcome is expected to be realized through the implementation of four sets of activities involving the: (1) Designing and planning of the demonstrations of green, energy efficient and low carbon technologies in phosphate mines development and operations in selected provinces; (2) Installation and operationalization of green, energy efficient low carbon technology application demos in phosphate ore mining and refining; (3) Establishment and operationalization of financial support schemes that are accessible to PCI mining companies to support their green, energy efficient and low carbon technology application initiatives; and (4) Approval of financed follow-up plan for the replication of the application of demonstrated green, energy efficient low carbon technologies in phosphate ore mining and refining in other localities.

The green, energy efficient and low carbon demos that will be implemented in the partner phosphate mining companies that mine and refine phosphate ore are the following:

? Demonstration 1.1: Application of Full Tailings Filling Technology in Underground Phosphate Mines

? Demonstration 1.2: Application of Underground Full-Bed Continuous Mining Technology in Phosphate Mines Using High Quality Mechanical Cutting Equipment

? Demonstration 1.3: Application of Phosphate Ore Pre-processing Sorting Technology for Discarding Tailings

? Demonstration 1.4: Improved Ore Flotation Efficiency through Automatic Control of Acid Mixtures used as Flotation Depressant

Component 2: Green and Low Carbon Design and Operation of Phosphate Chemicals Production Facilities

This component of the project will address the barriers to the application of green, energy efficient low carbon technologies/techniques and practices in phosphate chemicals production. This is comprised of activities that will deliver outputs that will collectively bring about two main outcomes: (1) Enhanced interest and commitment of the phosphate chemical industry in the green, low carbon and energy efficient production of phosphate chemicals in China; and, (2) Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production in China.

Outcome 2.1: Enhanced adoption by the phosphate chemical industry of a green, low carbon and energy efficient development model in phosphate chemicals production. There are six sets of activities that will bring about this expected outcome and these involve the: (1) Formulation and enforcement of policy and institutional frameworks supporting green, energy efficient low carbon technology applications in phosphate chemicals production; (2) Formulation and enforcement of standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in phosphate chemicals production; (3) Documentation o annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results based on the MRV system established under Component 1;

(4) Design, conduct and post-evaluation of continuing education program in the PCI chemicals sub-sector in selected provinces, with regular capacity needs assessment in the area of green, energy efficient and low carbon technologies applied in phosphate chemicals manufacturing; (5) Conduct of a market analysis report on the international trade trends for phosrock and phosphate chemicals, and the indirect carbon emission and ecological impacts in the international trading of these products; and (6) Establishment and operationalization of a system for managing and sharing available and accessible information on all aspects of green, energy efficient and cleaner phosphate chemicals production in China.

Outcome 2.2: Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production in China. There are five sets of activities that will bring about this expected outcome and these involve the: (1) designing and planning of demonstrations of green, energy efficient low carbon technologies in phosphate chemicals production including: (a) Improved design for cleaner production demos; (b) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosphate chemical production systems; and, (c) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosphate chemical companies; (2) Installation and operationalization of green, energy efficient low carbon technology application demos in phosphate chemicals production; (3) Design and approval of pilot financing scheme for small and medium enterprises (SMEs) that manufacture phosphate chemicals; (4) Operationalization of a pilot financing scheme for phosphate chemicals SMEs in 2 to 3 regions; and (5) Approval of financed follow-up plan for the replication of the application of demonstrated green, energy efficient low carbon technologies in phosphate chemicals production in other localities.
The green, energy efficient and low carbon demos that will be implemented in the partner phosphate chemical manufacturing companies are the following:

? Demonstration 2.1: Application of Advanced Purification Technology for the Production of Purified Wet-Process Phosphoric Acid (WPA)

? Demonstration 2.2: Application of Optimally Controlled Mechanical Vapor Recompression (MVR) System in the Evaporation Process of Ammonium Dihydrogen Phosphate Production

? Demonstration 2.3: Application of Improved Dihydrate-Hemihydrate Process for Wet Process Phosphoric Acid (WPA) Production

Component 3: Green and Low Carbon Design and Operation of Waste Management Systems in the Phosphate Chemicals Industry

This component of the project will address the barriers to the application of green, energy efficient low carbon technologies/techniques and practices in waste management systems in the phosphate chemicals industry. This focuses on the green and low carbon management of solid wastes generated in phosphate ore mining and refining and in phosphate chemicals production. It is comprised of activities that will deliver outputs that will collectively bring about two main outcomes: (1) Enhanced commitment of the phosphate chemical industry in green and low carbon waste management; (2) Increased confidence in the feasibility of the application of green and low carbon technologies in the management of waste in the phosphate chemicals industry in China.

Outcome 3.1: Enhanced commitment of, and institutional and technical arrangements for, the phosphate chemical industry in green and low carbon waste management. This expected outcome is to be realized through the implementation of six sets of activities involving the: (1) Formulation and enforcement of policies and institutional frameworks that supports green, low carbon initiatives in waste management in the PCI; (2) Enforcement of improved existing and new enforced schemes,

standards, policies/regulations on the application of green and low carbon waste management technologies in the PCI operations and processes; (3) Documentation of annual evaluation reports on the energy performance and environmental impacts of each demo based on the MRV system developed under Component 1; (4) Design, conducted and post-evaluation of continuing education program with regular capacity needs assessments in the area of green and low carbon technologies applied in waste management in the PCI; (5) Production and dissemination of research reports on: (a) annual volume of waste production in phosrock mining and refining, and in phosphate chemicals production in China; (b) green and low carbon waste management systems for waste recycling and reuse developed and implemented in other countries and their energy utilization performances; and, (c) potential commercial markets for processed waste, e.g., phosphogypsum; and (6) Establishment and operationalization of an information management system for sharing available and accessible information about market and research developments and R&D in the country and abroad on green and low carbon waste management systems in the PCI.

Outcome 3.2: Increased confidence in the feasibility of the application of green and low carbon technologies in the management of waste in the phosphate chemicals Industry in China. There are three sets of activities that will bring about this outcome and these involve the: (1) Designing and planning of demonstrations of the application of green and low carbon technologies/techniques in waste management in the phosphate chemicals industry, including: (a) improved phosphate ore mining tailings recycling and reuse; and (b) energy efficient processing of phosphogypsum and marketing of the gypsum products; (2) Installation and operationalization of green and low carbon waste management technology application demos in the phosphate chemicals industry; and, (3) Approval of financed follow-up plan for the replication of the application of demonstrated green, low carbon waste management technologies in the phosphate chemicals industry in other localities.

The green, energy efficient and low carbon demos on waste management that will be implemented in the partner phosphate ore mining and refining companies and phosphate chemical manufacturing companies are the following:

? Demonstration 3.1: Multi-Purpose Large-Scale Processing and Utilization of Phosphate Chemical Industry Waste

? Demonstration 3.2: Processing of Phosphogypsum for Use as Filler in the Production of Polymer Composite Plastic Products

? Demonstration 3.3: Recovery and Utilization of Yellow Phosphorus Tail Gas for Power Generation

Once successfully completed, PhosChemEE will enable China?s phosphate chemicals industry to transform towards a sustainable, green, low carbon development, which will provide technical, financial and environmental benefits to the entire PCI and its associated value chain. Furthermore, the successful completion of the proposed project will also reduce air, soil and water pollution, create new jobs, and help China achieve its mitigation targets set in the NDC. The biggest innovation that the PhosChemEE project will introduce in China is the holistic approach taken, and the proposed activities have large potential for replication and scale-up in the whole country.

1a.4) *Alignment with GEF focal area and/or Impact Program strategies:* N/A

This project is in line with the GEF-7 climate change mitigation objective of promoting innovation and technology transfer. This project is in line with the specific entry points under CCM-1.3: Acceleration of promoting energy efficiency. Presently, China attaches great importance to promoting the energy conservation and green development in its major industry sectors such as the PCI (inclusive of phosrock mining, phosphate chemical production, and by-products processing). The country has existing policies and programs on industrial energy conservation and on green, and low carbon development that can support the achievement of a more energy efficient and environment-friendly PCI. However, despite these bringing positive progress in the industry, there is still significant room for improvement in the understanding and application of green, energy efficient low-carbon technologies in this major energy consuming industry in China. The facilitation of the widescale application of these technologies is the objective of the project, and this will be done through the removal of identified barriers/problems through various technical assistance and investment-type barrier removal activities.

Additionally, the implementation of this project will mobilize more rural women in the project areas and enable women to play significant roles in the implementation of this project. This is in line with the UN's sustainable development goals for poverty eradication, gender equality, gender equality and empowerment of all women and children, as well as the GEF's focus on gender equality.

1a.5) *Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing:* N/A

The proposed project will build on the planned and budgeted projects in improving the PCI. These baseline projects are meant to improve the operational efficiency of the PCI through the application of green, energy efficient low carbon technologies in the 3 sub-sectors of the PCI (phosrock mining and refining, phosphate chemicals production, and by-product processing). While the idea of cost savings, environmental protection and operational efficiency improvement are among the driving force for the MNR and MIIT to improve the energy and environmental performance of the PCI, due to lack of knowledge of green, energy efficient and low carbon technologies/techniques, and practice, their current efforts are still largely based on the traditional industrial production model which does not take an integrated approach toward minimizing energy and environmental impacts at every stage of the PCI value chain. With these, the full potential for energy savings, operational cost savings, and GHG emission reductions in the PCI will not be realized.

For the effective showcasing and promotion of the application of the green, energy efficient low carbon technologies in the PCI, enhancements of the current efforts regarding this will be carried out through the removal of barriers associated with the lack of capacity and knowledge about the application, design, financing and operation of the various energy consuming processes and operations in the 3 sub-sectors of the PCI.

Based on the current projects (i.e., to be implemented, and/or planned and budgeted) of the identified partner PCI companies for their respective production operations and processes, further improvements on the planning, design and application of green, low carbon technologies were preliminarily identified. These projects have been improved/modified and the improved/modified versions have been included as demonstrations of the project. The improvements/modifications are meant to apply low/zero carbon technologies and techniques to bring about more energy savings and GHG emission reductions. The cost for such improvements are practically the incremental costs that the proposed project requires the GEF to financially support. The improvements in the baseline activities will depend on their type and

original design. In the case of the demonstrations, these improvements involve making the applied strategy/methodology or technology application: (1) more energy conserving and energy efficient, e.g., improved waste heat recovery, utilization of more energy efficient equipment/process; (2) more economically feasible, e.g., provision of financial support/incentives; (3) more environment-friendly, e.g., application of cleaner production techniques; (4) more resource conserving, e.g., application of improved phosphogypsum processing; and, (5) addressing the absent or insufficient enabling conditions (e.g., policies, regulations, standards, capacity and skills upgrading). Without these incremental features, the envisioned alternative scenario for the development of the PCI in China that the proposed project intends to bring about will not be realized. Detailed incremental cost analyses were carried out during the design and development (PPG) stage of the project.

Incremental support activities are necessary to facilitate the demonstrations of the application of the energy-saving and environment conserving aspects of the operations and processes in these sub-sectors of the industry. GEF support is necessary to encourage the major stakeholders in the PCI (national and local government authorities, phosphate mining and phosphate chemical manufacturing companies) to support the facilitative interventions of the project (e.g., demonstration of the installation and operation of improved, green, energy efficient PCI infrastructures; and facilitate the cost effective utilization of such infrastructures and the enabling of the various support policy and regulatory frameworks. Otherwise, without such incremental enabling activities the achievement of the desired alternative scenario for China?s PCI will not be realized. The incremental activities to remove barriers through the establishment and enforcement of supportive policy and regulatory frameworks that are supportive (through effective institutional arrangements, financial/fiscal incentives, information sharing, etc.) will be necessary to sustain the application of green, energy efficient and low carbon development of the PCI as well as the substantial sustainable development benefits that result from them.

Without GEF support for funding the incremental cost for removing the barriers that this proposed project will address, the expected potential additional global environmental benefits (in terms of avoided CO2 emissions linked from the fossil fuels that will be saved) would not be realized. Without this proposed project, China would have limited success in promoting energy efficient and environment friendly techniques and practices in an energy-intensive industry like the PCI, and consequently the potential contribution to achieving the country?s GHG emissions reduction targets will not be fully realized. With the GEF support for the incremental cost needed to create the much needed enabling conditions to remove the barriers that will in turn facilitate the widespread application of green, energy efficient and low carbon technologies/techniques, and ultimately realize the expected global environmental benefits of reducing GHG emissions (from energy savings derived from the energy efficient phosrock mining and refining; phosphate chemicals production, and by-product processing in the country?s PCI.

1a.6) *Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF):* N/A

The GHG emission reductions that will be derived from the interventions that will be carried out under the proposed project are direct and consequential (indirect). The direct emission reductions will come from improvements facilitated by the proposed project in phosphate rock mining is expected to reduce the current specific energy consumption in phosphate ore mining and beneficiation/refining. The improvement of the mining efficiency (including improving mine recovery rate, mining dilution rate, and beneficiation recovery rate) is also expected to achieve an energy consumption reduction per ton of refined phosrock. In phosphate chemicals production, the EE and cleaner production technologies and techniques applications that the project will facilitate will bring about a reduction in the production process energy consumption. The direct energy savings that will be derived from these process and operational improvements will bring about direct GHG emission reductions. The project activities on low-carbon waste management systems will be carried out in: (1) phosphate chemicals production; (2) phosrock mining and refining. The first one is on the utilization of the by-product phosphogypsum as

building material (specifically as filler in polymer composite plastic products. The second one is on the enhanced utilization of phosrock mine tailings as backfill in phosphate ore underground mining, and for the production of natural/biological phosphate fertilizer as replacement for the use of phosphate fertilizer. The resulting indirect energy savings will be from the reduced production of chemical phosphate fertilizers. Both of these indirect energy savings will have corresponding consequential GHG emission reduction.

In addition, there are other national benefits in terms of the reduced pollution of the water bodies that are near the PCI enterprises, reduction of the regional pollutant concentration in rural areas of Yunnan, Guizhou, Sichuan, and Hubei, promote the sustainable improvement of ecological environment in rural areas, and protect the livelihood of rural areas in these provinces.

1a.7) *Innovativeness, sustainability, and potential for scaling up:* N/A

Innovativeness: This project is designed to promote and facilitate the greening and low carbon transformation of China's PCI through innovative (in the context of China) interventions that addresses the current issues of the industry such as low quality products produced, high resource (process material and energy) consumption and environment damaging operations and processes. Innovative production management approaches that are green, energy efficient, resource and environment-conserving will be introduced not only to respond to the needs to be productive, cost-effective, but also responsive to climate change issues. These innovative technology applications in the PCI are estimated to bring about improvements in the specific energy consumption (SEC) in the various sub-sectors of the PCI. The proper application of these technologies will also reduce the overall SEC in phosrock mining and refining operations (e.g., improved mine recovery rate, mining dilution rate, and beneficiation recovery rate). With the same strategy, green, energy efficient low carbon technology applications in phosphate chemicals production will result in a reduction in the overall SEC of the sub-sector. The project also showcases the potential energy savings and corresponding GHG emission reductions in the implementation of innovative circular economy technology applications in the management and utilization of the mining and refining wastes, and phosphate chemicals production by-product wastes from the PCI. Another innovative feature is the employment of comprehensive assessment methods of energy savings and emissions reduction, improved carbon accounting system of the industry, analysis of the synergies between emission reduction efforts of the PCI and other industries, and formulation and enforcement of the standards for energy conservation and low-carbon development of the industry.

Sustainability: The potential for a wider adoption of green, energy efficient low carbon technologies and techniques in the PCI is quite high, considering the support that the GOC is providing to the industry. The activities that will be carried out under this proposed project are barrier removal in nature. To ensure avoidance of the recurrence of the barriers and the continuance of the enabling environments that will be created and/or facilitated by the project, appropriate sustainable follow-up actions will be planned as part of the project activities. Such action plan will be implemented after the project as per the institutional arrangements that will be developed for such purpose. During the project design stage, the project development team has determined and obtained expressions of interest from many entities in the PCI and to replicate the green, energy efficient low carbon energy technologies that are showcased and promoted by the project. Based on the discussions with the PCI, the estimated number of replication of the demos that will be implemented under the project is 15 to 20 per demo. Also, during the project implementation, MIIT and MNR will be coordinating closely with pertinent

industry associations (e.g., China Inorganic Salt Industry Association) in improving the PCI?s energy utilization efficiency can also help sustain efforts of the phosphate chemicals SMEs.

Scale-up Potential: The removal of barriers and the effective and seamless implementation of the procedures and regulatory and policy and institutional frameworks, as well as the financing schemes that will be established will influence the scaling-up of the project, e.g., to carry out the same interventions in other provinces with phosphate rock deposits. The PhosChemEE Project will lay a solid basis for scaling up with the successful demonstration of the applicable green, energy efficient and low carbon technologies/techniques, as well as the financing models that will support such applications by the phosphate chemicals SMEs. These, aside from the barrier removal activities, provide the possibility for scaling-up the application of these models/schemes in the other provinces, as well as in other countries. The scale-up will also be made possible through the project?s information sharing, technical assistance, and promotional activities. In the case of the EE and environmental footprint improvements in the phosrock mining and refining operations of the PCI and considering the number and production capacities of the big phosrock mining companies, the planned demo capacity in this proposed project can potentially be scaled up 5 times. In that case, the PCI in China can potentially be among the significant contributors to the achievement of the country?s NDC targets.

Annex K: CHANGES FROM THE PIF

This annex has been prepared in support of ?Section 1a.3): *Proposed alternative scenario with a brief description of expected outcomes and components of the project*?, and it shows how the detailed project design corresponds to the PIF and provides the rational for the changes. The table below compares the outcomes and output statements in the PIF to that in the ProDoc. The main change concerns the restatement of an outcome, which was previously stated as an output, but the essence of the former outcome has been preserved. The other changes made are mainly to merge outputs to improve efficiency during project implementation or to reorganize and restructure the sequence of outputs. In one case, an output has been split into two outputs for consistency with similar outputs under other project components. All changes are explained, correspondence between PIF outputs and ProDoc outputs (if there are changes) are highlighted, and justification and rational for changes is provided.

Finally, there has been a change in the budget for the two Outcomes under Component 1. While the total budget for Component 1 has not changed, part of the budget initially allocated for the TA activities (Outcome 1.1) has been shifted to the Investment activities (Outcome 1.2). An explanation is provided at the end of Table F-1.

Table F-1: Changes from the PIF

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 1.1.3: Documented annual evaluation reports on the energy performance and environmental impacts of each demo project and documented and disseminated demo project results.	**Output 1.1.3:** Documented annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results.	The word ?activity? replaces the word ?project? to include also other activities needed to implement the demos. For the same reason, to extend the coverage of the annual evaluation reports, the word ?project? at the end has been removed.

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 1.1.4: Completed capacity needs assessment in the area of green, energy efficient low carbon technologies applied in phosphate mining and refining, and designed capacity development program to be implemented for the phosrock mines in Weng'an, Guizhou, Jinning, Yunnan, and Mabian and Leibo counties, Sichuan. **Output 1.1.5:** Fully conducted and post-evaluated capacity development program on the principles and application of green, energy efficient low carbon technologies/techniques in phosphate mining and refining.	**Output 1.1.4:** Designed, conducted and post-evaluated continuing education program in the PCI mining sub-sector in Weng'an county in Guizhou Province, Jinning county in Yunnan Province, and Mabian and Leibo counties in Sichuan Province, with regular capacity needs assessment in the area of green, energy efficient low carbon technologies applied in phosphate mining and refining.	During the project identification exercise of the LFA workshop, it was noticed that Output 1.1.4 from the PIF is propaedeutic to Output 1.1.5. Therefore, to improve the efficiency of the project activities (i.e., some activities might be conducted by the same specialists) the two Outputs have been merged into a single Output. However, the new Output 1.1.4 will deliver the same results that the 2 former Outputs would have delivered.
Output 1.1.6: Published and disseminated technical guides and reference documents for the application of energy conserving and energy efficient practices in the phosphate mining sub-sector. **Output 1.1.8:** Published and disseminated publicity information about China's green, energy efficient and low-carbon phosrock mining and refining.	**Output 1.1.6:** Established and operational up-to-date information management and exchange system for all aspects of green, energy efficient low carbon phosphate mining and refining technologies and best practices.	During the project identification exercise of the LFA workshop, it was noticed that several activities in Outputs 1.1.6 and 1.1.8 from the PIF would have overlapped. To avoid duplication of activities and to improve the efficiency of the project activities the two Outputs have been merged into a single Output. However, the new Output 1.1.6 will not only deliver the same results that the 2 former Outputs would have delivered, but it would also establish and operationalize an exchange system to enhance the dissemination of information.
Output 1.1.7: Established the online monitoring, reporting and verification (MRV) system for energy-saving and GHG emission reduction from the application green, energy efficient low-carbon technologies in the PCI including information sharing scheme.	Label changed to **Output 1.1.5**	

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 1.2.1: Completed designs and plans of demonstrations of green, energy efficient and low carbon technologies in phosphate mines development and operations including: (a) Improved design for the mining and refining operations in the demo phosrock mines in Weng'an, Mabian, Guizhou, Sichuan; (b) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosrock mining and refining systems; and, (c) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosrock mines.	**Output 1.2.1:** Completed designs and plans of demonstrations of green, energy efficient and low carbon technologies in phosphate mines development and operations including: (a) Improved design for the mining and refining operations in the demo phosrock mines in Weng'an county in Guizhou province, and Mabian county in Sichuan province; (b) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosrock mining and refining systems; and, (c) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosrock mines.	The output statement has been slightly modified to clarify for the reader the selected demo counties and the provinces they belong to.
Output 1.2.2: Installed and operational green, energy efficient low carbon technology application demos in phosrock mining and refining in Weng'an, Guizhou, Jinning, Yunnan, and Mabian and Leibo counties, Sichuan.	**Output 1.2.2:** Installed and operational green, energy efficient low carbon technology application demos in phosrock mining and refining in Weng'an county in Guizhou province, Jinning county in Yunnan province, and Mabian and Leibo counties in Sichuan province.	The output statement has been slightly modified to clarify for the reader the selected demo counties and the provinces they belong to.
	Output 1.2.3: Established, funded and operational financial support schemes that are accessible to PCI mining companies to support their green, energy efficient and low carbon technology application initiatives.	During the project identification exercise of the LFA workshop, the PDT highlighted the need to introduce supporting financial schemes for phosphate mining companies to overcome the existing financial barriers, similar to the financial schemes for the phosphate chemicals SMEs designed under Outcome 2.2.

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 1.2.3: Approved and financed follow-up plan for the replication of the application of demonstrated green, energy efficient low carbon technologies in phosrock mining and refining in other localities.	Label changed to **Output 1.2.4**	
Outcome 2.1: Established a green and low-carbon development model for phosphorus chemicals.	**Outcome 2.1:** Enhanced adoption by the phosphate chemical industry of a green, low carbon and energy efficient development model in phosphate chemicals production.	Outcome 2.1 from the PIF was written as an Output statement, therefore it has been rephrased, but the essence of the Outcome does not change.
Output 2.1.3: Documented annual evaluation reports on the energy performance and environmental impacts of each demo project and documented and disseminated demo project results based on the MRV system (Output 1.1.7) established under Component 1.	**Output 2.1.3:** Documented annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results based on the MRV system (Output 1.1.5) established under Component 1.	See comments to Outputs 1.1.3 and 1.2.3 above.
Output 2.1.4: Completed capacity needs assessment in the area of green, energy efficient low carbon technologies applied in phosphate chemicals production, and designed capacity development program to be implemented for the phosphate chemical companies in Yunnan, Guizhou, Sichuan, and Hubei. **Output 2.1.5:** Fully conducted and post-evaluated capacity development program on the principles and application of green, energy efficient low carbon technologies/techniques in phosphate chemicals production.	**Output 2.1.4:** Designed, conducted and post-evaluated continuing education program in the PCI chemicals sub-sector in Yunnan, Guizhou, Sichuan, and Hubei, with regular capacity needs assessment in the area of green, energy efficient and low carbon technologies applied in phosphate chemicals manufacturing.	During the project identification exercise of the LFA workshop, it was noticed that Output 2.1.4 from the PIF is propaedeutic to Output 2.1.5. Therefore, to improve the efficiency of the project activities (i.e., some activities might be conducted by the same specialists) the two Outputs have been merged into a single Output. However, the new Output 2.1.4 will deliver the same results that the 2 former Outputs would have delivered.

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 2.1.6: Published and disseminated technical guides and reference documents for the application of energy conserving and energy efficient practices in the phosphate chemicals production sub-sector. **Output 2.1.8:** Published and disseminated publicity information about China's green, energy efficient and low-carbon phosphate chemicals manufacturing.	**Output 2.1.6:** Established and operational system for managing and sharing available and accessible information on all aspects of green, energy efficient and cleaner phosphate chemicals production in China.	During the project identification exercise of the LFA workshop, it was noticed that several activities in Outputs 2.1.6 and 2.1.8 from the PIF would have overlapped. To avoid duplication of activities and to improve the efficiency of the project activities the two Outputs have been merged into a single Output. However, the new Output 2.1.6 will not only deliver the same results that the 2 former Outputs would have delivered, but it would also establish and operationalize an exchange system to enhance the dissemination of information.
Output 2.1.7: Completed market analysis report on the international trade trends for phosrock and phosphate chemicals, and the indirect carbon emission and ecological impacts in the international trading of these products.	Label changed to **Output 2.1.5**	
Output 2.2.1: Designed and approved pilot financing scheme for small and medium enterprises (SMEs) that manufacture phosphate chemicals.	Label changed to **Output 2.2.3**	Output 2.2.1 from the PIF has been move down, and became Output 2.2.3, to improve the clarity of the logical framework, and to put next to one another the two outputs concerning the design of a pilot financing scheme (this Output 2.2.1 from the PIF) and its operationalization (Output 2.2.4)

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 2.2.2: Completed designs and plans of demonstrations of green, energy efficient low carbon technologies in phosphate chemicals production including: (a) Improved design for cleaner production demos; (2) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosphate chemical production systems; and, (3) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosphate chemical companies.	Label changed to **Output 2.2.1**	
Output 2.2.3: Installed and operational green, energy efficient low carbon technology application demos in phosphate chemicals production.	Label changed to **Output 2.2.2**	
Outcome 3.1: Enhanced commitment of the phosphate chemical industry in green and low carbon waste management.	**Outcome 3.1:** Enhanced commitment of, and institutional and technical arrangements for, the phosphate chemical industry in green and low carbon waste management.	The phrasing of the new Outcome 3.1 has been made more detailed to specify that institutional and technical arrangements necessary for the green development of the waste management in the PCI will also be improved.
Output 3.1.1: Completed research reports on: (1) annual volume of waste production in phosrock mining and refining, and in phosphate chemicals production in China; (2) green and low carbon waste management systems for waste recycling and reuse developed and implemented in other countries and their energy utilization performances; and, (3) potential commercial markets for processed waste, e.g., phosphogypsum.	Label changed to **Output 3.1.5**	Output 3.1.1 from the PIF has been move down, and became Output 3.1.5, to improve the clarity of the logical framework.

