



REQUEST FOR CEO APPROVAL

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title: Promoting the development of photovoltaic pumping systems for irrigation			
Country(ies):	Morocco	GEF Project ID: ¹	5539
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5284
Other Executing Partner(s):	Agency of Renewable Energy and Energy Efficiency Development (ADEREE)	Submission Date:	December 11 th 2015 March 9 th 2016
GEF Focal Area (s):	Climate Change	Project Duration(Months)	48 months
Name of Parent Program (if applicable): ➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> ➤ For PPP <input type="checkbox"/>	N/A	Project Agency Fee (\$):	250,774

A. FOCAL AREA STRATEGY FRAMEWORK²

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (M\$)	Cofinancing (M\$)
CCM-3	Renewable Energy: Promote investment in renewable energy technologies	Renewable energy capacity installed Renewable energy policy and regulation in place	GEFTF	2,639,726	70,903,000
Total project costs				2,639,726	70,903,000

B. PROJECT FRAMEWORK

Project Objective: To promote the take-up of PV-powered drip irrigation pumping systems in Morocco						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
1. Demonstration of technical and economic viability of solar	TA/INV	PV pump units covering a range of configurations designed,	Output 1.1: Approximately 3,750 small-scale off-grid PV pumps installed (covering	GEFTF	Total = 959,025	70,103,000

¹Project ID number will be assigned by GEFSEC.

² Refer to the [Focal Area Results Framework and LDCF/SCCF Framework](#) when completing Table A.

pumping for irrigation		assessed, installed and under implementation	<p>a total area of 19,000 ha with a total corresponding pump capacity of ~23.6 MW) in a diverse range of geographical locations, facilitated by system configuration, siting and maintenance protocols</p> <p>Output 1.2: Partial GEF funding for ten larger-scale demonstration PV pump units (each with a capacity of 20-30 kW, with a total capacity of 250 kW) installed to demonstrate the potential of solar energy for larger farms</p> <p>Output 1.3: Pump scrapping and recycling scheme studied and a programme contract with the Ministry in charge of Environment proposed to avoid GHG leakage effects associated with the project</p> <p>Output 1.4: Monitoring systems and indicators designed and operationalized to reliably track energy consumption and GHG emission reductions</p>		547,000 (TA) 412,025 (INV)	
2. Development of sustainable implementation framework and standards for solar pumping and drip-irrigation fertigation practices	TA	Sustainable implementation framework and standards for solar pumping and drip-irrigation fertigation practices developed	<p>Output 2.1: Renewable Energy Service Company (RESCO) model designed and in place to support implementation of the National Promotion Programme for Solar Irrigation Water Pumping</p> <p>Output 2.2: A comprehensive system of quality control (covering certification, verification and enforcement) for all PV pump irrigation systems is designed and set up to comply with international standards.</p>	GEF TF	540,000	100,000

			<p>Output 2.3: Fertigation management tool developed to inform farmers of the optimal fertilizer regime under drip-irrigation and development of a cost-savings calculator to demonstrate to farmers the immediate financial benefits of switching to an optimal fertigation regime</p> <p>Output 2.4: NAMA concept updated and operationalized in support of the PV pump installation programme</p>			
3. Supportive financing mechanisms	TA	Supportive financing mechanisms and incentive schemes identified, designed and proposed in collaboration with the Ministry of Economy and Finance (MEF) for implementation	<p>Output 3.1: Local private sector banks enabled to design and offer tailored financial products to farmers to support PV pump take-up</p> <p>Output 3.2: Smart incentives/tax benefits enhancing farmers' willingness to acquire PV technology designed in collaboration with Ministry of Economy and Finance</p> <p>Output 3.3: Options for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation analysed and recommended to the Ministry of Agriculture and the Ministry of Economy & Finance</p>	GEF TF	342,000	120,000
4. Capacity development of stakeholders	TA	Capacities enhanced in developing, implementing and managing solar pumping and associated drip irrigation systems	Output 4.1: Capacities of selected stakeholders enhanced to build local awareness and technical capability in solar pumping technology, business planning, life-	GEF TF	673,000	260,000

