GEF-6 REQUEST FOR PROJECT ENDORSEMENT/APPROVAL

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title: Upgrading of China SHP Capacity Project			
Country(ies):	China	GEF Project ID:[1]	6919
GEF Agency(ies):	UNIDO	GEF Agency Project ID:	140196
Other Executing Partner(s):	Ministry of Water Resources (MWR), Ministry of Finance (MOF), International Centre on Small Hydro Power (ICSHP)	Submission Date:	04-13-2016
GEF Focal Area (s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities ☐ IAP-Commodities ☐ IAP-Food Security ☐	Corporate Program: SGP ☐	
Name of Parent Program	n/a	Agency Fee ($)	847,875

A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES[2]

Focal Area Objectives/Programs	Focal Area Outcomes	Trust Fund	(in $) GEF Project Financing	(in $) Co-financing
CCM-1 Program 1	Outcome A. Accelerated adoption of innovative technologies and management practices for GHG emission reduction and carbon sequestration Outcome B. Policy, planning and regulatory frameworks foster accelerated low GHG development and emissions mitigation	GEFTF	7,725,000	74,578,448
CCM-1 Program 2	Outcome B. Policy, planning and regulatory frameworks foster accelerated low GHG development and emissions mitigation		1,200,000	
	Total project costs		8,925,000	74,578,448

B. PROJECT DESCRIPTION SUMMARY

Project Objective: Environmental upgrading of rural SHP stations in China

Project Components/ Programs	Financing Type[3]	Project Outcomes	Project Outputs	Trust Fund	(in $) GEF Project Financing	(in $) Confirmed Co-financing
1. Policy and institutional framework promoting green SHP plants	TA	1.1 Policy and institutional framework for promoting green SHP plants are strengthened	1.1.1 Green Small Hydropower Assessment Standard formulated and issued by MWR 1.1.2 Preferential green SHP policies developed and recommended 1.3 Evaluation Criteria for Rural Hydropower Station[4] Safe Production	GEFTF	1,200,000	1,685,000

[1] Project ID number remains the same as the assigned PIF number.
[2] When completing Table A, refer to the excerpts on *GEF 6 Results Frameworks for GETF, LDCF and SCCF*.
[3] Financing type can be either investment or technical assistance.
[4] In China Rural Hydropower refers to hydropower station with installed capacity up to 50MW, which are classified as small hydropower.

			Standardization (provisional) rolled out nationwide			
2. Greening and improving the management and safety standards of existing SHP plants	INV	2.1 24 refurbished green SHP plants are fully operational and improved management and safety standards are in place	2.1.1 24 business plans[5] and feasibility studies[6] finalised for upgrading SHP demonstration plants 2.1.2 Upgraded green SHP plants rehabilitated at 24 sites with additional capacity of approx. 23.7 MW and generation of 157,000 MWh.	GEFTF	5,500,000	64,494,448
	TA	2.2 Improved performance and safety management for SHPs in place	2.1.3 Socio-economic and environmental impact of green small hydro rehabilitation recorded	GEFTF	500,000	2,120,000
3. Knowledge base and capacities in the field of green SHPs and improved and safe SHP management	TA	3.1 Knowledge and awareness of decision makers, experts and technicians about green SHP retrofitting and management is improved	3.1.1 Capacity building programme for SHP project owners, developers and technicians delivered to 1200 people 3.1.2 Capacity building programme for 200 officials on green SHP and Safe Production Standard 3.1.3 Awareness raising campaign delivered 3.1.4 Recommendation list to carry out green SHP assessment established with 24 institutes 3.1.5 Capacity built in 30 institutions and assessed to carry out Safe Production Standard assessments	GEFTF	1,150,000	3,694,000
4. Monitoring and evaluation	TA	4.1 Project's progress towards objectives continuously monitored and	4.1.1 Mid-term and final evaluation carried out; Project's progress assessed, documented	GEFTF	150,000	700,000

[5] In China this refers to the technical and economic assessment document

[6] Feasibility study and Project Design Report (PDR) are used interchangeably in this document. In China the most important document is the PDR which includes the financial analysis and is the document used for Government approval.

		evaluated	and recommended actions formulated			
			Subtotal		8,500,000	72,693,448
			Project Management Cost (PMC)[7]	GEFTF	425,000	1,885,000
			Total project costs		8,925,000	74,578,448

C. CONFIRMED SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE

Please include evidence for co-financing for the project with this form.

Sources of Co-financing	Name of Co-financier	Type of Cofinancing	Amount ($)
Recipient Government	Ministry of Water Resources / Ministry of Finance	Grants	22,956,835
Recipient Government	Ministry of Water Resources	In-Kind	3,709,000
Recipient Government	Provincial and local Government	Grants	9,909,759
Recipient Government	Provincial and local Government	In-Kind	6,000,000
Beneficiaries	24 private, collective and state owned SHP companies (see co-finance letters)	Equity	19,250,782
Private Sector	National and provincial banks (see co-finance letters)	Loans	12,377,072
GEF Agency	UNIDO	Grants	75,000
GEF Agency	UNIDO	In-kind	300,000
Total Co-financing			74,578,448

This co-financing is confirmed in commitment letters from the main sources. The Ministry of Water Resources (MWR) has written a letter covering its grant and in-kind finance for the national Ministry as well as for its provincial offices and for ICSHP and INSHP (both which fall within the remit of MWR). In addition, each of the SHP companies that own the plants involved in the demonstration projects have submitted a letter committing their own finance as well as the amounts they will receive as loans from their banks. A set of the same letters in Chinese is also attached for reference.

D. TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

GEF Agency	Trust Fund	Country Name/Global	Focal Area	Programming of Funds	(in $)		
					GEF Project Financing (a)	Agency Fee a) (b)[2]	Total (c)=a+b
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
Total Grant Resources					0	0	0

a) Refer to the Fee Policy for GEF Partner Agencies

E. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS[8]

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets

[7] For GEF Project Financing up to $2 million, PMC could be up to10% of the subtotal; above $2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

[8] Update the applicable indicators provided at PIF stage. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the *GEF-6 Programming Directions*, will be aggregated and reported during mid-term and at the conclusion of the replenishment period.

1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	*hectares*
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	*hectares*
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	*Number of freshwater basins*
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	*Percent of fisheries, by volume*
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO_{2e} mitigated (include both direct and indirect)	*Direct - 2,200,000 metric tonnes Indirect – 6,622,000 metric tonnes (most conservative estimate)*
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	*metric tons*
	Reduction of 1000 tons of Mercury	*metric tons*
	Phase-out of 303.44 tons of ODP (HCFC)	*ODP tons*
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	*Number of Countries:*
	Functional environmental information systems are established to support decision-making in at least 10 countries	*Number of Countries:*

F. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

(If non-grant instruments are used, provide an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF Trust Fund) in Annex D.

PART II: PROJECT JUSTIFICATION

Clarification and justification on changes to co-finance compared to PIF: *The overall co-fiannce identified for the GEF-UNIDO project has increased compared to the PIF from USD 60 million to USD 74.5 million.*

During the PPG it became clear that the greater number of demonstration plants to be supported under Component 2 (24 instead of 15), and the extent of the proposed upgrading measures, meant that the amount of co-finance for these projects has increased significantly; from USD 44.5 million up to USD 66.6 million. Co-finance letters have been received from all the projects identifying the source of this co-finance. At the same time there has been a decrease in the co-finance associated with the technical assistance. During the PPG from the extensive consultation, the analysis of the current situation and a more detailed design and analysis of the proposed activities a more realistic contribution of staff and resources has been proposed for Components 1 and 3, project management and project monitoring and evaluation.

The PIF identified the project as supporting Climate Change Mitigation (CCM) Strategy Objective 1, Program 2. During the PPG it became clear that the proposed Project actually supports outcomes under both CCM-1 programs. Program 1: Promote the timely development, demonstration, and financing of low carbon technologies and mitigation options and Program 2: Develop and demonstrate innovative policy packages and market initiatives

to foster a new range of mitigation actions. Further details on how the project supports both programs is provided on page 37 in section A.1.3.

A.1.1 Global environmental problem, root causes and barriers that need to be addressed

a) Increasing global and Chinese GHG emissions

Total global anthropogenic GHG emissions have risen more rapidly from 2000 to 2010 than in the previous three decades, reaching the highest in human history at 49 gigatonnes CO_2-equivalent per year[9] (GtCO2eq/yr or billion tonnes CO_2eq/yr) in 2010. This figure includes all gas emissions and not just those due to carbon dioxide. Of this total increase about 78% was from CO_2 emissions from fossil fuel combustion and industrial processes and about 35% (17 $GtCO_2eq$) of 2010's GHG emissions were released in the energy supply sector[10]. Although there has been a slowdown of the global CO_2 emissions in the last year[11] overall trends are still increasing. From a global perspective, energy consumption and its CO_2 emissions is clearly related to economic development. Therefore these emissions will continue to grow over the next few decades even if current climate change mitigation policies and related sustainable development practices are maintained.

In recent decades, China has experienced impressive development, economic growth and poverty reduction, and consequently China's contribution to global GHG emissions is signficiant. The most recent information from China's official communication to the UN only covers emissions to 2005, and estimates CO_2 emissions at 5.98 billion tonnes, with an increase from 1994 of 94%[12]. Of the CO_2 emissions about 90% were associated with energy activities. More recent estimates put Chinese CO_2 emissions in the region of 10.3 billion tonnes in 2013[13] and according to the IEA, China's CO_2 emissions dropped in 2014 inline with a drop in coal consumption. However taking into account China's continued dependence on fossil fuels and its continued growth in GDP, China's GHG emissions are still likely to grow over the next decade.

China is prioritizing climate measures and contributing to climate change mitigation with targets to reduce carbon intensity by 40-45% from 2005 levels by 2020, to reduce energy intensity by 17% from 2010 levels by 2015 and to reduce coal consumption to below 65% by 2017 by increasing the use of renewable energies and nuclear. Under the 12th Five-Year- Plan (FYP) there are aims to achieve an 11.4% share in non-fossil fuel consumption and a 30 % share in non fossil fuel installed capacity by 2015. However even with these policies, emissions will increase in the short term. Still more needs to be done to keep within the internationally agreed limit of a 2°C temperature rise to avoid severe and irreversible changes in the global climate.

b) Environmental impacts of SHP

SHP is inherently 'green' since it is both a renewable energy and is largely emission free, and in addition to power generation, hydropower projects can provide public benefits such as flood control, recreation, water supply and irrigation. However, there are still significant environmental impacts from SHP. SHP does have a number of advantages over large hydropower: less land is flooded, there is less disruption to sediment transport and they do not create as much seismic instability as big dams. However SHP can still be responsible for considerable hydrological changes, altering natural flow cycles, major disruption to connectivity of river systems, lower water quality, reduction in habitat diversity and sometimes irreversible destruction to entire ecosystems and water landscapes.

In an attempt to maximise power output the flow conditions downstream of a dam or weir are necessarily altered and in many cases there can be a dehydrated, or de-watered, section downstream of the dam; in the diversion reach. This is quite common in China. Where dams are constructed typical impacts below a dam include alterations to velocity, depth, temperature, flow variability and sediment movement, which in turn affect the quality, quantity and type of habitat available. The artificial timing and volume of releases from dams play a role because they rarely replicate the natural flooding cycles of the natural river system. The below-dam water quality parameters which can

[9] ±4.5 GtCO2eq

[10] Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

[11] IEA, 2015

[12] Second National Communication on Climate Change of The People's Republic of China, NDRC, November 2012

[13] Trends in global CO2 emissions: 2014 Report, PBL Netherlands Environmental Assessment Agency, The Hague, 2014

be altered include temperature, dissolved oxygen and total gas pressure. These changes in habitat affect many ecosystem components and processes such as aquatic invertebrates, fish, plants, microbes, and nutrient dynamics. In the diversion reach, reduced habitat area or increased flow variability may decrease fish numbers or viability[14].

A literature review specifically on the impact of run of river hydropower on fish populations found that the impacts related to a number of issues including: impoundment structures impeding migration, altered flow regimes in the depleted channel reach, risk of fish entrainment through the turbines and associated mortality or damage as they pass through the turbines plus potential cumulative effects with cascade systems[15].

It should also be noted that SHP impacts are not limited to the dam or river diversion but can also be caused by SHP's associated infrastructure such as the power house, access roads to the construction site, power transmission lines or irrigation canals. In China many of the older SHP stations (built before 2000) can no longer guarantee full operational security; flood protection, drought prevention infrastructure, irrigation and water supply functions are not always fully operational. The old equipment not only severely impacts the environment but also causes safety risks. Many SHP owners only focus on their return on investment and as a result pay less attention to the safety risks including lack of safety training for operational staff, lack of tests or evaluation of equipment and poor emergency plans.

c) Potential for upgrading and greening of SHP projects

There is signficant scope to refurbish Chinese SHP plants to increase their efficiency, capacity and annual generation and at the same time improving the environmental and safety features. The improved output from the SHP plant offsets primarily fossil-fuelled electricity generation so reducing GHG emissions whilst the environmental features improve the local environment for the local population. By implementing green SHP standards, updating equipment, increasing the local capacities, establishing the right policy framework and improving safety management, SHP plants can deliver multiple co-benefits. On top of contributing to climate mitigation through GHG reductions, they also contribute to climate adaptation by contributing to flood control and management, the conservation of water bodies, improved water quality, improved irrigation and sustainability of water supply to the local population, increased climate resilience of water resource, biodiversity conservation and local economic development. Improved safety features will improve the environment and safety for staff as well as for the local affected communities.

Many of the environmental impacts mentioned above can be reduced or mitigated to an extent with 'greening' measures. For instance it is often possible to adjust the operational regime of an SHP and dam to better meet a variety of needs. So-called 'environmental flows' [16] provide critical contributions to river health, economic development and poverty alleviation[17]. Environmental flows are not natural flows but aim to find a balance for meeting a variety of water needs, including those of ecosystems and downstream communities. Also landscaping and planting can improve the riverine habitats. Fish passes can help maintain fish populations. Other measures can also have a positive impact such as the removal of trash picked up at the screen at an SHP plant can help clean the river and screens can prevent fish entrainment. Since China has many cascade systems, greater improvements in the habitat diversity could be achieved if every plant in a cascade is similarly treated. The increase of flood protection or the adaptation as recreation area are items of public interest and can be achieved by interdisciplinary and sustainable planning. Further potential measures are included in Annex T3. These measures can have a huge positive impact for the environment and local communities.

With more than 17,500 SHP stations not yet rehabilitated (pre-1995, and even more pre-2000) there is enormous scope to reduce GHG emissions with the existing plants and to incorporate environmental and safety measures into the projects. In addition it is possible to add the upgrading and greening measures to already rehabilitated plants and to newer plants.

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[14] Douglas, Tania, "Green" Hydro Power Understanding Impacts, Approvals, and Sustainability of Run-of-River Independent Power Projects in British Columbia, Watershed Watch Salmon Society, August 2007

[15] Robson, Cowx and Harvey, Impact of run-of-river hydro schemes upon fish populations: Phsae 1 Literature Review, SNIFFER, August 2011

[16] Also sometimes referred to as residual flow, ecological flows or minimum flows.

[17] Dyson, M., Bergkamp, G. and Scanlon, J., (eds). Flow – The essentials of environmental flows, 2nd Edition. Gland, Switzerland: IUCN. Reprint, Gland, Switzerland: IUCN, 2008.

There is an increasing awareness of the environmental impacts of small hydropower in China, which provides public pressure to carry out green small hydropower construction. Some provinces have adopted measures for green small hydropower, examples of which are provided in section A.1.2b) on page 10. These measures provide good examples for the country to carry out further green small hydropower construction.

d) Key barriers to the 'greening' and improved safety of SHP projects in China

Despite clear advantages to upgrading green and safe SHP, there is very little uptake of the associated measures in China due to a number of factors. During the PPG, consultation was carried out to understand the reasons behind the lack of development in this field. This was carried out primarily through meetings, workshops as well as site visits and phone calls. The consultation included the following consultee groups:

- SHP associations, project owners and project developers (incl. Zhejiang Provincial Rural Hydropower Association, Zhejiang Longyou Xiaoxitan Hydro Development Ltd., Co. Zhejiang Huadong Engineering Technology Development Ltd, Co., Yunnan Province Regional Power Design Institute , Baoshan Design Institute, Chongqing Jiangyuan Survey & Design Institute, Sichuan University Engineering Design Institute Co.,Ltd plus other 48 organisations)
- Government departments (incl. MWR, Department of Economic Construction, MOF, Department of Rural Economy, National Development and Reform Commission (NDRC), Pricing bureau, DRC, WRB from 8 provinces)
- Teaching and Research institutions (incl. Zhejiang University of Water Resources and Electric Power, Hohai University, SHP Committee within China Society for Hydropower Engineering)
- Financial institutions (incl. CITIC)
- Civil society (incl. Green Environment Institute, ICUN, WWF, Green Zhejiang, Women's Union)

The two workshops (Inception and Validation) had a total of 110 participants comprising representatives from national and provincial Government officials, hydro and design institutes, manufacturers and project owners. A list of workshop participants is given in Annex T8 along with the workshop proceedings.

The following table provides an outline of this feedback on the continued barriers and challenges. The barriers have been divided into three broad categories related to capacity, policy and finance. The barriers below are the primary, or key, barriers which are critical to address for the increased uptake of green SHP measures and which will be tackled in this project. Some additional background to these barriers is included in the following sections. The suggested mitigation activities are included in this project and will help to go some way to address the barriers identified.

Table 1: Main barriers to green SHP uptake which the project will aim to tackle and recommended action

Barriers	Detail (from the feedback from stakeholders)	Recommended mitigation actions
Capacity and awareness barriers		
• Lack of awareness of existing environmental impacts of SHP • Lack of knowledge of potential greening measures • Lack of awareness of potential benefits • Lack of technical expertise/capacity to implement or maintain measures • No public information on environmental impacts • No demonstration projects • Lack of wider social responsibility /concerns	This is one of the most important barriers related to penetration of green and safe SHP in China. The common belief is that small SHP is environmentally beneficial and benign at worst. Although there are low emissions and less impact than large hydropower there are still significant negative environmental issues such as dehydrated or flow depletion stretches. There is little knowledge of these impacts by SHP owners, government and the wider public. Many of these impacts are local and will have impacts on the livelihoods of local population. Linked with this is the lack of awareness of the possible measures available to reduce the environmental impacts due to lack of knowledge in the design institutes, by SHP owners, by Government and there are few demonstration projects showing what is possible. There is also a lack of capacity to design or maintain such measures due to lack of experience and knowledge of the measures.	Tailored capacity building and awareness raising among SHP owners, design institutes, government and the public. Demonstration projects showing what is possible.
Financial Barriers		

Barriers	Detail (from the feedback from stakeholders)	Recommended mitigation actions
• Potential revenue loss from green measure implementation • Low payback on additional investment • Difficult to quantify benefits	In consultation this barrier was one of the most cited and important since some of the proposed green measures associated with an environmental flow impact on the annual generation (by reducing flow through the main turbines). SHP owners are unwilling to invest when their potential revenue will reduce overall. Although there are clear social and environmental benefits associated with the greening measures these are difficult to quantify and there are not necessarily any economic benefits associated with them.	Develop specific incentives and tax exemption for SHPs that are successfully assessed as Green SHP which more than compensate for any loss of income.
• Lack of experience among financiers and perceived risk of financial institutions • Difficult to access finance for projects < 10 MW • Low priority investments	Although Chinese banks are happy to lend to SHP upgrades they are more wary when costs are higher due to 'additional measures' and any perceived risks associated with them. In some provinces it is difficult for small (<10MW) SHP owners to access any commercial finance and they must self fund. In addition any additional measures that are not associated with increased income are low priority investments for the SHP owners.	
Policy and Regulatory Barriers		
• National guidance and technical guidelines for green SHP are not established • Standardisation for green SHP not published • Regulation for green smallhydro assessment is not established; and application and assessment procedures, dynamic management for assessment institutions and grading is uncertain.	The green SHP assessment standard is only in its development phase so is not yet accepted widely. Without a clear ministerial standard it is difficult to encourage SHP owners to consider green SHP. There is currently a lack of procedures, assessment institutions and dynamic management of the green SHP assessment to enable its widespread uptake. In addition without guidance it is difficult for project owners to design, construct and operate green SHP. The applicability of all the technologies need to be analyzed for their applicability to the standard.	The Chinese green SHP standard needs to be finalised and published for widespread acceptance and new assessors need to be qualified to carry out the assessments. Specifically China needs to establish the guidance for green SHP construction and regulation. The green SHP assessment should be established and the application and assessment procedures and dynamic management content need to be finalised.
• Safe Production standardisation for SHP not rolled out nationwide yet or transcribed to provincial regulation. In addition there are not enough assessors to cover the sector.	The safe production standard has been issued and has been tested on 1000 plants. However for widespread acceptance it still needs to be rolled out nationwide and provincial regulations need to be prepared to implement it.	The Chinese safe production standard needs to be rolled out in the Provinces for widespread acceptance and new assessors need to be qualified to carry out the assessments.
• Lack of standards for environmental measures such as minimum or ecological flow	Six provinces have recommendations for a minimum river flow and since these are only recommendations, and many plants are in remote areas, there is no associated monitoring, enforcement or penalties associated with these recommendations. Therefore there is no incentive to apply the recommendations. The other provinces do not have any recommendations.	Consult to change recommendations into regulations and introduce monitoring and penality charges.
• Lack of incentives for green or safety technologies • Limited scope of existing policies • No specific policy targeted at the environmental aspects of SHP	Existing incentives are related to SHP upgrading and the grant money (through the government programme) is associated specifically with the electro-mechanical equipment and is awarded on a per kW basis. In addition some provinces offer higher tariffs for upgraded SHP. There are no specific incentives to increase the number of measures during upgrade to	Develop specific incentives and tax exemption for SHPs that are successfully assessed as Green SHP and gain the Class A safe production standard. Recommend to extend the Government policy to include

Barriers	Detail (from the feedback from stakeholders)	Recommended mitigation actions
	include additional safety and environmental measures. To access the government subsidy for upgrade the project must meet certain criteria including cost per kW (<6000 RMB or about USD 920/kW) investment and per kWh generation (<7 RMB or about USD 1.07/kWh) and must meet a Financial Internal Rate of Return (FIRR) of more than 8% or 10%, depending if the project has been defined as a 'construction project' or an 'SHP project' respectively. Additional investment on green and safety measures may result in a project not qualifying for the government support.	non state-owned stations, projects built before 2000 and expand scope of subsidy.

A.1.2. Baseline scenario

a) Baseline Status of SHP and Green SHP in China

China has made great achievements in hydropower development, which has contributed to the socio-economic development in rural areas, particularly in providing clean and affordable electricity. Due to the development of small hydropower (SHP) more than 300 million people have access to low carbon electricity. Half the world's SHP installed capacity is located in China with about 40 per cent of China's SHP potential of 128 GW (using the country's definition of 50 MW) having been developed[18]. By 2014, the country had approximately 46,000 SHP stations with a total installed capacity of about 73 GW and an annual output of over 220,000 GWh[19]. Using a SHP definition of up to 10 MW, following the European Commission standard, China has about 37 GW installed capacity.

A Government survey showed that SHP stations, built before or during the 1980s, operate below the average efficiency (82-88%) of those stations built after the year 2000. A total of 22,000 rural SHP plants (18,000 MW) were commissioned before 1995. In addition, as mentioned above, after many years of operation, several SHP plants can no longer guarantee full operational security; flood protection, drought prevention infrastructure, irrigation and water supply functions are not always fully operational. The old equipment not only severely impacts the environment but also causes safety risks. Many SHP owners only focus on their return on investment and as a result pay less attention to the safety risks including lack of safety training for operational staff, lack of tests or evaluation of equipment and poor emergency plans. Furthermore, because of the low wholesale electricity tariff for rural hydropower installed before the 1990s (about 0.04 USD/kWh, varying from province to province), many SHP stations cannot sustain their own operation and maintenance, let alone invest in refurbishment or additional environmental functions. This hinders SHP owners to retrofit their power plants.

As part of the 12th FYP the Ministry of Water Resources (MWR) and Ministry of Finance (MOF) implemented the SHP Capacity Expansion and Efficiency Improvements programme. During 2011-2012, the pilot project in six provinces had a significant effect on the improvement of the plants' performance. The first refurbishment of 733 SHPs (867 MW) led to efficiency increases resulting in 32% increased installed capacity and 51% increase in generation. Due to the pilot's success, the programme was extended nationwide aiming to support capacity expansion at about 3,700 SHP plants constructed before the end of 1995 with the aim of increasing the overall installed capacity from 6.6 GW to 7.9 GW, and generation from 21.3 million MWh to 31 million MWh. All the refurbishments are planned to be completed by the end of 2015.

Although the SHP rehabilitation programme has been very successful in increasing the capacity and output of the SHP, the activities have been limited to replacing equipment – namely the mechanical and electrical components and sometimes including some civil works. The Government subsidy is only available for these parts. There has been very limited focus on the ecological and environmental aspects and improved management practices. Since the rehabilitations are generally not expected to cause any changes to the environment, under the business as usual (BAU) scenario, no Environment Impact Assessment (EIA) or Environmental and Social Impact Assessment

[18] World Small Hydropower Development Report 2013 – China Country Report: http://www.smallhydroworld.org/index.php?id+244

[19] Small Hydropower Yearbook 2014 from Rural Hydropower Bureau, Ministry of Water Resources, China

(ESIA) is currently required by the Chinese authorities[20] , no further thought or action was given to the environment unless this project takes place[21]. However, as it becomes apparent during the PIF and PPG, there are significant benefits to improving the environmental performance of the plant yet there is little awareness or understanding of the benefits of green hydro refurbishment, nor the relevant expertise and necessary skills.

Despite this, a few provinces are interested in carrying out green hydro projects and are in the process of drawing up plans. Some pilot plants have been constructed, for example the Hunan Shiziyan plant, Shanxi Dongjiaohe plant, Hubei Dalongtan plant, Shaanxi Shimen plant, Jiangxi Panxi plant and Chongqing Daxihe plant have already adopted some measures of green SHP construction, including refurbishing the discharging facilities under the dam, installing small ecological units and managing the operation to meet different demands of the plant. Despite these few pilots, there is no national standard in place and the measures they adopted are not brought into the design or acceptance specification of existing plants.

b) Baseline policy framework and support initiatives for SHP

The Chinese government attaches great priority to the development and utilisation of hydropower in China. In line with this the Chinese government has passed a series of policies to support and encourage SHP development and rehabilitation. In particular the Government has launched the Small Hydropower Replacing Fuelwood Programme, the New Rural Hydropower Electrification Programme and the SHP Capacity Expansion and Efficiency Improvement of Rural Hydropower programme (mentioned above).

As discussed, the SHP Capacity Expansion programme started in 2011 as a pilot programme of MOF and MWR in six provinces with the objective of increasing the capacity of the stations. Due to its success, the programme was extended to 2013-2015. Criteria for inclusion in the programme include construction prior to 1995, capacity expansion of at least 20%, an increase in efficiency, key upper economic costs per kW and kWh and a number of planning, safety and financing criteria. The Government support for the plants is based on a subsidy per kW varying by geographical region and must be less than 50% of the total investment. The total investment for the two phases amounted to RMB 24.4 billion (around USD 3.8 billion[22]), of which RMB 8.8 billion (around USD 1.4 billion) was a subsidy from the Central Government.