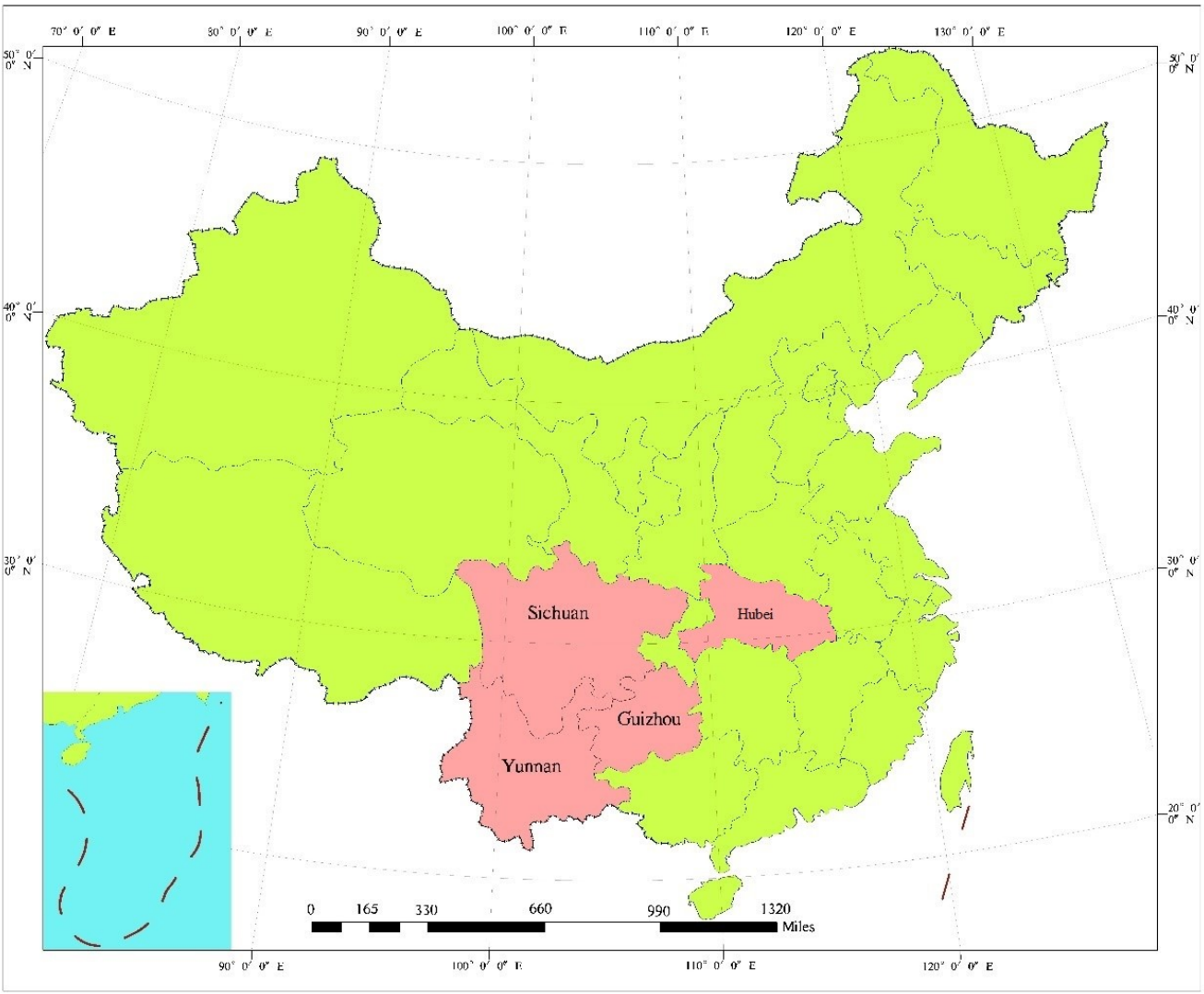
Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Output 3.1.2: Formulated and recommended schemes, standards, policies/regulations on the application of green and low carbon waste management technologies in the phosphate chemicals industry in China.	**Output 3.1.1:** Formulated, recommended, approved, and enforced policies and institutional frameworks that supports green, low carbon initiatives in waste management in the PCI. **Output 3.1.2:** Improved existing and new enforced schemes, standards, policies/regulations on the application of green and low carbon waste management technologies in the PCI operations and processes.	For consistency with homologues outputs under Components 1 and 2, Output 3.1.2 from the PIF has been split into Outputs 3.1.1 and 3.1.2 to separate the activities concerning the formulation and update of policies and institutional frameworks (new Output 3.1.1) from the activities devoted to drafting new and improved standards and regulations (new Output 3.1.2).
Output 3.1.4: Completed capacity needs assessment in the area of green and low carbon technologies applied in waste management in the phosphate chemicals industry, and designed capacity development program to be implemented. **Output 3.1.5:** Fully conducted and post-evaluated capacity development program on the principles and application of green and low carbon waste management technologies/techniques in the phosphate chemicals industry.	**Output 3.1.4:** Designed, conducted and post-evaluated continuing education program with regular capacity needs assessments in the area of green and low carbon technologies applied in waste management in the PCI.	During the project identification exercise of the LFA workshop, it was noticed that Output 3.1.4 from the PIF is propaedeutic to Output 3.1.5. Therefore, to improve the efficiency of the project activities (i.e., some activities might be conducted by the same specialists) the two Outputs have been merged into a single Output. However, the new Output 3.1.4 will deliver the same results that the 2 former Outputs would have delivered.
Output 3.1.6: Published and disseminated technical guides and reference documents for the application of green and low carbon technologies/techniques in waste management in the phosphate chemicals industry. **Output 3.1.7:** Published and disseminated publicity information about China's green and low-carbon waste management in the phosphate chemicals industry.	**Output 3.1.6:** Established and operational information management system for sharing available and accessible information about market and research developments and R&D in the country and abroad on green and low carbon waste management systems in the PCI.	During the project identification exercise of the LFA workshop, it was noticed that several activities in Outputs 3.1.6 and 3.1.8 from the PIF would have overlapped. To avoid duplication of activities and to improve the efficiency of the project activities the two Outputs have been merged into a single Output. However, the new Output 3.1.6 will not only deliver the same results that the 2 former Outputs would have delivered, but it would also establish and operationalize an exchange system to enhance the dissemination of information.

Expected Outcomes/Outputs		Rationale for Change in PIF Outcomes/Outputs in the ProDoc
GEF-Approved PIF	**Project Document**	
Budget		**Rationale for Change in PIF Budget in the ProDoc**
GEF-Approved PIF	**Project Document**	
Outcome 1.1: USD 872,000 **Outcome 1.2:** USD 1,619,400 **Component 1:** USD 2,491,400	**Outcome 1.1:** USD 436,300 **Outcome 1.2:** USD 2,055,100 **Component 1:** USD 2,491,400	During the project identification exercise of the LFA workshop, it was highlighted that the TA activities for the mining and refining sub-sector require fewer financial resources than anticipated, since this sub-sector is less complex in terms of policies, regulations, institutional frameworks, standards and guidelines as compared to the rest of the PCI value chain. Therefore, during project design part of the resources initially allocated to the TA Outcome 1.1 has been shifted to the Inv Outcome 1.2. This contributed to the fact that the EOP GHG emissions reduction target and the co-financing from the private sector are higher than estimated during the PIF preparation. However, the total budget allocated for Component 1 has not been changed.
Project Management Cost The approved PMC is US$ 444,923. This is within the allowable 5% max PMC.	**Project Management Cost** The stated PMC in Part I, Sec. B of this CERDoc is 244,923. This is net of US$ 200,000 M&E cost, which was initially budgeted as part of PMC.	The project?s M&E cost (US$ 200,000) was initially budgeted as part of the PMC. Per PPO advice, the M&E cost must be presented separately in Part I, Sec B of this CERDoc.

1b. Project Map and Coordinates

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

Figure 2. Map of the Project Sites:



Project Site	Geographical Coordinates
Fuquan City, Guizhou	107?31?E,26?38?N
Leibo County, Sichuan	103?34?E,28?16?N
Mabian County, Sichuan	103?32?E,28?50?N
Mabian County, Sichuan	103?29'E ,28?42?N
Jinzhong Town, Kaiyang County, Guiyang City	106?86 'E 27?19' N
Mianzhu City, Sichuan	104?19'E 31?22'N
Pantang, Wuxue, Huanggang City, Hubei	115?47'E 29?88'N
Jinning District, Kunming City, Yunnan	102?36?E,24?40?N
Anning City, Yunnan	102?36'E 24?96'N
Panzhihua City, Sichuan	101?73' E 26?56' N

1c. Child Project?

If this is a child project under a program, describe how the components contribute to the overall program impact.

n/a

2. Stakeholders

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

Civil Society Organizations Yes

Indigenous Peoples and Local Communities

Private Sector Entities Yes

If none of the above, please explain why:

n/a

Please provide the Stakeholder Engagement Plan or equivalent assessment.

Annex 7: Stakeholder Engagement Plan

This proposed plan describes how the project?s key stakeholders will be engaged during the project implementations. It should be note that this stakeholder engagement plan may be further elaborated or revised during the project?s inception period to accommodate possible changes in stakeholders and will be finally approved at the project inception workshop. During the project development process (PPG phase), a stakeholder analysis was undertaken to identify key stakeholders, assess their interests in the project and define their roles and responsibilities in its implementation.

The roles of key stakeholders in the project? oversight and management, including the project steering committee is provided in the **Governance and Management Arrangements** section of the Project Document (i.e. Project Board members, Project Management Office), and are only briefly mentioned here.

Table 1 below summarizes the main engagements of the key stakeholders in the implementation of the project. It also shows the capacity building needs of each stakeholder as identified during the project development phase.

Table 1: Stakeholder Engagement and Training and Capacity Building Needs

Stakeholder	Engagement in the Project	Training and Capacity Building Needs
Ministry of Finance (MoF)	As the GEF Operational Focal Point MOF will receive the GEF grant for this project on behalf of the Chinese Government. MOF will be a core member of the Project Steering Committee. MOF will have a core role in providing guidance, coordination and supervision on the disbursement and expense of the GEF grant, performance evaluation, documentation, and promotion of project results. The project team will provide project documentation and reporting to MOF through UNDP.	There is a need to sensitize relevant staff and departments within MOF on the importance and necessity of funding efforts to achieve greener, energy efficient and low carbon operations in the PCI, and the benefits of doing this towards contributing to the achievement of country?s NDC targets and improvements in the socio-economic development at the national and local levels.

United Nations Development Programme (UNDP)	As the GEF Agency for the project it is overall responsible for the project oversight. UNDP will ensure project quality control to ensure that the Implementing Partner achieve the set project objective and outcomes. As part of its oversight work, UNDP will ensure that the project implementation and management follows UNDP/GEF rules and regulations. UNDP is a core member of the Project Steering Committee. The project Implementing Partner will provide project documentation and reporting to UNDP as outlined in the project document or otherwise agreed.	
Ministry of Industry and Information Technology (MIIT)	MIIT is the project implementing partner and serves as a member of the project steering committee. MIIT will lead the implementation of the project?s Component 2 activities, which are in phosphate chemicals manufacturing; and part of the project?s Component 3 activities on waste management in phosphate chemical production through its project office within the Energy Conservation and Comprehensive Utilization Division. It will ensure coordination between the relevant government agencies involved in the project at both national and local levels. MIIT will coordinate with the MNR, and supervise, the use of GEF funds allocated each year by the UNDP for all project components and carry out regular reporting of achievements in accordance with UNDP rules and procedures.	Within MIIT, it is necessary to carry out training on GEF project design, implementation and management, as well as on application of green and low carbon technologies that can bring about energy saving and emission reduction in PCI, particularly in phosphate chemicals production, as well as in the sustainable management of phosphate chemicals manufacturing waste.
Ministry of Natural Resources (MNR)	MNR is a responsible partner of the project and will assist the MIIT (project implementation partner). MNR will lead the implementation of the project?s Component 1 activities, which are in phosphate mining and beneficiation; and part of the project?s Component 3 activities in waste management in phosphate ore mining and refining through its project offices under the Division of International Cooperation and the Division of Mineral Resources Protection Supervision. It will assist the MIIT in ensuring close coordination between the relevant government agencies involved in the project at both national and local levels. MNR will coordinate with the MIIT the use of GEF funds allocated each year by the UNDP for Component 1 and part of Component 3 activities and carry out regular reporting of achievements through the MIIT in accordance with UNDP rules and procedures.	Within MNR, it is necessary to carry out training on GEF project design, implementation and management, as well as on application of green and low carbon technologies that can bring about energy saving and emission reduction in the PCI, particularly in phosphate ore mining and refining, as well as in the sustainable management of mining/refining waste.

National Development and Reform Commission (NDRC)	As it has done during the preparation phase of this project, the NDRC will participate in and provide guidance in the planning of the proposed project activities to ensure that the project outputs can guide and encourage the participating PCI entities to promote the comprehensive and conserving utilization of the country?s phosphate ore resources, and also put forward suggestions for the planning and policy measures of resource conservation and comprehensive utilization in China.	No specific project related trainings are envisaged.
Ministry of Ecology and Environment (MEE)	As it has done during the PPG phase, MEE will participate in and guide the planning of this project activities during the implementation phase to ensure that the project outputs can provide intellectual support for China's participation in international climate change negotiations and the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), and contributes to the achievement of the country?s climate change mitigation and NDC targets.	No specific project related trainings are envisaged.
Local governments (Sichuan, Yunnan, Guizhou, Hubei)	The Provincial departments of natural resources (DNRs) and industry and information technology (DIITs) are to provide financial support and technical and policy advice in the detailed design and implementation of the demos that will be carried out under the project. Municipal and county-level governments will directly participate in the project activities providing support (e.g., logistical) in the implementation and monitoring and evaluation of the demos and demo replications that will be carried out in their respective localities. During project implementation, the provincial DNRs and DIITs are responsible for supervising municipal and county-level work, including providing technical support, monitoring support, coordination with partners, and capacity-building.	The local government is the target of training for some of the project?s capacity development activities. The training content includes, but not limited to, GEF project management, PCI knowledge, PCI energy conservation and emission reduction policies and technologies. At the same time, local government staff will also receive more training in the field.
Relevant Scientific Research Institutions	These are expected to provide technical support in the implementation of research, study, evaluation activities of the project, making use of their expertise and scientific knowledge in the areas of energy saving and green low-carbon technologies as applied to the comprehensive and sustainable utilization of phosphate ore resources in the PCI. These entities are expected to assist in clearly defining and verifying the baseline situation and market prospects regarding the PCI and its value chain. It is also expected to assist in coordinating the research activities of the project with ongoing and planned similar research work both at the national and provincial levels.	No specific project related trainings are envisaged.

Enterprises and Private Sector Organizations	These are expected to provide technical (research, engineering, construction, operation and maintenance) support to the project in the areas of low carbon and efficient comprehensive utilization of phosphate ore resources, cleaner and energy efficient production in the PCI, as well as circular economy type measures such as low-carbon reuse of phosphogypsum and phosphate mining/refining tailings. The participation of enterprises and the private sector in the project will ensure participation of the target beneficiaries, i.e., PCI entities, in guiding the efforts of the project to remove the financial and market barriers to greener, cleaner and more energy efficient PCI.	Enterprises and private sector organizations are the main beneficiaries of the project, and they will be the main targets of field training. The training they need to receive includes, but not limited to, GEF project management, PCI industry knowledge, PCI industry energy saving and emission reduction policies and technologies, and management, installation, operation and implementation of related facilities.
Non-governmental organizations	Non-governmental organizations at national, provincial and local levels shall participate in the stakeholder consultation processes during project implementation to ensure success of the promotional and capacity development activities of the project. They are also expected to facilitate effective coordination with the activities and projects of non-governmental organizations that contributes to the achievement of the project outcomes/outputs. These entities are also useful in the implementation of the capacity development and promotional activities of the project, where potential synergies can be used	No specific project related trainings are envisaged.

Based on the stakeholder analysis and the identified roles of each stakeholder, the following is the summary of the stakeholder plan, showing the means of engagement and engagement schedule.

Table 2: Stakeholder Plan

Project Stakeholder	Stakeholder Interest	Roles and Responsibilities in Implementation	Means of Engagement in the Project	Engagement Schedule during Implementation
GEF	GHG emission reduction	Project financing	Annual reporting	Yearly
UNDP	Sustainable Development	None. As GEF Agency, role is limited to Project oversight.	Regular consultation and follow-up meetings with implementing partner	Weekly

Project Stakeholder	Stakeholder Interest	Roles and Responsibilities in Implementation	Means of Engagement in the Project	Engagement Schedule during Implementation
MIIT	Energy saving and emission reduction in phosphate chemicals production	MIIT is the project implementation partner and is the executive member of the project steering committee. It is responsible for the organization, management and implementation of the project activities, particularly those in phosphate chemicals production and waste management in that PCI sub-sector.	Project activity monitoring and reporting; daily project management, coordination with project partners, QPR and PIR reporting.	Daily
MNR	Energy saving and emission reduction in phosphate mining and beneficiation	MNR is a responsible partner of the project that will assist the MIIT in the project implementation and management. MNR is responsible for the organization, management and implementation of the project activities in phosphate mining, beneficiation and waste management in that PCI sub-sector.	Project activity monitoring and reporting; daily project management, coordination with project partners, QPR and PIR reporting.	Daily
National Development and Reform Commission (NDRC)	Promote national energy conservation and emission reduction	Provide suggestions for policies on energy saving and emission reduction in the PCI; and in the promotion of the implementation of the policies.	PSC Meeting	As scheduled
Ministry of Ecology and Environment (MEE)	GHG emission reduction	Provide technical and policy support on climate change mitigation and GHG monitoring-related issues in the PCI.	PSC Meeting	As scheduled
Local governments, including Sichuan, Yunnan, Guizhou, Hubei etc.	Low carbon and energy saving development of local PCI industry	Participate in detailed project design and implementation, provide guidance and support in the implementation, monitoring and reporting of implemented project activities.	Project activity monitoring and reporting	Quarterly

Project Stakeholder	Stakeholder Interest	Roles and Responsibilities in Implementation	Means of Engagement in the Project	Engagement Schedule during Implementation
Relevant scientific research institutions	The practice of PCI low-carbon energy-saving policy research and the best practice of PCI low-carbon energy-saving technology	Participation in the implementation of policy research and technical studies of the project.	Project activity monitoring and reporting	Quarterly
Enterprises and private sector organizations	Improve production efficiency, reduce energy consumption and reduce carbon emissions.	Detailed design, engineering, installation, operation and maintenance, as well as performance evaluation and reporting of demonstration activities	Implementation of Components 1, 2 and 3 activities.	As scheduled

In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement

The Ministry of Industry and Information Technology (MIIT) is the implementing partner designated for the PhosChemEE project. As the implementing partner MIIT will assume a leadership role throughout the entire project implementation phase providing guidance and supervision. It will be responsible for communication and coordination with UNDP, which is the GEF Agency for this project. It will liaise with partner local governments and enterprises during implementation of the demo and demo replication activities, and it will gather, process, and manage information generated from the project activities (e.g., demonstrated low carbon technologies, energy savings, GHG emissions reduction, etc.) and help disseminate these to the general public. Lastly, relevant officials and stakeholders from MIIT, will participate in training programs to strengthen their skills on low carbon development of phosphate chemicals production and waste management, and therefore will be capable of providing data inputs on policies, plans and programs of the country concerning the greening of the PCI.

Other important project stakeholders are: 1) the Ministry of Finance, which is the GEF Operational Focal Point in China an in one of the GOC signatories to the PhosChemEE project document. During the implementation of PhosChemEE, MOF will seat on the project steering committee, and will be the recipient of the GEF grant on behalf of the government, managing the disbursement and expenses of the GEF grant and evaluating the project performance; 2) the Ministry of Natural Resources (MNR) is

a project proponent and a major partner and stakeholder of the PhosChemEE project. As the ministry in charge of overseeing the operations of the phosphate mining and refining sub-sector and the management of the waste generated, MNR will play a pivotal role in all aspects of project implementation, including establishment and enforcement of policies and regulations as well as implementation of the demos; 3) the National Development and Reform Commission (NDRC), a government agency in charge of devising and enforcing socio-economic development strategies. NRDC will also be a member of the project steering committee and its main role will be to promote low carbon technologies and measures to the PCI and advise the GOC on green development. Other key stakeholders that will be engaged during PhosChemEE implementation, participating in the implementation of the demonstration projects as well as capacity building and awareness raising initiatives, are the: a) Ministry of Ecology and Environment (MEE); b) Provincial governments; c) private sector investors; d) scientific research institutions; and e) NGOs, and particularly the All China Women?s Federation (ACWF).

Select what role civil society will play in the project:

Consulted only; Yes

Member of Advisory Body; Contractor;

Co-financier;

Member of project steering committee or equivalent decision-making body;

Executor or co-executor;

Other (Please explain)

3. Gender Equality and Women's Empowerment

Provide the gender analysis or equivalent socio-economic assesment.

Gender equity has been mainstreamed on a number of components of the PhosChemEE Project and a range of activities have been designed and planned to ensure this. **Table 1** below shows the success indicators and targets for these activities and a gender action plan with specific activities is listed in **Table 2**.

Based on the initial surveys and assessment of potential gender issues of the project (as mentioned in the SESP), the PhosChemEE Project as a whole does not have too much of a negative impact on gender equity, and in some ways has a positive effect. Firstly, implementation of this project will improve the technical level and reduce the intensity of labor in the PCI, which will in turn improve the work environment, job adaptability and enhanced chances of job advancement for women who are in some form or another involved in the PCI. Education and professional training opportunities that the proposed project will provide to PCI employees will contribute to improving women?s professional

competitiveness in the workplace and expand women?s scope of employment in the underdeveloped and agriculture-based regions of the country, some of which include the planned demo sites of the proposed project. Secondly, the implementation of this project will directly improve the quality of local ecological environment and indirectly improve women's and children's health. Thirdly, the implementation of this project will help ensure agriculture and food security through the reduction of rural pollution, and thus reduce the risk in women?s major source of income in these regions.

However, since many of the on-the-ground activities the PhosChemEE Project are in the underdeveloped western regions of China, the potential negative impacts of the project may include potential occurrence of discriminations against women based on gender, especially regarding participation in the design and implementation of the project activities or access to opportunities and benefits. As a key measure to mitigate these impacts, the implementation of the PhosChemEE Project must ensure the conduct of a specific capacity development program on gender equality for the stakeholders in these regions of the country.

The professional job capacity development interventions of the project will be designed to ensure that there will be equal opportunities for all genders and ages, providing gender responsive capacity development trainings which account for gendered differences in capacity, determined through an initial assessment, as well as through the conduct of training activities at times, and in a manner that does not increase women?s burden of work and that accounts for women?s preferences in regards to how the training courses are delivered. By doing this, men and women in the project areas will benefit from these trainings, which will be designed with the view of rectifying any existing imbalances in technical qualifications of the individuals, and ultimately contributing to the improvement and promotion of gender equality. The training, and capacity building will improve the number of qualified women in China in technical areas such as the green low carbon transformation of phosphorus chemical industry, while enhancing the technique level and participation of women. The monitoring and evaluation of the project activities will include tracking a number of human development indicators, among them would be gender equity, as the number of trained women in the green low carbon transformation of phosphorus chemical industry.

Table 1 Gender-related Indicators and Targets

Indicators	Means of Verification
Number of local project developers, equipment suppliers and vendors trained on the design, installation, operation, and business models for the applications of low carbon and energy efficient technologies in PCI industries. The percentage of women in the mid-term project is **at least 25%**, and the female proportion of women is **at least 40%** at the end of the project.	Documentation on the training program including the profiles of the trainees; Documentation on the training course implementation including post training evaluation.

Indicators	Means of Verification
Number of enterprise level promoters, technicians, administrators trained on relevant subjects for successful management and operation of the low carbon and energy efficient technologies in PCI industries **(The female participation rate for training and publicity at the project implementation site is not less than 40%)**	Survey of enterprise technicians and administrators. Documentation on the training program including the profiles of the trainees; Documentation on the training course implementation including post training evaluation.
Number of trained people that are gainfully employed utilizing the knowledge and skills they learned from the training in newly created jobs. (The percentage of women in the mid-term project is **at least 20%**, and the female proportion of women is **at least 35%** at the end of the project)	Survey of trainees (survey conducted a year after the training program)

The targets for the above stated indicators will be set during the inception phase of the PhosChemEE Project. The implementing partner (Ministry of Industry and Information Technology (MIIT) and Ministry of Natural Resources (MNR)) will carry out surveys, which will cover project developers, equipment suppliers, technicians, and administrators, as well as local PCI enterprises. The end-user awareness data shall be collected through surveys and focus group discussions at the beginning and final year of the project. The results of survey will be on tracked and made public to monitor the achievement of gender equity mainstreaming in China, as well as enable timely detection of any gender-specific issues cropping up so that they are addressed promptly.

Table 2 PhosChemEE Gender Action Plan

Principles of Gender Equity	Gender Specific Activities	Indicators Included in M&E	Timeline	Possible Output/Impact
Capacity building, knowledge sharing and exchange	Ensure women representation in all capacity building workshops and trainings, as well as at any working group or committee for project implementation and monitoring. Identify design features that impact positively on women and implement them and remove those that negatively impact the project.	Number of staff (and % women) from national and local governments with enhanced capacity in climate management and zero carbon development, such as participating in the low/zero carbon energy technology project planning.	Year 1,2	A well represented governing structure that involves all groups of society is in place and participates meaningfully in the design of projects. All bottlenecks that prevent the full and meaningful participation of women and girls are identified and removed.
	Support women and girls (or children) to voice issues and concerns about decisions and process of the project that affect their lives.	The female participation rate for training, publicity, and consultation.	Year 1,2,3	Concerns of vulnerable groups, including women and girls, are addressed and their voices are integrated through participatory approaches during the implementation of the project activities. Additionally, this applies to any and all future low- or zero-carbon development initiatives and programs in China.