			<p>cycle costing, quality assurance, maintenance, procurement and marketing</p> <p>Output 4.2: Capacity for national manufacturing of equipment and components built through strengthening of local private sector fabrication facilities</p> <p>Output 4.3: Technicians trained for designing, installing, operating and maintaining PV pumping systems</p> <p>Output 4.4: Finance professionals trained on the evaluation of bankable solar pumping projects</p> <p>Output 4.5: Capacities in the application of optimal fertigation practices strengthened among farmers, water user associations, Regional Agricultural Development Agencies, RESCOs and banks</p>			
Subtotal					2,514,025	70,583,000
Project management Cost (PMC) ³				GEF TF	125,701	320,000
Total project costs					2,639,726	70,903,000

C. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming co-financing⁴ for the project with this form⁵

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount (\$)
National Government	ADEREE	Cash	7,216,000
		In kind	400,000

³PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

⁴ The letter from MEMEE is forthcoming and will be sent to GEFSEC under separate cover

National Government	MAPM	Cash	30,928,000
		In kind	200,000
National Government	MEMEE	Cash	3,093,000
GEF Agency	UNDP (grant)	Cash	100,000
National bank sector	GCAM & other banks	Cash	28,866,000
		In kind	100,000
Total Co-financing			70,903,000

PLEASE SEE CO-FINANCE LETTERS ATTACHED IN SEPARATE FILE AND ANNEX OF THE PRODOC

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) ²	Total c=a+b
UNDP	GEF TF	Climate Change	Morocco	2,639,726	250,774	2,890,500
Total Grant Resources				2,639,726	250,774	2,890,500

¹ In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

² Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	460,000	0	460,000
National/Local Consultants	260,000	40,000	300,000

G. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? N/A

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

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF⁶

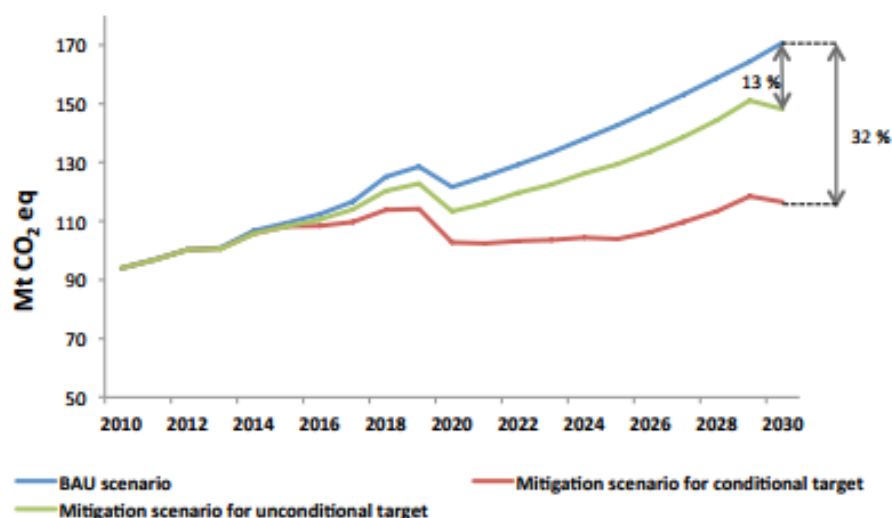
A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i. NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Rep

Since the PIF, Morocco has published its strategic mitigation objective within the framework of its Intended Nationally Determined Contribution (INDC) officially submitted to UNFCCC in June 2015. In developing its INDC, Morocco undertook a broad stakeholder consultation process, which culminated in a national conference held on June 2, 2015 in Rabat, chaired by the head of government, to officially present the draft INDC to all stakeholders. The project is fully aligned with Morocco's vision to address climate change as expressed in its INDC.

The Project is embedded in the National Water Solar Pumping Programme, hereinafter referred to as 'the National Programme), which has a strong support of the government of Morocco and is aligned with, and supportive of, a number of government policies and strategies, including the INDC.

Even though Morocco is primarily focusing its mitigation efforts in the energy sector, its greenhouse gas (GHG) emission reduction targets will be achieved through economy-wide actions based on strategies and sectoral action plans designed, amongst others, for the following areas of intervention: agriculture, water, waste, forests, energy, industry and urban planning.