The programme is managed at a provincial level and it is the province that determines the final allocation of funds from Central Government and which has commitment to provide Provincial co-finance. In addition some provinces have a policy to increase the tariff (up to an extra 0.03yuan/kWh, about USD 0.0046) following refurbishment and some refund a portion of VAT within five years. Further details of these policies are provided in Technical Annex T1.

As mentioned above there has been no focus on the environmental aspects of refurbishment and limited focus on safety. In addition, to date only state-owned and collective plants have been involved, with no private plants being included. SHP located in rural remote areas may lack the knowledge of refurbishment to be included. Further, smaller plants find it difficult to be included because they lack the finances and it is difficult for them to access bank loans.

The programme will be extended again into the 13th Five Year Plan (FYP) from 2016 but the details of the programme are not yet available although it is likely to include plants built up to year 2000. The preparation of this GEF project is already influencing the design of the 13th FYP and as a result it is anticipated that the new plan will include some focus on the environment and green measures.

In addition to the national programmes some provinces have adopted policies to encourage green small hydropower, which can be used as good experience for wider replication in China. For example, in Fujian Province, the government gives a subsidy to install small ecological units to maintain the minimum discharge flow. Those plants which are not applicable for refurbishment or upgrading should be decommissioned. Zhejiang Province carries out rural hydopower ecological demonstrations, not only refurbishing the old plants but also considering the minimum flow, in order to improve the river ecological environment.

[20] There is no specific guidance for rehabilitation projects regarding EIAs, but there is no regulation requesting one. Therefore they are not carried out.

[21] Although Chinese regulations do not request an EIA or ESIA for SHP plants refurbishment, as part of this PPG work a preliminary ESIA was carried out as well as an ESMP template prepared which will guide the implementation stage of this project in line with the GEF policies.

[22] Exchange rate used throughout document and budget: 1 USD = 6.3940 RMB

In addition to these programmes, the taxation policy offers incentives through the application of a subsidised value added tax (VAT) at 3% compared to the normal 17% for SHP.

c) Baseline Framework for safe and green SHPs

In China, Environmental Impact Assessments (EIAs) are only required for any new SHP construction project. In 1998, the "Regulations on the Administration of Construction Project Environmental Projection" was issued, which formally launched EIAs for construction projects. More specifically in 2003, MEP and MWR jointly published the "Code for Environmental Impact Assessment of Water Conservancy and Hydropower Project" which requires that if a project operation affects the water resource, in particular decreasing the the ecological water flow, relief and mitigating measures should be adopted. In 2006, MEP issued the "Environmental Impact Assessment Technical Guidelines on River Ecological Water, Low-temperature Water and Fish-pass Structure of Hydropower Construction Project", providing the standard value, applicable conditions and calculating method of ecological waterflow for hydropower construction projects. In the same year, MWR issued the "Regulation for Environmental Impact Assessment of River Basin Planning", which provides that the minimum flow can be determined by the mean flow in the driest months at a suitable frequency. In 2008, the "Regulations on Water License System" issued by MWR required that the approval authorities should approve the application of water dispatching of hydropower projects and reasonable discharging flow. In 2010, the "Guidelines for Assessment of Rivers Eco-water Demands" was issued. Finally in 2015, the "Regulation for River and Lake Eco-environmental Water Demand Computation" was issued. As mentioned above, currently EIAs are not required for rehabilitation projects in China[23].

Subsequently, MWR has been working on a draft Green Small Hydropower Evaluation Index based on international systems[24] and on results from SHP EIAs. The current draft has four areas of coverage (environment, society, economy and management) split into a further 15 elements and 20 indices. As part of the initial testing, 170 plants nationwide were selected to carry out green SHP assessment. This trial phase is led by MWR and implemented by the China Institute of Water Resources and Hydropower Research (IWHR), International Center on Small Hydro Power (ICSHP) and National Research Institute for Rural Electrification (also called Hangzhou Regional Center for Small Hydropower, HRC). The intial results showed 117 sites passing an 'interim pass score' for the draft greenhydro. The index and standard are still in early development and need further research, improvements, testing, feedback from the trials, cooperation between MWR and MEP, proposals for roll out and both government and user acceptance.

There is very little knowledge of green SHP basic construction requirements, specifications, draft standards or associated measures in China. Although MWR and the three institutes (IWHR, ICSHP, HRC) carrying out the assessments have knowledge, even within the 170 trials, there are still around 100 cities and counties in 17 provinces (where the 170 trial sites are located) where there is almost no knowledge about this. The local SHP administrative departments have not yet formulated guidance for green SHP construction. There is no requirement to construct green SHP in the standards for planning, design, construction and operation of small hydropower projects, and there are no initiatives for those who meet the requirements. Although some plants would like to construct green SHP plants, they do not know what they should do and what targets they should aim for. Furthermore there are no incentives for those who have constructed green SHP. There is a need to build up capacity including publishing guidance documents for green small hydropower construction, technical guidelines, assessment standards and regulations for green SHP assessment.

Despite the importance that SHP has played in economic and social development, there have also been a number of problems associated with the safety of the plants such as accidents, unclear management responsibilities and lack of security monitoring. In response, MWR developed draft "Implementation Measures on SHP Safe Production Standardisation Grading and draft Evaluation Criteria for SHP Safe Production Standardisation". This standardisation aims, inter alia, to stipulate safety management systems and operation, monitoring hazard sources and propose mitigation measures. There are three grades of SHP safe production standardisation: Grade A: x>-90%, Grade B: 75%-90%, Grade C: 65-75% and unqualified below 65%. In each province, the Water Administrative Department or Water Resource Bureau (WRB) set the standards and organises the evaluation, the SHP owners implement the measures according to the different grades and the validating agencies provide the on-site assessment and provide advice and rating suggestions.

[23] Although not required in Chinese regulations, as part of the project preparation a preliminary ESIA has been carried out and ESMPs will be conducted during inception phase when implementation the project.

[24] Greenhydro Standard (Switzerland), Low Impact Hydropower (LIHI) and Hydropower Sustainable Assessment Protocol (IHA). Further details of these are included in Section A1.3.

Included in the draft Implementation Measures was a proposal to assess 1000 trial projects. To carry out the assessments, 54 organisations nationwide have been trained and accredited to carry out the draft Grade A safe production standardisation assessment. Some provinces, including Zhejiang and Guangdong, have also drawn up provincial measures for Grade B and Grade C assessments. Few other provinces are in a position to carry out the Grade B and C assessments.

It is not mandatory for projects including refurbishment of SHP plants to be safety assessed and since there is a cost involved the vast majority have not been assessed. The key reasons for this is the lack of finance, or associated incentive mechanism, to pay for the upgrade measures required to meet the standard. In addition the management and operational staff lack the knowledge and skills to improve the safety standards. As a result many SHP, even following rehabilitation, remain with lower safety standards. Although quite well developed, the SHP Safe Production Standardisation there is an aim to increase participation in the standardisation process. If many more of the remaining 45,000 SHPs are to be assessed there is also a need for a far larger number of assessors.

Further details of the current status of the Green SHP and Safe Production Standards is included in Annex T2.

d) Baseline data (specific demonstration projects)

As detailed above there are 22,000 rural SHP plants (18,000 MW in total) that were commissioned before 1995. As part of the MWR's SHP Capacity Expansion and Efficiency Improvements programme (pilot and 12th FYP) 4433 (7467 MW) of these plants will have been upgraded by the end of 2015. This leaves a further 17,567 which form the baseline and could be upgraded in the future, if the conditions are right. The baseline for the demonstration projects of this GEF project is that all plants were built before 2000 (in line with the 13th FYP, rather than 1995) and they have all been identified as in need of efficiency and safety upgrades due to the age of construction and equipment and the opportunities available now from newer more efficient technologies available.

The selected demonstration plants were commissioned between 1942 and 2000 and have low efficiencies, high cost of maintenance, low water resource use and in some cases now have grid connection issues. In addition the current environmental conditions at these plants needs improving. Almost all the plants have dehydration sections downstream of the dam with associated environmental impacts. Some rivers have tributuries joining the river mitigating some impact. In some cases there is silting, some river bank erosion and irrigation channels have become damaged. A few of the SHP plants are in tourist areas and the current status of the plants and water flow affects the tourism (and local livelihoods). Some of the plants have populations living close by but many are not close to populations due to being in very rural areas. These pilot projects will provide the demonstration effect of enhanced efficiency, environmental and safety measures being incorporated into the government programme.

The baseline installed capacity for the 24 demonstration projects is 118 MW and the average annual generation over the past years from these stations has been 427 GWh, a capacity factor of 41%. Details of each plant and its specific baseline condition are provided in section A.1.3 (Component 2) and in Technical Annex T5.

A.1.3 Proposed alternative scenario, GEF focal area strategies and additional GEF activities (detailed design)

The Project is situated at the heart of the water-energy nexus and aims at promoting innovation, technology transfer, and supportive policies and strategies. The proposed project will focus on green and safe SHP upgrading/refurbishment. The main objective is to support MWR to introduce new measures to SHP upgrading to ensure that SHP has less of an environmental impact and that safe production and management processes are introduced at the same time as reducing GHG emissions. This will be achieved by a combination of interventions at policy and institutional level, combined with specific investments as well as building the capacity of market players and enablers and therefore addressing the specific challenges outlined. The awareness and understanding as well as a long term vision with regards to the necessity and benefits of green hydro refurbishment are lacking in China, as is the relevant expertise and necessary skills, both at policy level as well as at plant owner and project developer level. There is a signficiant gap with current international green hydropower development. Because the relevant incentive measures and expertise are lacking, the project owners are unwilling to take initial measures to upgrade to green hydropower construction. Without GEF intervention this situation is unlikely to change. GEF funding is needed to cover the incremental costs related to the greening of the SHPs to ensure additional environmental and social

benefits such as delivering water demand downstream, flood control, irrigation, water quality, and to increase the financial viability of the plants.

Furthermore, the knowledge base on environmentally sound SHP retrofitting needs to be built in China. The project will act as a trigger to demonstration and rapid replication in the uptake of the green and safe production SHP upgrading and to further GHG emission reductions.

The project is structured in three technical components, plus a monitoring and evaluation component, as set out below:

- ***Component 1: Policy and institutional framework.*** This component will strengthen the policy and regulatory framework to effectively promote and support green SHP upgrading by the development of guidance for green SHP construction, technical guidelines, a Ministerial Standard and regulations on green SHP, through support for incentive measures as well as assisting in the roll out of the Safe Production SHP standards.
- ***Component 2: Technology Demonstration***. This component will demonstrate technical feasibility and commercial viability of 24 green and safe upgraded SHPs at different capacities demonstrating a variety of environmental measures and safe production measures. Technical assistance and grants will be provided to facilitate the projects' development. These will build the confidence of both industry and the finance sector, create best practice examples to pave the way for replication, on the basis of experience gained reduced (perceived) risk and increase capacity and awareness at multiple levels, i.e. industry (both at operational and decision-making level) and finance.

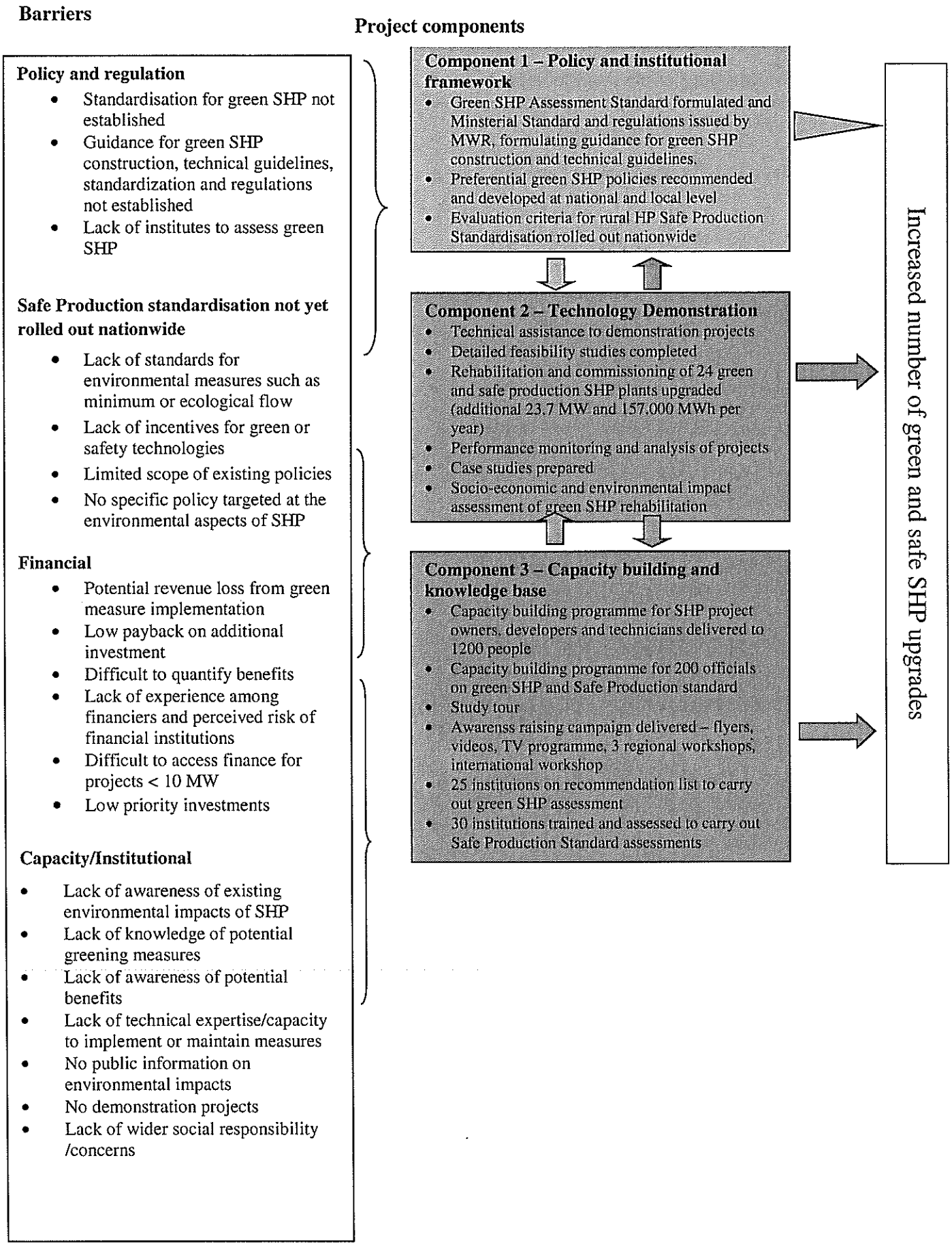
  Major effort during the PPG was carried out to support this component, including preliminary environmental and social impact assessment (pre-ESIA) carried out based on the feasibility study reports for all the 24 plants (see Annex T5).

  An ESMP template has been prepared (see Annex T5), and the actual ESMP will be conducted for all the 24 SHP plants in the Inception phase to satisfy GEF's requirements on Environmental and Social Safeguards, as set out in UNIDO's Environmental and Social Safeguards Policies and Procedures (ESSPP), which is to produce an ESMP for projects classified as Category B projects.

- **Component 3:** ***Capacity building and increasing knowledge base***. This component will strengthen the institutional capacity as well as address the insufficient technical capacity training, awareness and the development of knowledge products. Activities under this component will be implemented in parallel with components 1 and 2 on policy framework and technology demonstration in order to prepare for the scale up / mainstreaming of green and safe SHP within and beyond the project.
- ***Component 4: Monitoring and Evaluation***. A two pronged approach will be followed: 1) monitoring and evaluation against the GEF's strategic indicators and 2) monitoring and evaluation project specific technical indicators for outputs per component (components 1-3 as listed above). Ultimately this will provide an indication of the achievement of the goals that the project has set out to be achieved.

Figure 1 demonstrates the interaction/integration of project components in facilitating the development of a market for the uptake of green and safe production SHP upgrading in China. Further details are provided in the following sections.

Figure 1: Proposed project components and their interactions



Component 1: Policy and institutional framework promoting green SHP plants

To promote and develop a market to mainstream green and safe SHP upgrading it is important to have the supporting policy and institutional framework in place. This component will therefore assist in carrying out the necessary activities which will help SHP's sustainable development which, in China, includes the safe construction and operation and management of SHP stations and minimising the impact to the surrounding environment, i.e. to develop the green small hydropower construction and the associated assessment and certification system. In particular work supported by GEF will develop a Green SHP Ministerial standard, which will support the establishment of incentives at the national and local levels as well as help in the updating and rolling out of the Safe Production SHP standard. GEF funding will be used to bring best practice and international experience as well as accelerating the whole process, with the co-financing for this exercise to come from national and local Government (as personnel working with consultants). The proposed activities are in line with those proposed at PIF.

Long term ownership and sustainability is ensured through working closely with national institutions such as the Ministry of Water Resources(MWR), Ministry of Environmental Protection (MEP) and local government bodies on the development and roll out of the standards and on support for on-going incentive schemes. GEF inputs will assist and support these organizations in their development and beyond this project the respective organisations will be responsible for the implementation of their outputs.

Details of the component outputs and activities are described below.

Outcome 1.1: Policy and institutional framework for promoting green sustainable SHP plants are strengthened		
Outputs	Activities	Responsibility
1.1.1 Green Small Hydropower Assessment Standard formulated and issued by MWR	• Finalise the Green Small Hydropower Assessment Standard (including criteria, grading and assessment protocol) • National expert review • MWR approval and issuance • Develop the Green Small Hydropower Management Rules (Regulations) • Develop Guidance and Technical Guidelines on green small hydropower construction measures	MWR, MEP, national experts, international and national consultants
1.1.2 Preferential green SHP policies recommended and developed	• Development of green small hydro assessment and labelling system • Recommendations provided to develop national level policies • Support local governments to launch preferential policies for green small hydro	ICSHP, MWR, WRBs, Environmental Protection Bureaus (EPBs), MEP, NDRC, international and national consultants
1.1.3 Evaluation Criteria for Rural Hydropower Station[25] Safe Production Standardization (provisional) rolled out nationwide	• Best practice manual and case studies for provisional safe production standards • Promote the implementation of the Evaluation Criteria for Rural Hydropower Station Safe Production Standardization (provisional)[26] nationwide; • Guide the relevant provinces to issue implementation measures and regulations on safe production standards	MWR, international and national consultants

[25] In China Rural Hydropower refers to hydropower station with installed capacity up to and including 50MW, which are classified as small hydropower.
[26] Issued in September 2013

Green small hydropower assessment standards formulated and issued by MWR

The Chinese Green Small hydropower standard is still in its early development. A draft Green Small Hydropower Evaluation Index has been developed by MWR but it is in need of a review, further improvements and consultation prior to acceptance and issuance. The involvement of GEF in these activities will help to introduce international expertise and experience as well as accelerating the whole process.

- **Finalise the Green Small Hydropower Assessment Standard (including criteria, grading and assessment protocol)**

The first step is to review and finalise the standard which comprises the criteria, grading and assessment protocol. The GEF-UNIDO project will support this process through introducing international expertise on the standard and to promote cooperation between MWR and the MEP. Although the existing draft referred to international standards there is little expertise within China. Therefore, specifically, GEF will support international consultants to work directly with MWR and MEP. The consultants will discuss the advantages of the inclusion of different technical measures and how they could be included. In particular the project will provide international experts to discuss the benefits of fish by passes with Chinese counterparts and how they facilitate fish migration in new SHPs or in SHPs to be upgraded/refurbished, and how it would be possible to include them as part of the proposed standard or regulatory framework. The existing drafts will need to be translated into English and then the international experts will review them and make recommendations based on worldwide experience, to improve the green small hydro assessment and technical standard, whilst ensuring applicability for the Chinese context.

Selected EU member states with a high share of SHP such as Austria, Norway, Switzerland, and the U.S.A. have been leading in the field of green hydropower initiatives. The following initiatives will be considered in the revision and finalisation of the Chinese initiative because they are relevant to specific areas of the greening of SHPs:

- EU directives on habitat and water framework, these directives are particularly important for setting standards in nature protection, which are the most relevant in terms of environmental policies for SHP development in the EU;
- Low Impact Hydropower Certification Programme, this certification scheme sets standards for eight relevant criteria: 1) river flows, 2) water quality, 3) fish passage and protection, 4) watershed protection, 5) threatened and endangered species protection, 6) cultural resource protection, 7) recreation, and 8) facilities recommended for removal.
- Hydropower Sustainable Assessment Protocol launched in 2011, the protocol is the result of a large consultative process with the participation of civil society Governments, Banks and Industry. It offers a way of assessing more than 20 sustainability topics.
- Greenhydro Standard (Switzerland) which developed the fundamental principles required for a standardised and scientifically proven certification of "Green Hydropower Plants" and ensures environmentally responsible management and plant layout. The procedure contains both general concepts for the certification of hydropower plants and also the special criteria required in valuing a green hydropower plant.

All these initiatives focus on guaranteeing the environment-friendly operation or construction of hydropower stations. During the PPG a comparison between the international green hydropower standards and China's draft version was made. This is shown in Annex T2.

The areas of coverage, the number of elements and number of indices are all open to change. Each potential index will be scrutinised to ensure they are robust, compare favourably with the international standards and are in line with any environmental legislation. Following agreement on the criteria the grading system and cut-off points will be proposed. The importance that SHP plant owners place to the grading is closely related to any future incentive scheme therefore careful thought must be given to ensure its future-proofing and co-ordination with any incentive scheme (see activity 1.1.2). The assessment protocol will be developed in parallel and as much as possible will follow international protocols.

In addition to being robust, the standard must be accepted by the Government and users. The draft version will be circulated to a number of provinces (provincial WRBs) and MWR will work closely with MEP and will consult with industrial/SHP associations. The MEP has already been involved in the draft version and will be closely involved in the finalisation of the Standard. For its widespread uptake it is important to have as much buy-in as possible. Once

comments have been addressed from the consultation the Ministerial standar, the *"Green Small Hydropower Assessment Standard"* will be finalised by MWR.

- **National expert review**

Following the finalisation of the renewed Green SHP criteria, grading and assessment protocol the draft Green SHP Assessment Standard must be reviewed nationally to become official. Firstly a group of national experts will be selected from Government (MWR, MEP), design institutes, universities and hydropower representatives. They will review the document over a one month period. All the comments received will be addressed and highlighted in the text – if accepted, edited or disregarded. A one-day meeting will then be held with all the national experts to finalise the document taking into account all the comments. The resulting document will become the approved version.

- **MWR approval and issuance**

MWR will approve the final version of the Green Small Hydropower Standard and will issue a Ministerial Standard (SL xxx)[27]. There are two types of Ministerial Standard – compulsory and recommended. The Green Small Hydro standard will initially be issued as a recommended standard. On issuance the standard will be published and circulated to all provincial Water Resource Bureaus (WRBs) , design institutes, project developers, industry association and research institutes, which will implement the Standard, along with associated capacity building for its implementation. Please see capacity building under Component 3.

- **Develop the Green Small Hydropower Assessment Management Rules (Regulations)**

The Green Small Hydropower Assessment Management Rules is a key system to implement the Green Small Hydropower Assessment Standard and enhance its management. Hence, it is important to develop the rules in parallel to the standard. These rules will carefully consider the implementation details including how a plant can apply, how to make the assessment, the dynamic management as well as rewards, penalities and how to present the assessment results, and its validity will be specified. This work will be carried out by national consultants in co-ordination with MWR.

- **Develop Guidance and Technical Guidelines on green small hydropower construction measures**

In parallel with the development of the green small hydro standards, the GEF project will work with MWR to develop the technical guidelines to be targeted at provincial and local WRB officials, hydropower station owners, design institutes and manufacturers. These guidelines will aim to introduce the main technical measures available to mitigate as much as possible, the potential negative environmental impacts of SHP. The guidelines will provide advice on the applicability of the construction measures and how to implement the improvements. The guidelines will be written in such a way as to be gender sensitive and to include details of the impacts of green SHP measures on both women and men.

Case studies from international experience will be included and as case studies from China become available, these will be added to the document. The document will be in electronic format for easy updates and will be circulated to WRB officials and more widely through the capacity building and awareness activities of Component 3. The work will be undertaken by national experts working with international green hydro experts on the basis of suggestions and comments received from the MWR and more widely the SHP industry.

1.1.1 Preferential green SHP policies recommended and developed

The project aims at introducing innovative policy packages with the aim of reducing GHG while at the same time delivering multiple environmental benefits. Therefore the aim is to work on incentives for economically sound mitigation actions. Internationally the most common forms of subsidy schemes for green hydro are investment grants for retrofitting activities (procurement, construction, feasibility and design stage), concessional finance, higher electricity tariffs, quota systems, preferential access to the grid, or green certification schemes. The GEF-UNIDO project will work with MWR (and other government departments) on proposals for supportive policies and strategies, promotional instruments and incentive measures for green small hydro in China. Discussions were held

[27] China has a number of different level standards: National standards, Ministerial standard and local standards. Usually in China the national standard will be issued based on the international standard.

during the PPG about the different incentive measures available and those already in China were reviewed. The most appealing measure for SHP owners is a green (higher) feed-in-tariff for green SHP since this compensates for lower generation due to maintaining ecological flows. However SHP tariffs have been increased recently in many provinces and therefore there is little appetite for further increases in tariff. Further, many of the international schemes rely on fully liberalised electricity markets where buyers can select their electricity and are prepared to pay a premium for 'green' electricity. This situation does not exist in China, although the process for power sector reform has now started. In the short to medium term, the electricity market will open up for large generators and large purchasers and only in the long term will the market open to SHP and smaller buyers. Therefore one of the most promising incentives in the short term is for a capital subsidy for green SHP along with various tax and fee incentives (including tax reductions, exemptions or deductible investment taxes). Other options to be investigated relate to financing and review of loan repayment conditions from development banks or the issuance of Bank bond funds. Alternatively SHP owners could issue commercial bonds to lower capital costs or stock bonds. During the project all options for incentive policies as well as for environmental regulations will be studied and tested with the aim that a business model for up-scaling can be proposed for large scale replication of green SHP upgrading.

The work under this component will focus on three areas: on the development of a green hydro certification and labelling scheme; providing recommendations to national level ministries on the development of national policies; and supporting the local provinces/governments to launch preferential policies for green small hydro. In all three areas, the work will include recommendations on gender mainstreaming in the related policies.

- **Development of green SHP labelling system**

The aim of this activity is to develop a meaningful labelling system based on the developed Green Small Hydro Assessment Standard. Although the electricity market is not yet sufficiently liberalised for individual electricity buyers to select 'green' power, the country is undergoing power sector reform and therefore there is likely to be a market for 'green' electricity in the future. By developing the labelling system now this would lay the foundations for a future trading system. In the near term the labels would have a credibility and reputational value but in the future this could be converted to a monetary value. Depending on the preferential policies developed (below) the monetary value could be converted sooner.

GEF-UNIDO will support international and national experts to work with INSHP[28] on behalf of the Government to develop a system aligned to the Green Small Hydro Assessment Standard. Experiences from Europe will be used to help develop labels that are internationally acceptable and that will set the foundation for a future certification system.