	Creation of a safe and inclusive environment for the vulnerable groups and women to enhance their participation.	Whether the training materials and project documents are developed with inclusive language.	Year 1,2	Significant women participation and representation are encouraged during capacity building trainings or workshops. Widely available training materials and project documents including written text as well as audio and visual developed with inclusive language (e.g. ethnic minority language) and appropriate illustrations without gender bias and stereotype.
	Improve information and knowledge access such as operation of low carbon and energy efficient technologies in PCI industries, financial services, market information, and techniques for the community (both males and females) by mobile, internet, and TV.	Number of trained people that are applying the knowledge and skills they learned from the training in their current jobs. Number of trained people that are gainfully employed utilizing the knowledge and skills they learned from the training in newly created jobs.	Year 1,2,3,4,5	Wider dissemination of information and knowledge related to low carbon and energy efficient technologies and zero carbon development in China?s PCI industry.

Gender-balanced participation and female leadership	Facilitation of full representation of vulnerable groups including women, and their meaningful participation in projects and programs. Ensure adequate female representation is invited for surveys, focus groups and any training and workshops for the project. Both the project expert group and the project execution group contain a certain number of female members.	Number of staff (and % women) from national and local governments with enhanced capacity in climate management and zero carbon development, such as participating in the low/zero carbon energy technology project planning. The female participation rate for training, publicity, and consultation.	Year 1,2,3	This ensures that a well-represented expert and managing group is in place, as well as broad participation of vulnerable groups throughout project implementation.
	Improving women's access to new jobs created by low carbon and energy efficient technology application in PCI industries. Ensure the share of female labor force in new jobs created as a result of changing PCI industry?s patterns.	Number of new employment opportunities created by the applications of low carbon and energy efficient technologies in PCI industries to bring about zero carbon development in PCI industries (with % of women)	Year 2,3,4,5	Women's time commitment to household chores may be reduced. Women and children's income and well-being improve due to new employment opportunities. The PCI industries have sufficient women working in them.

	Increasing the number of women receiving technical training and their participation in projects. Strengthening the technical capacity of women for low carbon and energy efficient technologies by providing training on maintenance and repair. Creation, or facilitation of the creation, of opportunities to empower and capacitate women including training needs are identified and tailor-made to suit projects being implemented. Ensure equitable allocation of resources for the implementation of appropriate implementation measures.	Number of enterprise level promoters, technicians, administrators, end-users trained on relevant subjects for successful management and operation of low carbon and energy efficient technologies (The female participation rate for training and publicity at the project implementation site)	Year 1,2	Both men and women are familiar with and skilled in the operation and application of the low carbon and energy efficient technologies designed for the project. Broad participation of vulnerable groups throughout project implementation.

	Strengthening sensitization of project stakeholders with regards to gender equality. Invest in developing competency and knowledge on gender mainstreaming for Government?s counterparts, community leaders and partner agency as well as UNDP?s project staff. Integration of gender session in each capacity-building training or workshop.	Whether gender equality mainstreamed in project activities, in particular in capacity-building training and workshops.	Year 1,2,3	Gender responsive policies are consistent and gender considerations are treated equally in all modules of the project and for all stakeholders. Targeted and trained stakeholders are well oriented on gender issues and more confident to mainstream gender throughout the whole project circle.

Gender Responsive Policy Coherence	Strengthening the regulation and supervision role of women's organizations in the project design and implementation processes. Invite representatives of women's organizations to participate in surveys and workshops related to project design and integrate their feedback into the project document. Strengthen the catalytic role of women's organizations in mobilizing women and girls in training such as low carbon and energy efficient technology training.	Number of times women's organizations have been involved in project-related survey, consulting, training, workshop, etc.	Year 1,2,3	Significant women participation and representation are encouraged during capacity building trainings or workshops. In particular, vulnerable groups are identified and involved in project activities.
	Designation and appointment of project staff to implement and monitor the gender mainstreaming activities accordingly and their performance appraisal is evaluated by accomplishment on the assigned gender tasks.		Year 1,2,3,4,5	

Monitoring, tracking, and reporting of policy implementation	Facilitating appropriate adjustments to activities and implementation approaches and accountability to gender equality.		Year 1,2,3,4,5	Gender balance practice is applied in project staff recruitment process and hire gender-oriented staff (both male and female) for project implementation. Project staff is assigned and designated to implement and monitor the gender mainstreaming activities accordingly and their performance appraisal is evaluated by accomplishment on the assigned gender tasks.

	Enable better planning and actions through disaggregated data.		Year 1,2,3,4,5	Data are collected and tabulated separately for women and men with specific indicators measuring changes to gender equality and empowerment for adjustments to activities and implementation approaches to better outcomes of gender equality. The case study or success story is collected as for gender-related findings at the intervention area to prove the results of gender mainstreaming. Evidence that adapts the better program accordingly, measure changes to gender equality, policy integration of gender considerations.

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

Yes

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

Improving women's participation and decision making Yes

Generating socio-economic benefits or services or women

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

Yes

4. Private sector engagement

Elaborate on the private sector's engagement in the project, if any.

In recent years, private sector entities have been increasingly involved in the design, engineering, installation, operation, and maintenance of commercial green, energy-saving and low-carbon technology projects in China. In each of the demos and demo replications that will be implemented under the PhosChemEE Project, the baseline activities are financed by a private sector entity. These include: 1) Guizhou Kalin Mining and Fertilizer Co., Ltd.; 2) Sichuan Lomom Phosphorus Chemical Co., Ltd.; 3) Hubei Xiangyun (Group) Chemical Co., Ltd.; 4) Yunnan Xiangfeng Industrial Group Co., Ltd.; 5) Zhonglicheng Industry Co., Ltd.; 6) Guizhou Wengfu (Group) Co., Ltd. 7) Sichuan Huarui Mining Co., Ltd. 8) Sichuan Fuma Phosphating Co., Ltd.;9) Sichuan Development Tianrui Mining Co., Ltd.;10) Yunnan Phosphate Group Co., Ltd. The successful completion and operation of the demos is expected to be replicated and scaled-up in other enterprises in China, for which additional private investors will be identified and engaged.

Furthermore, as illustrated in the budget notes of the ProDoc, local and international contractual service companies will also be engaged. There are many credible and qualified engineering and consulting firms in China, and abroad, that can and will provide their services in the design and implementation of the incremental activities of the project (e.g., demos and demo replications), and possibly the scale up of some of these. Consulting firms will also be involved in technical assistance activities. These entities are among the stakeholders of the proposed project, and as such they will also benefit from the various interventions that will be carried out under the project in terms of knowledge and skills uptake in green, energy-saving and low-carbon technology applications, while complying with relevant policies, standards, and regulations.

5. Risks to Achieving Project Objectives

Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):

During the preparation of the PIF several potential risks that could prevent the achievement of the project objective and outcomes were identified and proper measures to prevent and alleviate their impact on the project were proposed. During the project preparation phase, these risks have been reassessed, validated, and confirmed; and are summarized in the Risk-log in Sec. V of the ProDoc. Additional risks have been identified during the preparation of the Social and Environmental Screening Procedure (SESP), which is annexed to the ProDoc. The risks related to climate impacts and the Covid-19 pandemic were also analyzed and the suggested mitigation actions are presented in Annexes G and H of this document. For all identified risks, the design of the PhosChemEE Project incorporated the suggested risk mitigation measures. As per standard UNDP requirements, the Project Manager will monitor risks quarterly and report on the status of risks to the UNDP China Country Office (CO). The UNDP CO will record progress in the UNDP ATLAS risk log. Risks will be reported as critical when the impact and probability are high. Management responses to critical risks will also be reported to the GEF in the annual PIR reporting process.

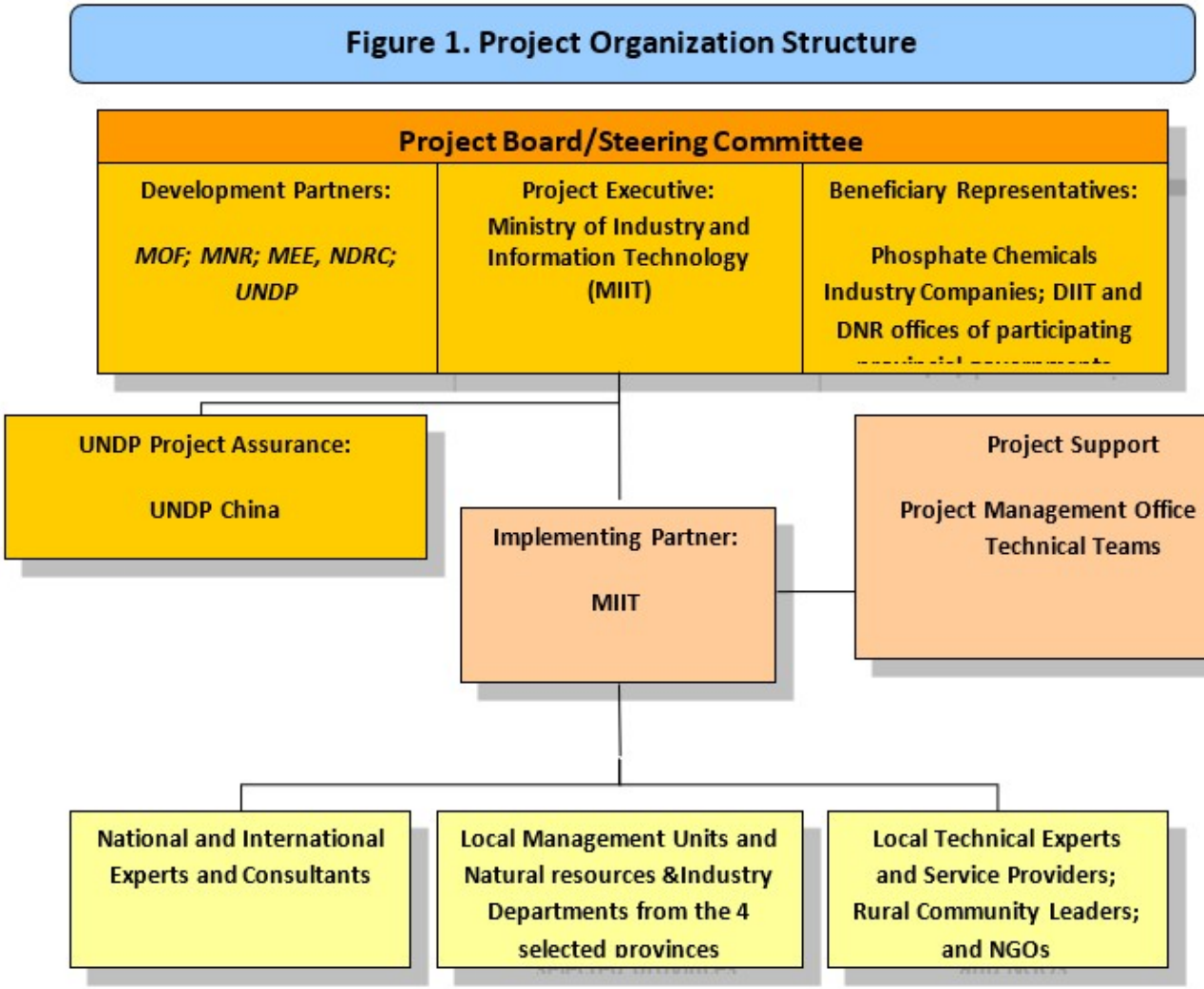
6. Institutional Arrangement and Coordination

Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

The project will be implemented following UNDP?s National Implementation Modality (NIM), per the Standard Basis Assistance Agreement between UNDP and the Government of China, and the Country Programme. The Implementing Partner for this project is the Ministry of Industry and Information Technology (MIIT). The Implementing Partner is the entity to which the UNDP Administrator has entrusted the implementation of UNDP assistance specified in this signed project document along with the assumption of full responsibility and accountability for the effective use of UNDP resources and the delivery of outputs, as set forth in this document.

The PhosChemEE Project will be governed by a Project Board (PB). This board will be made up of representatives from: MIIT, MNR, MOF, MEE, NDRC, representatives from the local governments from the partner provinces, and invited representatives from beneficiary groups, and the UNDP-Beijing Country Office (CO). The Project Board is responsible for taking corrective action as needed to ensure the project achieves the desired results. In order to ensure UNDP?s ultimate accountability. Project Board decisions should be made in accordance with standards that shall ensure management for development results, best value for money, fairness, integrity, transparency, and effective international competition. In case consensus cannot be reached within the Board, the UNDP Resident Representative (or their designees) will mediate to find consensus and, if this cannot be found, will take the final decision to ensure project implementation is not unduly delayed.

MIIT will establish a Project Management Office (PMO) and recruit its personnel for the management of project activities. The PMU will be headed by a Project Manager (PM) who has the authority to run the project on a day-to-day basis on behalf of MIIT within the constraints laid down by the Project Board. The Project Manager must be different from MIIT?s representative in the Project Board, and his/her primary responsibility is to ensure that the project produces the results specified in the ProDoc, to the required standard of quality and within the specified constraints of time and cost. The Project Manager will inform the Project Board and the UNDP Project Assurance team of any delays or difficulties as they arise during implementation so that appropriate support and corrective measures can be adopted. The Project Manager will remain on contract until the Terminal Evaluation report and the corresponding management response have been finalized and the required tasks for operational closure and transfer of assets are fully completed. Figure 1 shows a schematic of the Project Organization Structure.



7. Consistency with National Priorities

Describe the consistency of the project with national strategies and plans or reports and assesments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

-UNFCCC Related Technology Needs Assessment (TNA)
-UNCBD, UNFCCC, UNCCD National Capacity Assessment (NCSA)
-Poverty Reduction Strategy Paper (PRSP)
-UNFCCC Biennial Update Report (BUR)
-National Biodiversity Strategy and Action Plan (NBSAP)
-GEFSEC National Project Development Plan (NPFE)

Alignment with national strategy/planning

This project will explore a green and low-carbon sustainable development mode of the whole phosphorus industry chain in line with China's strategies, improve the energy efficiency of the industry, establish a phosphorus chemical circular economy mode, drive the green and low-carbon coordinated development of upstream and downstream enterprises, and minimize carbon emissions from the PCI. This project is highly consistent with China's national strategic planning. The relevant strategies, plans and policies of the Chinese government include:

Chinese government has put forward a series of ambitious climate commitments. China submitted the NDC?s target to increase the share of non-fossil fuels and to reduce its carbon intensity before 2030. China has also committed to carbon neutrality by 2060. The PCI is an important GHGs emitter among China?s industry sectors. Through the implementation of this project, the carbon intensity of, and GHG emissions from, the PCI will reduce significantly. This will be an important contribution to China?s realization of its commitments to the Paris Agreement and target carbon neutrality by 2060.

Ecological civilization as a major strategy for China's national development. The 19th National Congress of the Communist Party of China placed ecology-conserving construction in a prominent position, and clearly proposed to "accelerate the reform of ecological civilization system and build a beautiful China". This requires new developments and constructions to be innovative and green. It puts forward new and higher requirements for speeding up the implementation of green manufacturing, improving the utilization efficiency of resources and energy, and reducing environmental pollution.

Formulation and issuance of green development plans. The MIIT formulated and issued the 13th Five Year Plan for industrial green development, which clearly required the acceleration of R&D and application of technology on energy conservation and green development and improve the level of efficiency of process technology and equipment. It also requires the building of a green manufacturing system actively, accelerate the construction of green factories, development of green products, construction of green supply chain and construction of green parks.

Issuance and implementation of policies on industrial upgrading and transformation. ?The Guideline Catalogue for Industrial Restructuring (2019 Edition)? was released, in which the contents related to the green and low-carbon development of PCI were put forward. These include the development and application of green technologies for the comprehensive utilization of phosrock mining wastes and refining tailings, mining and utilization of medium and low grade phosphate, fluorite, and barite ores, etc. ?The implementation plan for special investigation and remediation of "three phosphorus" in the Yangtze River? was issued to focus on the pollution of "three phosphorus". The outline of ?the 13th Five Year Plan for national economic and social development? puts forward "promoting the conservation and intensive utilization of resources" and "vigorously promoting the construction of green mines and green mining development areas". Moreover, in the "leading action of circular development" that was jointly issued by the NDRC and 14 departments, also proposed to "vigorously promote resource conservation and comprehensive utilization, and earnestly promote the construction of green mines and green mining development demonstration areas and improve the efficient use of energy resources ".

Alignment with GEF focus areas / strategies

Through the promotion and facilitation of the application of green, energy efficient low-carbon technologies in the phosphate chemicals industry (PCI) and the formulation and enforcement of the supportive policy and regulatory frameworks (including standards), this project will bring about the acceleration of energy efficiency in this major industry in China. In this regard, it is in line with the GEF-7 CCM-1.3 objective of promoting innovation and technology transfer for sustainable energy breakthroughs through the acceleration of energy efficiency adoption, specifically in China?s PCI. This will not only bring about improved productivity, conservation of phosrock resources, and energy savings but also substantial GHG emission reduction and reduced environmental pollution. The energy savings that will be realized in the introduction of green and cleaner technologies in the industry will bring about GHG emission reductions that will contribute to achieving the country?s NDC targets[1]. It is in line with the development goals set out in the ?UN 2030 agenda for sustainable development?, including the promotion

of persistent, inclusive, and sustainable economic growth, the promotion of full and productive employment and decent work for all, and the reduction of inequality within and among countries. Women's participation will be taken into account in the design, development, and implementation of the proposed project. This is consistent with the goals of UN sustainable development goals, such as poverty eradication, gender equality and empowerment of all women and children. It is also consistent with GEF's focus on gender equality.

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[1] The PCI in China is an important part of the country?s industry sector. The goal of this project is the reduction of GHG emissions from the PCI. The planned direct interventions from the project itself are expected to bring about nearly 36 million tons direct CO_2 emission reduction. The sustained promotion and replication/scale-up of the project demonstrations after the end of the project are expected to further bring about more substantial GHG emission reduction. All these will be an important contribution to the achievement of China's committed GHG emission reduction targets to the Paris Agreement and its carbon neutrality target by 2060. This project would contribute to the achievement of China?s nationally determined contributions (NDCs) set out in the Paris Agreement at an earlier date and China?s 2060 Net-Zero-Carbon goal through the promotion an integrated region-wide energy conservation, green and low carbon development of the country?s PCI. Apart from the GHG emission reductions from the implementation and replication of the demonstrations, the enabling frameworks (e.g., policies/regulations/incentives) and conditions that the project will establish and operationalize, and the technical and institutional capacity that will be enabled will facilitate further development and application of green, energy efficient low carbon technologies and practices in the PCI, and potential influence also the other industry sectors with significant carbon and environmental footprints to follow suit.

8. Knowledge Management

Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.

During the implementation of this project, the knowledge management system that will be used includes the following aspects: Firstly, to carry out exchanges and cooperation between different regions and provide training for project participants. Secondly, to identify knowledge management activities through coordination with project stakeholders. Thirdly, special training will be given to relevant personnel to cultivate a group of professional leaders in the development of the PCI chain. These technical leaders will influence the process of knowledge management, which is of great significance to the implementation of this project and will play a positive role in promoting the development of the industry. See Annex N.

In regards knowledge management, the project implementers will develop information exchange/sharing networks/platform in conjunction with the MRV and information sharing system that will be developed and established under Component 1 of the project. These include:

(1) Green and low carbon PCI demonstration platform covering the entire PCI - This platform will provide the basis for all sub-sectors of the PCI to improve energy utilization efficiency, and involves the promotion of process optimization, achievements of the project demonstration activities, and green low carbon growth of the entire industry.

(2) Green and low carbon PCI technical specification, standardization, and evaluation system ? These will be used for promoting industrial green and low-carbon technological reform and development of the phosphate mining industry in regions of the country.

(3) Construction plan and publicity plan for green and low carbon PCI ? This will promote advanced technology and successful practices in China and help improve the green development capacity of the global PCI as well as in the countries included in the ?Belt and Road? initiative.

During the implementation of this project, knowledge management experience and lessons learned from other projects of other development partners related to industrial energy conservation and green development will be used in the implementation of the knowledge management activities of the project.

9. Monitoring and Evaluation

Describe the budgeted M and E plan

To track the successful completion of the project activities and delivery of the intended outputs, the continuous monitoring of project components and activities towards achieving the expected outcome and outputs will be done. This will be carried out in line with the UNDP-GEF monitoring and evaluation (M&E) system. A formal M&E Plan will be adopted during the project inception corresponding to a full-scale project to track the activities and contributions of the activities by all the project partners, in terms of both in-cash and in-kind co-financing contributions to augment the GEF funds. These M&E findings will be reported in the project?s two in-depth independent reviews during the mid-term and towards the end of the project.

The table below shows the project?s M&E Plan. The M&E will be conducted at multiple levels. At the most basic level, the project manager will be responsible for tracking project indicators and preparing quarterly reports and initial drafts of annual project reports. The project manager will also carry out site visits to the project demos to monitor their progress. The project board will meet annually to monitor and evaluate project progress, taking actions, as necessary. In addition, a mid-term review will be conducted during the third year of implementation of this 5-year project, and a terminal evaluation as the project is nearing its close. These evaluations will be carried out by parties who have not previously been involved with the project. The project?s M&E plan and indicators will be finalized at the time of inception.

Monitoring and Evaluation Budget for Project Execution:		
GEF M&E Requirements to be undertaken by Project Management Unit (PMU)	**Indicative costs (US$)**	**Time frame**
Inception Workshop and Report	30,000	Inception Workshop within 2 months of the First Disbursement
M&E required to report on progress made in reaching Project Log Frame Indicators and GEF Core indicators	5,000 per year	Annually and at mid-point and closure.
Preparation of the annual GEF Project Implementation Report (PIR)	0	Annually typically between June-August
Monitoring all risks	3,000 per year	On-going each year
Monitoring of social and environmental safeguard screening	2,000 per year	On-going each year
Monitoring of stakeholder engagement plan	1,500 per year	Ongoing each year
Monitoring of gender action plan	1,500 per year	On-going each year

Monitoring and Evaluation Budget for Project Execution:		
GEF M&E Requirements to be undertaken by Project Management Unit (PMU)	**Indicative costs (US$)**	**Time frame**
Project Board Meetings	5,000 per year	Annually
Independent Mid-term Review (MTR)*	40,000	*1 October 2024*
Independent Terminal Evaluation (TE):	40,000	*31 March 2027*
TOTAL Indicative COST	**200,000**	

10. Benefits

Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

10. Benefits

Bulk of the demonstrations that will be carried out under the project are on the application of energy efficient process technologies and technologies for cleaner production in the Phosphate Chemical Industry (PCI) in China. The application of these EE and cleaner production technologies will bring about energy savings, increased productivity, reduced material and energy losses, improved safety, etc., all of which will collectively bring about improved economic benefits to the PCI. The direct emission reductions will come from improvements facilitated by the proposed project in phosphate rock mining is expected to reduce the current specific energy consumption in phosphate ore mining and beneficiation/refining. The improvement of the mining efficiency (including improving mine recovery rate, mining dilution rate, and beneficiation recovery rate) is also expected to achieve an energy consumption reduction per ton of refined phosrock. In phosphate chemicals production, the EE and cleaner production technologies and techniques applications that the project will facilitate will bring about a reduction in the production process energy consumption. The direct energy savings that will be derived from these process and operational improvements will bring about direct GHG emission reductions. The project activities on low-carbon waste management systems will be carried out in: (1) phosphate chemicals production; (2) phosrock mining and refining. The first one is on the utilization of the by-product phosphogypsum as building material (specifically as filler in polymer composite plastic products. The second one is on the enhanced utilization of phosrock mine tailings as backfill in phosphate ore underground mining, and for the production of natural/biological phosphate fertilizer as replacement for the use of phosphate fertilizer. The resulting indirect energy savings will be from the reduced production of chemical phosphate fertilizers. Both of these indirect energy savings will have corresponding consequential GHG emission reduction.

In addition, there are other national benefits in terms of the reduced pollution of the water bodies that are near the PCI enterprises, reduction of the regional pollutant concentration in rural areas of Yunnan, Guizhou, Sichuan, and Hubei, promote the sustainable improvement of ecological environment in rural areas, and protect the livelihood of rural areas in these provinces.

11. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

Overall Project/Program Risk Classification*

PIF	CEO Endorsement/Approval	MTR	TE
High or Substantial	High or Substantial		

Measures to address identified risks and impacts

Elaborate on the types and risk classifications/ratings of any identified environmental and social risks and impacts (considering the GEF ESS Minimum Standards) and any measures undertaken as well as planned management measures to address these risks during implementation.

The overall risk is High. An ESMF has been prepared during the PPG stage to ensure that the necessary steps are taken to manage the site-specific risks during implementation (during which site-specific assessments and management plans will be required).

Supporting Documents

Upload available ESS supporting documents.