Morocco's commitment is to reduce its GHG emissions by 32% by 2030 compared to "business as usual" projected emissions. This commitment is contingent upon gaining access to new sources of financing and enhanced support compared to that received over the past years, within the context of an envisioned new legally-binding agreement under the auspices of the UNFCCC. This target translates into a cumulative reduction of 401 Mt CO₂eq over the period 2020-2030.



Meeting this target will require an overall investment in the order of USD 45 billion, of which USD 35 billion is conditional upon international support through new climate finance mechanisms.

⁶ For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter “NA” after the respective question.

Concerning adaptation, Morocco has already made significant efforts. Over the period 2005-2010, Morocco devoted 64 % of all climate-related spending in the country to adaptation, which represents 9% of overall national investment expenditures. Going forward Morocco expects to dedicate at least 15% of its overall investment budget to adaptation to climate change.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

No changes

A.3 The GEF Agency's comparative advantage:

The GEF Agency's comparative advantage is as detailed in the PIF.

A.4. The baseline project and the problem that it seeks to address:

The PIF provided a detailed description of the baseline situation and the problems to be addressed. There are no significant changes from the PIF as regards the problem that the project seeks to address. The related descriptions in the PIF remain valid but are more detailed in the PRODOC. The main constraints facing the sector include economic barriers, financial barriers, information barriers and the absence of a MRV system for tracking the sustainable development effects as well as climate mitigation impacts (see Section 2.7 of the Prodoc for a full description of barriers).

As mentioned in the PIF, the Ministry of Agriculture has initiated a national solar pumping national programme with an incentive mechanism for farmers that use drip irrigation; namely the provision of a subsidy grant of 50% of the installation cost of a drip system (with a ceiling of 75,000 DH per recipient). Although announced in 2013, this incentive grant has not yet been operationalized which has led many farmers to defer their solar system purchase decision in order to be able to profit from this financial incentive for drip system in combination with purchase of a solar PV pump. This has had an adverse effect of slowing down market activity in the solar pumping market in the near term. However the subsidy grant scheme is expected to become operationalized in the next 2-3 months.

The project baseline is similar to the PIF (as regards to the scope of activities). Table 2 below summarizes the changes in co-financing from the PIF stage to CEO Endorsement Request. Additional details were reflected in the actual co-financing commitments, as can be seen in particular with budget allocations included over the project period and beyond.

In summary, the overall baseline co-finance investments for the sector have increased significantly from the PIF stage from \$49,100,000 to \$ 70,903,000, an overall increase of 44%. This currently represents a co-financing ratio of over 27:1. However, as explained below only a portion of the total funding committed under the 2013 agreement for the implementation of the National Solar pumping program and reflected in the total co-financing letters is expected to be disbursed during the GEF project implementation period. The letters of co-finance received from partners cover their commitments for the entire period of the National Solar pumping program (it was not possible to get letters with co-finance just for the project period) and hence these are the figures used in Table C.

TABLE 2: MATERIAL CHANGES IN CO-FINANCE FROM PIF TO CEO ENDORSEMENT REQUEST (BY DONOR/FUNDING SOURCE)

Source of Co-Financing	Type of co-financing	PIF Amount (US \$)	Actual Amount at CEO ER (US \$)	Description
Ministry of Agriculture and Marine fishery (MAPM) - National Agricultural Development Fund	Grant	25,000,000	30,928,000	The MAPM co-financing corresponds to budget allocated under the 2013 agreement for state grants for the PV pumping equipment which amounts to DH 300 million (translated to USD with an exchange rate of 9.7 DH/\$). The total MAPM commitment within the framework of the agreement signed in 2013 for the implementation of the National Solar pumping program, amounts to US \$ 30,928,000 as confirmed in its co-financing letter. Of this amount, \$11,000,000 will be incurred during the project period (4 years) while the balance of \$19,928,000 is planned to be disbursed after 2019.
Ministry of Agriculture and Marine fishery (MAPM)	In-kind	100,000	200,000	The MAPM has confirmed the increase of its in-kind contribution to allow for the participation of its local staff to support the project activities, in particular to contribute to site selection for pilot projects (outcome 1), the development of the fertigation management model (outcome 3) and to the capacity building programs (outcome 4)
National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)	Grant	8,000,000	7,216,000	The ADEREE co-financing corresponds to budget allocated under the 2013 Agreement for State grants for the PV pumping equipment which amounts to DH 70 million (translated with an exchange rate of 9.7 DH/\$).ADEREE's commitment within the framework of the agreement signed in 2013 for the implementation of the National Solar pumping program amounts to \$ 7,216,000 as confirmed in its co-financing letter. Of this amount, \$ 2,500,000 will be incurred during the project period (4 years) while the balance of \$4,716,000 is planned to be disbursed beyond 2019.
National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)	In-kind	400,000	400,000	No change
Ministry of Energy, Mines, Water and the	Grant	3,500,000	3,093,000	The MEMEE co-financing corresponds to budget allocated under the 2013 Agreement for State grants for the PV pumping equipment