- **Support to local government/provinces on preferential policies for green small hydro**

Although some policies may be prepared at the national level, the provinces have a certain degree of autonomy and have the power to develop province-wide policies. For example SHP tariffs are set locally by the Pricing Bureau within the Development and Reform Commission (DRC). The local tax and some of the water resources fee can also be adjusted based on the decision of local governments. In addition, capital subsidies or investment grants can be set at provincial level and decrees can be issued stopping construction if it is not meeting certain guidelines. With these in mind there is significant scope to develop preferential policies at the provincial/local level[29], as seen in Fujian and Zhejiang. GEF-UNIDO will work with the selected 8 provinces to help them to develop suitable incentive policies. Each of these provinces was selected on the basis that they are already minded to supporting green small hydro (see criteria in Component 2). In addition, to the capacity building activities (Component 3.2) national and international experts will work with the provincial WRB, DRC and EPB to identify possible incentive policies that will provide enough of an incentive to encourage SHP owners to install green measures. The long-term aim would be to be able to identify business models using these incentives that can be easily taken forward by the SHP owners. Initial conversations with the government departments during the PPG showed that people are interested but that there limited resources. Therefore innovative ideas will need to be found and further evidence is needed on the real benefits to the wider environment and society to persuade change.

[28]The International Network on Small Hydropower is managed by ICSHP
[29] Including the province, city, or county level, etc

At the same time encouragement could be provided to SHP owners through the introduction of environmental regulations and penalty fines, or other fees associated with not abiding by local regulations. At the moment a number of provinces have recommended minimum (or ecological) flows for SHP (see Annex T1). Experiences and practices on environmental regulations in other countries will be studied to see what works best. Working with the WRB and EPB the possibility of changing these recommendations into mandatory regulations will be assessed along with how they could be enforced and the likely associated penalties for non-compliance. This would involve significant consultation with Government and SHP owners to take forward.

The output from the activity will be incentive policies developed and recommended for adoption by provincial and local government departments in each of the 8 selected provinces.

- **Recommendations provided to develop national level policies**

Other than MWR, green small hydro is not a priority for government ministries, in particular the Ministry of Environmental Protection (MEP) and the National Development Reform Commission (NDRC). During the PPG MEP expressed its interest in green SHP implementation but still GEF could use its influence as part of this project to help to increase visibility of the issues within MEP and NDRC with the aim of it gaining greater importance with these ministries. As a result of inspiration from the preparation of this GEF project, and under the guidance of China ecological civilization construction policy, the capacity expansion project during the 13th Five-Year Plan is considering implementing refurbishment by river basin, including green measures. Linked to this the central government is considering provding a subsidy for capacity expansion with green measures. This is currently under policy design. The GEF project will work with Government to finalise this incentive and will establish and recommend further initiatives that may be finally adopted by the government departments, such as MEP and MWR.

1.1.2 Promotion of the *Evaluation Criteria for Rural Hydropower Station Safe Production Standardization* (provisional) to be rolled out nationwide

In 2013, MWR issued the "Implementation Rules on the Rural Hydropower Safe Production Standardisation (temporary)" for use for 1000 trials. This document includes the procedures and assessments and grading for the assessments. However it still needs to be adopted and rolled out nationwide to increase participation. At the same time GEF's influence can be used to help bring some international best practice and some case studies on international safe production to China, which will encourage international information exchange and in the longer term could lead to recommendations for the Chinese safe production standard. GEF will help to accelerate this process and faciliate the exchange of international experience related to safe production.

- **Best practice manual and case studies on safe production standards**

A best practice manual will be developed which will take best practice from the Chinese examples as well as from international experience. The first step will be to summarise the results and best practice examples and gather feedback from the 1000 trials carried out to date with the provisional implementation measures and evaluation criteria. The feedback will come from the provincial WRBs, assessment institutes, experts and from the project owners being assessed. Best practice recommendations will then be prepared taking into account this feedback. Simultaneously the GEF-UNIDO project will support the process through introducing international expertise and best practice examples helping to ensure that the Chinese roll-out of the standard will also meet accepted international standards. The manual will highlight the roles of men and women in the development of Safe Production Standard SHP and will be gender mainstreamed. A Best Practice Manual, including the Chinese and international examples, will be produced for dissemination with the Safe Production standard.

- **Nationwide promotion of the standard and best practice recommendations**

Examples from the first demonstration projects and the standard and best practice manual will be circulated to all provincial WRBs along with associated capacity building programmes for its implementation in the target 8 provinces. In provinces without demonstration projects the promotion will include details about the whole GEF-UNIDO project, a background to the standard and information on how to implement in that province. Please see capacity building activities under Component 3.

- **Guide the relevant provinces to issue implementation measures and regulations on safe production standards.**

To implement the Safe Production Standard at the provincial level it is necessary to develop Provincial Standards based on the national standard. However at the moment there is not enough funding available to implement the standards at local level and with limited knowledge. Therefore the GEF project will support national experts to assist the 8 target provinces to develop the provincial regulations, for Grade A, B and C. This will result in faster roll out of the standard and the establishment of a safer industry more quickly.

Component 2: Greening and improving the management and safety standards of existing SHP plants

This component encompasses technical assistance, technology transfer and investment activities. About 24 SHP plants will be refurbished as Green Small Hydropower Demonstration Plants. The objective of the demonstration projects, besides delivering GHG emission reductions, is to generate national case studies and best practice that would be relevant to and have good replication potential in China. *The two outcomes anticipated at PIF have been combined to ensure that all demonstration projects include both green measures and improved management and safety standards.* There are three key areas of activity for this project component – technical assistance for the projects, the implementation of 24 demonstration projects plus the monitoring and evaluation of these projects to provide evidence of the benefits to help in establishing future incentive policies.

The GEF contribution of USD 5.5 million will be used mainly to cover for the incremental costs associated in the refurbishment to improve the environmental performance of SHPs; such as purchase and installation of special equipment required to improve the ecological condition and safety management e.g. innovative energy saving transformers, monitoring equipment, sensors, and measurement control systems. *As the number of pilot SHP stations has been increased since the PIF to 24 plants*, each station will receive on average USD 210,000 but actual amounts vary. For the pilot plants, the latest technology and equipment available will be installed. The co-finance will be from the Chinese government as a grant, from the project owners and in loans from local banks.
The proposed activities have been designed to ensure that the preparation, implementation and operation of these projects will build up the capacity of the industry (government, design institutes, project owners and associations) to ensure replication. Specifically it is anticipated that MWR will have the long term national ownership for such projects and it is expected that experiences from this will inform MWR's future policies.

Details of the component outputs and activities are described below.

Outcome 2.1: Refurbished green SHP plants are fully operational and improved management and safety standards are in place		
Outcome 2.2: Improved performance and safety management for SHPs in place		
Outputs	Activities	Responsibility
2.1.1 Twenty-four business plans[30] and feasibility studies[31] finalised for upgrading SHP demonstration plants	• Technical assistance provided on greening technology and safety measures • Business plans and project design reports finalised	ICSHP, WRBs, design institutes, national and international consultants, SHP owners
2.1.2 Upgraded green SHP plants rehabilitated at 24 sites with additional capacity of approx. 23.7 MW, additional generation of 157 GWh and improving the environment of about	• Installation and commissioning of demonstration projects • Performance Monitoring and analysis of projects o Environmental flow and performance monitoring and analysis of projects; o Assessment of the automation and technical level of the SHP stations	WRBs, national consultants, SHP owners

[30] In China this refers to the technical and economic assessment document
[31] Feasibility Study Report (FSR) and Project Design Report (PDR) are used interchangeably in this document. In China the most important document is the PDR which includes the financial analysis and is the document used for Government approval.

24 rivers.		
2.1.3 Socio-economic and environmental impact of green small hydro rehabilitation recorded	• Carry out Environmental and Social Management Plans (EMSPs) at each site • Carry out baseline and impact socio-economic and environmental studies of local area and population prior to, and post, rehabilitation at 10 representative sites • Documentation of results of demonstration projects and preparation of case studies.	WRBs, EPBs, national consultants, SHP owners

The selection of the GEF demonstration projects was a two-staged process to ensure that the projects are additional, incremental, replicable, viable and co-finance would be available. During the PPG project selection criteria were prepared in consultation with project stakeholders (see section A.1.1.d for details on consultation). In addition it was agreed that it would make sense for the project to focus on approximately 5-8 provinces and therefore province selection criteria were also prepared in consultation with MWR. Copies of these criteria are included in Annex T4. MWR circulated a request to every province for projects which met the criteria and which also met the criteria of the Government refurbishment programme. Gender considerations were added to the selection criteria to ensure that women and men will equally benefit from the SHP project and that neither women nor men will have disadvantages through the projects. Based on the responses from each province, 8 provinces were finally selected.

Initial information on projects interested and eligible to receive funding was received from SHP owners/developers. During the selection process it became apparent that it was difficult to meet the initial strict selection criteria, in particular with regard to size (1MW – 20 MW) and to dam and reservoir size (ICOLD definition on large dams) since in China the vast majority of projects eligible for the refurbishment programme have larger dams or reservoirs, or, alternatively, are smaller than 1 MW. As a result a greater number of projects was needed to result in the anticipated outputs (24 as opposed to the 15 mentioned in the PIF). In addition, criteria was added that each pilot project should confirm the SHP plants construction stability when it was built and at present, and show that the existing SHP plants have had the nationally required minimum SHP construction assessment conducted duringthe initial construction (according to the national guidelines at that time). For example, according to the "Reservior Dam Safety Appraisal Measure" revised by MWR in 2003, there was, and still is, a requirement for plants with a dam height above 15 meters or a reservoir capacity above 1 million m^3 to carry out mandatory dam safety appraisal . For smaller dams, such as those in this project, it is not compulsory. However, the plant owners do carry out routine dam checks.

From an initial list received by MWR of 53 projects, the project information received was then further screened and feasibility studies were carried out for each of the 24 short-listed projects on the viability and feasibility of greening the SHP rehabilitation and improving the safety standards. In particular the following aspects were reviewed:

- Proposed environmental improvements such as environmental remediation for dehydration sections between the dam and powerhouse of diversion SHP stations, ecological flow discharging and supervision, animal life protection;
- Proposed improved management such as management regulation of the optimization and electricity dispatching, safety and standardized operation to improve the efficiency;
- Proposed improved technology application and equipment such as innovative energy saving transformer, monitoring equipment, sensors and measurement control equipment.

Taking these into account, during the PPG, a long list of potential measures to be included in the project was prepared. The table below provides an overview of the measures. These were peer reviewed by experts in the field of green SHP around the world. A full copy of this long list along with a short technical description, its use internationally, applicability, indicative cost and advantages and disadvantages is included in Annex T3. For each of the demonstration projects a number of these measures were selected depending on local applicability with the objective that the demonstration projects will meet the highest grades of the new Green SHP criteria.

The aim is that, following the refurbishment, each of the demonstration projects will also meet China's Grade A of the safe production standard. Grade A stations showcase: a) safety production standards; b) intelligent monitoring systems including sensors and advanced measurement control equipment; c) establishing a connection between the

key equipment operation and the measuring point to realize real time monitoring of the equipment operation status and; d) a dynamic management. In some cases Grade A may not be appropriate due to the small scale of the project and in those cases Grade B will be attained which is more suitable and is still a significant improvement on the current situation. Accordingly, the management of the SHP stations including automation, information exchange and standardization will be improved. Automated SHP stations will be promoted through this effort and plant performance will be increased significantly.

Table 2: Summary of Long List of potential measures/activities for inclusion in demonstration projects

Aim	Measures/activities
Ecological flow discharging and monitoring	• Install discharge sluice • Install equipment for real-time monitoring • Installation of residual flow turbines to run all year on ecological flow.
Environmental remediation for dehydration sections	• Construction of weirs • Improve flow conditions
Protection of aquatic life	• Sonar/optical equipment in intakes • Trash facilities • Fish passes[32]
Reducing flushing effect from reservoir flow discharge	• Construct balance reservoirs
Increase local water supply and irrigation	• Install more water supply facilities for production and for drinking. • Install irrigation facilities for local population
Improve facilities to collect and dispose of floating debris	• Install floating debris collection devise in front of trash rack • Construct garbage disposal facilities
Improve local watershed and ecological recovery / natural landscape recovery	• Dredging river upstream and downstream • Forestation / grass planting • Use local materials to recover damaged areas • Stop felling trees
Monitor water quality	• Install water monitoring equipment for physical and chemical characteristics and carry out regular biological sample monitoring and analysis
Improve hydrological measurement and flood warning system	• Install hydrological equipment upstream • Install flood warning system
Optimise operation of plant	• Use software to optimise dispatching decisions • Install online efficiency monitoring devices
Safe production standardisation (Grade A)	• The plants conduct measures to meet safe operation standardization according to the national technical standard
Apply for Green Small Hydropower Assessment	• Apply for assessment according the green SHP assessment standard and regulations.
Realize unattended operation via remote monitoring	• Equipped with functions of remote communication , measurement, regulation and video; • Monitoring system is equipped with economic optimized operation function;
Transformer energy saving and consumption reduction	• Main Transformer of the Substation reaches S11 or above
Other measures where necessary and applicable	

[32] This will be decided depending on actual situation, whether it is considered necessary

Improve leisure functions and local public services	• Provide leisure areas and invest in public services to benefit local residents
Reduction in oil leakage	• Adopt the low-head turbine greening technology, including installing the external turbine blades relay at axle of the generator. • Oil free lubrication • Treatment and collection of turbine oil
Improve sound insulation facilities	• Install noise-proof equipment in control and duty rooms to improve the working environment for staff (if on-site staff)
Clear water basin and cesspool	• Zero release of waste water –applicable depending on number of staff
Other renewable energy generation	• If budget available and renewable resource available

Finally a list of 24 projects was selected. All projects are below 20 MW. The list of projects includes a number of 'bundled' projects where the same project owner will rehabilitate more than one plant on the same stretch of river. All the projects fall below the ICOLD definition on large dams and in all cases there will be no changes to the existing dam or reservoir, so no related environmental impacts. These projects all meet the objectives of the GEF projects and in total will mean an additional 23.7 MW of SHP is installed at the refurbished plants and an estimated 2.2 million tonnes of GHG are avoided over the lifetime of the projects. In some cases there is no increase in capacity but there is still a significant increase in annual generation. In total generation will increase by about 157 GWh a year.

During the PPG phase, a preliminary ESIA was conducted. The finding shows that there are no indigenous people at, or close to, any of the demonstration SHP plant sites. If during the inception phase it is found that there are indigenous people living closer, then these groups will be consulted with prior the final design and prior to implementation to ensure that they receive culturally appropriate social and economic benefits; and do not suffer adverse effects during the development process. The results of the pre-ESIA conducted during the PPG (Annex T5) also show that no negative environmental impacts are foreseen but instead the project will yield significant environmental social benefits. These will be explored more during the inception phase and during the preparation of Environmental and Social Mitigation Plans (ESMPs) at each plant.

The selection criteria included the need for the selected project owners to have agreed to partner with the GEF UNIDO project and to make co-financing commitments (24 signed letters have been received covering the 24 projects). The co-finance letters assume grant amounts in line with the 12th FYP so there may be minor changes with the 13th FYP. The organizations include state-owned companies, community organisations and privately owned companies. The MWR's capacity expansion upgrading programme for the 13th Five Year Plan has not yet been finalised. There is a chance that some of the selected projects in this list may not be included in the 13th FYP. If this is the case then they will be replaced during the inception period with a project with equal, or greater, efficiency improvements (i.e. equal or greater GHG emission reduction potential).

The final list of projects covers 8 provinces and includes different proposed greening and safety measures from the list, all of which have high replication potential in China. Every project will introduce ecological flow and monitoring. The following table provides an overview of the demonstration projects including the GEF grant proposed. The grant amount is calculated to ensure the project at least meets the 8% or 10% FIRR required for government approval[33]. The GEF contribution varies between 3.3% and 16.5% of the total project costs, depending on the proposed measures. Full details of each project is provided in the Technical Annexes – with a summary feasibility study and environmental and social assessment in English. Full reports are available in Chinese upon request.

[33] The benchmark depends if the project has been defined as a 'construction project' or an 'SHP project'.

Table 3: List of demonstration projects

No.	Name	Province	Original capacity (kW)	Proposed new capacity (kW)	Main measures to be implemented under Component 2 (covered by GEFTF & co-finance)	Total cost (000 USD)	GEF contribution (000 USD)	GHG emission reduction (tCO2e/life time)
1	Maoyandong Cascade.2 Hydropower Plant	Yunnan	12600	15000	Replace 2 turbines CJA475-L-145/3*17, 2 generators SF7500-14/2860, 2 main transformers SZ11-10000/35GY, replace excitation systems, governors, control protection systems and installs automatic control system, replace fire protection system and grounding devices, install ecological flow pipe & monitoring system, install racking equipment before trash rack, renovate the river channel, increase some retaining walls and restore the landscape, install water quality monitoring, Grade B Safe Production standard, Green SHP assessment, oil collection devices, sound insulation, water purifying tank and plant trees around plant and banks.	5226	260	223982
2	Mabozi Hydropower Plant	Yunnan	3650	5300	Replace turbines (4*1250+300kw), generators, transformers, control protection systems, install ecological flow unit, ecological flow and water quality monitoring, Grade A safe production standard, Green SHP assessment.	3458	235	246475
3	Quanqiaohe Cascade 1 & 2 Hydropower Plant	Yunnan	2300	2890	Replace 2 turbines HLA546-WJ-56, 2 generators SF500-6/990, 1 main transformers S11-2500/10, replace excitation systems, governors, control protection systems and install automatic control system, hydraulic structure refurbishment, Install ecological flow pipe & monitoring system, environment recovery for the dehydration section, Grade A safe production standard, sound insulation and water purifying, green SHP assessment.	1843	265	41192
4	Chahe Hydropower Plant	Yunnan	4000	4800	Replace 3 turbines(HLA384-WJ-86), 3generators (SFW1600-10/1730), SFZ11-6300/35), excitation, governor, monitoring system, valve, hydraulic structure refurbishment (replace gates, sub-powerhouse, sub-station), replace metal structures, fire protection, grounding systems, install ecological flow pipe & monitoring system, install trash rack and trash treatment devices, downstream river channel recovery and landscape, sound insulation, Grade B Safe Production Standard, Green SHP assessment.	2621	156	226339
5	Jiuqianyan Hydropower Plant	Yunnan	6400	8000	Replace 2 turbines/2generators (2*4000Kw), rebuild oil, gas and water system, replace electronic and mechanical equipment, automatic control system, replace metal structures and hoisting devices, hydraulic structure refurbishment, install ecological flow pipe & monitoring system, repair the path nearby the plant,	3638	231	69647

					sound insulation, water purifying, Grade B Safe Production Standard, Green SHP assessment,			
6	Jiugonghe Hydropower Plant	Hubei	2520	2520	Replace 4 turbines ZDT03—LH—160, 4 generators SF630-24/2150, 2 main transformers S13-1600, replace 4 excitation systems, 4 governors GLYWT—PLC—15000, 4 control protection systems and installs automatic control system, hydraulic building refurbishment, replace fire protection system and grounding devices, install ecological flow pipe and reconstruct trash rack, ecological weir downstream, ecological restoration for flood land, riverbank and estuarine wetland, Grade B Safe Production Standard, Green SHP assessment	1099	138	20905
7	Zhoujialiang Hydropower Plant	Hubei	2230	2630	Upgrade 3 turbine-generator units (2 x 1000+630kw); upgrade 6kV high voltage switch cabinet KYN28-12; replace 2 transformers and the main cables of generators and transformers, replace the intake gates of the units, technical water supply gates, as well as the water level of forebay and debris monitoring system of the canal, strengthen the diversion canal, and add diversion canal excess flow, replace part of outlet gates, sluice gates, hoists, ecological flow discharging (equipment, facilities, on-line monitoring system), ecological restoration for flood land, riverbank and estuarine wetland, Grade A Safe Production Standard, Green SHP assessment, install water supply facilities, floating debris disposal, water quality monitoring and hydrological telemetric equipment.	1492	185	63773
8	Yangdaohe Cascade project	Hubei	16250	17000	Replace 3 turbine-generator units (2×1250+1×2000Kw), 6 main transformers and 3 switchers, replace 7 governors, 4 main valves, 2 automatic monitoring systems and 3 oil-gas system. replace 3 bypass valves, renovation of damaged hydraulic buildings. decorate the powerhouse and site area greening, metal structure anticorrosion. replace fire-fighting device and grounding system. increase trash remover and a control center and cables, install facilities for ecological flow discharging, construct a submerged dam behind the existing dam to impound water, install barrier for household refuse and drift wood, install auto trash remover at the intake, install a cascade control centre, Grade A Safe Production Standard, Green SHP assessment	7886	629	193488
9	Majing Hydropower Plant	Chongqing	5000	6400	Replace two HLDT9-WJ-75 turbines; replace two SFW3200-6/1730 generators; replace one SF11-8000/38.5 of main transformer; replace 6.3kV of power distribution equipment. replace auxiliary equipment; replace GYWT-1000-16 of governors; replace the excitation system; replace the protection monitoring system to improve the automation level, replace the open canal; anti-seepage treatment to the non-pressure diversion	3759	192	183655

					tunnel. replace the penstock; renovate the trash rack, gate and headstock gear of the forebay intake; replace two inspection gates of tailrace; install fire-fighting system. install ecological flow discharging facilities: install discharging valve and real-time monitoring equipment; channel dredging and repairing the collapsed bank, Green SHP assessment, Grade A Safe Production Standard			
10	Xiaokeng Hydropower Plant	Chongqing	480	1200	Replace two turbines ZDT03-LH-150×800KW and ZDT03-LH-100×400KW; replace two generators SF-K800-18/2150 800kW COSφ=0.8 and SF-K400-12/990 400 kW COSφ=0.8; replace one S11-1600/10 10.5±5%/0.4KV of main transformer, re-design the lighting of powerhouse to energy saving or LED, install ecological flow discharging facilities: install discharging valve; install a monitoring device at outlet of discharging facility; construct three cascade retaining weirs for environmental remediation of the dehydration section,Grade A Safe Production Standard, Green SHP assessment.	923	125	41937
11	Gaokeng Hydropower Plant	Chongqing	4060	4600	Equipment replacement (replace 4 turbine-generator units 3×800+2200Kw, governors and intake gates; replace a bridge crane; replace the auxiliary and electrical equipment); replace the substation equipment (replace 3 main transformers, 10kV electrical equipment, 35kV electrical equipment and all grounding network.); canal desilting, tunnel lining, retaining wall of tailrace restoring, dredging; ecological flow discharging, ecological remediation for dehydration section, oil collection and disposal, sound insulation, site area afforestation, Grade A Safe Production Standard, Green SHP assessment	2642	219	57121
12	Jingtanfeng and Huangyan Plants	Chongqing	1860	2560	Replace 2 turbines (HL220-WJ-50A)/ 2generators (SFW800-W-6/990), 2 transformer S_{11}-1000/10.5/0.4kv, 2 valves, 2 governors, monitoring, excitation and protection board, dam repair and desilting, penstock repair and maintenance, .replace mechanical and electronical equipments (switch board, DC devices, monitoring system, cable etc), .hydraulicstructure refurbishment (gate, trash rack, booster-station); install ecological flow device & monitoring system, install automatic trash racking equipment, renovate river channel downstream, repair bank protection, optimize control system, sound insulation, water purifying, Grade A Safe Production Standards and Green SHP assessment	1759	235	87200
13	Taiping Hydropower Plant	Chongqing	2000	4000	Equipment replacement (two HLA551-WJ-95 of turbines, two SFW2000-12/1730 of generators and one S11-5000/38.5 of transformer); auxiliary equipment replace (two excitation systems, two YWT-1800-16 of governors and JZH-	2224	153	28488

					00/Φ1400×0.6 of intake valve.); hydraulic building renovation (heighten 1m of intake dam and diversion open canal and forebay; build powerhouse and sub-powerhouse and booster station); ecological flow (equipment, facilities and on-line monitoring system); improve facilities to collect and dispose of floating debris; optimise operation of plant, sound insulation, Grade A Safe Prodcution Standard, Green SHP assessment			
14	Tangban Hydropower Plant	Fujian	11000	12600	Replace existing 2 turbines/generators/control equipment (2*6300kw), 1 main transformer, 2 station-service transformer, 1 dam site transformer, control system, replace excitation systems, governors, monitoring systems and repair water pumps), 0.4kv panel board, 10kv switch board and bus bar, update ecological flow device & monitoring system; replace gate hoisting device, landscape recovery and collapse recovery, waste water treatment, Grade A Safe Production Standard, green SHP assessment.	3894	219	109179
15	Jiaosan & Thantou Hydorpower plant	Fujian	6800	7320	Replace 3 turbines/generators/S_{11} transformer replace 4 turbines (ZDK160-LH-120)/ 4generators (SF630-16/1730)/ 2transformer(S_{11}-1600/110) replace excitation systems, governors, monitoring systems and switch board); hydraulic structure refurbishment (gates and hosting system); replace and install ecological flow device & monitoring system, build 3 ecological weir in the downstream area at Thantou, replace trash rack device, Grade A Safe Production Standard, sound insulation, green SHP assessment	2086	266	73135
16	Gaofang Cascade II Hydropower Plant	Fujian	2000	2350	Replacement of equipment of 2 turbine/ generator/ governor/ switch board (2*1175kw) and installation, sub-station equipment and installation, install ecological flow device & monitoring system, repair the irrigation channel, install trash rack equipment, renovate the river channel, and landscape recovery, water quality monitoring, hydrology measrument and flood warning device, Grade A Safe Production Standard, green SHP assessment	826	109	14956
17	Baiyunxia Hydropower Plant	Shaanxi	1800	2760	Replacement of electromechanical equipment (turbines, generators 2760 kW, governor, switchboard), ecological flow facilities and monitoring, dredging, sound insulation, Grade A Safe Production Standard, green SHP assessment	1810	161	87288
18	Xiakou Hydropower Plant	Shaanxi	1320	1580	Replacement of electromechanical equipment (2×630+1×320kW turbines, generators, governor, switchboard), installation of metal structures, ecological flow facilities and monitoring, dredging, access road, sound insulation, Grade A Safe Production Standard, green SHP assessment	1279	169	7327

19	Xinpingya Hydropower Plant	Shaanxi	2500	3200	Replacement of electromechanical equipment (3200 kW turbines, generators, governor, switchboard), installation of metal structures, ecological flow facilities and real time monitoring, access road, flood warning system, sound insulation, Grade A Safe Production Standard, green SHP assessment,	964	151	30575
20	Guanxi Hydropower Plant	Guangdong	4800	6000	Replace 3 turbines (ZZK15-LH-280)/ 3generators (SF2000-48/4250), replace excitation systems, governors(wst-100), replace oil, gas and water system, 30/5t crane, replace mechanical and electronical equipments (switch board, DC devices, monitoring system, cable), replace sub-station S_{11}-2500kVA,S_{11}-5000kVA etc., install ecological flow device & monitoring system, river channel desilting and bank protection repair, landscaping, Grade A Safe Production Standard, green SHP assessment	3297	195	40596
21	Sandieling & Dongpai Hdropower plant	Guangxi	15000	15000	Construction engineering (renovation of retaining dam, diversion canal, forebay and booster station), equipment replace (turbine-generator units (3 x 4500kw, 3 x 500 kW), electric equipment, booster equipment), replace hoisting equipment, ecological flow discharging and monitoring, watercourse and irrigation canal renovation; water regime automatic forecasting system, Grade A Safe Production Standard, green SHP assessment	5092	203	69335
22	Aibu Cascade II & III Hydropower Plants	Guangxi	1860	5600	Civil engineering (dam, channel, forebay, powerhouse, boost station refurbishment), electrical and mechanical equipment (turbines 3 x 1600kW, 800 kW , generator, sub-station), hoisting devices, install ecological flow device & monitoring system, automatic control system and monitoring system, trash rack collection, Grade A Safe Production Standard, green SHP assessment	5734	188	178725
23	Qingshuitan Hydropower Plant	Zhejiang	960	1200	Replace the electrical equipment; install computerized monitoring system; replace the turbine-generator units to 3×400kW and replace the runners and generators. Replace the manual governor to the manual and electric governor; change the main valve, and replace the technical water supply system, construct drain at the south of the powerhouse; mend the cross section of diversion canal; reconstruct the cable trench inside the powerhouse; 10kV access systems, update the ecological flow discharging culvert, install trash rack at the intake, carry out remediation upstream and downstream of the dam, construct landscape water-raising weir; Grade A Safe Production Standard, green SHP assessment	659	109	81660

24	Panxi Cascades II, III & IV Hydropower Plants	Zhejiang	6400	7000	Electromechanical equipment replace of CJA475-W-99/1×10 of turbines and three SFW800-10/1430 of generators; three CJ-W-95/1×11.5 of turbines and three SFW1000-10/1430 of generators; and HL-WJ-60 of turbines and two SFW800-6/1180 of generators; booster stations replace; powerhouse renovations; install computerized monitoring systems; diversion systems refurbishment; replace some penstocks; replace the discharging pipe of Dayang reservoir at Cascade I and install real-time monitoring equipment, construct two ecological retaining dams; ecological bank protection for 400m of the river to strengthen the riverbank and avoid water-soil loss; increase local water supply and irrigation, increase facilities to collect and dispose of floating debris, plant trees to protect the river ecological environment, water quality monitoring, sound insulation, Grade A Safe Production Standard, green SHP Assessment	5660	586	30510
	Contingency						121	
Total			**117,790**	**141,510**		**69,871***	**5,500****	**2,207,488**

* Cost of experts included.