Title	Module	Submitted
PIMS_6618_PhosChemEE_SESP_02-11-2021_JM (1)	CEO Endorsement ESS	
6618 SESP-09252020_final	Project PIF ESS	

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

Project Results Framework

This project will contribute to the following Sustainable Development Goal (s): SDG 7: ?Ensure access to affordable, reliable, sustainable and modern energy for all?, SDG 9: " Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation"; SDG 12: ?Ensure sustainable consumption and production patterns?; SDG 13: "Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy ?, and to a lesser extent SGD 8: ?Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all?.				
This project will contribute to the following country outcome (UNDAF/CPD, RPD, GPD): UN Development Assistance Framework China (2016-2020): More people enjoy a cleaner, healthier, and safer environment as a result of improved environmental protection and sustainable green growth (Outcome 2).				
Strategy	**Objective and Outcome Indicators**	**Baseline**	**Mid-term Target**	**End of Project Target**
Project Objective:	Enabling the extensive application of low carbon and energy efficient technologies in the phosphate chemicals industry in China.			
	Mandatory Indicator 1: Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment.	Female: 0 Male: 0	Female: 150,000 Male: 150,000 - 250,000	Female: 600,000 Male: 600,000-1,000,000
	Mandatory GEF Core Indicators: Cumulative amount of greenhouse gas emissions mitigated from the PCI (million tons CO_{2eq}).	0	0.429	35.987
	Cumulative amount of fossil fuels saved in all energy consuming operations and processes in the PCI (million tce).	0	0.178	14.779
Project Component 1	**Green and Low-carbon Development and Operation of Phosphate Mines**			
Project Outcome 1.1: Improved interest and commitment of the	Number of additional technologies and process/operation improvements implemented by phosphate ore mining companies that are facilitated by the effectively enforced policies and regulations that promote and support green, energy efficient and low carbon technologies/techniques.	0	3	6

phosphate chemical industry in the green, low carbon and energy efficient operations of the phosphate mining sub-sector in China.	Number of additional certified technical and operations personnel of phosphate mining companies that are capable of designing and implementing projects on green, energy efficient and low carbon technology applications in phosphate ore mining and refining.	0	500	1600
Outputs to achieve Outcome 1.1	Output 1.1.1: Formulated, recommended, approved, and enforced policy and institutional frameworks supporting green, energy efficient low carbon development initiatives in phosphate rock (phosrock) mining and refining. Output 1.1.2: Formulated, recommended, and enforced standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in the development and operations of phosphate mines. Output 1.1.3: Documented annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results. Output 1.1.4: Designed, conducted and post-evaluated continuing education program in the PCI mining sub-sector in Weng'an county in Guizhou Province, Jinning county in Yunnan Province, and Mabian and Leibo counties in Sichuan Province, with regular capacity needs assessment in the area of green, energy efficient low carbon technologies applied in phosphate mining and refining. Output 1.1.5: Established the online monitoring, reporting and verification (MRV) system for energy-saving and GHG emission reduction from the application green, energy efficient low-carbon technologies in the PCI including information sharing scheme. Output 1.1.6: Established and operational up-to-date information management and exchange system for all aspects of green, energy efficient low carbon phosphate mining and refining technologies and best practices.			
Outcome 1.2: Enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosrock mining and refining in China.	Number of phosphate mining companies that have plans for projects on implementing green, low carbon and energy efficient technology applications in their operations & processes.	0	22	75
	Average overall specific energy consumption (SEC) in phosphate ore mining and refining, kgce per ton phosrock.	9.87 (2020)	9.67	9.38

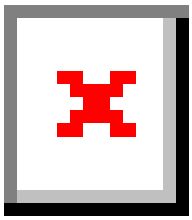
Outputs to achieve Outcome 1.2	Output 1.2.1: Completed designs and plans of demonstrations of green, energy efficient and low carbon technologies in phosphate mines development and operations including: (a) Improved design for the mining and refining operations in the demo phosrock mines in Weng'an county in Guizhou province, and Mabian county in Sichuan province; (b) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosrock mining and refining systems; and, (c) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosrock mines. Output 1.2.2: Installed and operational green, energy efficient low carbon technology application demos in phosrock mining and refining in Weng'an county in Guizhou province, Jinning county in Yunnan province, and Mabian and Leibo counties in Sichuan province. Output 1.2.3: Established, funded and operational financial support schemes that are accessible to PCI mining companies to support their green, energy efficient and low carbon technology application initiatives. Output 1.2.4: Approved and financed follow-up plan for the replication of the application of demonstrated green, energy efficient low carbon technologies in phosrock mining and refining in other localities.			
Project Component 2	**Green and Low-Carbon Design and Operation of Phosphate Chemicals Production Facilities**			
Outcome 2.1:	Number of additional technologies and process/operation improvements implemented in phosphate chemical companies that are facilitated by the effectively enforced policies and regulations that promote and support energy efficiency and cleaner production technologies/techniques.	0	10	20
	Number of additional certified technical and operations personnel of phosphate chemical companies that are capable of designing and implementing projects on energy efficiency and cleaner production technology applications in phosphate chemicals production.	0	500	1,800
Outputs to achieve Outcome 2.1	Output 2.1.1: Formulated, recommended, approved, and enforced policy and institutional frameworks supporting green, energy efficient low carbon technology applications in phosphate chemicals production. Output 2.1.2: Formulated, recommended, and enforced standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in phosphate chemicals production. Output 2.1.3: Documented annual evaluation reports on the energy performance and environmental impacts of each demo activity and documented and disseminated demo results based on the MRV system (Output 1.1.5) established under Component 1. Output 2.1.4: Designed, conducted and post-evaluated continuing education program in the PCI chemicals sub-sector in Yunnan, Guizhou, Sichuan, and Hubei, with regular capacity needs assessment in the area of green, energy efficient and low carbon technologies applied in phosphate chemicals manufacturing. Output 2.1.5: Completed market analysis report on the international trade trends for phosrock and phosphate chemicals, and the indirect carbon emission and ecological impacts in the international trading of these products. Output 2.1.6: Established and operational system for managing and sharing available and accessible information on all aspects of green, energy efficient and cleaner phosphate chemicals production in China.			

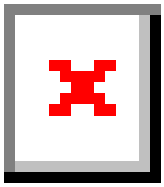
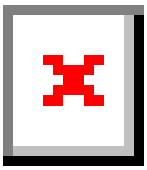
Outcome 2.2: Enhanced confidence, understanding and capacity in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production in China.	Number of phosphate chemical companies that have plans for projects for implementing energy efficiency and cleaner production technology applications in their operations & processes.	0	15	50
	Average overall specific energy consumption in phosphate chemicals production, tce/'000 CNY GDP (2020).	0.25 (base year 2020)	0.244	0.238
Outputs to achieve Outcome 2.2	Output 2.2.1: Completed designs and plans of demonstrations of green, energy efficient low carbon technologies in phosphate chemicals production including: (a) Improved design for cleaner production demos; (2) Feasibility analyses of the application and operation of green, energy efficient and low carbon phosphate chemical production systems; and, (3) Implementation plans (including financing arrangements) for each green, energy efficient and low carbon technology application in the demo phosphate chemical companies. Output 2.2.2: Installed and operational green, energy efficient low carbon technology application demos in phosphate chemicals production. Output 2.2.3: Designed and approved pilot financing scheme for small and medium enterprises (SMEs) that manufacture phosphate chemicals. Output 2.2.4: Operational pilot financing scheme for phosphate chemicals SMEs in 2 to 3 regions. Output 2.2.5: Approved and financed follow-up plan for the replication of the application of demonstrated green, energy efficient low carbon technologies in phosphate chemicals production in other localities.			
Project Component 3	**Green and Low Carbon Design and Operation of Waste Management Systems in the Phosphate Chemicals Industry**			
Outcome 3.1: Enhanced commitment of, and institutional and technical arrangements for, the phosphate chemical industry in green and low carbon waste management.	Number of additional technologies and process/operation improvements implemented in waste management in the PCI companies that are facilitated by the effectively enforced policies and regulations that promote and support green, energy efficient and low carbon technologies/techniques.	0	5	8

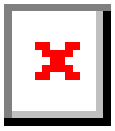
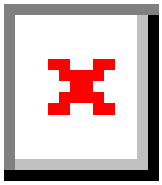
Outputs to achieve Outcome 3.1	Output 3.1.1: Formulated, recommended, approved, and enforced policies and institutional frameworks that support green, low carbon initiatives in waste management in the PCI. Output 3.1.2: Improved existing and new enforced schemes, standards, policies/regulations on the application of green and low carbon waste management technologies in the PCI operations and processes. Output 3.1.3: Documented annual evaluation reports on the energy performance and environmental impacts of each demo based on the MRV system developed under Component 1. Output 3.1.4: Designed, conducted and post-evaluated continuing education program with regular capacity needs assessments in the area of green and low carbon technologies applied in waste management in the PCI. Output 3.1.5: Completed research reports on: (1) annual volume of waste production in phosrock mining and refining, and in phosphate chemicals production in China; (2) green and low carbon waste management systems for waste recycling and reuse developed and implemented in other countries and their energy utilization performances; and, (3) potential commercial markets for processed waste, e.g., phosphogypsum. Output 3.1.6: Established and operational information management system for sharing available and accessible information about market and research developments and R&D in the country and abroad on green and low carbon waste management systems in the PCI.			
Outcome 3.2: Increased confidence in the feasibility of the application of green and low carbon technologies in the management of waste in the phosphate chemicals Industry in China.	Number of additional projects on green, energy efficient low carbon technologies in waste management in the PCI that are supported by the national and/or local governments.	0	5	10
Outputs to achieve Outcome 3.2	Output 3.2.1: Completed designs and plans of demonstrations of the application of green and low carbon technologies/techniques in waste management in the phosphate chemicals industry, including: (a) improved phosrock mining tailings recycling and reuse; and (b) energy efficient processing of phosphogypsum and marketing of the gypsum products. Output 3.2.2: Installed and operational green and low carbon waste management technology application demos in the phosphate chemicals industry. Output 3.2.3: Approved and financed follow-up plan for the replication of the application of demonstrated green, low carbon waste management technologies in the phosphate chemicals industry in other localities.			

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

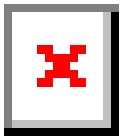
Exhibit B-1
Responses to GEFSec Comments (26 January 2022)

Comment & Response	Reference
Part I ? Project Information: Focal Area Elements	
1. Does the project remain aligned with the relevant GEF focal area elements as presented in PIF (as indicated in table A)?	
1. Budget table	
Comment: *(i) M&E is budgeted separately in the budget table ($200,000) but included under PMC in table B of the Portal entry ($444,923) ? in this context, M&E is a separate component outside PMC, so the activities related to M&E are charged to the M&E column accordingly. Please amend it accordingly.* **Response**: Per design, the cost for M&E activities of the project is part of the PMC budget. However, the M&E costs have been presented separately in the Total Budget and Work Plan (TBWP) of the project. In this regard, the sum of the M&E cost and the other project management expenses is the same as the approved PMC budget in the GEF-approved PIF.	ProDoc: Sec. IX, pp 105-106
Comment: *(ii) The activities related with Monitoring all risks, Monitoring of stakeholder engagement plan and Monitoring of gender action are wrongly charged to PMC ? these have to be charged to M&E.*  (screenshot can be seen in the Response Matrix document attached to the submission) **Response**: Thanks for pointing this out. The other unnecessary texts in the description of the cost of the stated specific monitoring activities have been deleted. The explanations for the contractual services (individual) budgets have been re-stated as follows: USD 6,000/yr. *5 (Monitoring all risks USD 3,000/yr., Monitoring of stakeholder engagement plan USD 1,500/yr., and Monitoring of gender action plan USD 1,500/yr.	Annex E: Cost Item 8

Comment: (iii) International consultants are budgeted to get paid with $35,000 but there is not any explanation about the tasks / deliverables for these consultants ? please clarify it.  (screenshot can be seen in the Response Matrix document attached to the submission) **Response**: The international consultants that will be engaged by the project will doing analyses and evaluation of the existing policies and institutional frameworks in other countries to define the pathway towards carbon neutral development in phosphate mining and refining. These experts are required to provide suggestions to support and promote the low-carbon development in phosphate mining and refining in China. The cost of USD 35,000 is inclusive of professional fees, travel expenses and DSA) for 50 working days at USD 700 per working day.	Annex E: Cost item 15.
Comment: (iv) Local Consultants will be paid $20,000 for activities related with Project Management, but they are charged to M&E ? they need to be charged to PMC. Also, the same budget line talks about $50,000, but only $10,000 are charged to the sources (in this case, M&E) ? please amend it.  (screenshot can be seen in the Response Matrix document attached to the submission) **Response**: Thanks for pointing this out. The other unnecessary texts in the description of the cost of the stated specific monitoring activities have been deleted. The explanations for the local consultant budgets have been re-stated as follows: USD 2,000/yr.*5= USD 10,000 (M&E) for Monitoring of social and environmental safeguard screening	Annex E: Cost Item 19

Comment: (v) Local consultants will be paid $200,000 but there is not any explanation about the tasks / deliverables for these consultants ? please clarify it.  (screenshot can be seen in the Response Matrix document attached to the submission) **Response**: The services of qualified local consultants will be engaged in the implementation and operation of the designed, engineered and planned demonstrations on the application of energy efficient technologies for mining activities of selected companies located in the provinces of Guizhou, Yunnan and Sichuan (Activity 1.2.2.1). Local consultants will also be hired in the implementation and operation of the designed, engineered and planned demonstrations on the application of green and low carbon technologies and renewable energy use for phosphate rock beneficiation activities of selected companies located in Sichuan Province (Activity 1.2.2.2). The US$ 200,000 budget for the local consultants is inclusive of professional fees, travel expenses and DSA) for 400 working days at USD 500 per working day. USD 100K is allocated for full time local consultants working on Activity 1.2.2.1, while USD 100K is also allotted for full time local consultants working on Activity 1.2.2.2.	Annex E: Cost Item 21.
Comment: (vi) Local consultants for Monitoring and Evaluation / Terminal Evaluation are charged to PMC ? they must be charged to M&E ? please amend it.  (screenshot can be seen in the Response Matrix document attached to the submission) **Response**: Thanks for pointing this out. The other unnecessary texts in the description of the cost of the stated specific monitoring activities have been deleted. The explanations for the local consultant budgets have been re-stated as follows: USD 2,000/yr.*5= USD 10,000 (M&E) for Monitoring of social and environmental safeguard screening; USD 500/day * 40 = USD 20,000 for mid-term review (M&E); and USD 20,000 will be paid in Year 5 for Termination Evaluation. (M&E).	Annex E: Cost Items 19, 34 and 35

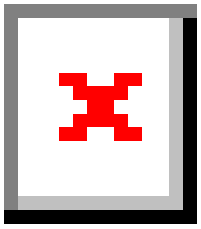
Comment:
2. Status of Utilization of Project Preparation Grant (PPG): in this section it is requested to provide detailed funding amount of the PPG activities financing status ? however, such details are not presented in the table (see screenshot below) ? please amend it.



CERDoc: Annex C

(screenshot can be seen in the Response Matrix document attached to the submission)

Response:
The relevant annexed have been updated and revised accordingly. At present, the total PPG expenditure is US$ 154,305 and US$ 45,695 are committed funds.



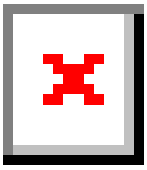
Comment: 3. While the budget table shows that several components will be financially managed by the Ministry of Natural Resources, the Executing Partners in Project Information and section 6 (Institutional Arrangements and Coordination) only show the Ministry of Industry and Information Technology as the entity responsible for the project?s execution ? please amend it in both sections (Project Information and Institutional Arrangements and Coordination).  (screenshot can be seen in the Response Matrix document attached to the submission) **Response**: Per the UNDP?s Program Operations Policies and Procedures (POPP), UNDP selects one implementing partner for each project in consultation with the government coordinating agency. One implementing partner is selected for each project. This project is a joint undertaking of the Ministry of Industry & Information Technology (MIIT) and the Ministry of Natural Resources (MNR). Per discussions with the country?s GEF OFP, MIIT and MNR, it was agreed that for this project the designated implementing partner (executing agency) is the MIIT. The MNR will be a responsible partner that will carry out specific components of the project on behalf of the MIIT. These are on the activities involving the phosphate mining and refining sub-sector (Components 1.1, 1.2 and 3.1). The MIIT will implement the activities involving the phosphate chemicals production sub-sector (Components 2.1, 2.2 and 3.2). As a responsible partner, it will assist the MIIT in ensuring close coordination between the relevant government agencies involved in the project at both national and local levels. MNR will coordinate with the MIIT the use of GEF funds allocated each year by the UNDP for Component 1 and part of Component 3 activities and carry out regular reporting of achievements through the MIIT in accordance with UNDP rules and procedures.	ProDoc: Part III: Stakeholder Engagement, p. 74
GEFSec Decision: Is CEO endorsement recommended? *(applies only to projects and child projects)*	
Comment: *Please address the comments of the GEF PPO that are shown in Box 1 of this review sheet.* **Response**: The project proponents have adequately addressed all the comments and made the necessary revisions in the Project Document and in Annex E; and are looking forward to the CEO endorsement of the project.	

Exhibit B-2
Responses to GEFSec Comments (15 December 2021)

Comment & Response	Reference
Part I ? Project Information	
Project description summary: Is the project structure/design appropriate to achieve the expected outcomes and outputs as in Table B and described in the project document?	

Comment: *Yes, the project structure/design remains almost the same as in the PIF and it is appropriate to achieve the expected outcomes and outputs. Please consider raising the ratio of co-financing over the PMC so that it will match that of the GEF funding.* **Response**: To make the ratio of the co-financing for PMC the same to that of the GEF funding for PMC, the amount of co-financing for PMC is increased to US$ 4,655,414. The co-financing for Component 2.2 is reduced to US$ 29,196,586 resulting in an increased co-financing sub-total. The new co-financing sub-total is US$ 93,108,273.	
Part II ? Project Justification	
Project Map and Coordinates: Is there an accurate and confirmed geo-referenced information where the project intervention will take place?	
Comment: *Not completed yet. A map is presented on page 52. Under the map, please (1) indicate the exact places of the GEF project demonstrations; (2) please elaborate if the project demonstration will take place at the boarder of Yunnan province where there might be any conflict of interest in international borders between China and its neighboring countries.* **Response**: Annex 2 of the ProDoc already provides the geographical coordinates of the project?s demo sites. The planned demo sites in the province of Yunnan are far from the geographical border with China?s neighboring countries, and that there are no known territorial disputes with the neighboring countries that border this province.	ProDoc: Annex 2 CERDoc: Annex D
Risks to Achieving Project Objectives: Has the project elaborated on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved? Were there proposed measures that address these risks at the time of project implementation?	

Comment: *In Section 5. Risks to Achieving Project Objectives on page 70 of the CEO ER document, please elaborate on risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved. The agency may copy relevant information from the ProDoc while addressing the issue. While addressing or screening climate risks, the Agency is encouraged to use STAP's methodology.* **Response**: Page 70 of the CEO ER document (CERDoc) is Annex K: Changes from the PIF. Annex L of the CERDoc is a detailed description of the strategies and actions to be taken in addressing potential Covid-19 issues during the implementation of the project to ensure that such issues will not significantly impact the project implementation. Annex M of the CERDoc is a detailed description of the climate risk assessment in the partner provinces. The assessments that were made are based on the results of the analyses that were carried out during the preparation of China?s 3rd National Communications to the UNFCCC (including the biennial update reports). The climate risk assessments will be updated during the course of project implementation using the results of climate observations and vulnerability and adaptation analyses that will be carried out during the preparation of China?s 4th National Communications to the UNFCCC. The STAP?s methodology for screening climate risks will be considered in updating the climate risk assessments. Furthermore, the ProDoc includes Annex 5: UNDP Risk Register, which summarizes the identified project risks (operational, social, political, financial and environmental). For each risk, the ratings are provided to the potential impact and likelihood/probability, the relevant mitigation measures, the project entity/entities that is/are responsible to monitor it, and the current status trend during the PPG stage. These risks will be monitored, and the status updated regularly during the project implementation. Among the identified risks are: (a) COVID-19 will negatively impact the social-economic development of the project areas; and (b) Extreme climate events in the project areas will delay and negatively affect the installation, operation and monitoring of the demonstration activities. Addressing the former is presented in Annex L, while the tackling of the latter is presented in Annex M.	CERDoc: Annex L CERDoc: Annex M ProDoc: Annex 5
Comment: *While addressing the risks of COVID-19 and taking into account any opportunities of COVID-19, please consider the following elements.* *1.1 General: Describe briefly how the pandemic overall is addressed in the project, including associated impacts, risks and opportunities. Projects are required to identify and establish likely impacts and risks from COVID-19, and how they will be dealt with in the context of delivering global environment benefits and climate adaptation and resilience benefits.* **Response**: Annex L (in CERDoc) provides the description of how the pandemic is addressed in project inclusive of associated impacts, risks and opportunities. In summary, the approach includes strict enforcements of public health measures such as mandating the reduced number of people in face-to-face gatherings and wearing masks in crowded areas and enclosed places. These may increase the cost of the government?s epidemic prevention and control, corporate business economics (e.g., PCI companies) will be affected negatively to a certain extent during the epidemic period, and some people in the PCI may be infected by the COVID-19 virus. However, with the enforcement of the epidemic prevention and control measures, there are also potential opportunities for people and companies in the PCI to adopt widely new automated technologies in virtual communications and in production operations and processes. This opens opportunities for PCI companies to consider enhanced process controls which can improve the efficiency of production operations, reduce losses/wastages, reduce energy consumption, and bring about reduced GHG emissions.	CERDoc: Annex L; Item a

Comment: *1.2 Risk analysis: Please consider any risks and measures to deal with the risks that are caused by COVID-19 and post-COVID-19. These risks include (1) availability of Technical Expertise and Capacity and Changes in Timelines in the selected provinces; and (2) any expected financing from the government and co-financing from all stakeholders. Please describe further how risks from COVID-19 have been analyzed and mitigation strategies incorporated into the design of this project. The CEO ER package is expected to include consideration to the risks that COVID-19 poses for all aspects of project implementation.* **Response**: Annex L (in CERDoc) also describes how risks from COVID-19 have been analyzed and mitigation strategies incorporated into the design of this project. In summary, the risks were analyzed using the experiences and lessons learned on how the Chinese government, the public and private sectors, and other sectors of the national economy reacted and addressed this public health issue, as well as actions and measures taken by the national and local governments that were effective and those with less success. Using these knowledge about the nature and extent of the pandemic the risks of potential worsening public health situations are analyzed in a much better way thereby understanding the extent of the potential risks, and in so doing able to come up with more appropriate and cost-effective mitigation measures. Other industry experts and where necessary, local public health officials in the project areas were also consulted to get a wide perspective view of the risk issues and come up with the appropriate preventive and alleviative mitigation measures.	CERDoc: Annex L; Item b
Comment: *1.3 Opportunity analysis: Describe further how the project has identified potential opportunities to mitigate impacts (if any) caused by COVID-19 to deliver GEBs and/or climate adaptation and resilience benefits and contribute toward green recovery and building back better.* **Response**: Annex L (in CERDoc) also describes how the project has identified opportunities to mitigate the impacts of the pandemic in delivering GEBs, resilience benefits, contribute towards green recovery and building back better. In summary, the most notable opportunity was the wide use of internet-based communications, which also presented opportunities for both public and private sector entities, as well as the academe, research community, NGOs/CSOs to enhancing the application of such technologies in their day-to-day business activities. The lessons learned and experience of these entities during the Covid-19 pandemic also presented opportunities for mitigating the impacts of Covid-19, such as showing to the PCI the importance of preventing infectious diseases from polluted bodies of water in the surrounding areas of PCI companies. This presents an opportunity for the local government and the PCI companies to work together to reduce the pollution brought about by effluents from these companies. Another opportunity is for the project proponents and their partners to formulate effective mitigating actions to prevent and/or remedy any negative impacts of the pandemic (assuming it persists for a long time) on the project interventions that are intended directly to bring about GHG emissions, as well as actions that will sustain/maintain the achievements that would be realized.	CERDoc: Annex L; Item c
Environmental and Social Safeguard (ESS): Are environmental and social risks, impacts and management measures adequately documented at this stage and consistent with requirements set out in SD/PL/03?	

Comment: *Not completed at this time. In Section 11. Environmental and Social Safeguard (ESS) on page 76 of the CEO ER document, please elaborate on Environmental and Social Safeguard that should cover social risks, impacts and management measures. The agency may copy relevant information from the ProDoc and/or from the attached document entitled "UNDP Social and Environmental Screening Procedure".* **Response**: During the project design stage, as per UNDP requirement, a Social and Environmental Screening (SES) of the proposed project has been done. The evaluation includes an assessment of the project design as to how it contributes to a strengthened social and environmental sustainability, covering the following: (a) mainstreaming of the human rights-based approach; (b) improving gender equality and women?s empowerment; (c) mainstreaming sustainability and resilience; and (d) strengthening accountability to stakeholders. Bulk of the screening process is on the identification and management of Social and Environmental Risks. Under this part of the screening process is the identification of the potential Social and Environmental Risks. The SES process includes a checklist for (1) identifying potential risks; (2) determining the overall risk categorization of the project; and (3) determining the required level of assessment and management measures. Each identified risk is evaluated to determine the level of significance (impact and likelihood/probability). With a clear understanding of the nature, extent and significance of the risk, appropriate mitigation measures are identified. The summary of the SES is in Annex 4 of the PhosChemEE ProDoc. There were 7 risks identified and evaluated. The risks include: (1) potential adverse impacts on enjoyment of the human rights of the affected population, potentially including ethnic minorities and/or vulnerable/disadvantaged groups, in the rural areas where the on-the-ground project activities will be carried out; (2) Potential adverse impacts to habitats and/or ecosystems, ecosystem services or possible changes to the use of lands and resources (e.g. phosphogypsum processing and use); (3) potential health and safety risks to local communities and workers due to the transport, storage, and use and/or disposal of any hazardous or dangerous materials during demo installations; (4) potential impacts of climate change, particularly in the identified project sites in the partner provinces where there are risks of extreme weather that can be exacerbated by climate change; (5) The new installed energy efficient systems in the demos may not be operated and maintained properly and safely by the existing and newly hired operators; (6) potential adverse impacts due to the significant extraction, diversion or containment of surface and/or ground water; and (7) potential generation of GHG emissions if the implemented actions are not properly carried out as per design. The overall risk rating is High, and in this regard, an Environmental & Social Management Framework (ESMF) has been prepared during the PPG stage to ensure that the necessary steps are taken to manage the site-specific risks during implementation (during which site-specific assessments and management plans will be required).	ProDoc: Annex 4
Benefits: Are the socioeconomic benefits at the national and local levels sufficiently described resulting from the project? Is there an elaboration on how these benefits translate in supporting the achievement of GEBs or adaptation benefits?	