Source of Co-Financing	Type of co-financing	PIF Amount (US \$)	Actual Amount at CEO ER (US \$)	Description
Environment (MEMEE) – National Energy Development Fund				which amounts to DH 30 million (with an exchange rate of 9.7 DH/\$). MEMEE commitment within the framework of the agreement signed in 2013 for the implementation of the National Solar pumping program, amounts to \$3,093,000 as confirmed in its co-financing letter. Of this amount, \$1,000,000 will be incurred during the project period (4 years) while the balance of \$2,093,000 is planned to be disbursed beyond 2019.
GCAM & other banks	Grant	11,800,000	28,866,000	It is previewed under the 2013 Agreement relating to the national promotion programme for solar irrigation water pumping that 50% of equipment PV pumping cost will be covered by the State grant. The budget allocated under the Agreement for subsidies is DH 400 million. The other 50% of equipment cost is expected to be funded through bank loan and farmers' own contributions. GCAM & other bank co-financing corresponds to 70% of DH 400 million with an exchange rate of 9.7 DH/\$. The GCAM commitment within the framework of the agreement signed in 2013 for the implementation of the National Solar pumping program, amounts to \$28,866,000 as confirmed in its co-financing letter. Of this amount, \$10,500,000 will be incurred during the project period (4 years) while the balance of \$18,366,000 is planned to be disbursed beyond 2019.
GCAM & other banks	In-kind	100,000	100,000	No change
UNDP	Grant	200,000	100,000	The UNDP grant has been reduced due to core budget constraints at the country office and the increased contribution of the national institutions to the project's co-financing.
Total		49,100,000	70,903,000 (of which 25,800,000 is targeted to be disbursed during the project period)	

A. 5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the

associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

Incremental reasoning

The incremental GEF activities (funding \$2,639,726) will leverage co-financing of \$25,800,000 from public sector and banking sector actors during project lifetime and an additional \$45,103,000 after 2019.

Butane gas is heavily subsidized by the Government with a subsidy that reached about 68% of the final consumer price in 2012. Indeed, the retail consumer price of a bottle of gas is 40 DH, while the Government pays about 84 DH for an actual imported bottle cost of about 124 DH. This policy has been implemented because butane gas is considered both as a social product and as a means to fight against deforestation by decreasing firewood use among rural households.

However, this high subsidy policy has resulted in the development of butane for other uses than those initially targeted by the authorities. **In particular, an alarming increase in the use of butane for agricultural irrigation has been observed, due in large part because of the differential between the price of butane gas and that of diesel oil, which results in the accentuation of the public finances deficit.** Demand for this product has undergone strong growth estimated at approximately 7.7% per year, far exceeding the average rate of increase in demand for other petroleum products (about 4.8% per year). The use of butane is mainly observed in small farms for individual irrigation (more than 50% of farms are smaller than 3 ha). These small farms provide subsistence agriculture and are often very vulnerable to higher energy prices, which constitute an increasingly disproportionate share of agricultural production costs (of up to 40% in some areas).

In an effort to address this Morocco decided in 2013 to launch the National Solar Pumping Programme in Water Saving Irrigation Projects through the signing of a partnership agreement between the National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE), the Kingdom of Morocco (represented by the Minister Agriculture, the Minister of Energy, Mines, Water and Environment and the Minister of Economy and Finance) and Crédit Agricole du Maroc (CAM), a state-owned bank for rural and agricultural development.