** The list of measures covered by GEFTF for each SHP project is in Table 2 of Annex T5 (p.15).

2.1.1 Twenty-four technical and economic assesmsents, and feasibility studies finalised for upgrading SHP demonstration plants

- **Technical assistance provided on greening technology; and business plans and feasibility studies finalised**

Each of the demonstration projects described above will include a variety of greening and additional safety measures. Therefore, it is proposed that tailored technical assistance is provided to the project owners and design institutes depending on their needs. This TA expertise will be supplied from the national and international hydro experts. In particular this will provide additional knowledge to these organisations on greening technology and will assist in the PDRs/feasibility study associated with the additional proposed measures. This will include international expertise to assess whether and where the environmental flow devices can be built as fish by passes/fish ladders and provide information on the number of environmental flow devices that can be built as fish by passes. The output from the technical assistance, along with the design institute's work, will be full feasibility studies and the technical and economic assessments (business plans). This will include the final designs and finalise the capital costs and co-finance which will include final approval from Government.

Local stakeholder consultation will be carried out at each project site prior to the project start to ensure that any local concerns are addressed, paying particular attention to the needs and perceptions of both local women and men, as well as the youth. Gender dimensions can then be considered in the project designs. In addition an Environmental and Social Management Plan will be prepared for each site (see 2.1.3).

Each project will be given the approval to start implementation based on the completion of the above activities. This task will be led by the National Project Coordinator with significant support from the provincial water bureaux and international and national hydro experts.

2.1.2 Upgraded green SHP plants rehabilitated at 24 sites with additional capacity of approx. 24 MW

- **Installation and commissioning of demonstration projects**

Following the agreement on support and finance for the projects, the installation and commissioning will be undertaken by the project owner as detailed in the feasibility studies. The office or Focal Point, established in the target provinces where the pilot projects are located will be responsible for the reporting to the Project Management Unit (PMU). The National Project Coordinator will be responsible for over-seeing each of the demonstration projects and for verifying progress on the ground. Regular reporting on the progress of each project will be required to process progress payments. Following the commissioning of the project the project owner will submit a completion report to the PMU. A template for the Completion Report will be provided to the unit owner and will include details of the installation, commissioning data, photos, videos, and also at least one month's performance data for the project. Representatives for the PMU will visit the demonstration projects to verify the reports. On receipt of this Completion Report the final percentage, to be outlined in the contracts between GEF/UNIDO and MOF, of the GEF contribution will be released to the project owner.

- **Performance monitoring and analysis of projects**

An independent consultant will carry out the evaluation of the demonstration projects, coordinated by the PMU. The evaluation of the demonstration projects will be carried out based on the baseline data provided as part of the full feasibility studies. Each project evaluation will follow the same reporting structure developed and established for this project and in line with similar GEF projects. The following elements will be covered:

  - **Environmental flow and performance monitoring and analysis of projects**

The performance will be monitored based on GEF monitoring guidelines, specify the data collection methodology, instruments used, performance parameters to be calculated and the procedures for calculation and presentation of results. The indicators against which the project will be monitored will also be finalised. This will include as a minimum: monitoring and verifying the kW installed, energy generated and GHG emissions avoided directly due to the GEF project; assessing the monitoring data of the environmental flow, assessing the operational record of the projects, assessing the commercial operation of the project; identifying any problems; compiling lessons learned, and recommendations from lessons learned and implication/strategy for scaling up or replication. During the project implementation phase, the monitoring data will be reviewed by the local water resources departments or the environmental protection bureau before submission to the PMU.

- **Assessment of the automation and technical level of the SHP stations for safe production**

After the rehabilitation is completed, an independent national expert will be invited to assess the automation and technical level of the pilot station with respect to the Safe Production Standard and compared to the situation described in the baseline feasibility study. Impact research will be conducted for a duration of more than one year after the rehabilitation, baseline data will be compared. Data collected will be both quantitatively and qualitatively evaluated. Certification of the standard will only be issued if the plant is assessed to have reached the proposed level. If the SHP plant has not attained the proposed safe production standard the local WRB will work with the plant owner to ensure that they reach the proposed level. Reimbursement will be withheld in the case of non-conformity until remedy action is taken to reach the satisfactory level.

For each project a case study will be prepared for dissemination purposes. The case studies should be designed in such a way that they are easily accessible by different stakeholder groups. These will also be included on the project, MWR and ICSHP websites.

2.1.3 Socio-economic and environmental impact of green small hydro rehabilitation recorded

The impact of the project is designed to be positive. To this end, an Environmental and Social Management Plan (ESMP) for each plant in the Inception phase will further define the mitigation and monitoring requirements for each project, ensuring its 'greenability' and providing a blueprint for future sustainable green SHP. It is also important that not only is the technical performance of the projects analysed but also clear evidence is collected of the environmental and local socio-economic impacts of the rehabilitation and its greening. This was also brought up as being important by the civil society consultees during PPG. This information can be used to feed into future policy and to promote further replication of the greening and safety measures for small hydropower. Therefore in addition to the ESMPs at each site it is proposed to carry out project baseline and impact studies focussing on the socio-economic and environmental conditions before and after the project. These can also contribute to the monitoring and evaluation of the project: Further details of the ESMPs and baseline and impact studies are provided below.

- **Carry out ESMPs for each site**

The ESMP for each site will define the mitigation and monitoring requirements and will include the specific tasks, schedule and the budget for implementation, supervising and monitoring the environmental and social impact mitigation and management measures. Gender dimensions will be conducted in parallel. It will also include a set of capacity building measures including procedures and practices and actions needed to implement all the measures. Clear Terms of Reference will be provided for the ESMP based on the guidance provided by UNIDO/GEF and the work will be carried out during the inception period by consultants in close cooperation with project stakeholders. A template for the ESMP is included at the end of Annex T5.

- **Carry out baseline and impact socio-economic and environmental study of local area and population prior to, and post, rehabilitation**

These studies will feed into the monitoring and evaluation of the project by providing detailed baseline information for project sites and recording real impacts of the project after the rehabilitation. The work will be carried out by experts with experience in previous socio-economic and environmental studies and assessments. The first step will be to identify the indicators and information to be collected at each site. This will include environmental factors such as current river flow (including variations over the year), water quality, conditions of river banks, evidence of silting, current aquatic life as well as more socio-economic factors such as current use of river, irrigation uses, economic situation of local population, current impact of SHP on the local population, current use of energy, quality of energy supply, etc. Both quantitative and qualitative methods will be applied taking into account the different data needs identified. Depending on the data needs identified the baseline study is likely to use a mix of methodologies such as site survey, household surveys and questionnaires, focus group discussions, key informant interviews and desk review of secondary sources. The experts will develop tools for collecting the information including the questionnaires to be used in conducting the surveys. All data will be gender disaggregated where appropriate and classified according to different background and social sectors. This data can be used for establishing the baseline to monitor gender related issues.

The baseline studies will take place prior to work starting on site at any of the projects and a report will be prepared for each project. It is intended to carry out baseline studies at 10 of the sites as representative of all the sites, rather

than carrying out at every site. In particular this will include the larger projects where a greater level of stakeholder consultation needs to take place anyway. At these sites the information can help in the preparation of the Environmental and Social Management Plans (ESMPs).

Following the rehabilitation, an independent consultant will carry out the socio-economic and environmental impact studies of the demonstration projects. The impact studies will be carried out comparing the baseline data provided in the baseline studies and will be carried out after over a year period post-rehabilitation. It is anticipated that the same protocols/methodologies will be used as in the baseline study and that all socio-economic data will be disaggregated by gender to assess the different impacts on men and women living locally. Data collected will be both quantitative and qualitative in nature.

- **Documentation of results of demonstration projects and preparation of case studies**

For each project a case study will be prepared for dissemination purposes. As more technical and performance case studies above become available, these should be designed in such a way that they are easily accessible by different stakeholder groups. If considered appropriate these can be combined with the technical case studies. These will also be included on the project, MWR and ICSHP websites.

Component 3: Knowledge base and capacities in the fields of green SHP and improved and safe SHP management

Capacity Building of the major stakeholders, including participating SHP owners and associations, national and local government departments, technology developers and suppliers, academia and design institutes, is essential to creating interest and ensuring replication for greening and safe SHP upgrading. This component encompasses technical assistance to strengthen the knowledge base and capacities of relevant stakeholders in China. This will happen through workshops, seminars, meetings and trainings on best practices in ecological SHP refurbishment and operation, management procedures, technology and equipment. Relevant officials, SHP project owners and industry actors will participate in the appropriate design and planning of upgrades and refurbishments and will learn through dissemination of experiences and lessons learned of case studies. The training and appraisal regulations for green SHP assessment institutions will be established to train experts and qualified agencies in supporting the construction of green SHP refurbishments. Attention will be paid to ensure equal opportunities for women and men to participate in and benefit from the trainings, both the participants as well as the facilitators. Hence, it is necessary to identify the gender differentiated needs, priorities and gaps allowing the female participation to be at least 25%[34]. If necessary targeted building of women's capacities will be considered under this component.

Each of these activities has been designed with long-term sustainability in mind. For this to be practicable the capacity building needs to be owned by national institutions which will be responsible for taking it forward beyond the project. MWR together with INSHP will be the owners of the training activities and will take over these activities in the long-term. The training will include train-the-trainers sessions ensuring that staff in universities are in a position to pass on their knowledge beyond the end of the project. In particular SHP associations will help ensure replication through their members and can play a role in identifying future projects.

Details of the component outputs and activities are described below.

Outcome 3.1: Knowledge and awareness of decision makers, experts and technicians about green SHP retrofitting and management is improved		
Outputs	Activities	Responsibility
3.1.1 Capacity building programme for SHP project owners, developers and technicians delivered to 1200 women and men (at	• Training material developed and train-the-trainers sessions conducted • Training programmes delivered to project owners, developers, managers, technicians and design institutes	INSHP, MWR, academic institutions, national and international consultants

[34] Participation in training courses should be gender balanced, i.e. targeting at having at least 40% of participants of the underrepresented sex. As the local energy sector is characterized by strong male domination, the optimal participation of 40% does not seem feasible. A gender analysis will be necessary to provide reliable information for defining a baseline. This will allow setting realistic targets for female participation, initially set at 25%. If not enough qualified females are available it could be considered to make an additional course to upgrade skills of female students to allow them to participate.

least 25% women)	• Study tour	
3.1.2 Capacity building programme for officials on green SHP and Safe Production Standard	• Training material developed on policy and regulation on Green Small Hydro and on Safe Production Standard • Training delivered to MWR officials at national and local level in 8 provinces • Study tour	INSHP, MWR, academic institutions, national and international consultants
3.1.3 Awareness-raising campaign delivered	• Green Small Hydro awareness and training delivered for project participants • Deliver an awareness-raising programme on green hydro and safe production standards o Develop green hydro and safety standards awareness material focussed on the public and for project developers/owners and officials o Develop a Chinese website dedicated to green hydro/or add a special area, including messenging platforms, ie. WeChat; • Three national seminars held • Hold an international green hydro event	INSHP, MWR, WRBs, national and international consultants
3.1.4 Establishment of a recommendation list for 25 green SHP assessment institutions (experts)	• Develop training material for assessors • Carry out training and appraisal for national SHP association, hydropower survey and design institutes and some agencies who carry out SHP assessment • Deliver training to potential assessment institutions Establish a recommendation list for green SHP assessment institutions (experts).	MWR, INSHP, national SHP association, design institutes, the third-party assessment agencies.
3.1.5 Thirty institutions trained and assessed to carry out Safe Production Standard assessments	• Develop training material for assessors • Select institutions for training • Deliver training to potential assessment institutions	INSHP, MWR, national consultants

During the PPG it became apparent that there were clear training needs across the sector. These included: National and provincial policy making officers and experts (WRB, DRC, EPB, pricing bureau, safety supervision and power departments); Government project managers of capacity expansion project (WRB); Professional organisations including ICSHP, IWHR, HRC and other hydropower research institutes; Provincial, city and county rural hydropower associations; SHP plant owners and staff; and design, supervision, manufacturing and construction enterprises on rural hydropower.

During the consultation it was agreed to focus the training of these groups as follows: a) Technical courses for SHP project owners, associations and design institutes; and b) Training policy makers and government staff. In addition support will be provided to establish a recommendation list for Green Small hydro assessment as well support for the qualification of a number of institutes to assess green small hydro and to assess the safety and protection measures. Details of each of these are provided below

3.1.1 Capacity building programme for SHP project owners, developers and technicians delivered to 1200 people

This will be a 3-day training workshop, owned by MWR and INSHP, targeted at the management and technical personnel at SHP sites, SHP developers, association members and design institutes. It is anticipated that initially a train-the-trainers course will be run to ensure the sustainability of the training beyond the project period.

The training will provide an introduction to the environmental/green measures available during SHP rehabilitation providing examples, citing impacts and detailing the applicability of each, before introducing the more detailed design and operating issues related to the measures. The training will help to identify measures each participant could develop at their sites and will help them to identify the technical aspects of such a project as well as to carry

out a life cycle cost analysis of the project. All training material will contain gender dimensions related to the topic. The training will also include briefing/training on the procedure of application for future potential SHP owners who wish to apply for similar green SHP scheme. The training will be provided in classroom and at demonstration projects. The training workshops will cover the following:

- Introduction to environmental impacts of SHP
- Identification, development and management of potential green measures
- Technology and equipment
- Detailed design and development of green measures
- Operation and maintenance issues relating to the green measures
- Safety and security standards including measures to meet Grade A Safety regulations
- Analysis of typical plants that meet the Safe and Production Standards.
- Related policy / grant issues

- **Training material developed and Train-the-trainers trained**

Minimum criteria will be developed to select the trainers to be trained to ensure they are suitably qualified. This will include the necessary experience and expertise. The trainers are likely to come from the design institutes, universities, MWR and provincial WRBs. It is anticipated that 80 trainers will be trained in one session. The training will be delivered by a group of international and national experts.

Simultaneously the training material will be developed with both national and international experts. The draft version of the training material will be used for the train-the-trainer course and it will then be revised and developed further with the help of the trained trainers. Following adaptation of the material a workshop will be held with the experts to finalise the training material.

- **Training programmes delivered to project owners, developers, managers, technicians and design institutes**

Training will be open to any SHP owner and design institutes involved in SHP rehabilitation. Attendance at the training will be free and these training sessions will be advertised through SHP associations, MWR and provincial WRBs and EPB. A series of 15 of these 3-day trainings is envisaged with the target of training 1,200 managers/personnel.

- **Study tour for project owners, developers, managers, technicians and design institutes**

An international study tour will be organised to allow project owners, technicians and design institutes to see green hydro measures in practice and to understand their local benefits. The study tour would allow for an exchange of ideas and innovation with project owners and engineers in Europe. The likely destination countries will be Switzerland and Austria linked to a local institution or university in the field of SHP, and will include certified training. It is expected that about 25 project owners/design institutes from the 8 provinces will participate in the study tour.

3.1.2 Capacity building programme for officials on green SHP and Safe Production Standard

Increasing the capacity of policy makers at national and provincial level will help policy makers to understand the benefits of the regulations and standards relating to green SHP and safety and protection as well as empowering them to design their own possible incentive measures (contributing to activities under Component 1).

- **Training material developed on policy and regulation on Green Small Hydro and on Safe Production Standard**

The training will cover the specifics of the existing and proposed regulations, gender dimensions as well as detailing the incentive policies and practices of international green SHP. The training will include reviewing the applicability of different incentive schemes for the Chinese context and will be developed by national and international experts. This training will be owned by MWR and INSHP.

- **Training programme delivered to national and provincial level MWR /WRB officials in 8 provinces**

Training sessions of 2 days are proposed in each of the target provinces along with an international study tour to see green hydro and incentive policies in practice. The study tour would allow for an exchange of ideas with relevant governments and experts. This could be combined with the study tour above, or be separate. The likely destination countries will be Switzerland and Austria. It is expected that in total 200 policy makers will be trained at both the national level and in the 8 provinces and of these about 30 trainees attend the study tour.

3.1.3 Awareness raising campaign delivered

- **Green Small Hydro awareness and training for the GEF project**

At the beginning of the project a number of introduction meetings to the GEF project will be held to discuss the principles of the project, the process to date and the next steps. This workshop will build on the validation workshop held in November 2015 and will include stakeholders from all the groups identified above along with the media. This will be organised by the PMU and approximately 150 participants are expected.

Linked to the above, training will be provided to the demonstration project owners so that they are familiar with the GEF-UNIDO procedures, policies, requirements, use of grant, reporting responsibilities, etc. As part of this the training will include gender dimensions. This will help with the smooth running of the project and will be arranged by the PMU.

- **Deliver an awareness raising programme on green hydro and safe production standards**

A two-pronged awareness raising programme will be designed which will be targeted at a technical and non-technical audience. The key messages of the two programmes will be the same but the language and focus will be different for the two different groups. The key activities will be:

  - Develop green hydro and safety standards awareness material focussed at the public and for project developers/owners and officials. Material for the public will be pamphlets, videos, short TV programmes to be circulated widely. Material for project owners will include pamphlets plus more detailed technical information and the case studies developed as part of this project. In addition, posters will be developed that can be displayed at the project sites for visitors to understand the environmental issues and measures undertaken there.
  - Develop a Chinese website dedicated to green hydro or add a special section to existing website. This will be hosted at MWR and will include pages for the public and for project owners, policy makers and design institutes. Knowledge products developed as part of this project will be included on the website. MWR will maintain it beyond the end of the GEF project.
  - A knowledge sharing platform and roster of experts on green SHP will be developed. The platform will be based on the project website and the consultants will be available to call upon for expertise on both technical and policy issues relating to green SHP.

- **Hold 3 regular national seminars**

Three national seminars will be held which will introduce the concepts of green SHP to the relevant Ministries including MEP, MWR, NDRC, the associations at the provincial levels, potential SHP plant owners, staff from development banks (potential lenders to SHP plants) both at national and provincial levels, SHP engineers, SHP academics and engineers, and journalists from SHP related trade journals, NGOs, general public, etc. The objective of these seminars is to share experiences and lessons lerned as well as to encourage other SHP plants to carry out green upgrades.

- **Hold an international green SHP event**

The event could include showcasing of journey (historical development), transformation (compare before and after) and accomplishments as a result of this project (and similar green SHP initiatives of the Chinese government in the country). The event will allow sharing of experience between international and Chinese experts on the experiences to date and to identify if any changes or improvements can be made. The whole event will be gender mainstreamed and will include a session focussing on gender dimensions in green SHP.

3.1.4 Establish a recommendation list of 25 institutions for green SHP assessment institutions (experts)

Currently only three organisations can carry out assessments under MWR – these are China Institute of Water Resources and hydropower Research (IWHR), ICSHP and the National Research Institute for Rural Electrification (HRC). Therefore a training and appraisal system for green hydro assessors will be established so that the roll out of the greeenhydro can be accelerated. The objective of this activity will be to develop the training and appraisal needed for national SHP associations, hydropower survey and design institutes and other agencies who carry out SHP assessment. A recommendation list of green SHP assessors will also be established for those who attend the training and pass the appraisals.

- **Develop training material for assessors**

The training material will include the management rules and assessment standards for green SHP, will contain gender dimensions and will include sharing experiences of the demonstration projects. The training course will include examination on relevant SHP rules, calculation of hydrologic water quantity, standardized selection of the minimum flow, calculation of energy saving and emission reductions, social and economic assessment and resettlement assessment. The material will take the potential assessors through a step-by-step approach to carrying out the asesssments and will include an assessment under supervision.

- **Develop a appraisal system and select institutions and trainees for green SHP assessment training**

To carry out green SHP assessment potential assessors must attend the training and pass the examination and receive an appointment letter. Working with MWR, criteria will be developed for the assessment organisations which are likely to include, inter alia:

  - Have carried out SHP planning, design, construction and operation over 15 years
  - Have a SHP Environmental Impact Assessment (EIA) qualification and have been engaged in SHP EIA over 10 years
  - At least (10) qualified assessment experts including experience in hydrology, sediment, water environment, hydropower and ecology
  - Technical capability and facilities for assessment

Qualification criteria for potential assessors to attend the course will also be set, including level of technical qualifications and number of years of work experience.

It is proposed that ICSHP invites MWR and the MEP for a meeting to discuss /recommend some institutes that meet the criteria to take the responsibiltiy to carry out green SHP assessment . As the PMU, ICSHP will complete the organization list and report to MWR and MEP to finalize the list of institutes.

It is proposed that 25 institutions and 250 trainnees are to be selected. Prioirty will be given to institutions in the selected 8 provinces.

- **Establish a recommendation list of green small hydro assessment institutions (experts)**

Training will be delivered by national experts and MWR. Following the training the potential assessors will be included on the recommended list.

3.1.5 Thirty institutions trained and assessed to carry out safe production standardization assessments

To date MWR have trained and identified 54 assessment organisations, yet with over 47,000 SHP plants in China there is a need to have many more organisations to become assessors, but this has been held back due to fund shortages. These 54 organisations are all qualified to assess Grade A safety standard, which is a national level standard. However there are few organisations at the provincial level which have been qualified to assess Grade B and Grade C safety standards. There is a greater demand for the provincial level assessors since it is cheaper for the SHP owner to be assessed at this level. GEF-UNIDO will therefore support MWR to update the training material and will assist in examining more organisations with a focus on provincial institutions.

- **Revised training material for assessors**

Training will be provided on the rural hydropower safe production and management and on the Assessment Standard of Rural Hydropower Safe and Production Standardisation and relevant policies as well as on the Code for Rural Hydropower Technical Management (SL529-2011). Using national experts, MWR's training material will be

updated in line with any revisions, with clear provincial-level specific material, with gender dimensions and with clear modules for those institutions becoming assessors at Grade A, B or C.

- **Select institutions for training**

Institutions and trainees for the training will be selected using the MWR's existing requirements focussed on the 8 target provinces. It is expected that about 300 trainees will be selected from 30 institutions.

- **Deliver training to potential assessment institutions**

Training will be delivered by national experts and MWR. Following the training the potential assessors will be assessed and accredited.

Consistency with GEF focal area strategy

The project is clearly in line with GEF-6 Climate Change Mitigation (CCM) Strategy in that it supports an integrated approach combining policy development, technology and concept introduction and capacity building, and the upgrading of SHP has significant climate change mitigation potential. In particular the project supports Objective 1 of the CCM strategy which aims to promote innovation, technology transfer, and supportive policies and strategies. The Objective consists of two Programs: This GEF project supports outcomes under both programs. Program 1: Promote the timely development, demonstration, and financing of low carbon technologies and mitigation options and Program 2: Develop and demonstrate innovative policy packages and market initiatives to foster a new range of mitigation actions. The overall project aims to mainstream the greening of SHP within upgrading SHP programmes and therefore will generate multiple environmental benefits including GHG emission reduction, improved local environmental conditions and increased biodiversity.

One of the project focus areas is on the demonstration and early deployment of innovative green, safe and efficient options for upgrading SHP which have proven GHG mitigation potential and vast replication potential in China. Therefore this in line with Program 1 which considers key application areas with significant anticipated and proven mitigation potential, and will support innovative polices and mechanisms to enable their uptake The project activities also seek to remove policy and regulatory barriers by creating enabling environments for green upgrading focusing on the development of incentives for green SHP upgrading and on the regulatory framework to assess green and safe SHP. In so doing the project is consistent with Program 1 (outcome 2) and Program 2 which focuses on helping countries develop and demonstrate a limited number of innovative policy packages and market mechanisms to foster a new range of incentives for economically sound mitigation actions.

A.1.4 Incremental cost reasoning, expected contributions from the baseline, GEFTF and co-financing

Sector analysis, review of existing barriers and meetings with various stakeholder groups - all carried out during the PPG phase - have shown the strong relevance of the GEF-UNIDO project, its additionality, incremental reasoning, cost effectiveness and complementarity to ongoing and planned national programmes to upgrade SHP in China.

GEF funding is being requested to provide the incremental policy, technical and financial inputs required to support and effectively leverage national efforts in facilitating greening and improving the safety of SHPs. The funds will help in bringing international experience to China, in speeding up changes, in the introduction of new SHP measures and will support GHG emission reductions. GEF financing will provide the necessary catalytic support to create and sustain demand for upgrading SHP inclusive of green and safe production measures. Specifically, GEF will be used to demonstrate the viability of selected and highly replicabe green and safe SHP. The demonstration effect will be significant in helping to remove barriers currently preventing SHP owners from upgrading and including greening and safety measures.