Comment: *Not yet. In Section 10. Benefits on page 76 of the CEO ER document, please briefly list the socioeconomic benefits due to the GEF project at the national and local levels. Please elaborate how these local benefits translate in supporting the achievement of global environment benefits (CO2 emission reduction) or climate change adaptation benefits.* **Response**: Bulk of the demonstrations that will be carried out under the project are on the application of energy efficient process technologies and technologies for cleaner production in the Phosphate Chemical Industry (PCI) in China. The application of these EE and cleaner production technologies will bring about energy savings, increased productivity, reduced material and energy losses, improved safety, etc., all of which will collectively bring about improved economic benefits to the PCI. The direct emission reductions will come from improvements facilitated by the proposed project in phosphate rock mining is expected to reduce the current specific energy consumption in phosphate ore mining and beneficiation/refining. The improvement of the mining efficiency (including improving mine recovery rate, mining dilution rate, and beneficiation recovery rate) is also expected to achieve an energy consumption reduction per ton of refined phosrock. In phosphate chemicals production, the EE and cleaner production technologies and techniques applications that the project will facilitate will bring about a reduction in the production process energy consumption. The direct energy savings that will be derived from these process and operational improvements will bring about direct GHG emission reductions. The project activities on low-carbon waste management systems will be carried out in: (1) phosphate chemicals production; (2) phosrock mining and refining. The first one is on the utilization of the by-product phosphogypsum as building material (specifically as filler in polymer composite plastic products. The second one is on the enhanced utilization of phosrock mine tailings as backfill in phosphate ore underground mining, and for the production of natural/biological phosphate fertilizer as replacement for the use of phosphate fertilizer. The resulting indirect energy savings will be from the reduced production of chemical phosphate fertilizers. Both of these indirect energy savings will have corresponding consequential GHG emission reduction. In addition, there are other national benefits in terms of the reduced pollution of the water bodies that are near the PCI enterprises, reduction of the regional pollutant concentration in rural areas of Yunnan, Guizhou, Sichuan, and Hubei, promote the sustainable improvement of ecological environment in rural areas, and protect the livelihood of rural areas in these provinces.	ProDoc: Part II; Sec. 10
GEF Secretariat Comments: Not completed yet. Please address the following comments of the GEF SEC indicated at the PIF stage:	

Comment: *1. Please show meeting minutes with key stakeholders including the MIIT and MNR, provincial governments and private companies, and materialize co-financing from the MIIT and MNR and provincial governments.* **Response**: The discussions among the project proponents (MIIT & MNR) with the other project partners such as the PCI companies leading to the conceptualization of the project were mainly through informal meetings. A logical framework analysis (LFA) workshop was conducted to develop and agree on the project framework (log frame). This was attended by the project proponents, partners (including UNDP) and stakeholders and a LFA Workshop Meeting Report was produced. Together with the designated project development team (PDT), the project partners (e.g., provincial DIITs and DNRs, and the demo companies) held meetings to discuss and define the project activities and project demonstrations. In these meetings, each partner have indicated their ongoing activities/programs concerning the PCI, as well as their expressed vision for the industry. Collectively, these form the main basis of the estimated financing that each party intends to contribute to the project. However, these informal meetings did not have the benefit of designated rapporteurs documenting the meeting minutes. Nonetheless, it is the common understanding of the project proponents, partners and stakeholders that the discussion results of each meeting are directly reflected in the PhosChemEE ProDoc and CERDoc. Furthermore, the co-financing commitment letters that were issued by the project partners are clear manifestation of their agreement to collaborate, support and ensure the successful implementation of the proposed project.	
Comment: *2. Please materialize co-financing from the private sector, including Yunnan Haoming Fine Phosphorus Chemical Co., Ltd., Yunnan Haokun Phosphorus Chemical Co., Ltd., and Yunnan Xuanwei Phosphorus Power Co., Ltd. In Yunnan province; Weng'an Xingnong Phosphorus Chemical Co. Ltd., Guizhou Yuedu Chemical Co., Ltd., and Guizhou Batian Ecological Engineering Co., Ltd. in Guizhou province; Hubei Xiangyun (Group) Chemical Co., Ltd., Hubei Huangmailing Phosphorus Chemical Co., Ltd., Xiangyang Zedong Chemical Group Co., Ltd. in Hubei province; Sichuan Hongda (Group) Co., Ltd., Sichuan Blue Ocean Chemical (Group) Co., Ltd., and Sichuan Hanyuan Chemical General Factory in Sichuan province.* **Response**: During the project design stage, the list of the demonstration hosts was finalized. Most of the initially identified PCI companies have been changed. The final list of host demonstration companies include the following: Guizhou Wengfu Group; Leibo County Huarui Mining Company; Mabian Fuma Phosphate Company; Sichuan Mabian Tianrui Mining Company; Guizhou Kailin Mining and Fertilizer Co., Ltd.; Sichuan Lomom Phosphorus Chemical Co., Ltd.; Hubei Xiangyun (Group) Chemical Co., Ltd.; Yunnan Phosphate Group; Yunnan Xiangfeng Industrial Group Co., Ltd.; and Zhonglicheng Industry Co., Ltd. These participating PCI companies have each issued co-financing commitment letter to the PhosChemEE Project, particularly to the demo activities that each of them are hosting. The total private sector co-financing accounts for 79.5% of the total co-financing of the project.	CERDoc: Part I; Sec. C ProDoc: Annex 11
GEFSec Decision: Is CEO endorsement recommended? *(applies only to projects and child projects)*	
Comment: *Not at this time. Please address the comments above.* **Response**: The project proponents have adequately addressed all of the comments and are looking forward to the CEO endorsement of the proposed project.	

Comment	Response
The project is providing technology to be a demo project. If this technology is successful, what is the strategy to support its uptake?	Once the demonstration of the applicable EE technologies is successful, the policy/regulatory barrier removal activities of the project will be supplemented with the formulation of policy recommendations and strategy papers for the national government. The recommended policies and strategies will include: (1) actions to remove barriers that are hindering the widespread adoption of the showcased energy efficient technologies; and (2) development of minimum energy efficiency standards and technology specification codes for phosphate-rock mining and refining and phosphate chemicals production. The government will then use these policies and strategies to regulate the operations of the Chinese phosphate chemicals industry (PCI) inclusive of the phosphate-rock mining and phosphate chemicals production sub-sectors. With the application of the new technologies, standards and codes, the energy intensity in, and the carbon emissions from, the PCI in the country will be significantly reduced over the next 10 to 20 years.

What is the case for a GEF intervention here and how will the mines/plants be selected to receive support?	To achieve the objective of the project, the Ministry of Finance (MoF) of China and the GEF communicated and coordinated with the Ministry of Natural Resources (MNR) of China, which is in charge of policy and strategy development for China?s phosphate-rock mining and refining sector, and the Ministry of Industry and Information Technology (MIIT) of China, which is in charge of policy and strategy development for China?s phosphate chemicals production, in the design and development of the GEF-funded PhosChemEE Project. The MNR and MIIT are two coequal and independent ministries of the national government. Without the GEF project, the two ministries would not have worked together to resolve the issues of high energy intensity in the PCI in China. The GEF and the UNDP will closely work with the MoF, MNR and MIIT to ensure the GEF funding for this noteworthy project will contribute energy savings and carbon emission reductions from China?s phosphate rock mining and phosphate chemicals production industries. Technically, the main GEF support is for the removal of barriers to the widespread and cost-effective adoption of the demonstrated EE technologies within the phosphate chemicals industry (PCI) in China. The GEF support is also for facilitating the effective trickling down of the benefits of the various appropriate EE management techniques and practices that will be introduced, promoted, and applied during the project, to the various segments of the PCI value chain. For the demonstrations, the project proponents will work with selected suitable PCI companies that can host the demonstrations. These are PCI companies that have planned investment projects for plant facilities upgrade and expansions to improve productivity, save on energy and process raw material inputs, reduce production losses and waste, and for environmental regulations compliance. These are companies that have expressed interest and commitments to participate and co-finance the demonstration activities of this proposed project. For the beneficiary PCI companies (phosrock mining and refining; phosphate chemicals production) - the eligibility and selection criteria for the provision of support will be conceptualized during the PhosChemEE Project design and development. These will further be developed and implemented during the design of the follow-up action plans[1]. Among the project outputs is an operational pilot financing scheme for phosphate chemicals SMEs (Output 2.2.4). The design of the eligibility and selection criteria for the SMEs that will be supported by the financing scheme will be developed during the PhosChemEE Project design and development.

Exhibit B-4: Responses to GEF Council (Germany and USA) Comments ? 20 December 2020

Comment	Response
Germany Comments	
Suggestions for improvements to be made during the drafting of the final project proposal:	

Comment	Response
? Outputs 1.1.1 and 1.1.2 are quite broad and multifaceted (formulation, recommendation, approving and enforcement of policy and institutional framework/implementing rules). It might be worthwhile breaking these outputs down into multiple ones.	Thank you for the suggestion. These 2 broad outputs will be delivered by separate step-by-step activities. These 2 are only focusing on the phosphate ore mining and refining sub-sector. There are also separate set of similar outputs in Component 2 for the phosphate chemicals manufacturing sub-sector, as well as in Component 3, where the focus is on waste management in the entire phosphate chemicals industry. In the project proponents? view, the breaking up of these 2 outputs (on phosphate ore mining and refining) into various sub-outputs on formulation, recommendation, approval, and enforcement; and also evaluation, would make the implementation be very unwieldy. This is considering that there are 2 other sets of similar outputs. During the PPG stage, to further assess this comment provided by the reviewers a very detailed set of activities has been designed for each of the two outputs (10 and 5 activities, respectively). The same approach has been applied for the similar outputs under Components 2 and 3.
? Output 3.2.3 could be complemented by or based on a critical evaluation of the management technologies in the phosphate chemicals industry applied in this project.	Agree. To enable this, the project design includes the delivery of 2 important outputs. These are: Output 3.1.5: Completed research reports on: (1) annual volume of waste production in phosrock mining and refining, and in phosphate chemicals production in China; (2) green and low carbon waste management systems for waste recycling and reuse developed and implemented in other countries and their energy utilization performances; and, (3) potential commercial markets for processed waste, e.g., phosphogypsum. Output 3.1.6: Established and operational information management system for sharing available and accessible information about market and research developments and R&D in the country and abroad on green and low carbon waste management systems in the PCI.

Comment	Response
? Being not perfectly aware of the precise policy context and the detailed distribution of responsibilities among different ministries, it might be worthwhile to assess collaboration with China?s Ministry of Ecology and Environment, e.g. in the development of frameworks and safeguards for all three components.	The MEE is an important partner for this project. As it has done during the project design stage, the MEE will be providing guidance in the planning of the project activities during the implementation phase to ensure that the project outputs can provide intellectual support for China's participation in international climate change negotiations and the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), and contributes to the achievement of the country?s climate change mitigation and NDC targets. All 3 components of the project includes the demonstration of green, energy efficient and low carbon technologies in the operations and processes in the Chinese Phosphate Chemicals Industry (PCI). These demonstrations are all expected to be replicated by other PCI entities. Collectively, these demos and demo replications can contribute to the achievement of the country?s NDC targets. Moreover, all demos will be benefitting on the safeguards guidance that the MEE will be providing when these are designed, installed and made operational.
United States of America Comments	
? We would like to see in the next iteration of the proposal, a clearer statement that the participating enterprises will have to demonstrate good environmental and social management practices.	The PCI is well aware of the need to address the social and environmental impacts of its operations and processes. In hosting the project demonstration activities, the demo companies have committed to not only improving their productivity (by reducing material losses, recovering material resource, and making use of waste by-products), efficiency (by improving the efficiency of energy utilization), but also improving the environment (through waste minimization and circular economy, and promoting the recycling and reusing of waste) in the places where they operate. The participating technical and engineering companies that will be involved in the implementation of the project activities, particularly the demonstrations, are obligated to comply with the relevant national laws and international standards for construction, operation, and waste management. Site-specific environmental and social assessments will be conducted for each demo to identify and mitigate critical health and safety risks. Moreover, all qualified and capable people, particularly qualified and capable women consultants/experts, will be engaged in the implementation of the project. During the project design, this suggestion from the reviewers has been adopted by the PDT and used as a main criterion for the selection of participating demo companies (please refer to the ?Private Sector Enterprises? section in Table 2 of the ProDoc).

Comment	Response
? We would like to see stronger engagement with ethnic minorities who live within the mining areas. These local, communities will be impacted by this work, and should be involved beyond the initial consulting stage.	There are some minorities living in the mining areas, and some are living near the planned demo sites. According to the project proponents (MIIT and MNR), the local governments that cover the planned project sites have contacted the local people in each of these areas, including people that belong to minority groups. The project has been promoted to these people as something that will bring substantial benefits to the citizenry inasmuch as the project will significantly contribute to the sustainable development of the local economy and improve/conserve the national environment. The expressed interest and support of the local residents are among the motivations to the project proponents to proceed with the development of the proposed project. In that regard, the design of the project has been done to make it consistent with the strategic requirements of the country?s Law on Ethnic Unity and Progress, which will ensure the enjoyment of the human rights of the potentially affected population in the project sites, especially ethnic minorities and/or vulnerable/disadvantaged groups. The implementation of this project will improve the level of technical knowledge and enhance the productivity of people working in the phosphate ore mining and refining, and phosphate chemicals manufacturing industries. People in the provinces where the PCI is active will benefit from the improvements in the industry and the job opportunities that the project will bring about, for example in the demonstration activities, as well as in the replication of these demos. They, including ethnic minorities who are involved in the community development planning process, will be consulted during the promotion of proposed policies, regulations and standards pertaining to the operations of the PCI in their respective localities.

Exhibit B-5: Responses to STAP Comments (8 January 2020)

STAP Rating: Minor issues to be considered during project design

Comment	Response
STAP Overall Assessment of the Project Proposal	

The climate and environmental impacts of phosphate mining, including in China, are well documented[2]. Hence, actions to introduce green and clean production and circular economy in the sector are urgently needed, especially because the world will continue to depend on phosphate products in different economic sectors. We encourage the project proponent to review the Withers et al. (2015) and Meshalkin et al. 2019 articles[3][3]. They present options for greening both the primary and secondary phosphate production. The recent STAP report on technology critical elements also contains information on making the mining sector more environmentally friendly, which can be useful to this project[4][4]. The possibility of recovering other valuable materials, including rare earth elements, uranium, and thorium, during phosphate mining has also been discussed[5][5]4 and should be explored in this project if possible.	The project proponents thank the reviewer for the suggestion. The suggested articles and reports will be reviewed with the aim of considering the suggested specific options during the design of the project activities that will facilitate the transformation of the current phosphate mining and refining processes and operations in the country cleaner, more energy efficient and environment friendly. While the radioactive materials content of the phosrock deposits in China are relatively lower than those in other countries (e.g., Brazil, Morocco, and USA), the recovery of valuable radioactive elements such as thorium (Th) and Uranium (U) including iodine (I) and rare earth elements (REE) will be considered in this project. The possibility of enriching these recoverable elements will be researched (as part of the research studies that will be conducted in Components 1 or 3) and if there are potentials, this can be considered in one of the project demos. If feasible, any U and Th, may be concentrated into one by-product or solid waste to prevent their release to the environment. For the REE and I, if feasible, refining processes will be explored to enrich these useful resources.

An analysis of barriers to green mining promotion in China[6][6] indicates that diverse factors influence companies and government willingness to carry out technological innovations, including the scale of mines, supervision cost, and yield and comprehensive utilization rate of tailings and waste rocks. The small-scale nature of most phosphate mining activities in China has been linked to inefficiencies[7][7]. Hence, this project should consider these barriers and come up with solutions to mitigating them.	There will be some barriers to green mining promotion in China, among which the small-scale nature is an obvious and important one. Although the straightforward solution to this issue is generally regarded as for enhancing the thresholds of market entry or early withdrawal, improvements in policy regimes and technology applications and innovation are critically important to fundamentally remove the barriers. With the supervision policy on environment and resource utilization getting tighter, some of the small-scale mines are shutdown or merged with large-scale mines. The rest of the mines can only put their focus on improving the resource utilization, be more environment friendly and lower their energy consumption level to survive. In this project, such barriers will be removed through the abovementioned strategies, as well as through the demonstration of the application of feasible cost-effective advanced mining and beneficiation technologies in large-scale and small-scale mines to promote the green mining in China. A better understanding of the nature and extent of barriers to green mining, particularly in small-scale mining and beneficiation operations will be studied in more detail during the project design to come up with the appropriate interventions that will be carried out under the proposed project to remove them.

A theory of change (ToC) narrative and diagram was presented. The ToC, however, lacks relevant components of an adequate ToC. The ToC that was presented is a diagrammatic expression of the project outputs, outcome, and impacts. The underlying assumptions, pathways, alternative plans, and medium- and long-term impacts required for a complete ToC were missing. We refer the project proponent to STAP's theory of change[8][8] for more information on developing ToCs.	Thanks for the suggestions. The ToC diagram in the PIF is based on the initial logical framework analysis (LFA) that was carried out to establish the project?s results framework (PIF, Part I, Sec. B). Based on that analysis, the project?s theory of change will be verified, confirmed, and clearly defined during the project design activities, which will start with a more detailed LFA. This will be done through the conduct of a 3-day stakeholder workshop that will be attended by the relevant stakeholders and partners of the proposed project. In this workshop the participants will further identify barriers and verify those that were already identified during the project concept stage (i.e., PIF development stage). The barrier analysis will establish the cause and effect relationships of these barriers. Having established the cause and effect relationship in a form of a problem tree, an objectives analysis will be carried out to determine the means and ends relationships of the various desirable, realistic, and achievable objectives in a form of an objectives tree. The objectives tree presents the various potential pathways by which the desired medium term and long term impacts (e.g., increased greenhouse gas reduction in the phosphate chemicals industry (PCI) in China) will be achieved. Based on the objectives tree, the following elements of the project will be defined: (a) goal; (b) objective; (c) outcomes that will contribute to the realization of the project objective; (d) outputs that have to be produced to contribute to the realization the project outcomes; and, (e) baseline and incremental activities that will deliver the project outputs. The objectives tree will also point to the logical assumptions that will be considered in the project. The appropriate SMART indicators will be defined for the project objective, and for each project outcome. The baseline and target values, means of verification and critical assumption for each indicator will also be defined by consensus among the project stakeholders and partners. The project log frame will be finalized by consensus among the project stakeholders and partners. The fully defined project log frame will embody the theory of change that the project intends to bring about. The approach for achieving the change will be guided by this log frame, with a clear rationale backed by credible evidence, integrating gender concerns into the approach.

Although this project is targeted at climate change mitigation, the issues considered in the project are interlinked with several environmental and socioeconomic concerns, including land degradation, water pollution, waste and wastewater management, biodiversity and forest loss, food security, job creation, environmental and occupational safety, etc. This was rightly recognized in the PIF. The project will, therefore, generate several co-benefits if well designed and implemented. Therefore, we encourage the project proponent to adopt the systems thinking approach for project development. The systems thinking approach allows project designers to analyze the interlinkages between the various elements of a system in which a problem is embedded, see the whole picture, and design solutions that consider the interlinkages and ensure that synergies are maximized, and tradeoffs minimized. See examples of STAP's reports on this[9][9].	Thanks for the suggestion. The integrated approach of addressing the economic, energy, environmental and social challenges in the PCI is the intention of this project. The system thinking, which considers these interconnected issues, particularly in PCI value chain of mining-manufacturing-waste material management, is part and parcel of the planned project design. Indeed, the examples of design solutions in the STAP reports will be useful for the project proponents in ensuring maximization of synergies and minimization of tradeoffs in this project. As proposed in the GEF-approved project concept, the objective is to enable the extensive application of low carbon and energy efficient technologies in the phosphate chemicals industry in China. The idea is to have cleaner and more sustainable PCI in China. This will be done through a holistic approach in the creation of enabling environments that will also address, in an integrated manner social, and economic development with ecological issues including climate change, water pollution, land degradation, resources conservation. This project can synergistically deliver multiple benefits in the socio-ecological-economic system, including a significant mitigation of greenhouse gas emission, reduction of water and land pollution caused by phosphogypsum, great improvement of utilization efficiency of phosphate resources, promotion of the employment of poor residents, and enhancement of public ecological awareness.

Concerning the reuse/recycling of phosphogypsum - there have been concerns about its radioactive properties, but the EPA has recently approved its use in road construction in the US[10][10]. Therefore, the prevailing legislation in China must be considered in determining the best recycling option. Several reuse/recycling options have been considered in the scientific literature, including as soil amendment, landfill cover, road construction, cement and concrete, coastal zone barrier, mine reclamation, geopolymers, and rare earth extraction. All of these should be analyzed to determine the best option under China's national circumstances.	During the project design, several reuse/recycling options for phosphogypsum will be studied in detail, including as soil amendment, landfill cover, road construction, cement and concrete, coastal zone barrier, mine reclamation, geopolymers, and REE extraction, to determine the best option to adopt considering China's national circumstances. Note that the radioactive material content of phosphate rock in China is much lower than in other phosphate mineral rich countries like Brazil, Morocco, and the USA. Nonetheless, the new national standard for the reuse/recycling of phosphogypsum will include requirements based on the radioactive content of this phosphate chemical production by-product. Cement or by-product gypsum used in cement will produce products that meet the standards in accordance with China's new standards for the reuse/recycling of phosphogypsum. Based on a 10-year tracking safety evaluation of the application of phosphogypsum in fertilizers and building materials in many countries around the world revealed that agricultural utilization of phosphogypsum is safe for human health and the ecological environment.
The PIF is missing some annexes, including Annex D on how the global environmental benefits were calculated, Annex E on improvement assumptions, Annex F on Covid response, Annex G on Climate Risk Screening, and Annex I on knowledge management.	These annexes are included in the PIF that was submitted to the GEF Portal. These are also included in the GEF-approved PIF. These can be resubmitted, if necessary.

Concerning the estimation of climate mitigation GEBs, it is unclear how the 15% reduction in specific energy consumption in phosrock mining and beneficiation/refining and 5% reduction in process energy consumption were derived. What are the assumptions behind these numbers? Annex D, which provides information on how the estimates were derived, is missing for the PIF.	The specific energy consumption reduction in phosrock mining and beneficiation are based on the comparison of current level and anticipate level with the application of advanced technology and equipment. There are various advanced phosphate mining and refining technologies that will be considered for application demonstrations under the proposed projects. Some of these, including the potential energy savings from their application, are described below; **Pillar free continuous mining method.** This method uses tunnel boring machines in the mining process. Compared to the traditional room and pillar method, this method has a lower energy consumption. The energy consumption is reduced from 15 kWh/t to 10 kWh/t, with an increased resource utilization rate increase from less than 70% to 90%. **Sorting before beneficiation.** For low-medium grade phosrock, traditional direct flotation technology needs the whole input grinding, which requires high energy consumption on the waste rock. Sorting technology can discard 20%-30% waste rock before grinding and save 20%-30% energy consumption. The resulting energy consumption in grinding, which typically accounts for 40%-50% energy consumption of the entire mill plant. About 10%-15% energy saving is achieved with the application of sorting. **Application of energy efficient large-scale beneficiation equipment.** Mechanical stirring flotation machine is widely used for phosrock flotation. Replacing this with a static flotation equipment, which has been successfully applied in some phosrock flotation plants, can save about 10% power consumption. Also, large-scale flotation cells result in energy saving. The promotion and application of these energy reduction equipment will benefit the whole phosphate mining and refining industry.
The potential for extreme climate events impacting the project areas was noted in the environmental and social safeguard template and the PIF. The proposal indicates that a project climate risk screening was completed and included as annex G. However, the annex is missing. We recommend that the climate risk screening of the project be provided for review.	This annex is included in the PIF that was submitted to the GEF Portal. This is also included in the GEF-approved PIF. This can be resubmitted, if necessary.

Overall, a good and ambitious project that will require careful and systems-based design and implementation to deliver multiple global environmental and socioeconomic benefits.	The project proponents cannot agree more. The project implementation team will consider more on the integration of systematic impacts into project design. Moreover, the project lays significant emphasis on experience sharing and replicable implementation. Greater environmental benefits could be gained when the successful project implementation is promoted to multiple regions in China and possibly worldwide.

Actions Taken in regards the STAP Rating:

During the PPG exercise, UNDP scheduled a dialogue with the STAP member screener (Saleem H. Ali) to review the actions taken to address the technical and/or scientific issues raised. The dialogue took place on 30 August 2021. The responses to the STAP comments were discussed and the STAP Reviewer agreed to the planned action of the project development team.

Exhibit B-5: Responses to GEFSec Comments (1 October 2020)

Comments & Responses	Reference
Part I ? Project Information	
2. Are the components in Table B and as described in the PIF sound, appropriate, and sufficiently clear to achieve the project/program objectives and the core indicators?	

Comment:

1). Please split the total budget into smaller pieces and allocate them to match each of the project outputs. In particular, for the technology demonstrations in Component 1 (Installed and operational green, energy efficient low carbon technology application demos in phosrock mining and refining in Weng'an, Guizhou, Jinning, Yunnan, and Mabian and Leibo counties, Sichuan.), Component 2 (Installed and operational green, energy efficient low carbon technology application demos in phosphate chemicals production.), and Component 3 (Installed and operational green and low carbon waste management technology application demos in the phosphate chemicals industry.), please indicate capacities of technologies to be installed and capital investment for each of the technology capacities.

Response:

PIF: Part I, Sec. B, pp 4-6

The breakdown of the estimated budget for the investment components of the project is now shown in Part I, Sec. B of the revised PIF. The preliminary identified indicative green, energy efficient low carbon technologies that will be considered in each investment sub-component includes:

PIF: Part I, Sec. B, Footnote 3, p.3

Component 1:

Phosphate mining and refining: (1) Improved phosrock transportation from mine site to refining section by phosrock conveying (5 million tons/year) and phosrock slurry pumping and pipeline transportation (5 million tons/year); (2), XRT sorting (2 million tons/year); and (3) Biological phosphate fertilizer from phosrock refining tailings (1 million tons/year). As to the corresponding capital investments: (1) phosrock transportation, depending on the terrain complexity for raw phosrock conveying and phosrock slurry pumping, is estimated at US$ 3M ? 4.5M/mile for a 5 million tons/year transfer rate; (2) XRT sorting system will cost about US$ 4.5M ? 7.5M for a 2 million tons/year processing rate; and, (3) a bio-phosphate fertilizer production plant cost about US$ 3M ? 4.5M for a 1 million tons/year production rate.