The objectives of this program are to develop institutional, technical and financial tools to support the installation of solar pumps for agriculture. The program therefore aims to promote a more sustainable development of Moroccan agriculture by transforming the pumping market for agricultural irrigation to expanded solar use as a competitive alternative to diesel and butane. The program indirectly aims to achieve savings on the butane gas subsidy granted by the compensation fund, by subsidizing small and medium farmers for the purchase of solar pumps under water saving projects.

With a total of 400 MDH mobilized, the program is targeted to provide for each farmer an investment grant of up to 50% of the cost of the system within the limit of 75,000 DH. The grant payment is contingent on the farmer installing a drip irrigation system. The remaining funding would be covered by a credit granted by Crédit Agricole du Maroc. With a total investment of around 750 MDH, the National Solar Pumping Program is aimed to benefit about 8,000 small farmers (with farms smaller than 5 ha) over the 2016-2025 period.

This program, although conceived to promote solar pumping, does not address the full range of associated barriers and opportunities and is hindered by a number of shortcomings which can inhibit the successful achievement of its objectives.

In absence of the GEF support, the national solar pumping program for drip irrigation would not achieve its objective of mobilizing private farmers to adopt solar pumping systems and of ensuring the required supervision for the dissemination of quality solar systems. The capacity-building and accreditation activities of RESCOs to ensure quality service and establish the confidence of private farmers to adopt technology that is new to them are not provided for under the national program. Similarly, the mobilization of financial

operators and awareness-raising on benefits of solar pumping is essential to expand the grants' complementary financing element and thus enable stakeholders to overcome the major constraint to the development of solar systems, namely the initial investment. Under these conditions it is clear that in the absence of the Project activities the national program magnitude would be sub-optimal as regards impact and scope.

Without GEF support, it is clear that the baseline scenario:

- is heavily reliant on grants and state-supplied loans for its support to PV pumping systems;
- runs a high risk of failure without additional support (lack of equipment quality assurance, untrained farmers, no maintenance and support regimes in place); and
- fails to comprehensively track climate change mitigation impacts from technology uptake of solar PV pumping systems in terms of monitoring, reporting and verification.

The Project will therefore offer tailored support to the baseline National Promotion Programme for Solar Irrigation Water Pumping while also addressing the identified weaknesses in the Programme. In this respect, the Project was sized for the categories of plots for which the use of solar PV pumping is sufficiently profitable for the small-scale farmers, the main target of the national program of solar pumping. The regions targeted by the project are those where the payback time of PV compared to diesel and butane is below or equal to 3 years.

Based on modelling results, during its implementation period (2016-2019) the Project will benefit at least 3,750 farms covering a total area of 19,000 ha. The total corresponding pump capacity is about 23.6 MW, for a total aggregate investment cost of about 280 MDH. It is important to note that the Project will support the first phase of implementation of the national program of solar pumping over the period 2016-2019. Beyond the type of the projects selected for SWSP sizing, the proposed activities will benefit all projects of the National Promotion Programme for Solar Irrigation Water Pumping.

The Project will primarily target fruit plantations and legume crops grown by small and medium private operators through gravity irrigation. Given Morocco's vulnerability to climate change and the impact of rainfall variability on the economy (particularly in the agriculture sector), the Project will allow water saving by converting gravity irrigation to drip irrigation. It will thus contribute to improving plantation productivity, adaptation to climate change and contributing to the strategic objective of the Green Morocco Plan to strengthen the food security of Morocco.

The project will also support the low-carbon and climate-resilient development of Morocco, notably through:

- Reinforcement of the institutional capacities which are necessary for the management of the program, and of other stakeholders in terms of development, implementation and management of solar pumping and drip irrigation systems. These capacities could then lead to extend the program to medium and large farms and the promotion of other activities of renewable energies and/or energy efficiency in agriculture sector (those that are difficult to implement on a large scale without innovative support mechanisms, as those proposed within the framework of the Project);
- Contribution to the emergence of a national policy concerning the decentralized small-scale RE generation;
- Support and reinforce the national capacity of production of PV pumping equipment and components that will allow local industry to benefit from the technology and to create jobs;
- Creation of a structured local supply industry of solar pumping equipment and installation and maintenance services. The development of such an offer will in turn cater for increasing demand and lowering of installation prices thanks to competition, which will in turn strengthen the market

expansion and consequently will contribute to the low-carbon and climate-resilient development of Morocco; and

- Creation of long-term high quality market on the basis of sound and balanced public private partnership by putting in place a management system within the program, through an equipment standards system, operator certification, skills training for installers and equipment labelling.