GEF financing will provide technical assistance to develop and finalise a green SHP ministerial standard, to develop technical guidelines, to assist in roll out of the safe production standards and will support the establishment of incentive mechanisms for further uptake. Further, GEF financing will provide technical assistance for institutional strengthening, capacity building and awareness raising to create a supportive institutional framework. Finally, GEF support will contribute to project management and co-ordination. In so doing the project will multiply the impact and global environmental returns of resources allocated to SHP by the Government.

a) Baseline / business as usual scenario including expected contributions from the baseline

As elaborated, the Chinese government attaches great priority to the development and utilisation of hydropower in China and has passed a series of policies to support and encourage SHP development and rehabilitation. In particular the Government has launched the Small Hydropower Replacing Fuelwood Programme, New Rural Hydropower Electrification Programme and the SHP Capacity Expansion and Efficiency Improvement of Rural Hydropower programme. Although the SHP rehabilitation programme has been very successful in increasing the capacity and output of the SHP, the activities have been limited to replacing equipment – namely the mechanical and electrical components and sometimes including some civil works. The Government subsidy is only available for these parts. There has been very limited focus on the ecological and environmental aspects and improved management practices. The baseline scenario includes 22,000 SHP plants (built pre 1995) in China with only 4,433 being upgraded to date with electro-mechanical equipment only.

There is a provisional Safe Production SHP standard but there is insufficient resources to review or to roll it out to the provinces. MWR has also been working on a draft Green Small Hydropower Evaluation Index however it is still in its early development and needs further research, improvements, testing, feedback, cooperation between MWR and the Ministry of Environmental Protection (MEP), proposals for roll out and both government and user acceptance. In addition outside of key people at the ministry there is little knowledge of the safe production or green SHP draft standards or associated measures in China.

In the absence of the proposed GEF-UNIDO project SHPs will be upgraded under the Government programme but it would be limited to upgrading only the electro-mechancial equipment, this would limit the efficiency improvements and improved safety and would likely only include state owned enterprises. Many SHP plants would still not be upgraded and fossil fuelled power generation would not be reduced. The environmental impacts of the SHP would remain the same with numerous dehydrated sections, impacted biodiversity and loss of livelihoods.. The vast majority of potential stakeholders will continue to suffer from lack of information, understanding and technical capacity of the green and safe SHP upgrading opportunities. There will be few demonstration projects showing what is technically feasible and financially viable. Without support, limited resources will be directed at developing the green SHP standard and in rolling out the Safe Production standards since there is a lack of resources to enable it to happen.

In conclusion, in the short-term, the baseline scenario would not be able to address the barriers to environmental upgrading of SHPs and therefore there will be little change to upgrading projects. The underlying critical problems of the lack of awareness of opportunity, lack of adequate institutional capacity and good technical expertise and skills on the market would remain unresolved. The potential environmental upgrading of SHPs would not be realised; increased SHP power generation would not be commissioned, meaning more fossil fuelled power generation with associated GHG emissions that could otherwise be avoided, and there would continue to be some negative environmental impacts with existing SHPs.

b) GEF Project Alternative scenario and expected contributions from GEFTF and co-finance

At the policy level the project would provide the additional technical assistance needed to strengthen the policy and standards framework for green SHP and to support the development of incentive mechanisms to provide the assurances required to encourage SHP owners to invest in environmental upgrading of SHPs . GEF financing is sought to bring in international experience, to support the review and development of the green SHP ministerial standard as well as to assist in developing the associated management rules and technical guidelines. In addition GEF financing is requested to help in the support and development of national and provincial/local incentives for green and safe production SHPs and is sought to help in accelerating the roll-out of the Safe Production SHP standard. Expected contributions from the GEFTF are USD 1,200,000 and from other co-finance sources of USD 1,685,000.

At the project implementation level the project would provide project-specific technical assistance and financing support through Project Component 2 by facilitating the implementation of 24 selected highly replicable SHP upgrading projects. GEF financing is sought to provide assistance to approximately 24 projects leading to the installation of an estimated additional 23.7 MW and 157,000 MWh generation per year. The GEF financing will facilitate these projects to get off the ground and will introduce green and safe production best practice measures by leveraging co-finance and where necessary providing technical assistance. Without the GEF support these projects would not go ahead. The realisation of these projects would generate Chinese case studies and demonstrate success stories which will then be disseminated through the other project activities. This is expected to fuel the interest in green upgrading SHP projects and reduce the associated perceived risks. Expected contibutions from the GEFTF are USD 6,000,000 and from other co-finance sources of USD 66,600,000.

At the institutional level, through an extensive technical assistance, knowledge and capacity building programme the GEF financing will add the technical assistance needed to strengthen local expertise, knowledge and capacity in developing, implementing, maintaining and assessing green and safe production SHPs. GEF financing will be used to develop knowledge products, training material and courses, public awareness raising material and to accredit 55 institutions which would not be possible without the funding. All training activities will actively promote the inclusion of women with the project targeting 25% female participation.

At the market level the project would target all players. For SHP owners and local government, the project will provide the knowledge to fully understand the economic and environmental benefits of environmental upgrading; and the technical capacity and tools to take such projects forward. Increased awareness across the sector of green SHP potential and benefits delivered by the project will boost demand for environmental upgrading SHP generating the pull for market creation. Creation of the basis of an on-going sustainable training programme will enable the market to continue to develop and create technicians and engineers able to service the future growing market. Expected contributions from the GEFTF are USD 1,150,000 for these activities.

Considering the proposed structure of the GEF-UNIDO project, its implementation will provide critical contributions for the creation of a demand for environmental and safe upgrading of SHP projects by SHP owners across China. With more than 17,500 SHPs not yet upgraded, there is huge potential for further replication and scale-up.

A.1.5 Global environmental benefits

a) Global Environmental benefits

The investments as part of the green SHP demonstraton plants (24 projects) are initially estimated to result in at least 2.20 million tCO2eq (direct GEBs) emission reduction over a 20 year lifecycle duration of the systems. After the completion of this project, investments are expected to be increased due to the long term outcomes of the project activities; work undertaken under the regulatory Component will strengthen the policy and institutional framework to enhance penetration and scaling up of green upgrading of SHP plants; awareness raising and capacity building activities will contribute to significant indirect CO2 emissions reduction.

Considering the number of SHP plants in China, a conservative estimate for a replication factor of 3 can be used on the demonstration projects, which will result in deployment of further upgraded SHP projects with the cumulative amount of emission reductions achieved at at least 6.62 million tCO2eq over the project and post-project duration. Using the GEF top-down methodology, indirect emission reductions attributable to the project are estimated at 60 million tCO2eq. The range of indirect CO2 emission reductions is therefore 6.6-60m tCO2eq.

More information on how the emissions reductions were estimated is provided in Annex F.

In addition, the Project is expected to produce a number of other environmental benefits besides the reduction of GHG emissions such as biodiversity improvments, water and air pollution reductions and public health improvement.

b) Cost effectiveness

The project takes a comprehensive approach to introduce green SHP and to address many of the barriers that are preventing its uptake by SHP owners, in particular those related to awareness and capacity as well as a supportive regulatory framework. The strategy for the project to achieve good cost-effectiveness is based on a number of principles: 1) build on and maximize leverage of national public and private resources; 2) The train-the-trainers approach for industry-wide awareness raising of and capacity building in green and safe SHP; and 3) select demonstration projects on the basis of their replication potential (and therefore direct and indirect avoided GHG emissions).

Given its focus on addressing policy and technical capacity barriers, this project will generate the biggest share of GHG emission savings after the project implementation period, when the new standards would be in place, capacity built and the training programmes established that will deploy their full impact in terms of green upgrading of SHP projects.

This project will result in:

- Direct emission reductions of 2.20 million tonnes of CO_2eq through its demonstration activities.

- GEF investment levels of USD 5.5 million in the demonstration projects by the end of the project in 2020 leveraging at least USD 64 million for a 11.6:1 leverage ratio.
- Direct additional energy generation from demonstration projects totalling 157,000 MWh.
- Post-project indirect emission reductions estimated at a range of 6.6 to 60 million tonnes of CO_2eq due to increased awareness and capacity to upgrade SHP projects to green SHP.

Calculating the cost per tonne of direct reduction of emissions for GEF, the cost per tonne of abatement would be USD 4/tonne CO_2eq and if looking at the investment cost only it would equate to USD 2.49/tonne CO_2eq. Incorporating the post-project indirect reduction of emissions, the cost per tonne of abatement would reduce to as low as 0.15-1.35 USD/tonne CO_2eq.

A.1.6 Innovativeness, sustainability and potential for scaling up

Innovativeness

This project brings proven international expertise to China's SHP sector. The project's modernization approach to the world's largest economy is deemed to be innovative as it builds strongly upon existing initiatives to assure larger-scale impacts and long term sustainability of both energy and water availability contributing to a number of co-benefits that increase climate resilience of the local population. Innovation has been incorporated in all four components of the project, in that new concepts are being introduced, but particularly in the demonstration projects. As described earlier 'green' SHP is not common in China and a number of the measures included on the 'long list' are relatively untested in China (including operating the discharge sluice for an ecological flow, environmental remediation, installation of measures to protect aquatic life such as ecological flow, and the widespread use of online efficiency monitoring devices). China's welcoming towards these proven technologies and techniques on the international arena means each of these will show what is possible and will improve the safety and environmental operation of the plants and so it helps in scaling up. In addition, a new Ministerial Standard and guidelines will be introduced for green SHP which will be new to China and will help in increasing the uptake of green hydro.

In the long term, the successful implementation of the pilot plants and these innovative green measures will showcase to other developing countries on best practices in scaling up SHP in an environmental beneficial ways, extending its legacy beyond the project's duration for decades to come.

Sustainability

National and local ownership of the standards and policies prepared as part of the project, as well as an increased awareness programme on the new policies and standards, will ensure their sustainability beyond the end of the project. Given the commercial interest in the demonstration projects, the SHP owners will have an interest in keeping the projects running and hence sustain the additional global environmental benefits beyond the life of the project. In addition the increased safety and environmental measures will reduce any local negative impacts and therefore will also help in the longevity of the demonstration projects. The capacity building aspects of the project have been designed to ensure sustainability with trainers trained and national ownership with the related institutions. Newly accredited organisations will be able to offer their assessment services to more SHP owners and therefore are incentivised to continue offering these services.

Scale-up

The general strategy for long-term national ownership to ensure scale-up and replication has been described in the individual components. The focus of the activities is to develop the supporting policy framework, national examples and build up capacity, particularly within national and local government departments, SHP owners, research and academic institutions, and financial institutions since these organisations are in the best position to replicate the activities.

The outputs to be generated by the GEF UNIDO Project will contribute to creating an enabling environment for a national market for environmental and safe SHP upgrading projects. All planned outputs are consistent with, and instrumental to, achievement of the objectives of China's key SHP policies and legislation. Therefore, the combined efforts of the three technical project components are designed in such a way to ensure the sustainability of global environmental benefits beyond the life of the project.

Policy and institutional Framework (Component 1) – The development of a Ministerial standard on green SHP and the roll-out of the green SHP construction and Safe Production Standard on the one hand, and the development and

support of incentive mechanisms for green hydro on the other will provide the institutional framework needed to support the further uptake of environmental and safe upgrading of SHP. The standards will provide the formal guidance and assessment criteria and regulations, in addition to technical guidelines. To ensure there is clarity in the market the incentive measures will help to persuade SHP owners to take up measures during upgrade. The availability of clearer support and transparency for environmental and safe SHP upgrading will provide assurances to project developers and financiers and therefore provide conducive market conditions for progressive and sustained scaling-up of upgrading SHP and consequent global environmental benefits. The support from the Government of China for this project provides strong foundations for institutional continuity, sustainability and further development of the GEF UNIDO project outputs as well as achievement of expected project's outcomes.

Technology Demonstration (Component 2): Demonstrating the technical feasibility and commercial viability of green and safe upgraded SHP provides national examples that can be replicated across the country. With more than 17,500 SHP projects not yet upgraded there is huge potential for replication and further scale-up. The pilots have been selected on a number of criteria including their GHG emission reductions and their replicability. One of the main constraints to investment in environmental upgrading is the lack of demonstrated technical feasibility and commercial viability of projects in China. Theoretically there are many feasible and possibly commercially viable projects, but there is a lack of experience and confidence to make the investment. The 24 demonstration projects will address uncertainties of other SHP owners and a 3.3-16.5 % grant from the UNIDO-GEF Project encourages the projects to be implemented. Not only will the demonstration projects show what is possible and the examples be disseminated widely in the country, but the implementation and operation of these projects will build up the technical capacity within the project developer institutions to help in the replication of these projects. The projects will give confidence to all parties involved in upgrading SHP projects, i.e. from developer, owner to financier. In addition the case studies, performance monitoring of the projects and the gathering of evidence of the real impacts of the upgraded projects will help provide more information to decision makers.

Knowledge base and Capacity Building (Component 3) – The creation of a group of green and safe production SHP experts skilled and fully equipped in the development and implementation of environmental upgrading of SHP is expected to play an important role in generating and implementing new projects during and after the completion of the GEF project implementation. During the GEF project implementation period not only will stakeholders be trained directly but trainers will be trained to ensure that the training continues beyond the timeframe of the project. Overall ownership of the training by national institutions (MWR and INSHP) will also ensure its sustainability. Fifty-five institutions will be newly recognised to carry out assessments and SHP associations will be more aware of the impacts and able to spread the message to their members beyond the time frame of the project.

A.2. Child Project? **If this is a child project under a program, describe how the components contribute to the overall program impact.**

n/a

A.3. Stakeholders.

Identify key stakeholders and elaborate on how the key stakeholders engagement is incorporated in the preparation and implementation of the project. Do they include civil society organizations (yes X /no☐)? and indigenous peoples (yes ☐ /no X)? [35]

To achieve the objectives of this project a large number of stakeholders from the government, industry, design institutions, academia, financial institutions, civil society and local populations need to be engaged in the project. Primary target beneficiaries of the project are energy and environmental policy-making and implementing institutions at national and local level, primarily MWR and MEP, SHP owners (end beneficiaries), designers, installers, training institutions, energy professionals, service providers and the financial sector. Importantly, the local SHP associations will be stakeholders in helping SHP plants opt to invest in projects post project. The outcomes of the planned project activities and potential recommendations for bridging the gaps have been discussed with all the potential stakeholders during the PPG stage (as outlined in section A.1.1.d). A list and summary of their intended roles is provided in the following table.

[35] *As per the GEF-6 Corporate Results Framework in the GEF Programming Directions and GEF-6 Gender Core Indicators in the Gender Equality Action Plan, provide information on these specific indicators on stakeholders (including civil society organization and indigenous peoples) and gender.*

Table 4: Stakeholder engagement

Stakeholder group	Engagement in the preparation and implementation of the project
Ministry of Water Resources (MWR), provincial level Water Resource Bureaus (WRBs) and the International Centre for Small Hydropower (ICSHP)	MWR as the executing partner for the project, is the main Government counterpart for UNIDO and responsible for the management and coordination of the whole project. MWR and the Project Steering Committee (PSC) will identify the institutional arrangement, staffing, roles and responsibilities to ensure the execution of the project. MWR will chair the (PSC and coordination of the decisions on policies design, tasks and the capital allocation; Coordination of project implementation progress, quality and the fund arrangement; Coordination of the contact between UNIDO and project provinces. During the PPG, MWR has been the principle government consultee. WRBs from the 8 provinces will be responsible for the demonstration projects in their province and will participate in the PSC and management of the overall project. ICSHP as MWR's designated execution entity will host the project management unit (PMU) in its premises in Hangzhou and will co-ordinate all the project activities. The National Project Coordinator will be a staff member of ICSHP along with support staff. Project consultants will be hosted at the PMU when necessary. ICSHP will be responsible for the project technical management, organizing the project application and execution, providing service, supervision, monitoring and acceptance, establishing a complete management system to ensure the project implementation. ICSHP will help the project provinces to finalise the project proposals, feasibility study reports, project implementation plan report and fund application report (GEF fund plan). ICSHP will inspect and summarize the provincial year implementation progress, supervise the project installation progress, quality and payment of grant and cofinancing and execution of relevant agreements and negotiation summaries. Guide the SHP owners in the procurement of main equipment, material and civil engineering bidding for demonstration provinces in accordance with the Execution Agreement and in consultation with UNIDO. Organize and coordinate the monitoring and evaluaton, completion acceptance and compilation of the project completion report. Carry out the research on relevant issues and key technologies. Review and summarize project research and application subjects, domestic and overseas training and study tour plan, coordinating the overseas training and study tour, organizing relevant technical training. According to the requirements of PSC, coordination of daily contact with UNIDO. Responsible for the draft of relevant documents and reports and achiving for all documents, materials and receipts. Other works assigned by the PSC.
Ministry of Environmental Protection (MEP) & provincial Environment Protection Bureaus (EPB)	MEP will be one of the principle consultees during the drafting and finalization of the green SHP ministerial standard. In addition the local EPBs will be involved in the project reviewing possible incentive measures and options for monitoring the pilot projects.
Ministry of Finance (MOF)	The role of the MoF in relation to participation in the Steering Committee, financial and substantial reporting will be further clarified in negotiations upon approval of the CEO Endorsement document .
National Development Reform Commission (NDRC) and provincial Development Report Commissions (DRCs).	The pricing bureau come under provincial and local DRC and have the responsibility for the SHP tariffs. Therefore they will form part of the consultees when reviewing the incentive measures for green hydro.
SHP owners	SHP owners have been involved in the PPG in the preparation of the feasibility studies and were invited to the validation workshop. They have contributed to the design of the green measures and provided co-finance

	letters for the projects. As the hosts for the demonstration projects they are an integral part of the project, responsible for the implementation of the projects in line with GEF requirements. They will receive project specific training and once SHPs are rehabilitated will help in the monitoring and management of the plants.
SHP associations	As representatives of SHP owners the associations will be key beneficiaries of the knowledge building and training activities and will be involved in awareness raising with their members on the impacts of greening and safe SHP.
Academic organization, consultants and design institutes	Academic organization, consultants and design institutes will be key recipients of the capacity building programme and will be involved in the train-the-trainers programme so are an important part of the sustainability of the work. They will also be involved as the key experts during the expert review of the green small hydro ministerial standard, will be involved in the design of the pilot projects and could become accredited safe and green small hydro assessors. They will also be included on a roster of experts who can be approached for green SHP technical and policy issues.
Manufacturers	Manufacturers will be involved in supplying the upgrading, greening and safety equipment for the pilot projects. Those consulted during the PPG were supportive of the project as they see the potential market, the project will help with technology advancement and they also look forward to learning from the international practices towards the eco-friendly turbine and equipment technology.
Financial institutions	Finance is key to any SHP upgrading and therefore financial institutions (FIs) are important stakeholders. The FI needs to be sure that any project it lends to will be able to repay and thefore will be interested in any changes to a standard SHP upgrade. Many of the pilot projects will receive some grant money but also needs a loan from a financial institution. Professionals from financial institutions will be invited to participate in greening SHP related seminars in exhibitions organized in Component 3 of this project.
Civil society	A number of NGOs have been consulted during the PPG and were invited to the validation workshop. Where possible their ideas have been incorporated into the project – such as the inclusion of a baseline and impact socio-economic and environmental study so that real evidence can be collected on the impacts of greening and safe SHPs. Civil socity will continue to be involved in the project in consultation in Component 1, as consultees for the socio-economic studies and as part of the training and awareness raising in Component 3. The GEF Project will also ensure that gender perspectives are integrated throughout project activities by regular engagement with key relevant women's associations such as All-China Women's Federation (ACWF) and its affiliated NGOs. In addition, efforts will also be made to include gender focal points from relevant ministries in the Project Steering Committee meetings, and consult gender experts, where possible.
Local populations	At each of the pilot demonstration sites there will be consultation with women and men, girls and boys, from the local population prior to finalizing the design and starting implementation. The Environmental and Social Management Plans (ESMPs) will include local consultation as will the baseline studies. Ideas and comments from the female and male local population will be incorporated into the final design and implementation plan. During the course of the PPG, indigenous populations have not been found near/at the demonstration sites. If during the inception phase it is found that migratory indigenous groups have moved to a project area then, as above,

	they will be consulted, consistent with the rights and responsibilities set forth in the GEF Principles and Guidelines for Engagement with Indigenous People, the UN Declaration on the Rights of Indigenous Peoples and other international law relating to indigenous peoples,[36] prior to finalizing the design of the project and starting implementation. This will ensure that that they receive culturally appropriate social and economic benefits; and do not suffer adverse effects during the development process. Regular consultations with both female and male stakeholders and local beneficiaries will ensure that the project's impact on and appropriation by the local communities can be assessed throughout project implementation. Project stakeholders, for instance partner financial institutions, will be encouraged to nominate female employees to participate in the project.

Equal participation of women will be encouraged as experts, conveners and consultants for training and capacity building activities, as well as in expert panels. Project stakeholders, for instance partner financial institutions, will be encouraged to nominate female employees to participate in the project.

A.4. Gender Considerations. **Elaborate on how gender equality and women's empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. In addition, 1) did the project conduct a gender analysis during project preparation (yes X /no☐)?; 2) did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes X /no☐)?; and 3) what is the share of women and men direct beneficiaries (women 25%, men 75%)?** [37]

Gender mainstreaming at UNIDO

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. This has been laid down in the UNIDO Policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy.

To ensure that men and women equally benefit from development projects and that gender inequalities in activities and outcomes are reduced or eliminated, gender differences need to be considered during the entire project cycle – from design and implementation to monitoring and evaluation. By systematically mainstreaming gender into their interventions, UNIDO's Energy Branch (ENE) aims to ensure equal opportunities for both women and men, thus furthering UNIDO's inclusive and sustainable industrial development agenda and contributing to the achievement of the Sustainable Development Goals (SDGs), as well as the Sustainable Energy for All (SE4ALL) objectives. In order to "demystify" gender mainstreaming and provide practical guidance on how to systematically address existing or potential gender inequalities specific to UNIDO's energy and climate change interventions, a tailored guide has been developed aimed at helping the staff of UNIDOs ENE Branch to apply a gender perspective to their work and, more specifically, to mainstream gender throughout the project cycle (Guide on Gender Mainstreaming – Energy and Climate Change Projects, 2014[38]).

To ensure that all projects consider gender dimensions from inception, UNIDO has also integrated a robust gender review as part of the project appraisal process both at technical and organizational level. The gender guidelines for the Energy Branch within UNIDO are established and a Gender Team is in place to support gender related efforts. The planning and formulation process for the GEF project has been an opportunity to discuss gender issues as GEF

[36] Including the International Labor Organization Convention 169 on Indigenous and Tribal Peoples (1989); United Nations Declaration on the Rights of Indigenous Peoples (2007); UNDG Guidelines on Indigenous Peoples' Issues (2008); United Nations Permanent Forum on Indigenous Issues (under the Economic and Social Affairs Department), Inter-Agency Support Group on Indigenous Issues, and United Nations International Decade of the World's Indigenous Peoples Plan of Action.

[37] Same as footnote 35 above.

[38] http://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Women_and_Youth/Guide_on_Gender_Mainstreaming_ECC.pdf

and UNIDO have a clear commitment on gender equality. The preliminary gender analysis for China and the selected gender dimensions of the project integrated in the logframe are included in Annex T6.

Gender analysis in China

UNIDO has carried out a preliminary analysis the situation of women and gender equality in China (see Annex T6). In summary it appears that the situation of women in China has improved significantly since the government established a gender equality policy in 1949, and the country ratified the Convention on the Elimination of all Forms of Discrimination against Women (CEDAW) in 1980, although it has not yet ratified the Optional Protocol.[39]. The World Bank indicates that 48% of the total population of China is female, and of those, 69% participate in the labour market in comparison to 82.9% of the male population. According to the Gender Gap Report[40], there are almost as many women as men in professional and technical professions (professional and technical workers male 56% versus female 44%). Although women in the PRC are better educated and more deeply involved with professional jobs than ever before, they have rarely broken through the "glass ceiling" that keeps them from top-level management and decision-making positions. Most women work in the service sector, farming, forestry, and herding or fishing—considered to be low skill, low-paid jobs. Despite women in China making great strides in educational achievement and workforce participation, there is now growing concern that the gap between women and men's social and economic status is widening again in the wake of China's rapidly changing economic, social and political conditions.[41]

Gender dimensions of the project

China requires skilled professionals in the SHP sector and as such the increased participation and representation of women in the sector is considered as highly advantageous. Although women's involvement at the energy and SHP policy level is fairly decent, to date women's involvement in SHP management and implementation has been less pronounced at the company or enterprise level. It is important, therefore, to advance women's participation in, and influence on, SHP interventions, so that both women and men equally benefit from this technology and future SHP development. This speaks to the need to build women´s knowledge and capacity on the subject, giving women a voice in decision-making, while ensuring that support (for instance childcare, flexible working hours, maternity leave) and mentorship structures to sustain women in the sector are put in place. It also calls for efforts aimed to remove obstacles preventing the promotion of gender equality and women´s empowerment in the field, such as the creation of gender sensitivity of all stakeholders. Finally, it is necessary to showcase and promote women as agents of change and to build the institutional capacity for gender sensitive governance, policy development and implementation.

Even though the project as a whole is not focusing on promoting women's empowerment, the gender aspect is a cross cutting dimension and is therefore expected to be relevant. This is especially true in terms of the participation and involvement of the local population and the impact of the local environment as well as in the training and capacity building activities. During the project preparatory phase, a preliminary gender analysis of the project has been conducted, based on which potential gender dimensions of project outcomes and outputs, as well as potential entry points for gender equality and women's empowerment (GEEW) were identified. To the extent possible, many expected results have already included gender-disaggregated indicators and target. Key gender dimensions of the project outcomes and outputs as well as potential gender-relevant indicators are provided in the logical framework in Table 1: Selected Gender Dimensions (Annex T6). These identified gender dimensions will be verified as part of a detailed gender analysis carried out during the project inception phase, as part of the capacity assessments of the project. This will then be used as a guide during the inception and implementation phases of the project as well as during M&E.

Since women represent part (approximatley 10%) of the work force at SHPs, support in environmental improvements and safety will promote more favorable working conditions for both women and men. Moreover, changes to the local environment will benefit the local population, and if gender aspects are considered during the planning stages, then both women and men will equally benefit from the project. As such the GEF Project has the potential to contribute to reducing gender inequalities. Therefore, the project's partners and stakeholders support the integration of realistic and achievable gender equality and women's empowerment related targets within the

[39] http://genderindex.org/country/china
[40] Gender Gap Report 2013
[41] http://genderindex.org/country/china

project's components, with clear and measurable key performance indicators, as well as respective gender activities and outputs.

In line with this, efforts will be made to make the training programmes available to qualified female candidates and will set a minimum target for the training (25%), relative to the employee ratios within assisted companies and institutions[42]. There is also already a criteria in demonstration project selection to ensure female participation. Efforts will also be made in the recruitment process as well as in making the training accessible to women, for example, suitable times and locations which are easily. The training courses will be actively promoted through women's advocacy and professional groups and training material will not only be gender responsive (e.g. use gender neutral language) but will also highlight the positive role that women can play as agents of change.

In any awareness and communication activities the GEF project will actively include and communicate on gender equality and women's roles in the energy sector and present gender-disaggregated information to raise awareness and ensure that the project contributes to national efforts to promote gender equality and women's empowerment in the sector. The GEF Project plans regularly engage with relevant women's associations such as the All-China Women's Federation (ACWF) and its affiliated NGOs and the Association of Women Entrepreneurs in China, ENERGIA and UN Women, among others.