PIF: Part I, Sec. B, Footnote 4, p. 4

Component 2:

Phosphate chemicals production: (1) Process optimization and the improved heat recovery in thermal phosphoric acid production: (2) Medium pressure steam production using tail gas (CO) from the electric furnace used in yellow phosphorus production; and (3) Improved wet-process phosphoric acid production. Both for large companies and SMEs that produce phosphate chemicals, green and low carbon technologies, and practices (e.g., waste heat recovery, application of energy efficient electric motors and equipment, distributed control systems, energy management systems, etc.) that will improve and optimize their production operations and processes for improved productivity, cleaner production and energy efficiency will be demonstrated. The specific demonstrations will be designed to fit the appropriate partner entities that will be able to showcase cost-effective implementation of the green low carbon technologies, generate high energy savings and bring about high GHG emission reductions.

PIF: Part I, Sec. B, Footnote 5, p. 6

Component 3:

PCI waste management: (1) Improved phosphogypsum pre-treatment (200,000 tons/year); (2) improved production of ? high-strength gypsum that is used as building material and molding compound, replacing silicate cement (200,000 tons/year); and (3) improved production of ? gypsum that is commonly used as building material (200,000 tons/year). Regarding the corresponding capital investment for the stated production rates: (1) Improved phosphogypsum pre-treatment is estimated at US$ 1.5M; (2) Improved ? high-strength gypsum production is estimated at US$ 7.5M; and (3) improved ? gypsum production is about US$ 3M.

Comment: *2). Co-financing amount in Table B for the project components are not sufficient to achieve the targeted demonstration facilities and the project goal. Please increase the co-financing ratio to 1:10.* **Response**: The follow-up discussions between the project proponents and stakeholders resulted in a decision to increase the co-financing for the project, making the co-financing ratio 1:10.	PIF: Part I, Secs. A & C
Comment: *3). Please indicate the M&E budget for the project.* **Response**: Considering the envisioned project activities and outputs, the estimated monitoring & evaluation budget for this project is US$ 265,000.	PIF: Annex D
3. Are the indicative expected amounts, sources, and types of co-financing adequately documented and consistent with the requirements of the Co-Financing Policy and Guidelines, with a description on how the breakdown of co-financing was identified and meets the definition of investment mobilized?	
Comment: *Historically, co-financing ratio in China for energy efficiency projects since GEF 5 has been much higher than 1:7 which is an expected ratio for the average of all GEF project portfolio in GEF7. Please raise the ratio at no less than 1:10 for this project. In particular, please raise the co-financing funding from the private sector, namely the relevant companies and farmer cooperatives in project sites.* **Response**: Additional PCI companies have been identified as potential project partners. Among them are: Guizhou Phosphate Group, Jixing Chemical Group, Yuanan Industrial Park, and Hubei Yidu Chemical Industrial Park. These are PCI companies that can host, the envisioned demonstrations under this project since some of them already have plans to carry out some of the preliminarily identified potential demos. While the project proponents believe that the estimated co-financing from these entities (based on their individual current planned energy efficiency and productivity improvement initiatives) will be available, the final co-funding commitment of each private sector participant will be confirmed during the project design stage. The private sector partners will cover part of the costs for the planning, design, engineering, installation, operation and maintenance of the demo green, energy efficient, low carbon technologies that will be implemented in their respective facilities. It should be noted that since the proposed project will only cover biological/chemical phosphate fertilizer production, farmer cooperatives will not be involved. The promotion and utilization of biological/chemical phosphate fertilizer is not directly part of the project. It is expected that other entities promoting the sustainable application of natural/chemical fertilizers will be doing this downstream activity. Nonetheless, such activities can be informed by the knowledge management products from, and other information dissemination activities of, the proposed project.	PIF: Part I, Sec. C, Footnote 6.

Comment: *Please describe how the Ministry of Industry and Information Technology and the Ministry of Natural Resources were engaged to discuss and agree to finance the project with the proposed co-financing amounts. The best is to show meeting minutes or email communications.* **Response**: Before PPG Stage Several informal meetings have been conducted between the MIIT and MNR regarding the project activities that will be involved in the project. In these meetings, each partner have indicated their ongoing activities/programs concerning the PCI, as well as their expressed vision for the industry. Collectively, these form the main basis of the estimated financing that each party intends to contribute to the project. However, these informal meetings did not have the benefit of designated rapporteurs documenting the meeting minutes. Nevertheless, it is the common understanding of officials of both Ministries that the discussion results of each meeting are directly reflected in the pertinent version of the PIF. After PPG Stage: A logical framework analysis (LFA) workshop was conducted to develop and agree on the project framework (log frame). This was attended by the project proponents (MIIT and MNR), partners (provincial governments, PCI companies, including UNDP) and stakeholders and a LFA Workshop Meeting Report was produced. Together with the designated project development team (PDT), the project partners conducted meetings to discuss the define the project activities and project demonstrations. In these meetings, each partner have indicated their ongoing activities/programs concerning the PCI, as well as their expressed vision for the industry. Collectively, these form the main basis of the estimated financing that each party intends to contribute to the project. However, these informal meetings did not have the benefit of designated rapporteurs documenting the meeting minutes. Nonetheless, it is the common understanding of the project proponents, partners and stakeholders that the discussion results of each meeting are directly reflected in the PhosChemEE ProDoc and CERDoc. Furthermore, the co-financing commitment letters that were issued by the project partners are clear manifestation of their agreement to collaborate, support and ensure the successful implementation of the proposed project.	
Comment: *Please consider mobilizing Investment Mobilized or IM from provincial and local governments.* **Response**: The provincial governments of Sichuan, Yunnan, Guizhou, and Hubei will play important roles in the implementation of the project. Firstly, the concerned departments of these provincial governments will actively promote the implementation of the project, promote the energy-saving, energy efficient and sustainable low carbon development of the PCI in their respective province. This will be done through the creation of the required enabling environment that will facilitate the realization of such kind of development in the PCI in each province. Among these are the development and enforcement of supportive policies and regulations that would incentivize the local PCI entities to adopt and apply green, energy efficient local carbon technologies and practices in their operations and processes, as well as adequate capacity building for all PCI stakeholders along the PCI value chain. As part of their responsibilities and regular activities, the provincial and relevant local governments will mobilize (either through appropriate reallocations of their annual budgets, or encouraging the PCI companies in their respective provinces to promote and support the enabling activities that the provincial/local governments will carry out, as well as motivating the PCI companies to invest in the implementation of green, energy efficient low carbon technologies in their respective production facilities.	

Comment: *For each source of co-financing identified as IM, the UNDP must provide a description on how it was identified.* **Response**: The identification of the IM co-financing for this proposed project is mainly derived from the discussions on UNDP with the project proponents, which are the MIIT and MNR. The project proponents are the ones that are in discussions with the potential project partners from the private sector (mainly the PCI companies) for the involvement of these entities in the project, which is specifically for the PCI. See also the response to the next comment below.	PIF: Part I, Sec. C
Comment: *The PIF does not show anything on how the IM by the private sector will be mobilized. Please address the issue on page 6.* **Response**: Apart from their expressed co-financing of the project, on the basis of their respective programs/activities for the PCI, according to the MIIT and MNR there are special funds[11][11] set aside by the national government for the use of government ministries and local governments in promoting energy efficiency and pollution reduction. These funds usually need the private sector?s financial contributions. The proposed project, same as any other GEF-supported project in China, will make use of this special fund to ensure IM. Such practice has been proven effective to ensure government co-financing of donor-funded projects. The PCI entities that have been consulted for potential participation in the project have expressed interest in participating in the project, e.g., hosting the project demos. Nonetheless, at this early stage (PIF development), the estimates for the private sector co-financing, is at best order-of-magnitude. This will be further estimated in more detail during the design and development stage of the project.	
6. Are the identified core indicators in Table F calculated using the methodology included in the correspondent Guidelines? (GEF/C.54/11/Rev.01)	
Comment: *In Indicator 6.1, please delete 36,970,000. In Indicator 6.2, please change 36.97 into 36,970,000. Please check the number of saved energy (1.73 MJ). It is wrong, because the number is too, too small. Please put the number of women and girls who will get benefits from the project.* **Response**: The original values in the PIF are 36.97 million tons, and 1.93x10$_{11}$ MJ. These are now re-stated as 36,970,000 tons; and 1.93x10$_{11}$ MJ. Recalculations were made and the new values are as follows: GHG emission reduction (project lifetime) = 35,960,000 tons; Energy savings (project lifetime) = 1.73x10$_{11}$ MJ. The corrected values are shown in Part I, Sec. F and Annex B. For Core Indicator 11, about 600,000 women and girls and 600,000-1,000,000 men would benefit from the project, mainly from improvement of work environment and new job opportunities in mines, improvement of the natural environment of nearby towns and villages surrounding the phosphate mines.	PIF: Annex E
Part II ? Project Justification	
1. Has the project/program described the global environmental / adaptation problems, including the root causes and barriers that need to be addressed?	

Comment: *The project description is unclear. The PIF is very difficult for readers to understand. Some data make readers confusing. For example, On page 11 of the PIF, in Section of 1a.2. Baseline scenario and any associated baseline projects -Baseline scenario, it reads the following: In 2019, the average energy consumption per ton of raw phosrock in phosphate mining in China is 1.94 kg standard coal, and the corresponding carbon emission is 5.04 kg CO_2. The average energy consumption per ton of raw phosrock is 7.93 kg standard coal, and the corresponding carbon emission is 20.6 kg. The average utilization rate of waste rock is 39.5%. The average utilization rate of tailings is 23.86%. According to the PCI estimate, there are potentials for reduction in the industry?s energy consumption by 3% and for an increase in utilization rate of generated waste products by 3% in 2025. Compared to the PCI in developed countries, China PCI?s mining efficiency, beneficiation efficiency, waste rock utilization rate and tailings utilization rate are relatively low ((an average lower by about 10%). The above highlighted numbers and the English language confuse readers. Please hire a professional to check and edit the whole PIF and make the PIF comply with the high standard of the UNDP and the GEF. Thanks.* **Response**: Thanks for pointing out this inadvertent mistake. The average energy consumption per ton of raw phosrock in phosphate mining is 1.94 kgs standard coal; and the average energy consumption per ton of refined/beneficiated phosrock is 7.93 kgs standard coal. The corresponding carbon emission from these specific energy consumptions in the phosphate mining and beneficiation process are, 5.04 kg CO_2, and 20.6 kg CO_2, respectively, per ton of raw phosrock. The statements that contain the highlighted numbers have been restated to include the specific energy consumption and corresponding carbon emission in the phosphate refining/beneficiation process. The other statements are clear, and the project proponents are certain that there is no need for further editing of the remaining texts.	PIF: Part II, Sec. 1a.2
2. Is the baseline scenario or any associated baseline projects appropriately described?	

Comment: *Not at this time. Please see the comments in the previous box. Technically, please articulate the baseline technologies and existing policies that are related to phosphate mining. Please list all major names of technologies, capacities, phosphate industrial equipment, and energy consumptions per unit of output (or energy efficiency) of these technologies and equipment. Then, please also forecast what will happen to these phosphate mining and industrial technologies in terms of energy efficiency and energy consumption in the forthcoming 20 years if the GEF does not finance this project. The above analysis can focus on the three baseline projects listed on page 13 of the PIF. This is the baseline scenario. With this scenario and information, the alternative scenario can be easily presented and understood.* *More comments will be provided on the forthcoming revised version.*	
Response: The project proponents have clarified further the baseline scenario. The current trend of phosrock production and phosphate fertilizer consumption in China are expected to continue to grow at the same rates in the past 5 years and are expected to peak during the period 2020-2025 where the demand for phosrock is estimated to reach 100 million tons/year. The current average specific energy consumption and CO_2 emission in phosphate mining and beneficiation, and phosphate chemicals production will more or less remain the same. All improvements in the processes and operations of the PCI will mainly involve replacement and upkeep of the process equipment, and upgrades are mainly for scaling up production. Nonetheless, it is expected that at best, the energy utilization performance (and corresponding CO_2 emission generation) in the major production processes and operations in the PCI will remain the same unless further improvements involving green, energy efficient low carbon technologies are introduced and applied in the various PCI entities in China.	PIF: Part II, Sec. 1a.2
3. Does the proposed alternative scenario describe the expected outcomes and components of the project/program?	

Comment:
Not at this time. The alternative scenario is not clear. In the Proposed Alternative Scenario, please articulate what kind of highly efficient technologies and industrial processes will be used to replace the existing inefficient ones in phosphate rock mining and production of natural phosphate fertilizer.
More comments will come after the above essential issue is addressed.

Response:
With the forecast growth rate of phosrock production, phosphate chemicals and phosphate fertilizer production, it is expected that additional production capacities will be installed, or the productivity rates will be improved with existing installed capacities. In that regard, the alternative scenario in the PCI will feature the application of new improved production technologies in the new plants that will be built and in existing facilities that will be retrofitted. These improvements are mainly in line with the achievement of the envisioned alternative scenario, whereby the productivity rates are improved, and at the same time the specific energy consumption in the phosrock mining and refining operations/processes, and phosphate chemicals and the management of PCI waste. The alternative scenario is also characterized by the widescale application of circular economy initiatives that will feature waste recovery, recycling and utilization, which will bring about improved resource conservation, reduced production losses and process wastage, and reduced accumulation of PCI mining and refining waste, as well as the phosphate chemicals production waste by-products. Such scenario will feature lesser energy consumption as the specific energy consumption for the PCI operations and processes will be reduced, with the corresponding reduction in GHG emissions from the PCI, as well as lesser environmental footprint, with the minimization of the generation of solid, liquid, and gaseous wastes from the industry.

PIF: Part II, Sec. 1a.3

In the alternative scenario, through the application of green energy efficient low carbon technologies, some of which are mentioned above, it is expected that the recovery rate in phosrock mining will improve from 72% to 75%. Carbon emissions per ton of phosphate chemical products will be reduced by an average of 0.04 tons by 2025, i.e., from 1.25 tons CO_2 per ton phosphate chemicals to 1.20 tons. Furthermore, the comprehensive utilization rate of PCI waste will increase to 80% by 2025, which is 30% higher than the utilization on current policy trajectory.

To enable the realization of the envisioned alternative scenario, the widespread application of several potential green, energy efficient and low carbon technologies in the 3 major sub-sectors of the PCI (phosrock mining and refining; phosphate chemicals production; and waste management) is very essential. Depending on the current state of the production facilities and operations and processes in each company within the PCI, there are proven applicable technologies that can be applied by each of them to transform their operations to a more sustainable green and low carbon track. Among these are the following, which are also among those that are envisioned to be promoted and demonstrated in the proposed project:

? Phosphate mining and refining: (1) Improved phosrock transportation from mine site to refining section by phosrock conveying and phosrock slurry pumping and pipeline transportation; (2) XRT sorting; and (3) Biological phosphate fertilizer from phosrock mining waste and refining tailings.

? Phosphate chemicals production: (1) Process optimization and the improved heat recovery in thermal phosphoric acid production: (2) Medium- pressure steam production using tail gas (CO) from the electric furnace used in yellow phosphorus production; and (3) Improved wet-process phosphoric acid production.

? PCI waste management: (1) Improved phosphogypsum pre-treatment; (2) improved production of ? high-strength gypsum; and (3) improved production of ? gypsum.

The specific designs of the application of each technology will be done during the project design. Nonetheless, suffice to say that each technology will be designed based on the design practices and experiences from the technology application that will ensure technical and financial viability, reliability, climate resilience, safety, and environmental integrity. Not only the application of green, energy efficient low carbon technologies in the production operations and processes in each of these sub-sectors of the PCI will be

5. Is the incremental / additional cost reasoning properly described as per the Guidelines provided in GEF/C.31/12?	
Comment: *In the Section of **1a.5: Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing**, please elaborate what kind of energy efficient technologies, green production facilities, and their production capacities will be introduced onto China's phosphate rock mining and phosphate fertilizer production.* **Response**: Based on the current projects (i.e., to be implemented, and/or planned and budgeted) of the identified partner PCI companies for their respective production operations and processes, further improvements on the planning, design and application of green, low carbon technologies were preliminarily identified. These projects will be subsumed into the proposed project as baseline demos that will be enhanced/improved (or modified) to bring about more energy saving s and GHG emission reductions. Among these technologies are those presented in the response to the previous comment regarding the alternative scenario that this proposed project intends to bring about. The cost for such improvements is practically the incremental costs that the proposed project requires the GEF to financially support. The improvements in the baseline activities will depend on their type and original design. In the case of the demonstrations, these improvements will basically involve making the applied strategy/methodology or technology application: (1) more energy conserving and energy efficient, e.g., improved waste heat recovery, utilization of more energy efficient equipment/process; (2) more economically feasible, e.g., provision of financial support/incentives; (3) more environment-friendly, e.g., application of cleaner production techniques; (4) more resource conserving, e.g., application of improved phosphogypsum processing; and, (5) addressing the absent or insufficient enabling conditions (e.g., policies, regulations, standards, capacity and skills upgrading). Without these incremental features, the envisioned alternative scenario for the development of the PCI in China that the proposed project intends to bring about will not be realized. The detailed incremental cost analysis will be carried out during the design and development (PPG) stage of the proposed project.	PIF: Part II, Sec. 1a.5
6. Are the project?s/program?s indicative targeted contributions to global environmental benefits (measured through core indicators) reasonable and achievable? Or for adaptation benefits?	
Comment: *The data and the calculation need to be checked and revised. In Annex D on page 34, please site the data sources and justify the following assumptions: ?In phosphate rock mining in China the average energy consumption per ton of raw phosrock is 1.94 kgce (kilograms of standard coal), while that in the beneficiation process is 7.93 kgce. The project envisions an energy saving rate of 15% in the mining process and 10% in the beneficiation process. Additionally, the improvement of mining efficiency (including improving mine recovery rate, mining dilution rate, and beneficiation recovery rate) can achieve a reduction of 0.987 kgce per ton of output. The envisioned low carbon mining demo under the proposed project is expected to process about 10 million tons (Mt) per year of phosrock. For that production rate, the estimated energy saving in phosphate mining would be about.?* **Response**: The project proponents have added data sources in Annex E. For the component 1 ?low carbon phosphate rock mining and refining?, the current energy consumption data were obtained from the average specific energy consumption in major phosphate mines in southwest China. The 15% and 10% reduction rate data are the level best estimates from various assessments done by the PCI from the application of potential of technology improvements. The total demo scale is 10 Mt per year in phosrock mining.	PIF: Annex E.

Comment:
*The main body of the PIF does not present any information on forest recover. Why and how the project can claim GHG reduction from afforestation? This comment is for the second last paragraph of the PIF: ?In addition, ecological restoration of phosphate mines can achieve 1,000 hectares of afforestation. It is estimated that 1 hectare of forest trees can achieve carbon sequestration of 1.01 tCO_2 per day, and the conversion coefficient of carbon sequestration efficiency within five years of non-adult forest trees is 60%. It is estimated that for an ecological restoration that will be facilitated by the project, the potential carbon sequestration would be about: 0.22 $MtCO_2$/yr. ? (1000 ha. ? 1.01 tCO_2/(ha. * d) ? 60% = 0.22 $MtCO_{2e}$/yr.? What is 0.22 $MtCO_2$/yr. at the beginning of the above formula? The formula does not make any sense! In this planet, nobody can find any forest that can sequestrate 1.01 tons of CO_2 per ha in each or per day! Please revise the PIF and add information on afforestation and hire an expert in forest and climate change to recalculate carbon sequestration. Please rewrite the whole section of GHG emission estimation!*

Response:
The restoration of old depleted phosrock mines is not part of the proposed project. The mention in the original PIF of such activity in conjunction with afforestation is primarily for stating that GHG emission reductions (i.e., carbon sequestration) from of such activity are regarded as indirect/consequential. The relevant statements have been modified to clarify that while such activity will result in indirect GHG emission reductions, it is not part and parcel of the proposed project. However, as part of the sustainable development of the PCI value chain, the mine site restoration efforts will be carried out in a separate project using government funds.

7. Is there potential for innovation, sustainability and scaling up in this project?

Comment: *In the section of **1a.7: Innovation, sustainability, and potential for scaling up,** please use quantitative data to justify the arguments. For example, for Innovation, please elaborate how much energy will be reduced per ton of outputs in each of selected demonstration sites at mining, industry and facilities, and how much carbon intensity will be reduced in the phosphate production industry in China due to the innovative technology application and policy advancement by the project. Similarly, use quantitative information to justify sustainability and scaling up.*	
Response: The energy savings that are expected from the activities and demonstrations that will be carried out under the proposed project are based on observed improvements in the specific energy consumption in the various operations and processes in the PCI in China and to some extent from the same industry in other countries that are endowed with phosphate mineral resources. The details of the energy saving, and GHG emission reduction calculations are shown in Annex E. The innovative technology applications in the PCI that will be promoted and facilitated under the proposed project are estimated to bring about improvements in the specific energy consumption (SEC) in the various sub-sectors of the PCI. For example, about 15% and 10% reduction in the specific energy consumption in the phosrock mining, and phosrock refining/beneficiation, respectively. The proper application of these technologies will also reduce the overall SEC in phosrock mining and refining operations (e.g., improved mine recovery rate, mining dilution rate, and beneficiation recovery rate) to 0.987 kgce per ton phosrock. As shown in Annex E, for a demo capacity of 10 million tons/year phosrock, the total energy savings would be = 20,710 tce/year, and the corresponding total GHG emission reduction is 54,260 tCO_2/year. With the same strategy, green, energy efficient low carbon technology applications in phosphate chemicals production will result in a reduction in the overall SEC by 5%. At a demo capacity of 18.2 million tons/year, this translates to a total energy savings of $1.34x10_{10}$ MJ/year and a corresponding GHG emission reduction of about 1.2 million tCO_2/year. Please refer to Annex E for the potential energy savings and corresponding GHG emission reductions in the implementation of innovative circular economy technology applications in the management and utilization of the mining and refining wastes, and phosphate chemicals production by-product wastes from the PCI In regards the sustainability of the interventions and enabling environment that the proposed project is envisioned to create, estimates based on the number of companies in the PCI, it is estimated that the replication of the demos that will be implemented under the proposed project is in the order of 3 to 4 per demo. In the regards potential scale-up, in the case of the energy efficiency and environmental footprint improvements in the phosrock mining and refining operations of the PCI and considering the number and production capacities of the big phosrock mining companies, the planned demo capacity in this proposed project can potentially be scaled up 5 times. In that case, the PCI in China can potentially be among the significant contributors to the achievement of the country?s NDC targets.	PIF: Part II, Sec. 1a.7
Is there a preliminary geo-reference to the project?s/program?s intended location?	

Comment: *Not completed at this time. There is a map in the PIF, but there is not any description on whether the selected project area in Yunnan has territory disputation with China's neighboring countries. Please address the issue in the PIF.* **Response**: The identified project sites in Yunnan Province are far from the China-Myanmar border. As far as the project proponents know, there is known territorial dispute in that province. Note that Myanmar and China are currently working together on development initiatives under the Belt & Road Initiative.	PIF: Annex A
Does the PIF/PFD include indicative information on Stakeholders engagement to date? If not, is the justification provided appropriate? Does the PIF/PFD include information about the proposed means of future engagement?	
Comment: *On pages 20-21, please elaborate the roles of project stakeholders to match the outputs of the project in Table A. For example, which organization or project stakeholders will execute the sub-components of capital investments for technology demonstrations. Please be aware that* ***approval of the PIF does not imply that the GEF Implementing Agency will execute the Project. The UNDP cannot be an executing agency in the project****. There must be specific project stakeholders to execute the project.* **Response**: As far as the project proponents know, and as they have presented in the original PIF, is that for stakeholder engagement, the requirement is to present the respective roles of the stakeholders in the project preparation, not in project implementation. Please refer to the table in Part II, Sec. 2 that now shows the project outputs that each stakeholder will help design the project activities. Note that it is also most likely that some of the stakeholders will also be involved in the implementation of the activities that they assisted in the design. It is the clear understanding of the UNDP that it being the GEF Agency for this project is mainly responsible for the project development and approval/endorsement. Later, in regards project implementation, it is clear to the project proponents that UNDP?s role is limited to project oversight, seeing to it that actions carried out by the project?s designated implementing partner and other responsible parties in regards their management and execution of the project are as per the signed project document, aligned to the country program, and do not contravene the principles of the financial regulations and rules of UNDP and GEF. To emphasize, UNDP has no role in the execution of any project activity nor any project management task. Its role is limited to overseeing the project implementation on behalf of the GEF.	PIF: Part II, Sec. 2
Comment: *Please elaborate whether this project will benefit or impact any Indigenous or minority Peoples and Local Communities in the mining areas. If so, please show evidence that they have been consulted with the project impacts. Please indicate which stakeholders will be affected by the project on ground and how they have been consulted.* **Response**: There are some minorities living in the mining areas, and some are living near the planned demo sites. According to the project proponents (MIIT and MNR), the local governments that cover the planned project sites have contacted the local people in each of these areas, including people that belong to minority groups. The planned project has been promoted to these people as something that will bring substantial benefits to the citizenry inasmuch as the project will significantly contribute to the sustainable development of the local economy and improve/conserve the national environment. The expressed interest and support of the local residents are among the motivations to the project proponents to proceed with the development of the proposed project.	Part II, Sec. 2, Footnote 9.

Comment: *Ensure that the PIF include information about the future roles of stakeholders and proposed means of future engagement. Please check if the future roles of stakeholders have been identified. Please demonstrate how the project keeps engaging stakeholders through adequate means. Please elaborate any difficulties or barriers in stakeholder?s engagement due to COVID-19 and provide measures to deal with them. Please see more comments on COVID-19 issues at the end of this review sheet.*	
Response: The project proponents have consulted the relevant and potential stakeholders for the project prior to the development of the project concept, i.e., original PIF. These initial stakeholder consultations has led to the delineation of the roles of each stakeholder in the project design as presented in the table in Part II, Sec. 2 of the PIF. The stakeholders will be engaged during the project planning and design phase through in-person consultation meetings and virtual communication means. The private sector and related government agencies have provided inputs to the development of the PIF and feedbacks to queries from UNDP. Experts in the PCI that were consulted by the project proponents have also provided technical information for the project design. The COVID-19 situation has posed certain difficulties on stakeholder engagement by preventing free travel across provincial and municipal jurisdictions and thus in-person communication. If the pandemic will persists, virtual communication tools will be used to ensure timely and proper stakeholder inputs in the future stages of project planning and implementation. The future engagement of the stakeholders is more or less ensured inasmuch as almost all of them will be involved in the project implementation, particularly the project proponents (MIIT and MNR) and the private sector entities (i.e., PCI companies). In particular, the PCI companies will be involved in the project implementation since the main target beneficiary is the local PCI in the provinces that will be involved in this project. This would naturally ensure constant engagement with them from design, implementation, and completion of the project. To formalize this, a Stakeholders Engagement Plan (SEP) will be prepared during project design and development (PPG) stage. A stakeholder analysis will be carried out to identify further all the relevant stakeholders of the project that will be engaged as partners to deliver specific outputs of the project and collectively with their outputs bring about the project outcomes. The main output of the analysis is the SEP. In such plan, the roles and responsibilities of the pertinent stakeholders are identified, including their perception of likely benefits, risks and impacts of the proposed project. This is also to assess how to mitigate risks on stakeholders as a result of the implementation of the project.	PIF: Part II, Sec. 2
Is the articulation of gender context and indicative information on the importance and need to promote gender equality and the empowerment of women, adequate?	