A full description of all project components and incremental reasoning versus the baseline is found in Section 3 of the Prodoc. A comparison of project outputs at the PIF and the CEO Endorsement Request stages is detailed in the table below.

TABLE 3 - COMPARISON IN OUTPUTS (DISAGGREGATED BY COMPONENT) FROM PIF TO CEO ENDORSEMENT REQUEST

Component	Outputs at PIF stage	Outputs at CEO ER	Comments
Outcome 1	Output 1.1 Approximately 5,000 small-scale (2 kW) off-grid PV pumps installed in a diverse range of geographical locations, facilitated by system configuration, siting and maintenance protocols reductions	Output 1.1 Approximately 3,750 small-scale off-grid PV pumps installed (covering a total area of 19,000 ha with a total corresponding pump capacity of ~23.6 MW) in a diverse range of geographical locations, facilitated by system configuration, siting and maintenance protocols	At PIF stage, the program had aimed to install around 5,000* 2kW pumps over the period 2014-2019 (i.e. a total installed pumping capacity of 10 MW). At PPG stage, a comprehensive economic and financial model has been developed for the evaluation of the Project's results and benefits. The modeling carried out within the framework of the Project covered 440,000 ha concerning 72,370 irrigated plots. Economic evaluations were done for solar pumping use in replacement of three fuel type systems: gasoil, butane and electricity. A selection of 19,000 ha covering 3,750 irrigated plots using gasoil and butane was analyzed and compared based on the most favorable payback periods. On the basis of modeling results and feasibility analysis, the project will target supporting 3,750 farms covering a total area of 19,000 ha. The total corresponding pump capacity is about 23.6 MW, for a total investment cost of about MDH 280.
	Output 1.2 Seven larger-scale (29.6 kW) demonstration PV pump units installed to demonstrate the potential of solar energy for larger farms	Output 1.2 Partial GEF funding for ten larger-scale demonstration PV pump units (each with a capacity of 20-30 kW, with a total capacity of 250 kW) installed to demonstrate the potential of solar energy for larger farms	At PIF stage, GEF funds were intended to, inter alia, provide 50% cost subsidies – for a total of approximately US\$ 922,000 – to 7 larger-scale (29.6 kW) PV pump systems for medium- and large-scale farms. The number and capacity of pilot projects have been revised at PPG stage after extensive consultations with the key stakeholders. GEF funds will now subsidize 50% of 10 large-scale (each with a capacity of 20 to 30 kW, with a total capacity of 250 kW) PV pump systems for an investment cost-share total of US\$ 412,025.
	Output 1.3 Pump scrapping and recycling scheme implemented to reduce the GHG leakage potential of the National Promotion Programme for Solar	Output 1.3 Pump scrapping and recycling scheme studied and a programme contract with the Ministry in charge of environment is	The proposed activities under the project are intended to benefit all projects of the National Promotion Programme for Solar Irrigation Water Pumping. From this perspective, it is proposed during the project implementation to study Pump scrapping and recycling scheme and to propose a programme contract with the Ministry in charge of environment to avoid GHG leakage effects associated with the project. Once these activities