In addition efforts have been made in the project design to include gender demensions in all project activities. Specifically:

- Efforts will be made to secure gender balance among the national and international consultants recruited for the project, whenever possible, while also ensuring that all project staff are gender sensitive.
- The work related to the policy and institutional framework will seek to ensure that gender dimensions are included in the standards relating to safety and environmental measures. During the PPG phase the selection critiera for the pilot projects were amended to include criteria to take into account gender dimensions and so ensuring the involvement of women in the pilot projects. In particular during the inception phase an Environmental and Social Management Plan (ESMP) will be prepared for every pilot site and will include sex-disaggregated data and identify impacts and mitigation activities.
  In addition, at some sites an Environmental and Social Baseline Study and Impact Assessment study following SHP upgrading will be carried out which will also include disaggregated data and qualitative information of impacts by gender.
- A gender-responsive member of the PSC in cooperation with the UNIDO energy-gender expert or the respective gender focal point will be nominated to review and provide guidance on gender dimensions,
- All monitoring and evaluation actitivies will include reporting on gender dimensions, e.g. participation of women in trainings.
- It is anticipated that a gender expert will be involved to monitor gender-specific dimensions of the project and provide guidance to maximize its impact. During the inception period an additional UNIDO Gender Mainstreaming exercise will be carried out. This will include:
  - The preliminary gender analysis will be updated and validated by a local gender expert.
  - A valid baseline for the gender targets can be checked and monitored by the local gender expert.
  - An action plan will be developed allocating the required resources and responsibilities to reach the defined gender outputs and targets.

A.5 Risk. **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):**

The results of risk assessment carried out during the PPG identified the following major project risks and risk mitigation measures:

[42] Participation in training courses should be gender balanced, i.e. targeting at having at least 40% of participants of the underrepresented sex. As the local energy sector is characterized by strong male domination, the optimal participation of 40% does not seem feasible. A gender analysis will be necessary to provide reliable information for defining a baseline. This will be carried out during the inception phase and will allow setting realistic targets for female participation, initially set at 25%. If not enough qualified females are available it could be considered to make an additional course to upgrade skills of female students from other areas to allow them to participate.

Table 5: Risk factors and mitigation measures

Risk Factors	Description of risk	Risk Level	Mitigation measures
Political risk	Lack of government commitment to support the project.	L	The project objectives and activities are in line with national policies and objectives. MWR has been involved in all stages of the project design and have ensured their full support throughout the project and beyond. In addition the provincial governments have been involved in the project preparation and have stated their interest in greening projects.
Implementation risk	Lack of interest or trust in green SHP technology Unsuccessful demonstration at selected sites due to lack of capacity to operate and maintain projects Lack of management and coordination capacity	L	China has a very active national SHP industry which in part is already active in exporting equipment and knowledge. The Project will further strengthen industry actors across the value chain in extending their product and service portfolio towards more ecological sound solutions. MWR, Provincial governments and SHP owners expressed their interest in the project during the PPG and helped to identify potential demonstration projects. Throughout the project, there will be regular and continued contact with stakeholders which should lead to their continued interest and participation. Capacity building is an essential part of the Project. Knowledge and skills on SHP upgrading and operation and maintenance is already strongly established in the country. The pilot projects will be located at existing sites with qualified staff who will be further trained in environmental and management aspects. Management organizations were selected for their experience and skills in managing other similar GEF projects. A project management unit will be set up at the national level and monitored under M&E plan. Clear indicators for tracking outcomes and outputs with a focus on implementation milestones and project results and impacts have been prepared
Technical risks	Green and safe technologies and measures do not perform as described mainly due to lack of skills to operate the technologies.	L	There is limited technical risk since technological measures are widely used in many other countries. Detailed assessment of suitable sites for measures will be carried out and training for operating personnel will be provided, including from technology importers, when necessary.
Project Sustainability	Lack of collaboration by key agencies Failure to achieve project outcomes and objectives after successful delivery of outputs. Lack of technical capacity Failure to scale-up the project activities	L	A Project Steering Committee including different agencies will be established to oversee project implementation and will ensure collaboration. Members will include representatives of MWR, MOF, MEP, ICSHP and the provincial WRBs. By making all market players fully aware of the advantages of greening SHP and by equipping them with the capacity and tools to realize these benefits, the project aims to generate a self-reinforcing market. In addition, the incentive mechanisms that will be recommended will create a positive context that is expected to ensure the attainment of the project outcomes and their sustainability. Strengthening and expansion of technical capability through training are built into existing organisations in Component 3. Training activities will be closely monitored and supported under the M&E plan. Linkage to experts and specialized institutions for training and support will be established and coordinated. To ensure that further green SHP projects are built after this project, the project will include a clear awareness raising activity for potential SHP owners, financiers and provincial government to understand the benefits of the measures. In addition, the project will review and recommend possible incentive measures which will support further investment.
Financial Risks	SHP owners' lack of resources to repay loans Lack of business case for green SHP Lack of co-finance	M	This will be mitigated as much as possible through the choice of greening measures, the allocation of a grant, and the development of incentive policies. Demonstration projects are only selected on evidence of co-finance for the project. There is stringent selection of borrowers through assessment and due diligence of each borrower's historic and future financial management capacity.

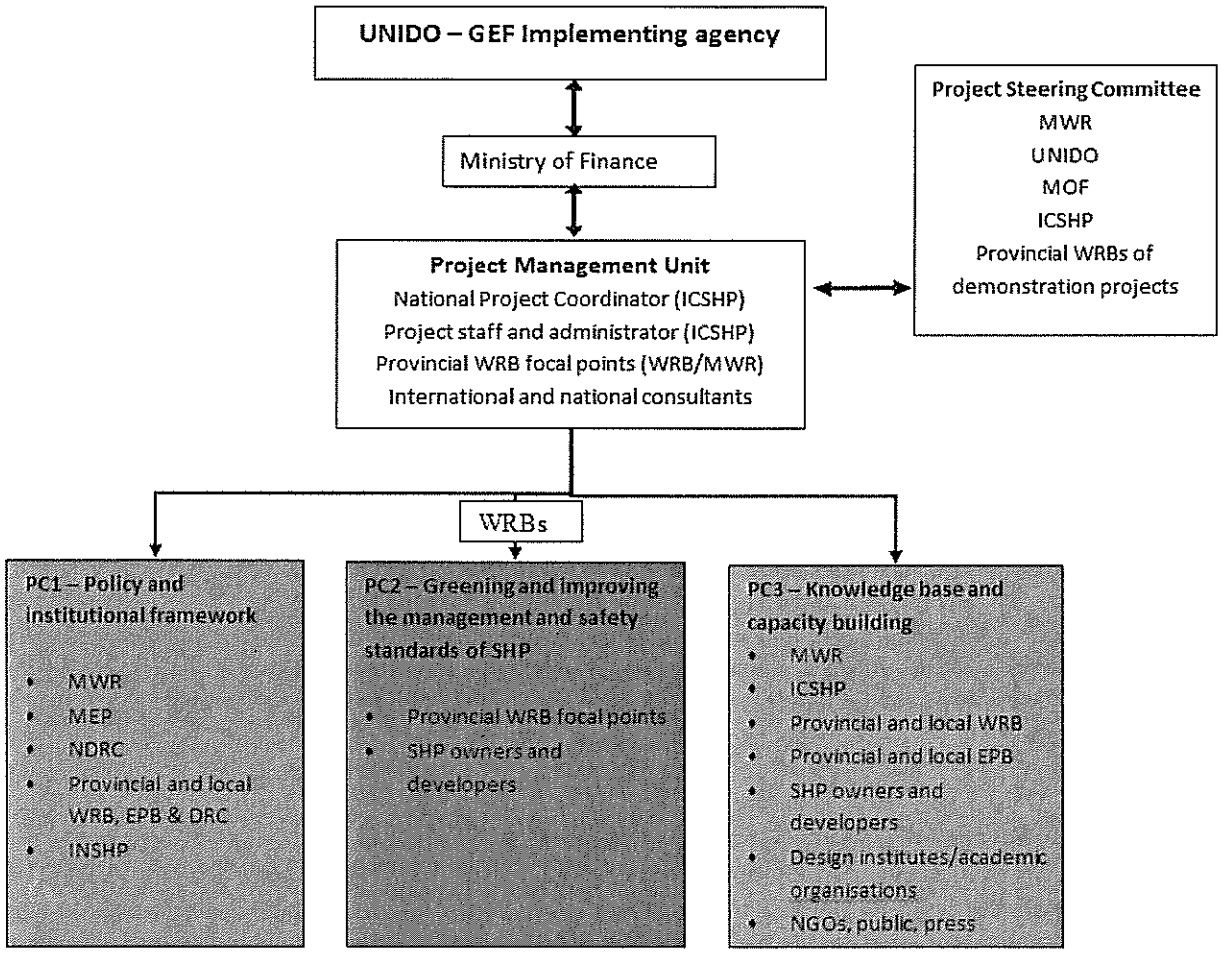
	Lack of interest among banks for large scale uptake.		The banking sector has shown that is it interested in these projects through the provision of loans, as part of the co-finance, for the demonstration projects. The letters of commitment to invest provided by the projects include the loans from banks. Proper dissemination of the results will be organised to raise awareness in the banking sector.
Environmental and social risk	Failure to mitigate environmental risks; Failure to ensure social safeguards GEEW Risk: Risk of resistance against, or lack of interest in, the project activities from stakeholders, especially with regard to the active promotion of gender equality. Low participation rates of suitable female candidates due to lack of interest, inadequate project activity or missing qualified female population within engineering sector.	M	The project specifically aims to improve the environmental and social circumstances of the SHP. Although in China formal EIAs are not required for upgrading SHP projects, an environmental and social management plan (ESMP) will be prepared for each project and will identify any risks where applicable. Mitigation measures will be proposed at that time. In addition an environmental and social impact assessment study will be carried out at 10 of the sites before and after the project. Annual environment and safeguards M&E reports will be provided, which will follow up with necessary actions. This Project will pursue thorough and gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as CSOs and NGOs promoting GEEW, and a gender expert. This shall mitigate social and gender related risks, promote gender equality, create a culture of mutual acceptance, and maximize the potential contribution of the project to improving gender equality in the energy field. To attract qualified female candidates to the project, adequate and gender responsive communication strategy will be carried out by reaching out to women's groups and associations, while also making trainings and workshops accessible for women, e.g. by providing safe transport, offering childcare, offering trainings at suitable times for women when children are in school and day-care, etc.
Climate change risk	Water flow variability could affect hydropower generation	L	Changing patterns in rainfall may affect the availability of the water flow and hydropower output. Activities included in the greening of the SHP should help to mitigate against adverse impacts and improve resilience.

A.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.

Figure 2 below shows a diagram of the planned project implementation and execution arrangement.

Figure 2: Diagram of planned project implementation structure



- UNIDO: as the GEF Implementing Agency holds the ultimate responsibility for the implementation of the project, the delivery of the planned outputs and the achievement of the expected outcomes; UNIDO will be responsible for monitoring of the project, and reporting on the project performance to the GEF;
- MOF: acts as the national implementing partner as per the Implementation Agreement for the project agreed between UNIDO and MOF. MOF will receive GEF funds and will disburse on instruction from UNIDO. Funds will flow to MWR, the PMU and to the Provincial WRB for onward disbursement to the pilot projects.
- MWR: acts as the national executing partner. MWR will ensure that the activities are properly coordinated with the Government programmes and other on-going activities. MWR will chair the Project Steering Committee. The International Centre on Small Hydropower (ICSHP) as MWR's designated execution entity will carry out duties as per MWR's guidance and instructions. The Project Management Unit (PMU) under the guidance of UNIDO, GEF and MWR: will be responsible for the day-to-day planning and execution of project activities in line with the agreed project work plan. The PMU will be headed by the National Project Coordinator (NPC), and project staff. The PMU will be based at ICSHP. Consultants will be drafted into the PMU when required. Terms of References for consultants will be approved by UNIDO. The PMU will coordinate all project activities and will report to UNIDO and MWR. (see A.3. Stakeholders in Table 4)

- Project Steering Committee (PSC): will be established for periodically reviewing and monitoring project implementation progress, provide strategic advice, facilitate co-ordination between project partners, provide transparency and guidance, and ensure ownership and sustainability of the project results, and is expected to be chaired by MWR and as a minimum, will include representation from Government partners (MOF), UNIDO, ICSHP and SHP owner representation.

  Terms of Reference of the PSC: (project execution) will be established for supervising and guiding the project execution, with the participation of MWR and MOF. The Terms of Reference and final composition of the Steering Committee will be defined during the project execution start-up/inception phase. The responsibilities of the PSC are envisaged to consist of:

  - Responsibility for the management and coordination of the whole project, for identifying the management organization, the institutions, staff and responsibilities to ensure the execution of the project remains with the PSC in line with the regulations of GEF and UNIDO.
  - Providing the necessary political support to the project implementation;
  - Commenting on project work plans, progress reports and M&E reports;
  - Coordination of project implementation progress, quality and the fund arrangements.
  - Coordination of the decisions on policy design, tasks and the budget allocation.
  - Mobilizing cost-sharing and follow-up financing;
  - Assuring coordination between this project and other ongoing government activities and programmes;
  - Assuring all stakeholders are appropriately involved in the project planning, execution and management;
  - Facilitating linkages with high-level decision-making.
  - Coordination between UNIDO and project provinces.

Any changes to the above, including PSC's responsibilities shall be in accordance to the GEF policy C39. The responsibilities listed are also governed by the Implementation Agreement agreed between UNIDO and MOF.

At the beginning of project implementation, a detailed work plan for the first year of implementation will be developed by the PMU in collaboration with UNIDO and MWR, based on the overall work plan for the entire duration of the project. The yearly work plan will clearly define roles and responsibilities for the execution of project activities, including monitoring and evaluation; it will set milestones for deliverables and outputs. The overall and yearly work plans will be used as management and monitoring tool by PMU and UNIDO, and the overall work plan will be reviewed and updated as appropriate on a biannual basis. A preliminary workplan is included in Annex G.

Co-ordination with other relevant GEF financed projects and other initaitives

The project will strive to work with other GEF initatives in China including CRESP II, managed by the World Bank, and UNIDO's Integrated adoption of New Energy Vehicles (NEV) in China. Where appropriate links will also be made with other GEF projects but it is noted that many are focused on urban areas and industrial energy efficiency.

- CRESP Phase II is to support the ambitious renewable energy (RE) scale-up program in China with a focus on efficiency improvement and reduction of incremental costs. Synergies will be sought with the project, in particular with regards to incentive policies for green SHP. One of the proposed outputs of CRESP II is to make progress towards electricity pricing based on State Council Decree No 5 especially with internalization of environmental costs through appropriate use of a fuel tax and/or a carbon tax and/or provision of incentives to RE, particularly small hydro, off-shore wind, and solar PV.
- The NEV project aims to support the Ministry of Industry and Information Technology (MIIT) in the development of policies, technologies and standard system to promote development of NEV and RE, and carry out integrated demonstration of the policies and technology standards in areas which have extensive experience in this sector. Although the pilots for this project are planned for Yanchang and Shanghai any potential for the installation of charging units at the SHP demonstration projects will be investigated – for example to provide power to hydropower company vehicles.

The project will also work closely with MWR's other potential ongoing initiatives in the SHP field:

- New Rural Hydropower Electrification Counties Programme - completing the National Planning of New Rural Electrification during the 12th FYP, i.e. to invest RMB 43.52 billion (around USD 6.8 billion) to build SHPs (5,516MW) in 300 new rural electrification counties.
- SHP Substituting Fuelwood Program (2009-2015): The program's aim is to replace traditional (wood) fuels for cooking and heating through the provision of electricity from newly installed SHPs, thus protection forest resources. A total of 1,022 SHPs (1,700MW) will be constructed to reach a rural population of 6.77 million (1.7 million households), with 271 SHPs (722 MW) already constructed.

Additional Information not well elaborated at PIF Stage:

A.7 *Benefits.*

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

The project will catalyse social and economic benefits at the local and national level by increasing employment opportunities, helping to develop the local economy and strengthening capacity by increasing technical knowledge and capabilities.

Rehabilitated SHPs will bring national and local economic benefits through the improved efficiency and productivity of the upgraded SHP, ensuring the SHP plants are more competitive and bringing down the costs of electricity. At a national level this can contribute to overall lower electricity prices and, since tariffs are set at a provincial level, this can improve the costs at provinical levels. Locally, the SHP organisations will operate more effectively, will increase their returns and therefore will contribute to the local economy.

The demonstration projects will improve the livelihoods of the local populations at the project sites through helping to protect habitats, reduced erosion, re-introducing year round water flow, improving irrigation as well as opening up tourism options. Not only will the rehabilitated SHP plants offset greater amounts of GHG emissions they will also generate local environmental benefits. These different activities will widen the possible livelihoods available (through improved agriculture, more fishing and river based income generating activities) and so contribute to increased incomes. At rehabilitation, the works at the pilot sites also offer employment opportunities for local unskilled labour in civil and planting works so increasing incomes. These socio-economic benefits are expected to impact women and men differently since they have different roles and responsibilities in society. However the project aims to narrow this gap between women and men, thus aiming to ensure the benefit is balanced.

In addition a number of the demonstration projects are collectivey owned and in some cases there are clear additional benefits planned for the local population. For example at the Majing plant in Chongqing the SHP company pays RMB 4000 (around USD 600) each year to the local community to subsidise the electricity price. In Yunnan the Mabozi plant provides 30,000 kg or rice for the surrounding 42 households as well as free electricity and the Guanxi project in Guangdong province provides 60MWh per year of water pumping for free to the local population.

At national and local levels these projects will also generate new ventures for entrepreneurs in consulting, designing, project implementation, manufacturing, operation and maintenance; hence creating employment opportunities. Although SHP is a very well established industry in China, the additional green and safety measures will expand the market. Those who participate in training programmes may benefit from enhanced technical capacity and knowledge, increased job security, increased employability, and possible increased income levels.

A.8 *Knowledge Management.*

Elaborate on the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives (e.g. participate in trainings, conferences, stakeholder exchanges, virtual networks, project twinning) and plans for the project to assess and document in a user-friendly form (e.g. lessons learned briefs, engaging websites, guidebooks based on experience) and share these experiences and expertise (e.g. participate in community of practices, organize seminars, trainings and conferences) with relevant stakeholders.

Knowledge management is a key part of the whole project and is therefore integrated into the main project activities. In addition, Project Component 3 is dedicated to enhancing knowledge and capacity building of green and safe SHP management to stakeholders and the public, particularly electricity consumers. Activities include the use of international consultants to bring up-to-date knowledge from other countries to China and consultation with UNIDO's panel of experts on greening small hydropower, who have also been involved during the project preparation. Technical guidance will be prepared during the project implementation and disseminated during the project and the awareness raising activities include further knowledge products such as a green SHP website, case studies, lessons learned briefs and sharing of experience. The project website will be integrated in the MWR website, thus ensuring that its contents will remain live and freely accessible beyond the project lifetime. The project will be featured and promoted through UNIDO's SHP knowledge portal www.smallhydroworld.org, efforts will also be made to collaborate with other hydrology platforms such as UN Water, International Waters Learning Exchange & Resource Network, etc.

Training and information sharing is a key part of the project and one of the activities includes a study tour, linked to a local SHP institution/university,to Europe for key stakeholders. Different training and awareness activities will be targeted at different stakeholder groups to share the experience and expertise. During the project there are scheduled events that will promote project outcomes to key stakeholders, and allow engagement to better align project output with stakeholder needs. This includes three national seminars and an international seminar.

Knowledge management will be the responsibility of the PMU who will prepare a knowledge management plan during the inception phase and will update it annually. The following table provides an overview of some of the tools for knowledge management.

Table 6: Knowledge management tools and target audience

Dissemination and communication tools	Target audience
Website (including knowledge platform)	Wider public and professionsals (Government, SHP owners, design institutes) – different parts of the website targeted at different groups
National seminars	National SHP owners, associations, developers, design institutes and Government officials
International seminar	International and national SHP owners, associations, design institutes and Government officials
Flyers	Wider public and professionsals
Posters	Displayed at each demonstration project for visitors
Case studies	SHP owners, associations, provincial government, design institutes
Technical guidance	SHP owners, project developers, design institutes
Social media	Wider public and professionsals
Video	Wider public and professionsals
Lessons learned briefs	SHP owners, associations, provincial government, design institutes
Local events near project sites	Local population to SHP sites
Scientific / academic articles	Professionals / design institutes/ academic organisations
e-newsletter	Wider public and professionsals

B. Description of the consistency of the project with:

B.1 *Consistency with National Priorities.*

Describe the consistency of the project with national strategies and plans or reports and assessements under relevant conventions such as NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.:

The project addresses China's environmental concerns in line with the country's National Communications and its national strategies in terms of reducing greenhouse gas emissions and supporting renewable energy. The State Council has set up the National Leading Group on Climate Change and it has released China's National Climate

Change Programme. The Standing Committee of the National People's Congress (NPC) has endorsed the Resolution on Tackling Climate Change, by which the active response to climate change is one of major strategies for the national economic and social development. For the first time, the 12th Five Year Plan (FYP) for National Economic and Social Development has taken the reduction of CO_2 emission intensity per unit of GDP by 17% as a binding target, and further specified the key activities for GHG emission control. In addition, at the UN Climate Change Conference in 2009, the Chinese government announced to cut emission intensity by 40 to 45 percent by 2020 from the 2005 level.

The State Council attaches great importance to the development of renewable energy which can promote social-economic development. Under the 12th FYP there are aims to achieve an 11.4 % share in non-fossil fuel consumption and a 30% share in non-fossil fuel installed capacity by 2015, with the hydropower installed capacity to reach 290GW, accounting for 66% of total non-fossil fuel electricity installed capacity. More recently in November 2014, the State issued the "Plan of Energy Development Strategy from 2014 to 2020" which pointed out that it should optimize the energy structure and vigorously develop renewable energy. By 2020, non-fossil energy consumption will increase to 15%. In particular this plan stressed the development of medium- and small-sized hydropower plants.

In fact since 2004, the central Chinese Government has listed rural hydro power development as a priority to further increase investments and loan input to support rural hydropower development. In the past 10 years, the No.1 Central Document of each year proposed to vigorously develop SHP. Further importance of the sector has been stressed by the Premier and President in the past two years. Further details of these announcements are included in Annex T1. SHP is recognized not only for its electricity generation potential but also for its role in flood control, irrigation and water supply.

The Chinese Government has passed a series of policies to support the development of SHP resources since the early 1970s. For instance value added tax for SHP has, since 1994, been 6 % (compared to 17 % tax on large hydropower stations) and recently has been reduced further to 3% for SHP. As detailed in Section A.1.1 the Chinese Government has a number of supportive policies for SHP including the Efficiency Improvement and Capacity Expansion Planning programme. This GEF project works directly with the Ministry of Water Resources (MWR) on further upgrading and environmental improvements within this programme.

This project is clearly in line with these Government policies by facilitating further investment in upgrading SHP and reducing environmental impacts associated with SHP in helping the Government to meet its objectives.

C. DESCRIBE THE BUDGETED M&E PLAN:

According to the Monitoring and Evaluation policy of GEF and UNIDO, follow-up studies like Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.

Formal monitoring and evaluation (M&E) of the project will follow the principles, criteria and minimum requirements set out in the GEF Monitoring and Evaluation policy in its current version and the respective guidelines and procedures issued by the GEF Evaluation Office and/or the GEF Secretariat. At the same time, M&E will comply with the rules and regulations governing the M&E of UNIDO technical cooperation projects, in particular the UNIDO Evaluation Policy and the Guidelines for Technical Cooperation, both in their respective current versions. In addition, all monitoring and evaluation tools and documents, such as the monitoring plan, progress reports, final evaluation report, and thematic evaluations (such as training needs assessment), will include gender dimensions wherever appropriate.

The overall objective of the monitoring and evaluation process is to ensure successful and quality implementation of the project by:

i) Tracking and reviewing project activities execution and actual accomplishments;
ii) Leading the project processes so that the implementation team can take early corrective action if performance deviates significantly from original plans;

iii) Adjust and update project strategy and implementation plan to reflect possible changes on the ground, results achieved and corrective actions taken; and
iv) Ensure linkages and harmonisation of project activities with that of other related projects at national, regional and global levels.

A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the Project Management Unit (PMU) and project partners at the beginning of project implementation and then periodically updated.

By making reference to the impact and performance indicators defined in the Project Results Framework, the monitoring plan will track, report on and review project activities and accomplishments in relation to:

a. Renewable energy power delivered and GHGs emission reductions directly generated by the UNIDO GEF project. These will include the number of projects upgraded and implemented.
b. Renewable energy investment generated by the UNIDO GEF project, directly and indirectly
d. Development of policy, legislative and regulatory frameworks aimed to promote and support the environmental upgrading of SHP
e. Level of awareness and technical capacity of women and men for the environmental upgrading of SHP within relevant institutions and enterprises.
f. Overall socio-economic and environmental impacts of the project to include improved local livelihoods, gender balance and other gender dimensions, improved river flow and aquatic environment and improved water quality.

The National Project Coordinator will be responsible for day-to-day and local management of project activities execution, performance and track progress towards milestones. However, monitoring and evaluation of the demonstration projects with respect to energy generation, technical performance, commercial viability and GHGs emission reduction, and related information, will be integral part of the evaluation component of Project Component 2.

The UNIDO project manager will be responsible for oversight and tracking of the overall project milestones and progress towards the attainment of the set project outputs. The UNIDO project manager will be responsible for the reporting to GEF. The UNIDO project manager will be responsible for the preparation of Annual Project Implementation Reviews (PIR) and coordination of the mid-term evaluations as established in the M&E Plan.

One mid-term review will be carried out and a final external evaluation six months prior to the completion of the project. During the last three months of the project, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Final Evaluation (FEV) - The Project will undergo an independent FEV six months prior to the closure of project activities. The FEV will focus on the delivery of the Project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). It will examine the Project's performance with respect to the planning and adaptive management requirements of both UNIDO and GEF (The GEF Monitoring and Evaluation Policy 2010) and it will determine progress made toward the achievement of project's outputs and outcomes. The TOR for this evaluation will be prepared by the UNIDO Project Manager based on guidance from the UNIDO Office for Independent Evaluation (ODG/EVA). The FEV will also provide recommendations for follow-up activities and requires a management response.

The following table provides the tentative budget for the M&E, which has been included in Project Component 4.

UNIDO as the Implementing Agency will involve the GEF Operational Focal Point and project stakeholders in order to ensure the use of the evaluation results for further planning and implementation.