Comment:
The description on gender issues on pages 21-22 is too general. Please elaborate preliminary issues or findings on gender-specific context of the project, describes plans to address gender issues during the project development phase. For example, please show any planned gender responsive measures/activities to address gender gaps and promote gender equality and women's empowerment that is related to the project.

Response:
The project will be guided by principles of gender equality and women?s empowerment. Women are involved in both the management and technical departments of the national and local government agencies/institutions and play major roles in the top-level decision-making and strategic design process. On the ground level, the implementation of the proposed project will promote the welfare of, and offer equal opportunities to, both men and women, but particularly women in the areas where the project will be implemented. Firstly, implementation of this project will improve the technical level and reduce the intensity of labor in the PCI, which will in turn improve the work environment, job adaptability and enhanced chances of job advancement for women who are in some form or another involved in the PCI. Education and professional training opportunities that the proposed project will provide to PCI employees will contribute to improving women?s professional competitiveness in the workplace and expand women?s scope of employment in the underdeveloped and agriculture-based regions of the country, some of which include the planned demo sites of the proposed project. Secondly, the implementation of this project will directly improve the quality of local ecological environment and indirectly improve women's and children's health. Thirdly, the implementation of this project will help ensure agriculture and food security through the reduction of rural pollution, and thus reduce the risk in women?s major source of income in these regions.

PIF: Part II, Sec. 3

During the project design and development (PPG) stage an assessment will be carried out to determine how the project will facilitate gender equity in the PCI with the implementation of green, energy efficient low carbon technologies in all aspects of the day-to-day operations and processes in the industry. Considering the limited information regarding the current gender equity context in China?s PCI that are currently available to the project proponents, the following indicative gender actions are recommended to reduce some of the existing inequalities and comply with national and international gender regulations and best practices. Details of these indicative recommended actions, as well as others that will be identified later, will be determined during the project design and development stage.

? Ensure that the project will be guided by principles of gender equality and women?s empowerment. Women are involved in both the management and technical departments of the China?s government agencies/institutions and play major roles in the top-level decision-making and strategic design process.

? Ensure the proposed policies, regulations, standards on the application of green, energy efficient, low carbon technologies in the PCI are gender responsive;

? Complete the gender action plan and ensure that it is implemented thoroughly;

? Ensure gender equity is included as a criterion for providing/distribution of goods and services to communities in the project sites;

? Strengthen existing governance structures that promote gender equality and leadership in local governance structures in the PCI to support project implementation;

? Encourage information exchange and learning for men, women, and youths in the communities where the phosrock mines and phosphate refining and phosphate chemicals production facilities are situated to promote green, energy efficient and low carbon practices to other communities;

? Gender disaggregated data is collected during trainings, workshops, discussions, interviews, or focus group interaction;

? Consult both men and women during baseline data assessments, mid-term evaluations and terminal evaluations in the project sites;

? Ensure both men and women access information sharing sessions e.g. individuals with

Is the case made for private sector engagement consistent with the proposed approach?	
Comment: *As indicated in the box of co-financing, please further engage the private sector to enlarge co-financing amounts for the project (pages 22-23).* **Response**: Before PPG Stage The project co-financing ratio has already been increased to 1:10 by involving more PCI companies. The project will include large number of private enterprises from the four project provinces, including Yunnan Haoming Fine Phosphorus Chemical Co., Ltd., Yunnan Haokun Phosphorus Chemical Co., Ltd., and Yunnan Xuanwei Phosphorus Power Co., Ltd. In Yunnan province; Weng'an Xingnong Phosphorus Chemical Co. Ltd., Guizhou Yuedu Chemical Co., Ltd. and Guizhou Batian Ecological Engineering Co., Ltd. in Guizhou province; Hubei Xiangyun (Group) Chemical Co., Ltd., Hubei Huangmailing Phosphorus Chemical Co., Ltd., Xiangyang Zedong Chemical Group Co., Ltd. in Hubei province; Sichuan Hongda (Group) Co., Ltd., Sichuan Blue Ocean Chemical (Group) Co., Ltd., and Sichuan Hanyuan Chemical General Factory in Sichuan province. MOF and the project proponents (MIIT and MNR) will work with provincial governments to coordinate fund matching from local enterprises and ensure the required financial capacity from the private sector be met. After PPG Stage The project co-financing ratio is 1:10.46 made possible by the involvement of PCI companies that host the planned demos. The private sector co-financing accounts for 79.5% of the total co-financing. During the project design stage, the list of the demonstration hosts was finalized. Most of the initially identified PCI companies have been changed. The final list of host demonstration companies include the following: Guizhou Wengfu Group; Leibo County Huarui Mining Company; Mabian Fuma Phosphate Company; Sichuan Mabian Tianrui Mining Company; Guizhou Kailin Mining and Fertilizer Co., Ltd.; Sichuan Lomom Phosphorus Chemical Co., Ltd.; Hubei Xiangyun (Group) Chemical Co., Ltd.; Yunnan Phosphate Group; Yunnan Xiangfeng Industrial Group Co., Ltd.; and Zhonglicheng Industry Co., Ltd. These participating PCI companies have each issued co-financing commitment letter to the PhosChemEE Project, particularly to the demo activities that each of them are hosting.	PIF: Part I, Secs A & C CERDoc: Part I, Secs A & C
Does the project/program consider potential major risks, including the consequences of climate change, that might prevent the project objectives from being achieved or may be resulting from project/program implementation, and propose measures that address these risks to be further developed during the project design?	
Comment: *Please consider any risk and measures to deal with the risk that the co-financing from the private sector may not be available.* **Response**: This risk is already covered in the PIF, particularly in the following risks: (1) Allocated funds cannot support project implementation in time and in full; and (2) Availability of co-financing is delayed and negatively affects the implementation of the project activities. Appropriate preventive and alleviative mitigation measures were also provided for each risk. These are rated low to medium. Based on the response to the previous comment, the risk of co-financing from the private sector not materializing is rated low. With the large pool of potential private sector participants is considered minimal. Any remaining risk would be mitigated by public funding from the local governments where the project activities will be carried out.	PIF: Part II, Sec. 5

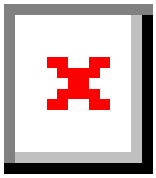
Comment: *Please consider any risks and measures to deal with the risks that are caused by COVID-19 and post-COVID-19. These risks include (1) availability of Technical Expertise and Capacity and Changes in Timelines in the selected provinces; and (2) any expected financing from the government and co-financing from all stakeholders. Please also see the list of activities to be undertaken to deal with COVID-19 that are attached in the last question/comments of the review sheet.* **Response**: China has developed a rather effective institutional system to address the pandemic situation in a timely manner. The initial COVID-19 outbreak did not pose a substantial risk on the project since the project planning phase was mostly carried out through virtual stakeholder engagement, and where only possible and feasible direct in-person consultations with project partners in the private sector. If the pandemic will persists during the project implementation phase, it is possible that the pandemic could cause problems in the installation of the demonstration facilities by halting work and disrupting the movement of personnel and materials. However, other implementation areas such as policy-making and educational programs could still be carried out with the help of virtual means. Contingency plans for project implementation will be prepared to counter serious impediments from future outbreaks, and proper financial, technical, and medical assistance would be made available by the provincial and state institutions in the project provinces to ensure safe operation of project personnel in the partner agencies/institutions and in the demonstration facilities. Please see Annex F of the revised PIF for more detailed Covid-19 risk assessments and how will these be addressed by the project.	PIF: Part II, Sec. 5 Annex F.
Comment: *Since the project is related to mining in forested area, please elaborate how the project will help protect and restore natural systems and their ecological functionality. How the agency will minimize the risk of damaging the existing eco-system.* **Response**: The planned phosphate mining and refining demos will be implemented in mines whose operations have already been approved by the government as compliant with current environmental regulations. The favorable results of the environmental assessments of these mines enable these to be in operation. The environmental assessments were done under the auspices of the Chinese Government?s ?Green Mine? Project. One of the core objectives of that project is to minimize the disturbance of natural environment during mining operations with the requirements for compliance with specific measures such as enclosed mining area, waste water recycling, solid waste utilization and/or dry piling, and ecological restoration. The planned technology application demos on the mining and refining of phosrock and the proper management of the mining/refining and phosphate chemical production by-product wastes in the identified ?Green Mine? phosrock mines will be designed in such a way to maintain the various environmental protection features that these mines have already put in place, and where possible, include improved incremental features that can be showcased as part of the planned demos.	PIF: Part II, Sec. 5, Footnote 13.

Comment: *Please elaborate how to decrease the risk of human and nature conflicts in such a mining project that is related to landscapes and land use.* **Response**: As in the response to the previous comment, the planned activities, particularly the technology application demos on the mining and refining of phosrock and the proper management of the mining/refining and phosphate chemical production by-product wastes will be carried out in PCI companies with mines that have been designated as ?Green Mine? phosrock mines. Such mines are considered compliant to the environmental protection requirements for minimizing the disturbance of natural environment during mining and refining operations, which most likely includes actions to minimize risks of human and nature conflicts in such operations that is related to landscapes and land use. In that case, the demos will be designed in such a way that the various environmental protection features that these mines have already put in place are fully maintained and sustained.	PIF: Part II, Sec. 5, Footnote 13.
Is the institutional arrangement for project/program coordination including management, monitoring and evaluation outlined? Is there a description of possible coordination with relevant GEF-financed projects/programs and other bilateral/multilateral initiatives in the project/program area?	

Comment:
Please use a diagram to present the institutional structure with major stakeholders of the project in different provinces including monitoring and evaluation coordination at the project level. Please describe possible coordination with other relevant GEF-financed projects and other similar initiatives that are financed by other institutions.

Response:

PIF: Annex G.



The above diagram presents the indicative institutional arrangement among the project stakeholders for the project implementation, with the UNDP providing oversight/guidance in the project implementation as part of its GEF Agency responsibility. There will be a separate overall project management structure that involves a project steering committee, and this will be designed during the project design and development stage.

This project development work will be coordinated with, and possibly learn from the applied strategies in the implementation of activities of, ongoing GEF-funded EE projects in China. The project development work can also learn from the results, experiences, and lessons learnt from the implementation of these EE projects. These include the following UNDP-GEF projects:

PIF: Part II, Sec. 6

? *Promoting Energy Efficient Electric Motors in Chinese Industries (PREMCI)*

? *Greening the Logistics Industry in Zhejiang Province (GLIZP)*

? *Enabling Solid State Lighting Market Transformation & Promotion of Light Emitting Diode (LED) Lighting*

? *Energy Efficiency Improvement in Public Sector Buildings in China*

The project proponents will also coordinate with the project development team that is currently working on the design and development of another UNDP-GEF RE/EE project in China, which is the Enabling Zero Carbon Energy in Rural Towns and Villages in China (EZCERTV) Project. This project also include the design, development, and implementation of green, energy efficient low carbon energy technologies in selected rural towns and villages in a number of provinces in China.

Has the project/program cited alignment with any of the recipient country?s national strategies and plans or reports and assessments under relevant conventions?

Comment: *Please elaborate how this project is aligned with China's NDCs to Paris agreement; how this project will contribute China's Net-Zero-Carbon Strategy by 2060 that was recently announced by Mr. Xi Jing Ping, the president of China.* **Response**: The PCI in China is an important part of the country?s industry sector. The goal of this project is the reduction of GHG emissions from the PCI. The planned direct interventions from the project itself is expected to bring about 35.96 million tons direct CO_2 emission reduction. The sustained promotion and replication/scale-up of the project demonstrations after the end of the project are expected to further bring about more substantial GHG emission reduction. All these will be an important contribution to the achievement of China's committed GHG emission reduction targets to the Paris Agreement and its carbon neutrality target by 2060. This project would contribute to the achievement of China?s nationally determined contributions (NDCs) set out in the Paris Agreement at an earlier date and China?s 2060 Net-Zero-Carbon goal through the promotion an integrated region-wide energy conservation, green and low carbon development of the country?s PCI. Apart from the GHG emission reductions from the implementation and replication of the demonstrations, the enabling frameworks (e.g., policies/regulations/incentives) and conditions that the project will establish and operationalize, and the technical and institutional capacity that will be enabled will facilitate further development and application of green, energy efficient low carbon technologies and practices in the PCI, and potential influence also the other industry sectors with significant carbon and environmental footprints to follow suit.	PIF: Part II, Sec. 7
Is the proposed ?knowledge management (KM) approach? in line with GEF requirements to foster learning and sharing from relevant projects/programs, initiatives, and evaluations; and contribute to the project?s/program?s overall impact and sustainability?	
Comment: *Not at this time. Please address the issues below: (a) Lack of an overview of existing lessons and best practice that inform the project concept; (b) Lack of time-linked plans to learn from relevant projects, programs, initiatives & evaluations; (c) Lack of description of processes to capture, assess and document information, lessons, best practice & expertise generated during project implementation; (d) Lack of elaboration of description on how to develop a sound GHG accounting tool and methods that will be used for this project and other scaling -up projects in the future in China; (e) Lack of plan to develop knowledge exchange, learning & collaboration among different provinces that have been selected for technology demonstrations. Please consider knowledge platforms and websites; and (f) Lack of long term plans for strategic communications and knowledge sharing all over China.* **Response**: The description of the indicative knowledge management approach and plan for the proposed project is presented in Annex I of the revised PIF.	PIF: Annex I
Are environmental and social risks, impacts and management measures adequately documented at this stage and consistent with requirements set out in SD/PL/03?	

Comment: *The issue of Environmental and Social Safeguard (ESS) has not been addressed. While doing the ESS homework, please: (1) 1. Ensure that the PIF has provided the preliminary overall risk categorization (High/Substantial, Moderate/Medium, Low). Please check for appropriate justification. (2) Confirm that the PIF includes information on any measures to address ESS related risks and impacts during project design and implementation. (3) Please upload any available screening/assessment reports such as preliminary Environmental and Social Risk and Impact Assessment report(s).* **Response**: The project proponents have prepared and submitted the UNDP Social and Environmental Screening Assessment (SESP) document, which includes the information asked in the comment. The SESP is the preliminary evaluation of the identified potential social and environment risks of the project, and this was uploaded to the GEF Portal on 28 September 2020 along with the PIF. A total of 8 risks were identified and each of these were assessed. Most of these were rated high, and the overall risk rating is high. The identified potential risks are adequately explained and the corresponding social and environmental management measures that are required to address each risk have been provided. Because of the high risk rating for this project, there will be more detailed social and environmental assessments that will be required during the project design and development stage. An environmental and social management plan (ESMP) will be prepared, particularly for the planned demos. The ESMP will be implemented during the project implementation stage. The SESP will be uploaded once more in the GEF Portal during the submission of the revised PIF and this Response Matrix document.	SESP ? submitted to GEF Portal on 28 Sep 2020
Comment: *Please consider social measures to deal with the impact of COVID-19 at local communities where the mining activities are conducted.* **Response**: China has developed a relatively effective institutional system to address the Covid-19 pandemic in a timely manner taking into consideration potential socio-economic impacts. The initial COVID-19 outbreak did not pose a substantial risk on the project since the project planning phase was mostly carried out through virtual stakeholder engagement, and where only possible and feasible direct in-person consultations with project partners in the private sector. Care will be taken in the implementation of the project especially when the pandemic persists to ensure that hardware installation works that are involved in the demo activities in phosrock mining and refining, phosphate chemicals production, and waste management will be done safely at the demo sites with the health, safety, and welfare of the people in the demo sites and within local communities in mind. If effective vaccination will not yet be publicly available during the project implementation stage, public health measures will be taken as is currently being done in China to ensure safety of the project participants and beneficiaries. If the pandemic persists during the project implementation phase, the project activities that will not involve on-the-ground work will be prioritized and implemented with the help of virtual means. The scheduling of, and action planning for, the hardware-related activities will be reviewed regularly by keeping abreast with the status of the pandemic and the public health situation in the country, in general, and particularly in the project demo sites.	
Part III ? Country Endorsements	
Has the project/program been endorsed by the country?s GEF Operational Focal Point and has the name and position been checked against the GEF data base?	

Comment: *The LoE will be available in the week of October 9, 2020, per the communication between the GEF and the MOF of China on September 27, 2020.* **Response**: The signed Letter of Endorsement from China?s National GEF Operational Focal Point has been uploaded to the GEF Portal on 15 October 2020.	
GEFSEC DECISION RECOMMENDATION	
Is the PIF/PFD recommended for technical clearance? Is the PPG (if requested) being recommended for clearance?	
Comment: *Not at this time. Please address the comments above boxes. In addition, please write one more section to address COVID-19 related risks, issues, and measures. These include: (1) Availability of Technical Expertise and Capacity and Changes in Timelines; (2) Stakeholder Engagement Process; (3) Enabling Environment; (4) Financing/Co-financing; and (5) Future Risks of Similar Crises* **Response**: The project proponents believe that all of the review comments have been adequately addressed. The additional section on addressing risks, issues and measures is presented in Annex X of the revised PIF.	

Comment:
Please also indicate whether and how the project can: (1) help in reducing the risk of emerging infectious diseases in the future, while increasing the resilience of the ecologic and socio-economy systems; (2) do more to protect and restore natural systems and their ecological functionality; (3) decrease the risk of human/nature conflicts that are related to production landscapes and land use practices; (4) promote circular solutions to reduce unsustainable resource extraction and environmental degradation; and, (5) promote innovation in in engaging with the private sector in climate change mitigation.

Response:
(1) The project will facilitate the realization of improved economic benefits for the PCI companies, and increase the income of local residents that are employed in the PCI. In view of the strategies and actions that will be carried out under the project during the time of a pandemic, there will be both direct and indirect benefits in terms of improved health and sanitation to the project participants and beneficiaries, including enhanced support capacity of the public health system, and improved people?s awareness of diseases and disease control, actions to take to reduce the risk of spreading infectious diseases, and treatment of diseases. The technological improvements that will be implemented and facilitated by the upgrade will contribute to the improvement of the working conditions and environment in the phosrock mines, improve the economic benefits of enterprises and improve the conservation of the natural environment (land, water, and air) in locations where PCI companies operate. In line with this, the project will reduce the risk of spreading water-borne infectious diseases by helping in the restoration of the ecological health of Yangtze River?s main streams and upstream tributary areas and to develop economic resiliency of the local communities in the project sites.

(2) The project will be designed and implemented in line with the ecological protection objectives of the GOC?s ?Green Mine? Project. In line with its objective of enabling the extensive application of low carbon and energy efficient technologies in the PCI, the project will minimize the impact of phosrock mining development and operation on the environment through measures such as technological upgrading to enable more energy efficient operations and avoiding accumulation of mining and phosphate chemical production wastes. The project will showcase restoration of the ecological environment primarily through the recycling and reuse of phosphogypsum stock and the reduction of soil and water pollution caused by stacked phosphogypsum, and secondarily through the reduction of phosphorus chemical production-related pollution and carbon emission.

(3) The project will decrease the risk of human/nature conflicts by engaging local community in project planning phase and creating ecological and economic benefits for the local community through project implementation. The utilization of mine waste includes making sand and gravel aggregate from waste rock and making biological phosphate fertilizer from tailings, etc. The above reuse can reduce the impact of traditional resource development on the environment. Moreover, by ensuring that project activities are compliant with the environmental requirements for ?Green Mines? and the maintain/sustain the environmental protection features that are already in place in the demo mines, any potential human/nature conflicts will be avoided in the implementation of the project activities.

(4) Waste utilization is an important aspect of circular economy. The implementation of the project will promote 100% recycling of process water and waste reuse, reduce the direct impact of mine development on the environment, and reduce the impact of other resource development on the environment by replacing production capacity; and the project will promote circular solutions to reduce unsustainable resource extraction and environmental degradation by designing and implementing a policy mechanism that facilitate clean and low-carbon transformation of the whole industrial chain.

(5) The proposed project is envisioned to be comprised of activities on the application of innovative solutions in PCI enterprises. This is to not only show to the private sector the benefits of implementing green, energy efficient low carbon technologies that will not only

[1] These include the approved and financed follow-up plans for the replication/scale-up of the application of demonstrated green, energy efficient low carbon technologies in: (a) phosrock mining and refining (Output 1.2.3.); (b) phosphate chemicals production (Output 2.2.5); and (c) in the phosphate chemicals industry (Output 3.2.3), in other Chinese provinces.

[2] Reta et al., 2018. Environmental impact of phosphate mining and beneficiation: review. http://medcraveonline.com/IJH/IJH-02-00106.pdf; Yang et al., 2014. Environmental impacts caused by phosphate mining and ecological restoration: a case history in Kunming, China. https://link.springer.com/article/10.1007/s11069-014-1212-6.

[3] Greening the global phosphorus cycle: https://pubs.rsc.org/en/content/articlelanding/2015/gc/c4gc02445a#!divAbstract; Meshalkin, V., Bobkov, V., Dli, M., & Dov?, V. (2019). Optimization of Energy and Resource Efficiency in a Multistage Drying Process of Phosphate Pellets. Energies, 12(17), 3376. https://doi.org/10.3390/en12173376

[4] Ali, S. and Katima, J. 2020. Technology Critical Elements and their Relevance to the Global Environment Facility. A STAP Background Document. Scientific and Technical Advisory Panel to the Global Environment Facility. Washington, DC.

[5] Zhang, 2014. https://www.sciencedirect.com/science/article/pii/S1877705814011035

[6] Zhao et al., 2020: https://www.mdpi.com/2071-1050/12/7/2991/pdf

[7] Chen et al., 2015: The Phosphorus Flow in China: A Revisit from the Perspective of Production. http://www.airies.or.jp/attach.php/6a6f75726e616c5f476c6f62616c456e7669726f6e6d656e74616c5265736617263685f4d696c736463354c/save/0/0/19_1-4.pdf.

[8] https://stapgef.org/theory-change-primer

[9] Integration: to solve complex environmental problems: https://stapgef.org/integration-solve-complex-environmental-problems
STAP, 2020. Delivering Multiple Benefits through the Sound Management of Chemicals and Waste. Background report https://stapgef.org/publications
Achieving enduring outcomes from GEF investment: https://stapgef.org/achieving-enduring-outcomes-gef-investment
Multi-stakeholder dialogue: https://stapgef.org/multi-stakeholder-dialogue

[10] https://www.epa.gov/newsreleases/epa-approves-use-phosphogypsum-road-construction

[11] These special funds for energy efficiency and GHG emission reductions are within the Central Government Funds, e.g., special funds for circular economic development, Fiscal Reward Funds for Energy Saving Technology Improvement, Fiscal Reward Funds for EPC Projects, Financial subsidy funds for the promotion of energy-efficient products, etc. All of these funds are set up by the MOF together with some ministries, such as NDRC, mandated by relevant laws, e.g., Circular Economy Promotion Act, Law on Energy Conservation. Provincial governments also set up corresponding Provincial Special Funds.

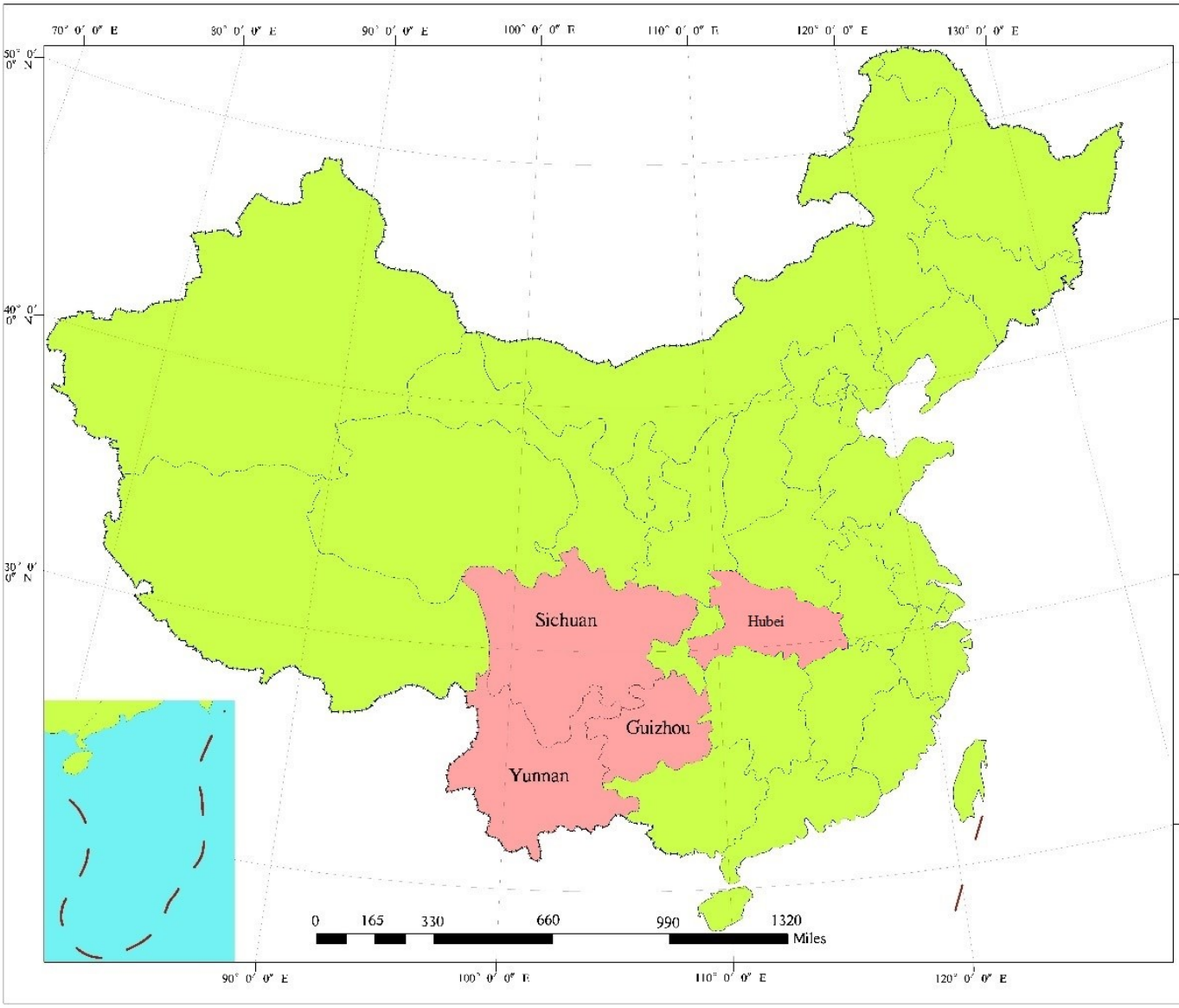
ANNEX C: Status of Utilization of Project Preparation Grant (PPG). (Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: US$ 200,000			
Project Preparation Activities	***GETF/LDCF/SCCF Amount ($)***		
	Budgeted Amount (US$)	***Amount Spent To date (US$)***	***Amount Committed (US$)***
Design and development of the UNDP-GEF project: Facilitating Cleaner and Energy Efficient Phosphate Chemicals Industry in China (PhosChemEE) Project			
International lead consultant	38,000	18,900	19,100
11 national consultants	95,000	76,795	18,205
Workshops	49,000	48,710	290
Travel	15,000	8,000	7,000
Office supplies	3,000	1,900	1,100
Total	**200,000**	**154,305**	45,695

ANNEX D: Project Map(s) and Coordinates

Please attach the geographical location of the project area, if possible.

Map of the Project Sites:



Project Site	Geographical Coordinates
Fuquan City, Guizhou	107?31?E,26?38?N
Leibo County, Sichuan	103?34?E,28?16?N
Mabian County, Sichuan	103?32?E,28?50?N
Mabian County, Sichuan	103?29'E ,28?42?N
Jinzhong Town, Kaiyang County, Guiyang City	106?86 'E 27?19' N
Mianzhu City, Sichuan	104?19'E 31?22'N
Pantang, Wuxue, Huanggang City, Hubei	115?47'E 29?88'N
Jinning District, Kunming City, Yunnan	102?36?E,24?40?N
Anning City, Yunnan	102?36'E 24?96'N
Panzhihua City, Sichuan	101?73' E 26?56' N

ANNEX E: Project Budget Table

Please attach a project budget table.

NOTES:

1. Implementing Partner (Executing Agency) - Ministry of Industry and Information Technology (MIIT)

2. Responsible Partner - Ministry of Natural Resources (MNR)

Expenditure Category	Detailed Description	Component (USDeq.)				M&E	PMC	Total (USD eq.)	Responsible Entity (Executing Entity receiving funds from the GEF Agency)[1]
		Component 1	*Component 2*	*Component 3*	*Sub-Total*				
1. Equipment/Furniture	Information Tech. Equipment: USD 10,500 (for related activities under component 1)	10,500			10,500			10,500	MNR (thru MIIT)
2. Equipment/Furniture	Information Tech. Equipment: USD 15,200 (for activities related to Component 2)		15,200		15,200			15,200	MIIT
3. Equipment/Furniture	Information Tech. Equipment: USD 5,000 (for office equipment.)						5,000	5,000	MIIT

4. Equipment/Furniture	Equipment and Furniture: USD 1,900,100: USD 1,166,700 for Activity 1.2.2.1 (Implementation and operation of demos on energy efficient technology of mining in Weng?an, Guizhou province and Leibo, Sichuan province.) USD 733,400 for Activity 1.2.2.2 (Implementation and operation of demos on green and low-carbon utilization technology and equipment in phosphate rock beneficiation in Mabian, Sichuan Province.)	1,900,100			1,900,100			1,900,100	MNR (thru MIIT)
5. Equipment/Furniture	Equipment and Furniture: USD 2,076,156: For Activity 2.2.2.1 (Implementation and operation of demonstrations on energy savings and green and low-carbon development in phosphate chemicals production.)		2,076,156		2,076,156			2,076,156	MIIT

6. Equipment/Furniture	Equipment and Furniture: USD 800,000: USD 800,000 for Activity 3.2.2.1 (Implementation and operation of demonstrations of green equipment/technologies for the comprehensive utilization of resources in waste management in the phosphate mining and refining sub-sector.)			800,000	800,000			800,000	MNR (thru MIIT)
7. Equipment/Furniture	Equipment and Furniture: USD 961,538: For Activity 3.2.2.2 (Implementation and operation of demonstrations of green equipment/technologies for the comprehensive utilization of resources in waste management in the phosphate chemicals production sub-sector.)			961,538	961,538			961,538	MIIT
8. Contractual services-Individual	USD 6,000/ya *5 (Monitoring all risks USD3,000/ya, Monitoring of stakeholder engagement plan USD 1,500/ya, Monitoring of gender action plan USD 1,500/ya)					30,000		30,000	MIIT
9. Trainings, Workshops, Meetings	USD 30,000 in Year 1 is for inception workshop (M&E)					30,000		30,000	MIIT
10. Contractual services-Individual	1,000/ya*1+11,000 *4 for project management office						45,000	45,000	MIIT

11. Contractual Services ? Company	Contractual Services: USD 188,000: All sub-contract budgets include: national and international experts, travel, meetings, workshops and DSA for the subcontractor to undertake the activities and contribute to the outputs (multiple activities could be conducted by one company): Sub-contract 1 ? USD 40,000: Study domestic and foreign related policies and make policy recommendations.(Activity 1.1.1.1, 1.1.1.2, 1.1.1.3, 1.1.1.7, 1.1.2.1 and 1.1.2.2) Sub-contract 2 ? USD 30,000: Establish and apply standardized methods to assess demonstrated energy consumption and GHG emissions. (Activity 1.1.3.1, 1.1.3.2) Sub-contract 3 ? USD 13,000: Preparation and dissemination of reports. (Activity 1.1.3.6 and 1.1.3.7) Sub-contract 4 ? USD 20,000: Preparation of two capacity-building and two assessment meetings. (Activity 1.1.4.1, 1.1.4.2, 1.1.4.4 and 1.1.5.4) Sub-contract 5 ? USD 50,000: Design and develop PCI energy saving and emission reduction online monitoring and technology sharing system and verify the system	188,000			188,000			188,000	MNR (thru MIIT)

12. Contractual Services ? Company	Contractual Services: USD 480,400: All sub-contract budgets include: national and international experts, travel, meetings, workshops and DSA for the subcontractor to undertake the activities and contribute to the outputs (multiple activities could be conducted by one company): Sub-contract 1 ? USD 85,200: Formulated, recommended, approved, and enforced policy and institutional frameworks supporting green, energy efficient low carbon technology applications in phosphate chemicals production (Activity 2.1.1.1, 2.1.1.2, 2.1.1.4, 2.1.1.5, 2.1.1.6, 2.1.1.9) Sub-contract 2 ? USD 60,000: Formulated, recommended, and enforced standards, policies and implementing rules and regulations on the promotion and practice of green, energy efficient, low carbon technologies/techniques, in phosphate chemicals production. (Activity 2.1.2.1,2.1.2.2 and 2.1.2.4) Sub-contract 3 ? USD 40,000: Documented annual evaluation reports on the energy performance and environmental		480,400		480,400			480,400	MIIT

13. Contractual Services ? Company	Contractual Services: USD 176,982: All sub-contract budgets include: national and international experts, travel, meetings, workshops and DSA for the subcontractor to undertake the activities and contribute to the outputs (multiple activities could be conducted by one company): Sub-contract 1 ? USD 20,000: Formulated, recommended, approved, and enforced policies and institutional frameworks that support green, low carbon initiatives in waste management in the PCI. (Activity 3.1.1.1, 3.1.1.3, 3.1.1.5 and 3.1.1.7) Sub-contract 2 ? USD 16,000: Improved existing and new enforced schemes, standards, policies/regulations on the application of green and low carbon waste management technologies in the PCI operations and processes. (Activity 3.1.2.1, 3.1.2.3, 3.1.2.5 and 3.1.2.7) Sub-contract 3 ? USD 24,000: Documented annual evaluation reports on the energy performance and environmental impacts of each demo based on the MRV system developed under Component 1. (Activity 3.1.3.1,			176,982	176,982			176,982	MNR (thru MIIT)

14. Contractual Services ? Company	Contractual Services: USD 335,000: All sub-contract budgets include: national and international experts, travel, meetings, workshops and DSA for the subcontractor to undertake the activities and contribute to the outputs (multiple activities could be conducted by one company): Sub-contract 1 ? USD 45,000: Formulated, recommended, approved, and enforced policies and institutional frameworks that support green, low carbon initiatives in waste management in the PCI. (Activity 3.1.1.10, 3.1.1.11, 3.1.1.12, 3.1.1.2 and 3.1.1.9). Sub-contract 2 ? USD 40,000: Improved existing and new enforced schemes, standards, policies/regulations on the application of green and low carbon waste management technologies in the PCI operations and processes. (Activity 3.1.2.10, 3.1.2.11, 3.1.2.2, 3.1.2.4 and 3.1.2.9). Sub-contract 3 ? USD 20,000: Documented annual evaluation reports on the energy performance and environmental impacts of each demo based on the MRV system developed under Component 1. (Activity 3.1.3.2,			335,000	335,000			335,000	MIIT

15. International Consultants	International consultants: USD 35,000 (including professional fees, travel expenses and DSA) for 50 working days at USD 700 per working day (multiple activities could be conducted by one consultant): 50 working days in total for activity 1.1.1.2 under Output 1.1.1.	35,000			35,000			35,000	MNR (thru MIIT)
16. International Consultants	International consultants: USD 17,500 (including professional fees, travel expenses and DSA) for 35 working days at USD 500 per working day (multiple activities could be conducted by one consultant): 5 working days for Output 2.1.6 activity 2.1.6.4. 5 working days for Output 2.2.2 activity 2.2.2.3; 5 working days for Output 2.2.3 activity 2.2.3.2; 20 working days for Output 2.2.4, and specifically: 10 days for activity 2.2.4.2; 10 days for activity 2.2.4.3;		17,500		17,500			17,500	MIIT

17. International Consultants	International consultants: USD 22,500 (including professional fees, travel expenses and DSA) for 45 working days at USD 500 per working day (multiple activities could be conducted by one consultant): 10 working days for Output 3.1.1 activity 3.1.1.11. 5 working days for Output 3.1.2 activity 3.1.2.12. 10 working days for Output 3.1.3 activity 3.1.3.2. 10 working days for Output 3.2.2 activity 3.2.2.6.10 working days for Output 3.2.3 activity 3.2.3.8.			22,500	22,500			22,500	MIIT
18. Contractual services- Individual	Contractual services: USD 25,000 for M&E required to report on progress made in reaching Project Log Frame Indicators and GEF Core indicators					25,000		25,000	MNR (thru MIIT)
19. Local Consultants	USD 2,000/ya*5= USD 10,000 (M&E) for Monitoring of social and environmental safeguard screening					10,000		10,000	MNR (thru MIIT)

20. Local Consultants	Local consultants: USD 40,000 (including professional fees, travel expenses and DSA) for 80 working days at USD 500 per working day (multiple activities could be conducted by one consultant): 28 working days for Output 1.1.1, and specifically: 10 days for activity 1.1.1.1; 8 days for activity 1.1.1.3; 4 days for activity 1.1.1.6; 2 days for activity 1.1.1.7; 4 days for activity 1.1.1.10. 24 working days for Output 1.1.2, and specifically: 10 days for activity 1.1.2.1; 10 days for activity 1.1.2.2; 4 days for activity 1.1.2.5; 4 working days for activity 1.1.3.6 under Output 1.1.3. 12 working days for Output 1.1.4, and specifically: 4 days for activity 1.1.4.1; 4 days for activity 1.1.4.3; 4 days for activity 1.1.4.5; 8 working days for Output 1.1.5, and specifically: 4 days for activity 1.1.5.4; 4 days for activity 1.1.5.5; 4 working days for activity 1.1.6.3 under Output 1.1.6.	40,000			40,000			40,000	MNR (thru MIIT)

21. Local Consultants	Local consultants: USD 200,000 (including professional fees, travel expenses and DSA) for 400 working days at USD 500 per working day (multiple activities could be conducted by one consultant): USD 100,000 will be paid to full time local consultants from activity 1.2.2.1's budget; USD 100,000 will be paid to full time local consultants from activity 1.2.2.2's budget	200,000			200,000			200,000	MNR (thru MIIT)

22. Local Consultants	Local consultants: USD 230,000 (including professional fees, travel expenses and DSA) for 920 working days at USD 250 per working day (multiple activities could be conducted by one consultant): 20 working days for Output 2.1.1 activity 2.1.1.2. 10 working days for Output 2.1.6 activity 2.1.6.4; 20 working days for Output 2.2.1 activity 2.2.1.1; 10 working days for output 2.2.2 activity 2.2.2.3; 30 working days for Output 2.2.3; in which 10 working days for activity 2.2.3.2 and 20 working days for activity 2.2.3.3; For Output 2.2.4, USD 100,000 will be paid to full time project manager from activity 2.2.4.1's budget; USD 100,000 will be paid to full time project manager from activity 2.2.4.2's budget; 10 working days for activity 2.2.4.3; 20 working days for Output 2.2.5 activity 2.2.5.5.		230,000		230,000			230,000	MIIT

23. Local Consultants	Local Consultants: USD 25,000 (including professional fees, travel expenses and DSA) for 50 working days at USD 500 per working day (multiple activities could be conducted by one consultant): 19 working days for Output 3.1.1, and specifically: 6 days for activity 3.1.1.1; 5 days for activity 3.1.1.3; 4 days for activity 3.1.1.5; 4 days for activity 3.1.1.8; 15 working days for Output 3.1.2, and specifically: 6 days for activity 3.1.2.1; 5 days for activity 3.1.2.5; 4 days for activity 3.1.2.8; 4 working days for activity 3.3.3.7 under Output 3.1.3. 12 working days for Output 3.1.4, and specifically: 5 days for activity 3.1.4.1; 4 days for activity 3.1.4.3; 4 days for activity 3.1.4.8;			25,000	25,000			25,000	MNR (thru MIIT)

24. Local Consultants	Local consultants: USD 42,500 (including professional fees, travel expenses and DSA) for 170 working days at USD 250 per working day (multiple activities could be conducted by one consultant): 50 working days for Output 3.1.1, in which 10 working days for activity 3.1.1.10; 10 working days for activity 3.1.1.11; 10 working days for activity 3.1.1.4; 20 working days for activity 3.1.1.9. 60 working days for Output 3.1.2, in which 20 working days for activity 3.1.2.10; 10 working days for activity 3.1.2.12; 20 working days for activity 3.1.2.2; 20 working days for activity 3.1.2.4. 20 working days for Output 3.1.3 activity 3.1.3.2. 10 working days for Output 3.1.4 activity 3.1.4.6. 20 working days for Output 3.1.6 activity 3.1.6.4. 10 working days for Output 3.2.3 activity 3.2.3.8.			42,500	42,500			42,500	MIIT

25. Trainings, Workshops, Meetings	Training, Workshops and Confer: USD 5,000/ya*5=25,000 (M&E) for Project Board Meetings) and USD 8,469: for other meetings and conferences for project management office				-	25,000		25,000	MNR (thru MIIT)
26. International Consultants	International consultants: USD 20,000: For mid-term review of the project (M&E)				-	20,000		20,000	UNDP
27. International Consultants	International Consultants: USD 20,000 will be paid in Year 5 for Termination Evaluation (M&E)				-	20,000		20,000	UNDP
28. Local Consultants	USD 20000 For project management						20,000	20,000	MNR (thru MIIT)
29. Local Consultants	USD 6,000/ya *4+11,000*1 =35,000 for project management office.						35,000	35,000	MIIT

30. Trainings, Workshops, Meetings	Training, workshops: USD 62,000: Workshops on related policy approvals (Activities 1.1.1.4, 1.1.1.8 and 1.1.2.3). 6 sessions: USD 2,000*6 = USD 12,000. Capacity-building programs in low-carbon and green phosphorus chemical industry. 3 session: USD 10,000*2 + 2000 = USD 22,000. Policy and project evaluation meetings. 12 session: USD 2,000*12 = USD 24,000. Promotion and implementation of the PCI greenhouse gas emissions accounting and inventory system. 1 session: USD 4,000	62,000			62,000			62,000	MNR (thru MIIT)

31. Trainings, Workshops, Meetings	Training, workshops: Workshops for enhanced adoption by the phosphate chemical industry of a green, low carbon and energy efficient development model in phosphate chemicals production. (Activities 2.1.1.2, 2.1.1.3, 2.1.1.4, 2.1.1.6, 2.1.1.7, 2.1.1.8, 2.1.1.9, 2.1.2.1, 2.1.2.3, 2.1.3.5, 2.1.4.2, 2.1.5.2, 2.1.5.3, 2.1.6.5). 14 sessions: USD 15,000*4 + USD 40,000*2 + USD 5,000*21 + USD 6,000*1 = USD 251,000. Training, workshops: Workshops for enhanced confidence in the feasibility of the application of green, energy efficient low carbon technologies in phosphate chemicals production in China.(Activities 2.2.1.2, 2.2.2.2, 2.2.3.1, 2.2.3.2, 2.2.3.3, 2.2.4.1, 2.2.4.2, 2.2.4.3, 2.2.5.1, 2.2.5.3, 2.2.5.4, 2.2.5.5, 2.2.5.6, 2.2.5.7). 14 sessions: USD 5,000*33 + USD 7,000*2 = USD 179,000. Training, workshops: other related training, workshop, and confer, in total USD 1,000.		431,000		431,000			431,000	MIIT

32. Trainings, Workshops, Meetings	Training, workshops: USD 40,000: Workshops on related policy approvals (Activities 3.1.1.6 and 3.1.1.8). 2 sessions: USD 3,000*2 = USD 6,000. Capacity-building programs in low-carbon and green phosphorus chemical industry. 1 session: USD 2,000*2 = USD 4,000 Policy and project evaluation meetings. 7 session: USD 2,000*4 + 1000*5 = USD 13,000. Promotion and implementation of the PCI greenhouse gas emissions accounting and inventory system. 1 session: USD 2,000 Workshops on development and approve project design, work plan and financing plan.(Activities 3.2.1.2). 1 sessions: USD 5,000 Prepare for ESMF and ESMP meetings. 2 session: USD 2,500*2 = USD 5,000. Conduct capacity building training and evaluate it after one year. 2 session: USD 2,500*2 = USD 5,000.			40,000	40,000			40,000	MNR (thru MIIT)

33. Trainings, Workshops, Meetings	Training, workshops: Workshops for enhanced commitment of, and institutional and technical arrangements for, the phosphate chemical industry in green and low carbon waste management (Activities 3.1.1.2, 3.1.1.4, 3.1.1.9, 3.1.2.12, 3.1.2.2, 3.1.3.2, 3.1.5.8). 7 sessions: USD 5,000*9 = USD 45,000. Training, workshops: Workshop for increased confidence in the feasibility of the application of green and low carbon technologies in the management of waste in the phosphate chemicals Industry in China (Activities 3.2.2.5, 3.2.3.4, 3.2.3.7, 3.2.3.8). 4 sessions: USD 15,000*1 +USD 5,000*8 = USD 55,000. Training, workshops: other related training, workshop, and confer, in total USD 10,000.			110,000	110,000			110,000	MIIT
34. Local Consultants	USD 500/day * 40 = USD 20,000 for mid-term review (M&E)				-	20,000		20,000	UNDP
35. Local Consultants	USD 20,000 will be paid in Year 5 for Termination Evaluation. (M&E)					20,000		20,000	UNDP

36. Trainings, Workshops, Meetings	Training, Workshops and Confer: USD 5,000/ya*5=25,000 (M&E) for Project Board Meetings) and **USD 8,469: for other meetings and conferences for project management office**						8,469	8,469	MNR (thru MIIT)
37. Travel	Travel: USD 55,000: the travel and DSA expenses for 3 PMO officers participating to each of the 6 training sessions (3 sessions for Activity 1.1.4.4 and 3 session for Activity 1.1.5.4) and to the 7 workshops (Activities 1.1.1.6, 1.1.1.10, 1.1.2.5, 1.1.3.3, 1.1.4.3, 1.1.5.6 and 1.1.6.3), and for 8 stakeholders to the same 2 training sessions, and 2 workshops (55 travels at USD 1,000 each), (The other participants to the 3 training sessions and 2 workshops will be connected via videoconference)	55,000			55,000			55,000	MNR (thru MIIT)

38. Travel	Travel: USD 300,000: The travel and DSA expenses for 3 PMO officers participating to each of the 7 national and/or international training sessions for Activity 2.1.4.4 and to the 8 workshops (Activities 2.1.1.1, 2.1.1.7, 2.1.1.8, 2.1.2.3, 2.1.4.1, 2.1.4.2, 2.1.5.1 and 2.1.6.4), and for 15 stakeholders to the same 7 training sessions, and 8 workshops (50 domestic travels at USD 1,000 each and 25 international travels at USD 10,000 each), (The other participants to the 7 training sessions and 8 workshops will be connected via videoconference) Travel: USD 168,000: The travel and DSA expenses for 3 PMO officers participating to the 14 workshops (Activity 2.2.1.1, 2.2.2.3, 2.2.3.1, 2.2.3.2, 2.2.3.3, 2.2.4.1, 2.2.4.2, 2.2.4.3, 2.2.5.1, 2.2.5.2, 2.2.5.3, 2.2.5.4, 2.2.5.5, and 2.2.5.7), (168 domestic travels at USD 1,000 each). Travel: others related travel, in total USD 2,500.		470,500		470,500			470,500	MIIT

39. Travel	Travel: USD 10,000: the travel and DSA expenses for 2 PMO officers participating to each of the 1 training session and the 4 workshops (Activity 3.1.1.8, 3.1.2.8, 3.1.4.8 and 3.1.5.7), (10 travels at USD 1,000 each).			10,000	10,000			10,000	MNR (thru MIIT)

40. Travel	Travel: USD 98,000: The travel and DSA expenses for 2 PMO officers participating to each of the 5 international training sessions for Activity 3.1.4.9 and to the 11 workshops (Activities 3.1.1.10, 3.1.1.11, 3.1.1.2, 3.1.1.4, 3.1.2.10, 3.1.2.12, 3.1.2.2, 3.1.2.4, 3.1.3.4, 3.1.4.6 and 3.1.6.4), and for 16 stakeholders to the same 5 training session, and 11 workshops (78 domestic travels at USD 1,000 each and 2 international travels at USD 10,000 each), (The other participants to the 7 training sessions and 8 workshops will be connected via videoconference) Travel: USD 23,000: The travel and DSA expenses for 1 PMO officers participating to 1 training sessions for Activity 3.2.2.5 and to the 2 workshops (Activities 3.2.2.6 and 3.2.3.8), and for 3 stakeholders to the same 1 training session, and 2 workshops (23 domestic travels at USD 1,000 each). Travel: others travel cost related to component 3, in total USD 9,000			130,000	130,000			130,000	MIIT

41. Travel	Travel: USD 53,000: Travel and DSA of 2 officials from the PMO to the demonstration site				-		53,000	53,000	MNR (thru MIIT)
42. Travel	Travel: others including PMC related travel, in total USD 66,454				-		66,454	66,454	MIIT
43. Office Supplies	Supplies and stationery: USD 800 Supplies and stationery related to Component 1.	800			800			800	MNR (thru MIIT)
44. Office Supplies	Supplies and stationery: USD 644 Supplies and stationery related to Component2.		644		644			644	MIIT
45. Office Supplies	Supplies and stationery: USD 1,000: Supplies and stationery related to Component 3.			1,000	1,000			1,000	MNR (thru MIIT)
46. Office Supplies	Supplies and stationery: USD 136: Supplies and stationery related to Component 3.			136	136			136	MIIT
47. Other Operating Costs	Publication and printing: USD 16,000		16,000		16,000			16,000	MIIT
48. Other Operating Costs	Publication and printing: USD 15,000			15,000	15,000			15,000	MNR (thru MIIT)
49. Other Operating Costs	Professional services: USD 12,000: For project audit				-		12,000	12,000	UNDP
Grand Total		2,491,400	3,737,400	2,669,656	8,898,456	200,000	244,923	9,343,379	

ANNEX F: (For NGI only) Termsheet

Instructions. Please submit an finalized termsheet in this section. The NGI Program Call for Proposals provided a template in Annex A of the Call for Proposals that can be used by the Agency. Agencies can use their own termsheets but must add sections on Currency Risk, Co-financing Ratio and Financial Additionality as defined in the template provided in Annex A of the Call for proposals. Termsheets submitted at CEO endorsement stage should include final terms and conditions of the financing.

ANNEX G: (For NGI only) Reflows

Instructions. Please submit a reflows table as provided in Annex B of the NGI Program Call for Proposals and the Trustee excel sheet for reflows (as provided by the Secretariat or the Trustee) in the Document Section of the CEO endorsement. The Agencys is required to quantify any expected financial return/gains/interests earned on non-grant instruments that will be transferred to the GEF Trust Fund as noted in the Guidelines on the Project and Program Cycle Policy. Partner Agencies will be required to comply with the reflows procedures established in their respective Financial Procedures Agreement with the GEF Trustee. Agencies are welcomed to provide assumptions that explain expected financial reflow schedules.

ANNEX H: (For NGI only) Agency Capacity to generate reflows

Instructions. The GEF Agency submitting the CEO endorsement request is required to respond to any questions raised as part of the PIF review process that required clarifications on the Agency Capacity to manage reflows. This Annex seeks to demonstrate Agencies? capacity and eligibility to administer NGI resources as established in the Guidelines on the Project and Program Cycle Policy, GEF/C.52/Inf.06/Rev.01, June 9, 2017 (Annex 5).