Table 7: Project's Indicative Monitoring and Evaluation Work plan

Type of M&E activity	Responsible Parties	Time frame	Indicative cost (USD)	
			GEF*	UNIDO and Project partners
Inception Workshop (IW) and inception report	UNIDO Project Manager (PM); Project Management Unit (PMU)	Within first two months of project start up	0**	20,000
M&E design and tools to collect and record data (performance indicators) including survey to confirm baseline including gender specific indicators	UNIDO Project Manager (PM); Project Management Unit (PMU) and M&E specialists as required	Within first two months of project start up and mid of project	20,000***	30,000
Regular monitoring and analysis of performance indicators (technical, social(incl. gender, policy, environmental) and assessment of automation and safety at plants. Includes the provincial WRB's plant inspections and routine field investigations, a performance evaluation report for each demonstration project and MWR selective examination	UNIDO Project Manager (PM); Project Management Unit (PMU), WRB and M&E specialists as required	Regularly to feed into project management and Annual Project Review	0**	450,000
Annual Progress Reports (APRs) and Project Implementation Reviews (PIRs)	Project Management Unit (PMU) to prepare prior to the annual project review PM UNIDO to validate and finalize to submit to GEF	Annually	0**	25,000
Backstopping by M&E specialist	UNIDO	As required		5,000
Annual Project Review to assess project progress and performance (including GEF Tracking Tool specific indicators)	Project Management Unit (PMU), PM UNIDO HQ and Project Steering Committee to review the project performance and make corrective decision	Annually prior to the finalization of APR/PIR and to the definition of annual work plans	15,000	20,000
Project Executive Committee	PMU, PM UNIDO HQ	Every six months	0	0
Mid-term Evaluation including survey to measure progress against baseline	PMU, external consultants, UNIDO PM, UNIDO Evaluation Unit (ECA) in advising on TOR and selection of evaluators, Steering Committee and M&E specialists as required	Mid project	40,000	50,000
10 environmental and socio-economic impact studies carried out at least one year following upgraded SHP (included in Component 2)	UNIDO Project Manager (PM); Project Management Unit (PMU) and M&E specialists		0***	0***

Type of M&E activity	Responsible Parties	Time frame	Indicative cost (USD)	
			GEF*	UNIDO and Project partners
Project terminal report	UNIDO Project Manager (PM); Project Management Unit (PMU)	One month before end of project implementation		50,000
Final Project Evaluation	UNIDO Evaluation Unit (EVA), Project Management Unit (PMU), PM UNIDO HQ and Project Steering Committee, independent external evaluators	Within 6 months of project completion	75,000	50,000
Lessons learned	PMU, external consultants, UNIDO PM	By the end of project implementation; annual as part of PIR	0**	
Visits to field sites	PM	Annually	0**	
	UNIDO HQ Representative from the Steering Committee		0**	
TOTAL indicative cost ** Excludes project team staff time and UNIDO staff* *** The costs are covered under Project Management Costs* **** Baseline environmental and socio-economic studies for 10 sites is included in Component 2 budget*			**150,000**	**700,000**

Legal Context:
The Government of the People's Republic of China agrees to apply to the present project, mutatis mutandis, the provisions of the Standard Basic Assistance Agreement concluded on 29 June 1979 between UNDP and the Government of the People's Republic of China (the "Basic Cooperation Agreement").

PART III: CERTIFICATION BY GEF PARTNER AGENCY(IES)

A. GEF Agency(ies) certification

This request has been prepared in accordance with GEF policies[43] and procedures and meets the GEF criteria for CEO endorsement under GEF-6.

Agency Coordinator, Agency Name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation, UNIDO-GEF Focal Point		04/13/2016	Rana P. Singh, Industrial Development Officer, Renewable and Rural Energy Division, Department of Energy 	+43(1)260263819	R.P.Singh@unido.org

[43] GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF

List of Annexes

A – Project Results Framework

B – Responses to Project Reviews

C – Status of Implementation of Project Preparation Activities and the use of Funds

D – Calendar of Expected Reflows (If non-grant instrument is used) – N/A

E – GEF Grant Project Budget

F – Estimate of Energy Savings and GHG Emission Reductions

G – Work plan

H – Co-financing letters

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 Strategy	KPIs/Indicator	Baseline	Target	Sources of Verification	Assumptions
Objective: Environmental upgrading of rural SHP stations in China	Direct CO2eq emission reductions (tCO2e) Indirect CO2eq emission reductions (tCO2e) Additional energy generatedgeneration (MWh) Number of pilot green SHP projects supported by project	0 tCO2e (additional) 0 tCO2e (additional) 0 MWh 0 0	Additional 2.20 million tCO2e 6.62 million tCO2e (most conservative estimate) 157,000 MWh/yr 24	Project documents Ex-post project evaluations Market surveys GEF project tracking tool	Technical, economic and financial feasibility of technologies Continuing support of the key stakeholders to meet the project objectives. Implementation of project activities will foster investment in green and safe SHP upgrading Execution of planned activities with adequate resources mobilized
Project Component 1 – Policy and institutional framework promoting green SHP plants					
Outcome 1.1: Policy and institutional framework for promoting green SHP plants are strengthened	Final version of Green small hydro standard Greenhydro labelling system established Incentive policies in 8 provinces recommended for adoption Introduction of mandatory ecological flows	Preliminary version of Chinese Green SHP standard. No greenhydro labelling system No specific green incentive policies in place	Final versions of Chinese Green SHP Ministerial standard Management rules for green SHP Standard Technical guidelines on how to implement green hydro measures published Greenhydro labelling system established At least one incentive policy recommended for adoption in each of 8 provinces	Project documents MWR standards Website	Government commitment to green and safe production SHP
Output 1.1 Green SHP assessment standard formulated and issued by MWR	Final version of Green small hydro standard	Preliminary version of Chinese Green SHP standard. No management rules for Green SHP No technical guidelines on green	Draft and Final versions of Chinese Green SHP Ministerial standard Management rules for green SHP Assessment Guidance on green SHP construction and technical guidelines on how to implement	Project documents MWR standards Website	National and local government commitment to green and safe production SHP Good co-ordination

Project Strategy	KPIs/Indicator	Baseline	Target	Sources of Verification	Assumptions
		SHP in China	green hydro measures published		between stakeholders
Output 1.2 Preferential green SHP policies developed and recommended	Green SHP labelling system established	No green SHP labelling system	Green SHP labelling system established	Project documents MWR documents	Issue national or provincial green SHP initiatives
	Incentive policies in 8 provinces recommended for adoption Introduction of mandatory ecological flows	Few (1-2) specific green incentive policies in place Guidelines in place in 5 provinces	At least one incentive policy recommended for adoption in each of 8 provinces Mandatory ecological flows introduced in 2 provinces	Project documents Provincial WRB records	
	National and provincial incentive policies recommended for adoption including a section on gender considerations.	No green SHP incentive policies in place	At least one incentive policy recommended for national adoption	Project documents Annual report	
Output 1.3 Safe Production standard criteria rolled out nationwide	Safe production standard rolled out nationwide Provincial safe production standards issued	Draft 'document' on safe production No provincial standards issued	SHP safe production rolled out nationwide Issuance of provincial standards on safe production in 8 provinces	Project documents MWR documents Provincial WRB records	
Component 2: Greening and improving the management and safety standards of existing SHP plants					
Outcome 2.1: 24 Refurbished green SHP plants are fully operational and improved management and safety standards are in place	Number of detailed feasibility studies and business plans No. of demonstration plants Installed capacity (MW) Annual MWh generated Number of Environmental and Social Management plans prepared No. of socio-economic and environmental impact studies post SHP rehabilitation	24 simple prefeasibility studies prepared. No business plans No demonstration projects 0 MW installed 0 MWh generated None None	24 business plans and project design reports finalised 24 demonstration projects 25 additional MW installed 157,000 additional MWh generated 24 ESMPs completed 10 post rehabilitation socio-economic and environmental impact studies	Project documents Commissioning reports Project monitoring data ESMPs	Industry interested in developing green and safe SHP projects. Viable projects possible Continued commitment from Government and interest from Chinese banks. Commitment from industry owners.
Outcome 2.2: Improved performance and safety management for SHPs in place					

Project Strategy	KPIs/Indicator	Baseline	Target	Sources of Verification	Assumptions
2.2.1 24 business plans and feasibility studies[44] finalised for upgrading SHP demonstration plants	Number of detailed feasibility studies and business plans including gender considerations.	24 simple prefeasibility studies prepared. No business plans	24 business plans and project design reports finalised	Project documents	Industry interested in developing green and safe SHP projects. Viable projects possible.
2.2.2 Upgraded green SHP plants rehabilitated at 24 sites with additional capacity of approx. 23.7 MW and generation of 157,000 MWh	No. of demonstration plants	No demonstration projects	24 demonstration projects installed and commissioned	Project documents Commissioning reports Project monitoring data	Continued commitment from Government and interest from Chinese banks. Commitment from industry owners.
	Installed capacity (MW)	0 MW installed	23.7 MW installed (an additional 23.7 MW)		
	Annual MWh generated	0 MWh generated	157,000 MWh		
	Annual GHG emissions reduced	No GHG reduced	110,000 tCO2e reduced per year		
	No. of pilot sites where ecological flow maintained year round	None	24 pilot sites		
	#/% of female-led (management team) pilot SHP plants (beneficiaries)	Baseline study	15%[45]		
	#% of female employees at pilot SHP plants	Baseline study	25%		
	Number of rivers with improved ecology	None (related to project)	24 rivers		
2.2.3 Socio-economic and environmental impact of green SHP rehabilitation recorded	Number of Environmental and Social Management plans prepared	None	24 ESMPs carried out (one at each site)	ESMPs Project documents	
	% of ESMP that includee a gender dimension	None	100%		
	Number of baseline and post impact socio-economic and environmental studies of local area and population prior to rehabilitation,	None	10		

[44] Feasibility study and Project Design Report (PDR) are used interchangeably in this document. In China the most important document is the PDR which includes the financial analysis and is the document used for Government approval.

[45] To be updated depending on the baseline findings during the inception phase

Project Strategy	KPIs/Indicator	Baseline	Target	Sources of Verification	Assumptions
	including a chapter on gender.				
	No. of socio-economic and environmental impact studies post SHP rehabilitation, including a chapter on gender.	None	10		
	% of female/ male beneficiaries at project areas	To be provided in baseline study	50%		
	No. of case studies prepared (% that includes gender section/ dimension)	No case studies	100% case studies (%)		
Component 3: Knowledge base and capacities in the fields of green SHP and improved and safe SHP management					
Outcome 3.1: Knowledge and awareness of decision makers, experts and technicians about green SHP retrofitting and management are improved	No. of SHP project owners, developers and technicians trained	0	1200 (at least 25% women)	Project reports Official Gov't publications Feedback forms Participation lists Survey of trainees Website	Targeted stakeholders show willingness for training. Training programme successfully implemented
	No. of officials trained on green SHP and Safety and Protection regulation	0	200 (at least 25% women)		
	Awareness raising campaign delivered	None	Website and project information distributed		
	No. of green SHP accredited organisations on recommended list	3	28		
	No. of institutions qualified to carry out safety and protection assessments	54	84		
3.1.2 Capacity building programme for SHP project owners, developers and technicians delivered to 1200 people	Training materials developed on greenhydro and safe SHP with consideration on gender.	No dedicated training material developed	Training material developed and Train the trainers with a chapter on gender.	Project reports Official Gov't publications Feedback forms Participation lists Survey of trainees	Targeted stakeholders show willingness for training.
	No. of train-the-trainer sessions delivered	None	One		
	No. of trained trainers	No trained trainers	50 trained trainers	13 female trainers (at least 25%	

Project Strategy	KPIs/Indicator	Baseline	Target		Sources of Verification	Assumptions
				women)		
	No. of training workshops delivered to project owners, developers, managers, technicians and design institutes	No workshops dedicated to green and safe SHP	15 workshops			
	Total no. of trainees	0 trainees	1200 trainees	300 female trainees (at least 25% women)		
	No. of study tours	No study tour	1 study tour completed			
	No. of study tour participants	None	25	7 female (at least 25% women)		
3.1.3 Capacity building programme for 200 officials on green SHP and Safety and Protection regulation	Training material developed on policy and regulation on Green Hydro and on Safe Production with considerations on gender.	No training material available	1 set of training material developed on policy and regulation on Green Hydro 1 set of training material developed on Safe Production Both documents will carry a chapter on gender.			
	No. of training sessions for MWR officials in provinces	No training available	4 training sessions			
	No. of officials trained	No officials trained	200 official trainees	50 female trainees (at least 25% women)		
	No. of study tours	No study tour	1 study tour completed 1 external certified training course completed			
	No. of study tour participants	None	30	8 female (at least 25% women)		
3.1.4 Awareness raising campaign delivered	Inception awareness raising workshop held	None	1		Proceedings from workshops Awarenss raising material	
	No. of attendees at workshop	None	150	38 female (at least 25% women)		
	Awareness raising and	Shortage of	Public awareness raising,			

Project Strategy	KPIs/Indicator	Baseline	Target	Sources of Verification	Assumptions
	marketing material available for the public	effective and good quality public awareness raising and marketing material.	marketing and training material developed and adapted for Chinese conditions and made available in printed and electronic format. Posters available at project sites	Website Participant lists Feedback forms	
	Awareness raising and marketing material available for project developers and officials including consideration on gender.	No public awareness raising and marketing material in Chinese	Public awareness raising, marketing and training material developed (with a chapter on gender) and adapted for Chinese conditions and made available in printed and electronic format		
	National and provincial seminars on greenhydro	None held	3		
	Chinese Green SHP website established	No website	Website established and regularly updated		
	International greenhydro event held in China with a side event on relevant to gender.	No international event	1 international greenhydro event		
3.1.5 Establishment of a recommendation list for green SHP assessment institutions (experts)	Establish a recommendation list for green SHP assessment institutions (experts)	No list	MWR and ICSHP promote the training for green SHP assessors and standards.		
	Training material developed for green SHP assessment with consideration on gender.	Ad-hoc training material	Training material for greenhydro assessors, including a chapter on gender, promoted by MWR and ICSHP.		
	No. of training institutions receiving training	0	25	Project reports Official Gov't publications Feedback forms Participation lists Survey of trainees	
	No. of accredited organisations	3	25 institutes		
	No. of trainees receiving training	None	250 trainees | 63 female trainees (at least 25% women)		
3.1.6 30 institutions trained and assessed to carry out Safe Production standards	Training material developed for safe production assessment	Draft training material	Training material for safe production assessors promoted by MWR		Targeted stakeholders show willingness for training.
	No. of training institutions	54	84		

Project Strategy	KPIs/Indicator	Baseline	Target		Sources of Verification	Assumptions
	receiving training					
	No. of accredited organisations	54	84			
	No. of trainees receiving training	None	300 trainees	75 female trainees (at least 25% women)		

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).

GEF Secretariat Review

GEF Secretariat comment		Response at CEO Endorsement submission
Box	Comment	
25. Items to consider at CEO endorsement/approval	Please explicitly indicate Program 2 of CC1: Develop and demonstrate innovative policy packages and market initiatives to foster a new range of mitigation actions in Table A, and justify it in the text of the CEO Endorsement.	CC1 Program 1 and 2 have been included in Table A since the project addresses both areas. The justifications in the CEO Endorsement are provided on page 4 (Part II) and on page 38 (at the end of the A.1.3).
	The Agency needs to consider increasing cash co-financing for the project at the CEO endorsement stage. See comment in Box 17.	See below.
17. At PIF: Is the indicated amount and composition of co-financing as indicated in Table C adequate? Is the amount that the Agency bringing to the project in line with its role?	MY 8/9/2014 Not at this time. Please consider increasing the overall cofinancing amount. This project will last for 5 years and the agency only put $150,000 in-kind and $75,000 cash. Please raise the amount of Agency co-financing in both in-kind and cash. Please change the "Appropriation" in Table C into a standard GEF word for co financing. MY 8/24/2014 Comments are addressed. But the Agency co-financing needs to be cleared at the CEO Endorsement Stage. In the CEO Endorsement Stage, please articulate how the Agency will be able to manage the project with $150,000 in-kind and $75,000 cash for the project.	The overall co-finaning amount has been increased as a result of the detailed design during the PPG of the activities and demonstration projects. The overall co-finance identified has increased compared to the PIF from USD 60 million to USD 74.4 million. Page 4 of CEO Endorsement document provides some explanation. UNIDO has raised its in-kind contribution to $300,000 taking into account of the overall cost that will be incurred in project implementation during the 5-year period.

STAP review

STAP Advisory Response: Based on this PIF screening, STAP's advisory response to the GEF Secretariat and GEF Agency(ies): **Concur**

Guidance points from STAP		Response
1	Technical upgrades of existing SHP plants is well understood and this project encompasses water use, biodiversity, and land use as well as power generation.	-
2	Each plant is unique, but finding lessons learned from upgrading of a selection of "demonstration" plants makes good sense.	-
3	It is not clear who owns the plants and whether the owners could increase their existing tariffs in order to pay for the plant upgrades and gain the benefits. GEF support is for meeting ecological and safety criteria to an international standard but perhaps innovative funding mechanisms could	The demonstration projects were selected during the PPG and therefore the ownership of the projects is also now known. The projects are a mix of state, collective and privately owned SHP stations. Under Chinese regulations tariffs for SHP are decided at a provincial level and it is not possible for the SHP owner

	possibly be explored to maximise the benefits.	to increase the tariff unilaterally. Some provinces do allow for a tariff increase following upgrade. Details of the policy is included in Annex T1 and the financing of each project is shown in Annex T5. One of the key activities of the project is to identify appropriate incentives for upgrading which would include funding mechanisms (see 1.1.2 of the project activities).
4	It is assumed that "intelligent monitoring systems" will be able to be remotely controlled from a centre covering several SHPs, but details are not given. The concept is well understood and could be beneficially applied.	It is intended that each station is automated as part of the upgrade allowing remote control of the station. Remote monitoring will be from SHP owners' offices. Each project is expected to reach the "5 remote controls[46]", meeting the requirements of unmanned and remote monitoring and operation. In particular for cascade stations, the operation of several cascade stations will be controlled from one control center, which could even connect to the dispatching center. It is expected that this will improve the operation and efficiency and reduce costs for the plants.
5	Capacity building in Component 3 is fine but what exactly will be taught and who will be used as the trainers is not evident. Linking to the international low impact hydro certification scheme is commendable.	The details of the capacity building have been included in the CEO document with targeted training envisaged for SHP owners and design institutes as well as for officials. In addition there will be training on the assessment of green SHP and safe production SHP. The trainers will be trained as part of the work and will include staff from government, academia and design organisations.
6	Monitoring of increased power output above the current baseline is easy to achieve, but the criteria to be used for assessing improvements in ecological and safety issues will need some careful thought.	One of the key areas of the project is to develop the assessment criteria for green SHP (activity 1.1.1) and to refine and roll out the assessment criteria for the safety issues at SHP (activity 1.1.3). Therefore one of the outputs of the project will be the criteria to assess these issues.
7	The GHG assessment appears sound (assuming 6,455.750tCO2e is intended to represent ~6.4Mt).	Yes – 6,455.750tCO2e was intended to represent ~6.4Mt in PIF.

German GEF council member comments

No	Comment on PIF	Response 22/10/14	German response 18/11/14	Response at CEO Endorsement submission
1	Using the Chinese definition, the project addresses small hydropower plants (less than 50 MW). However, according to the International Commission on Large Dams (ICOLD) large hydropower plants start from 20MW, and the European Commission defines small hydropower plants as having a capacity up to 10 MW. The definition has implications on the use	YES. Currently there is not an international consensus on the definition of SHP. In China, SHP is classified as up to 50MW, which are in most cases located in rural areas, hence are called rural hydropower as well. The project will work on SHPs that take into consideration the ICOLD recommendations. Please note however, that ICOLD does not have a definition of SHP but rather focuses on the height of the dams and their storage capacity (i.e. 15 mt or higher or 5-15mt with a reservoir exceeding 3 million m3). Furthermore, different countries such as Germany, Switzerland, USA,	Germany can agree with the choice of the definition as presented in the response by UNIDO to Germany's comments as long as the project aims	The project only includes the refurbishment and retrofitting of SHP plants. No new construction or enlargement of dams or reservoirs is anticipated in the project. All plants are below 20MW. In total 24 demonstration projects have been selected. All demonstration projects are aiming for the highest grades of

[46] The Five Remote(Tele) means teleindication; Tele-Measuring, TM; Tele-Controlling, TC; Tele-Adjusting; Tele-Viewing;

	of standards, the involvement of stakeholders and the knowledge management. If the project includes large hydropower plants according to the ICOLD definition, it would be necessary to take into account the standards for large hydropower plants as well as to involve a broader range of stakeholders.	Brazil, etc, have different definitions and some of them have introduced green certification schemes which include principles for the involvement of stakeholders. One of the activities of the GEF project is to research and learn from those best international practices and take into consideration the situation in China to develop similar guidelines, including the involvement of stakeholders, environmental, social, economic and management aspects.	at refurbishing and retrofitting hydropower plants, and does not involve the enlargement of existing plants or the construction of new plants. This would require the observance of the higher standards for large hydropower plants according to the international definition.	the new Green SHP standard which will be in line with international standards.
2	Germany kindly requests some further specification on the affordability of energy for the end user. It is of particular importance that the investments necessary to achieve a sustainable energy/ electricity supply do not result in increased energy/electricity prices in rural areas. This issue should be carefully taken into account when considering incentives such as subsidy schemes for green hydropower (investment grants for retrofitting activities, higher electricity tariffs, quota systems), preferential access to the grid, or certification schemes.	The goal of supporting SHP is to increase rural energy access and to make energy more affordable and available to the rural population. The existing electricity price in China is set by the government. One of the aims of the GEF project is to introduce policy packages such as incentive schemes for green hydropower in China. The experience of Germany as well as other countries will be considered during PPG and project implementation, to look at the best options to ensure the affordability of energy for the end users.		The domestic electricity price is set by the government and is not under the control of the local SHPs. However, six of the demonstration projects are collectivey owned and in some cases there are clear additional benefits planned for the local population. For example, at the Majing plant in Chongqing the SHP company pays RMB 4000 (around USD 600) each year to the local community to subsidise the electricity price. In Yunnan, the Mabozi plant provides 30,000 kg or rice for the surrounding 42 households as well as free electricity.
3	Germany kindly requests some further clarification on the need and the reasons for the demonstration/pilot projects, including their role in the implementing process.	The GEF project aims at supporting China in broadening its scope of current upgrading activities to reduce impacts, while gaining additional environmental co-benefits from the existing SHP refurbishment projects. As new technology and new equipment will be showcased, demonstration projects are deemed to be necessary. These pilot plants which will represent different types of SHP in versatile setting (region, size, etc) will be refurbishment applying the latest knowledge and applications. Also for capacity building purposes it will be essential to have best practice examples which can be used for	Germany welcomes the clarification on the need and reasons for demonstration projects and suggests including this in the revised PIF document. Germany also	Further details on the need for demonstration projects and the barriers to current green and safe upgrading has been added to the CEO Endorsement document, eg: activities under Component 1, especially 1.1.3, Component 2, and promotion of these good practices under Component 3.

		knowledge and skill dissemination. Through project demonstration, the green hydropower index and evaluation criteria will be tested and improved, good practices will be summarized, various support mechanism will be recommended and to be promoted, and the potential to replicate will be explored.	welcomes the envisaged summary and promotion of good practices.	
4	Furthermore, the question of ownership is not addressed in the proposal; therefore further clarification about who operates the plants and which incentives will be provided to them to implement the measures is needed.	During the PPG phase a selection of the pilot demonstration sites will be carried out including suitable state-owned, community owned and private sector owned plants. Furthermore, one of the aims of the GEF project is to set up policies for the up-scaling, in large numbers, of the deployment of green SHP refurbishment through the GEF project promotion.		The 24 demonstration projects have been selected which have a mix of ownership – state-owner, community/collectively owned and private. The ownership is shown in Annex T5. As part of the project it is intended to recommend new incentive policies to encourage further uptake (see activity 1.1.2).
5	As the project aims at increasing sustainability of both energy and water availability, Germany suggests involving the Ministry of Energy and the Ministry of the Environment in the project activities.	In China, SHP management falls under the MWR and the existing SHP refurbishment program is carried out by the MWR and the MOF. Accordingly the MWR and MOF will be responsible for the implementation of the GEF project. The involvement of the National Energy Administration and the Ministry of Environmental Protection will be considered during project implementation.	Germany would welcome involving the National Energy Administration of the NDRC and the Ministry of Environmental Protection at the earliest possible stage of project development and to include both institutions in the revised PIF document.	During the PPG consultation was held with the Department of Rural Economy and the Pricing Bureau of NDRC and MEP. The National Energy Bureau is responsible for large hydro and therefore is not the correct government department for SHP. MEP and the Department of Rural Economy will be involved in the development of the green SHP standard and both the Pricing Bureau, DRC and MEP will be involved in the development of incentive policies at national and local level.
6	The proposal mentions the water-energy nexus. However, it does not provide any information on the impact on fish passages, and whether these will be taken into account.	The proposal mentions various options for environmentally friendly upgrading of SHPs. The project will consider addressing the fish passages under the environmental considerations together with hydrology, water quality, biology, landscape and emission reduction. Depending on the certification scheme, which will evolve more clearly during the PPG phase, the final criteria and activities will be determined.	Germany welcomes the specifications regarding the co-benefits which have been included in the revised PIF. Regarding fish passages, Germany would like UNIDO to take these into	During the PPG a list of possible measures to be included in the upgrading of the SHPs was drafted. During the project international consultants will be involved in the technical design to ensure that the latest state of technology is included. This includes all measures (including fish passes) that will be considered although the actual measures to be applied at each site will be site
7	The proposal would also benefit from a more extensive account of the co-benefits of upgrading hydropower plants.	The expected co-benefits of green upgrading of small hydropower plants are: • Improved water quality for human consumption, fauna and		

<table>
<tr>
<td></td>
<td></td>
<td>flora
• Improved biodiversity
• Increasing climate resilience of the water resource
• Improved water management for irrigation, in case of flooding, for drinking water purposes
• Increased production of renewable energy supporting energy access and reducing energy costs
• Improved safety management for staff and affected communities
• Poverty alleviation.</td>
<td>consideration, as this should be part of an environmental upgrading of rural SHP stations for waters harboring fish populations. In this context Germany kindly asks to take into consideration and comply with the latest state of technology. Germany suggests to also include this aspect in the list of co-benefits.</td>
<td>specific. Annex T3 provides the list of measures and Annex T5 includes the anticipated actual measures to be implemented at each of the demonstration projects.</td>
</tr>
<tr>
<td>8</td>
<td>It would be beneficial to clarify whether the 12th FYP has set a target for the use of hydropower, its share in non-fossil fuel consumption and its share in non-fossil fuel installed capacity.</td>
<td>Under the 12th FYP for Renewable Energy Development, by 2015 the hydropower installed capacity will reach 280 GW (excluding pumped storage hydro) and 910,000Gwh and accounting 66% of total non-fossil fuel electricity installed capacity and 75.6% of non-fuel electricity output. (see table below)
<table>
<tr><td colspan="6">The use of renewable energy in the 12th Five-Year Plan</td></tr>
<tr><td rowspan="2">Content</td><td colspan="2">Using Scale</td><td colspan="2">Annual Output</td><td rowspan="2">Standard Coal equivalent (10^4tons y)</td></tr>
<tr><td>Quantity</td><td>Unit</td><td>Quantity</td><td>Unit</td></tr>
<tr><td>Electric generation
1.Hydropower
2 Wind
3 Solar
4 Biomass</td><td>39,400

26,000
10,000
2,100
1,300</td><td>10^4KW</td><td>12,030

9,100
1,900
250780</td><td>10^4KW h</td><td>39,000

29,580
6,150
910
2,430</td></tr>
<tr><td>Gas supply
1 Methane
2.Industrial organic wastewater biogas</td><td>
5,000
1,000</td><td>
10^4households
Site</td><td>220
215
5</td><td>10^8 m³</td><td>1,750
1,700
50</td></tr>
<tr><td>Heating and cooling
1.Solar water heater
2 Solar oven
3.Geothermal</td><td>
40,000
200</td><td>
10^4 m²
10^4 set</td><td></td><td></td><td>6050
4550

1500</td></tr>
<tr><td>Fuel
1 Biomass Fuel
2 Ethanol
3 Biodiesel</td><td>
1,000

400
100</td><td>
10^4 tons

10^4 tons
10^4 tons</td><td></td><td></td><td>1,000
500

350
150</td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td></td><td>47,500</td></tr>
</table>
</td>
<td>Germany welcomes the clarification on the use of hydropower as foreseen in the 12th FYP. As noted by UNIDO in their comments "by 2015 the hydropower installed capacity will reach 280 GW, accounting 66% of total non-fossil fuel electricity installed capacity and 62% of non-fossil fuel consumption", Germany would welcome if this would be included in the revised PIF.</td>
<td>Policy details and targets are provided in the CEO Endorsement document in section B.</td>
</tr>
</table>

		[1] The 12th FYP for Renewable Energy in China by National Energy Administration 2013		
9	The proponent should clearly describe in how far the project targets the increase of competitiveness of hydropower technologies in China or if development of the same technology is foreseen to be promoted by the GEF funds.	SHPs are expected to become more competitive with other energy technologies as their productivity will increase through the refurbishments as well as their social and ecological co-benefits (irrigation, water management, etc.) strengthened. The GEF funds will support technology and know-how transfer in the field of safety management and environmental aspects for SHP development, refurbishment and operation.	There remains a certain lack of clarity regarding the issue of „competitiveness" as addressed in Germany's comments which is not elaborated in the PIF document yet.	The project will introduce more efficient electro-mechanical equipment as well as additional environmental and safety measures ensuring that SHP remains competitive. SHP is already competitive in China but with the additional efficiency and automation measures introduced it will become more competitive. Please also refer to section A.7. Benefits (p.57)
10	In order to ensure the environmental integrity of this project, it is vital that an environmental impact assessment is conducted and that it not only incorporates new developments but also the refurbishment of already existing hydropower plants, including small hydropower. Moreover, a full climate proofing regarding adaptation and mitigation should take place.	The project focuses on the refurbishments of SHP plants and how to improve their environmental condition. The environmental impact assessment will be included in the project preliminary design report to be approved by the local governments at different levels for the SHP refurbishment program. As a system to support such environmental friendly upgrading activities will be installed, the criteria, standard or certification scheme to come will incorporate environmental and climate impacts of the activities to be carried out.	Germany welcomes that "the environmental impact assessment will be included in the project preliminary design report" as mentioned by UNIDO in its comments. However, the aspect is not yet included in the PIF document.	Under Chinese regulation it is not necessary to undertake a full Environmental Impact Assessment for upgrading SHP. During the PPG, preliminary design reports for each project were undertaken which included some environmental aspects. As a result a preliminary Environmental and Social Impact Assessment has been carried out with the summary feasibility for all projects (see annex T5). Chinese versions of the PDRs are also available. In addition, it is intended to carry out an Environmental and Social Management Plan at each project site during project inception which will include local consultation, mitigation and adaptation.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[47]

A. Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: **US$200,000**			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF Amount ($)***		
	Budgeted Amount	***Amount Spent Todate***	***Amount Committed***
1. National sub-contractor (International Center on Small Hydropower, ICSHP) for baseline data collection, recruitment of two national consultants, organization of inception and validation workshops, stakeholders consultations, demonstration projects selection and review	90,000	87,000	3,000
2. International consultants/staff	87,000	80,707	6293
3. Local travel	18,000	10,984	7016
4. Other direct costs	5,000	332	4668
Total	200,000	179,023	20,977

[47] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities. Agencies should also report closing of PPG to Trustee in its Quarterly Report.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (IF NON-GRANT INSTRUMENT IS USED)
Provide a calendar of expected reflows to the GEF/LDCF/SCCF Trust Funds or to your Agency (and/or revolving fund that will be set up)

No expected reflows

ANNEX E: GEF GRANT PROJECT BUDGET

All figures in USD

Output Based Budget for the GEF Grant							
		GEF Grant Budget Component 1					
Component 1. Policy and institution	Type of Expense	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Output Total
1.1.1 Green Small Hydropower Assessment Standard formulated and issued by MWR	International Expertise	90,000	90,000				180,000
	Local Travel	-	-	-			-
	National Expertise	163,750	163,750				327,500
	Contractual Arrangement	-	-	-			-
	Training/Workshops	2,000	2,000	2,000			6,000
	International Meetings/Workshops	-	-	-			-
	Equipment	-	-	-			-
	Miscellaneous	-	-	-			-
	Output sub-total	**255,750**	**255,750**	**2,000**	**-**	**-**	**513,500**
1.1.2 Preferential green SHP policies developed and recommended	International Expertise	37,500	37,500	37,500	37,500		150,000
	Local Travel	-					-
	National Expertise	60,625	60,625	60,625	60,625		242,500
	Contractual Arrangement	-	-	-	-	-	-
	Training/Workshops	3,000	3,000	3,000			9,000
	International Meetings/Workshops	-					-
	Equipment	-					-
	Miscellaneous	-					-
	Output sub-total	**101,125**	**101,125**	**101,125**	**98,125**	**-**	**401,500**
1.3 Evaluation Criteria for Rural Hydropower Station Safe Production Standardization (provisional) rolled out nationwide	International Expertise	45,000	45,000				90,000
	Local Travel	-	-	-			-
	National Expertise	97,500	97,500	-			195,000
	Contractual Arrangement	-	-	-			-
	Training/Workshops	-	-	-			-
	International Meetings/Workshops	-	-	-			-
	Equipment	-	-	-			-
	Miscellaneous	-	-	-			-
	Output sub-total	**142,500**	**142,500**	**-**	**-**	**-**	**285,000**
TOTAL Component 1		**499,375**	**499,375**	**103,125**	**98,125**		**1,200,000**

		GEF Grant Budget Component 2					
Component 2	Type of Expense	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Output Total
2.1.1 26 business plans and feasibility studies finalised for upgrading SHP demonstration plants	International Expertise	90,000					90,000
	Local Travel	-					-
	National Expertise	33,750	33,750				67,500
	Contractual Arrangement	-	-				-
	Training/Workshops	-	-				-
	International Meetings/Workshops	-					-
	Equipment	-					-
	Miscellaneous	-					-
	Output sub-total	**123,750**	**33,750**	**-**	**-**	**-**	**157,500**
2.1.2 Upgraded green SHP plants rehabilitated at 26 sites with additional capacity of approx. 25 MW and generation of 187 GWh	International Expertise	-	-	-	-	-	-
	Local Travel	-	-	-	-	-	-
	National Expertise	52,500	52,500				105,000
	Contractual Arrangement	-	-	-	-	-	-
	Training/Workshops	-	-	-	-	-	-
	International Meetings/Workshops	-	-	-	-	-	-
	Equipment	2,750,000	2,750,000	-	-	-	5,500,000
	Miscellaneous	-	-	-	-	-	-
	Output sub-total	**2,802,500**	**2,802,500**	**-**	**-**	**-**	**5,605,000**
2.1.3 Socio-economic and environmental impact of green small hydro rehabilitation recorded	International Expertise	-	-				-
	Local Travel	-					-
	National Expertise	79,167		158,333			237,500
	Contractual Arrangement	-					-
	Training/Workshops	-	-				-
	International Meetings/Workshops						-
	Equipment						-
	Miscellaneous						-
	Output sub-total	**79,167**	**-**	**158,333**	**-**	**-**	**237,500**
TOTAL Component 2		**3,005,417**	**2,836,250**	**158,333**	**-**	**-**	**6,000,000**

		GEF Grant Budget Component 3					
Component 3	**Type of Expense**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**		**Output Total**
3.1.1 Capacity building programme for SHP project owners, developers and technicians delivered to 1200 people	International Expertise		15,000				15,000
	Local Travel						-
	National Expertise	66,667	66,667	66,667			200,000
	Contractual Arrangement						-
	Training/Workshops	6,000	6,000	6,000			18,000
	International Meetings/Workshops		90,000				90,000
	Equipment						-
	Miscellaneous						-
	Output sub-total	**72,667**	**177,667**	**72,667**	**-**		**323,000**
3.1.2 Capacity building programme for 200 officials on green SHP and Safe Production Standard	International Expertise		15,000				15,000
	Local Travel						-
	National Expertise	43,333	43,333	43,333			130,000
	Contractual Arrangement						-
	Training/Workshops	3,000					3,000
	International Meetings/Workshops		112,000				112,000
	Equipment						-
	Miscellaneous						-
	Output sub-total	**46,333**	**170,333**	**43,333**	**-**		**260,000**
3.1.3 Awareness raising campaign delivered	International Expertise		15,000	15,000	15,000	15,000	60,000
	Local Travel						-
	National Expertise	54,000	54,000	54,000	54,000	54,000	270,000
	Contractual Arrangement						-
	Training/Workshops	2,400	2,400	2,400	2,400	2,400	12,000
	International Meetings/Workshops						-
	Equipment						-
	Miscellaneous						-
	Output sub-total	**56,400**	**71,400**	**71,400**	**71,400**		**342,000**
3.1.4 25 institutions on recommendaton list to carry out green SHP assessment	International Expertise						-
	Local Travel						-
	National Expertise		28,125	28,125	28,125	28,125	112,500
	Contractual Arrangement		-				-
	Training/Workshops	3,000					3,000
	International Meetings/Workshops						-
	Equipment						-
	Miscellaneous						-
	Output sub-total	**3,000**	**28,125**	**28,125**	**28,125**	**28,125**	**115,500**
3.1.5 30 institutions qualified to carry out Safe Production Standard assessments	International Expertise						-
	Local Travel						-
	National Expertise		27,375	27,375	27,375	27,375	109,500
	Contractual Arrangement		-				-
	Training/Workshops		-	-	-	-	-
	International Meetings/Workshops						-
	Equipment						-
	Miscellaneous						-
	Output sub-total	**-**	**27,375**	**27,375**	**27,375**		**109,500**
TOTAL Component 3		**178,400**	**474,900**	**242,900**	**126,900**	**28,125**	**1,150,000**

The budget for the Monitoring and Evaluation is detailed in Table 7 on page 53 of the main document.

ANNEX F: ESTIMATE OF ENERGY SAVINGS AND GHG EMISSION REDUCTIONS

Direct emission reductions

Direct emission reductions within this project result from the investment in 24 demonstration projects. These projects will be upgraded and commissioned during the project's 5 year implementation phase resulting in direct GHG emission reductions. In each case as a result of the upgrading the annual generation is increased. For each of these projects an economic lifetime of 20 years is assumed. For the 24 demonstration projects this results in total direct emission reductions of 2.20 million tonnes of CO_2 equivalent (tCO_2eq) over the lifetime of the investments.

In the non-GEF project baseline scenario, these SHP projects may not be upgraded and would continue to generate below their potential. The additional generation as a result of this project will offset the local provincial grid electricity in each case. Depending on the province this offset electricity is largely dependent on coal fired generation. The Chinese government publishes emission factors for the different regional grids varying from 0.6775 tCO_2/MWh to 0.841 tCO2/MWh.

GHG grid emission factors[48]	Operating Margin	Build Margin	Hydro plants	Including provinces:
Northern Power Grid	1.058	0.541	0.7995	Beijing, Tianjin, Hebei, Shanxi, Shandong, Inner Mongolia
North-east Power Grid	1.1281	0.5537	0.8409	Liaoning, Jilin, Heilongjiang
Eastern Power Grid	0.8095	0.6861	0.7478	Shanghai, Jiangsu, Zhejiang, Anhui, Fujian
Central Power Grid	0.972	0.4737	0.72305	Hubei, Hunan, Jiangxi, Sichuan, Chongqing, Henan
North-west Power Grid	0.958	0.4512	0.7045	Shaanxi, Gansu, Qinghai, Ningxia Autonomous Region, Xinjiang Uygur Autonomous Region
Southern Power Grid	0.9183	0.4367	0.6775	Guangdong, Guangxi Zhuang Autonomous Region, Yunnan, Guizhou, Hainan

These figures have been used to calculate the GHG emission reductions for each project.

The following table summarises the emission reductions associated with the demonstration projects.

	Demonstration project	Generation before upgrading (10^4 kWh/yr)	Generation after upgrading (10^4 kWh/yr)	Additional generation (MWh/yr)	Grid emission factor (tCO_2/MWh)	Annual GHG reduction (tCO_2eq)	GHG over Lifetime (tCO_2eq)
1	Maoyandong Cascade.2 Hydropower Plant	5196	6849	16530	0.6775	11199	223982
2	Mabozi Hydropower Plant	478	2297	18190	0.6775	12324	246475
3	Quanqiaohe Cascade I & II Hydropower Plant	1011	1315	3040	0.6775	2060	41192
4	Chahe Hydropower Plant	949.59	2620	16704	0.6775	11317	226339
5	Jiuqianyan Hydropower Plant	4108	4622	5140	0.6775	3482	69647
6	Jiugonghe Hydropower Plant	515	659.56	1446	0.72305	1045	20905
7	Zhoujialiang Hydropower Plant	975	1418	4410	0.72305	3189	63773
8	Yangdaohe Cascade project	6908	8246	13380	0.72305	9674	193488
9	Majing Hydropower Plant	1606	2876	12700	0.72305	9183	183655
10	Xiaokeng Hydropower Plant	151	441	2900	0.72305	2097	41937
11	Gaokeng Hydropower Plant	1898	2293	3950	0.72305	2856	57121

[48] China Emissions Factors For CCER Projects, China Carbon ,net,cn, Feb 2015

12	Jingtanfeng and Huangyan plants	1860	2560	917	0.72305	4360	87200
13	Taiping Hydropower Plant	1088	1285	1970	0.72305	1424	28488
14	Tangban Hydropower Plant	3270	4000	7300	0.74780	5459	109179
15	Jiaosan & Thantou Hydropower plant	2881	3370	4890	0.74780	3657	73135
16	Gaofang Cascade II Hydropower Plant	500	600	1000	0.74780	748	14956
17	Baiyunxia Hydropower Plant	701.5	1321	6195	0.7045	4364	87288
18	Xiakou Hydropower Plant	450	502	520	0.7045	366	7327
19	Xinpingya Hydropower Plant	970	1187	2170	0.7045	1529	30575
20	Guanxi Hydropower Plant	1500	1799.6	2996	0.67750	2030	40596
21	Sandieling & Dongpai Hydropower plant	3108.3	3620	5117	0.67750	3467	69335
22	Aibu Cascade II&III Hydropower Plant	1136	2455	13190	0.67750	8936	178725
23	Qingshuitan Hydropower Plant	331	877	5460	0.74780	4083	81660
24	Panxi Cascades II, III & IV Hydropower Plant	2107	2311	2040	0.74780	1526	30510
	Total	**43,698.39**	**59,524.16**	**152,155**		**110,375**	**2,207,488**

Direct post-project emission reductions

Although the project will facilitate the financing of new projects beyond the implementation phase, this is not expected to use GEF funding which would be used during the project implementation phase only. Therefore as a conservative assumption, no direct post-project greenhouse gas emission reductions are claimed.

Indirect emissions reductions

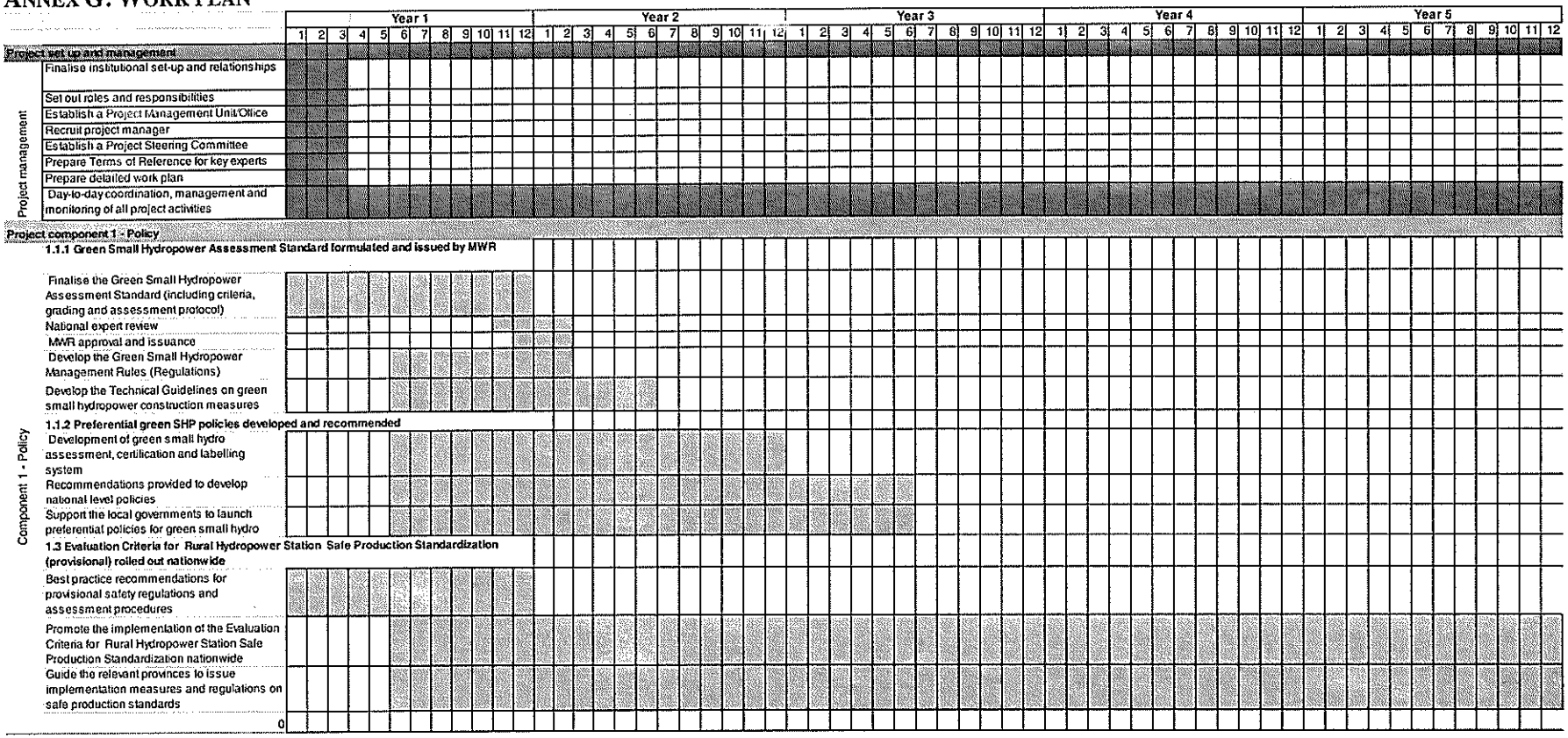
The project is expected to catalyse significant further investment in green upgrading of SHP due to its policy, technical and capacity building activities that are designed to address the current barriers to investment resulting in indirect emissions reductions. Using the GEF bottom-up methodology, indirect emission reductions attributable to the project are expected to be approximately 6,620,000 tCO_2eq. This figure assumes a conservative replication factor of 3 (GEF uses 3 for a market transformation initiative and 4 where a credit guarantee is introduced).

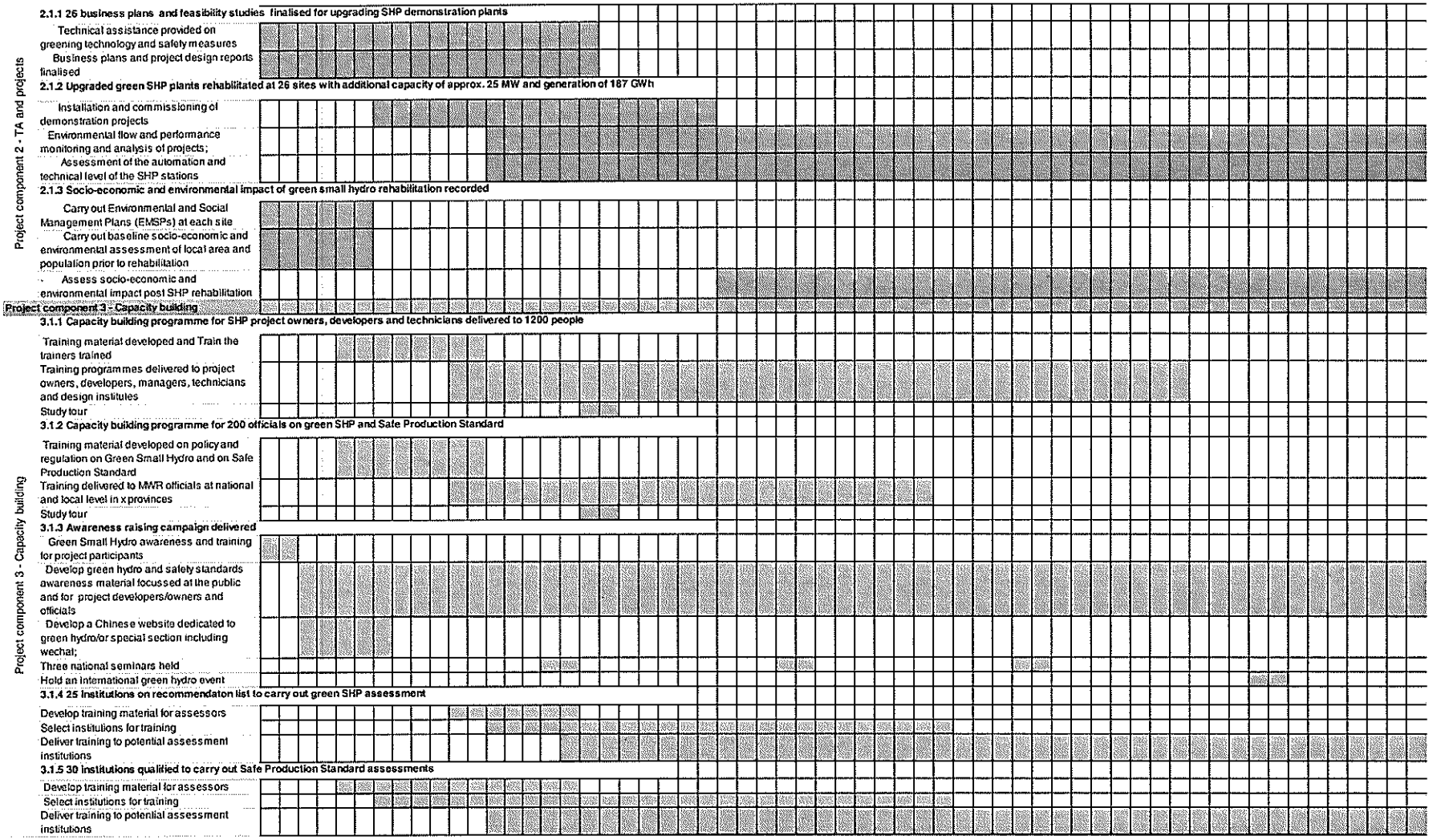
Using the GEF top-down methodology, indirect emission reductions attributable to the project are estimated at 60,000,000 tCO_2eq. This figure assumes that total technological and economic potential for GHG emission reductions in this area over the post-project 10 years is 240,000,000 tCO_2eq, with a realistic project causality factor of 25 %, which takes into account the influence of the related existing government initiatives[49].

The range of indirect CO_2 emission reductions is 6.6 million – 60 million tCO_2eq

[49] It is expected that post – project about 600 projects would be upgraded annually . Conservatively the emission reductions due to these installations would equal approximately 4000 tCO_2eq per project per year. In reality many of the 600 projects will be larger as they will fall within the Chinese definition of SHP, i.e. up to 50 MW and therefore the potential for emission reductions would be greater.

ANNEX G: WORK PLAN




Project component 2 - TA and projects
2.1.1 26 business plans and feasibility studies finalised for upgrading SHP demonstration plants
Technical assistance provided on greening technology and safety measures
Business plans and project design reports finalised
2.1.2 Upgraded green SHP plants rehabilitated at 26 sites with additional capacity of approx. 25 MW and generation of 187 GWh
Installation and commissioning of demonstration projects
Environmental flow and performance monitoring and analysis of projects;
Assessment of the automation and technical level of the SHP stations
2.1.3 Socio-economic and environmental impact of green small hydro rehabilitation recorded
Carry out Environmental and Social Management Plans (EMSPs) at each site
Carry out baseline socio-economic and environmental assessment of local area and population prior to rehabilitation
Assess socio-economic and environmental impact post SHP rehabilitation
Project component 3 - Capacity building
3.1.1 Capacity building programme for SHP project owners, developers and technicians delivered to 1200 people
Training material developed and Train the trainers trained
Training programmes delivered to project owners, developers, managers, technicians and design institutes
Study tour
3.1.2 Capacity building programme for 200 officials on green SHP and Safe Production Standard
Training material developed on policy and regulation on Green Small Hydro and on Safe Production Standard
Training delivered to MWR officials at national and local level in x provinces
Study tour
3.1.3 Awareness raising campaign delivered
Green Small Hydro awareness and training for project participants
Develop green hydro and safety standards awareness material focussed at the public and for project developers/owners and officials
Develop a Chinese website dedicated to green hydro/or special section including wechat;
Three national seminars held
Hold an international green hydro event
3.1.4 25 institutions on recommendaton list to carry out green SHP assessment
Develop training material for assessors
Select institutions for training
Deliver training to potential assessment institutions
3.1.5 30 institutions qualified to carry out Safe Production Standard assessments
Develop training material for assessors
Select institutions for training
Deliver training to potential assessment institutions
Project component 3 - Capacity building

ANNEX H: CO-FINANCING LETTERS
See separated file

OVERVIEW OF TECHNICAL ANNEXES

Annex T1: Overview of the policy and regulatory framework relevant to SHP in China

- SHP in macro policy, SHP programmes and incentives
- Environmental regulations and guidelines relating to Chinese SHP

Annex T2: Overview of the status of Green SHP Standards and the Safe Production Standardisation

- Development of China's Green SHP standards, comparison with international standards, barriers to implementation
- Policy framework and current status of China's Safe Production Standardisation

Annex T3: Long list of potential measures for demonstration green SHP projects

Annex T4: Selection criteria for demonstration projects

- Project selection criteria and province selection critiera

Annex T5: Summary Feasibility Report for Demonstration projects (including preliminary ESIA) – see separate file (114 pages)

- ESMP template
- Individual Chinese Preliminary Design Reports available on request

Annex T6: Preliminary Analysis for Gender dimensions

- Key Gender Dimensions: Gender Mainstreaming Logical Framework
- Preliminary Gender Analysis of China

Annex T7: Terms of Reference for key staff

- Overivew of staff and consultants required
- TOR for National Project Coordinator (and office)

Annex T8: Summary of Validation Workshop proceedings (November 2015)

- Proceedings and participants