Component	Outputs at PIF stage	Outputs at CEO ER	Comments
	Irrigation Water Pumping	proposed to avoid GHG leakage effects associated with the project	are carried out it is proposed to implement Pump scrapping and recycling scheme starting from 2020.
	Output 1.4 Monitoring systems and indicators designed and operationalized to reliably track energy consumption and GHG emission reductions	Output 1.4 Monitoring systems and indicators designed and operationalized to reliably track energy consumption and GHG emission reductions	No changes
	Output 2.1 Renewable Energy Service Company (RESCO) model designed and in place to support implementation of the National Promotion Programme for Solar Irrigation Water Pumping	Output 2.1 Renewable Energy Service Company (RESCO) model designed and in place to support implementation of the National Promotion Programme for Solar Irrigation Water Pumping	No changes
Outcome 2	Output 2.2 ADEREE test and certification laboratories strengthened to test and label pumps, generators and associated equipment	Output 2.2 A comprehensive system of quality control (covering certification, verification and enforcement) for all PV pump irrigation systems is designed and set up to comply with international standards.	Outputs 2.2 and 2.3 have been consolidated in one output at CEO ER. It was decided based on consultations at the PPG phase with stakeholders that it would be more appropriate to design a comprehensive quality control system covering certification, verification and enforcement). Such a system will support ADEREE to develop a certification criteria for the full range of hardware components of PV pumping systems; to strengthen ADEREE's existing certification laboratory and other test benches to be identified to allow it to test and certify such components; and to design and implement a certification monitoring and enforcement scheme to ensure that all equipment procured using Programme funds are certified and comply with international standards.
	Output 2.3 Certification, verification and enforcement system designed and implemented for supported PV pump installations		
	Output 2.4 Fertigation management tool developed to inform farmers of the optimal	Output 2.3 Fertigation management tool developed to inform farmers of the	Syntax and format editing only: Output order changed

Component	Outputs at PIF stage	Outputs at CEO ER	Comments
	fertilizer regime under drip-irrigation; and development of a cost-savings calculator to demonstrate to farmers the immediate financial benefits of switching to an optimal fertigation regime	optimal fertilizer regime under drip-irrigation; and development of a cost-savings calculator to demonstrate to farmers the immediate financial benefits of switching to an optimal fertigation regime	
	Output 2.5 NAMA design elaborated and implemented in support of the PV pump installation programme	Output 2.4 NAMA concept updated and operationalized in support of the PV pump installation programme	Since the PIF a NAMA concept has been developed for the solar pumping national programme. It is proposed that during the project implementation to update the concept of the NAMA and adapt it to the project objectives and incorporate the MRV system for monitoring its activities. The project will contribute to the creation of the enabling framework for the registration and the operationalization of NAMA implementation.
Outcome 3	Output 3.1 Local private sector banks enabled to design and offer tailored financial products to farmers to support PV pump take-up	Output 3.1 Local private sector banks enabled to design and offer tailored financial products to farmers to support PV pump take-up	No changes
	Output 3.2 Smart incentives/tax benefits enhancing farmers' willingness to acquire PV technology (including VAT exemption) designed (on the basis of systems dynamic modelling analysis), established and operational	Output 3.2 Smart incentives/tax benefits enhancing farmers' willingness to acquire PV technology designed in collaboration with Ministry of Economy and Finance	The project will support the first phase of implementation of the national program of solar pumping over the period 2016-2019. The proposed activities under the project are intended to benefit all projects of the National Promotion Programme for Solar Irrigation Water Pumping. From this perspective, it is proposed during the project implementation to design in collaboration with Ministry of Economy and Finance smart incentives/tax benefits enhancing farmers' willingness to acquire PV technology. Once these incentives are agreed and designed, it is proposed to implement them starting from 2020.
	Output 3.3 Options for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation analyzed and recommended to the Ministry of Agriculture and the Ministry of Economy & Finance	Output 3.3 Options for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation analyzed and recommended to the Ministry of Agriculture and the Ministry of Economy & Finance	No changes

Component	Outputs at PIF stage	Outputs at CEO ER	Comments
	Output 3.4 Assessment, at the mid-term of the project, of the residual need for subsidy support, and appropriate re-design of the PV pump subsidy digressive regime	Dropped	At PIF stage, it was envisioned under component 3 to conduct an assessment of the ongoing need for subsidies (and their calibration) for PV pump equipment under the National Promotion Programme and accordingly re-design the PV pump subsidy digressive regime. After extensive consultations with the key stakeholders during PPG phase, it was agreed to consider the 2013 Agreement as the official reference of phase 1 of the national promotion programme for solar irrigation water pumping, which represents the baseline for the GEF Project. Under this agreement, it is stipulated that 50% of equipment PV pumping cost will be covered by a public grant. The other 50% of equipment cost will be funded through bank loans and farmers contributions. The subsidy rate is fixed and no digressive regime is envisioned under the agreement in the near term; however the appropriateness of the subsidy level will be assessed by the project as part of the MTR and recommendations made to the GoM if it is deemed to be too high and should be reduced.
Outcome 4	Output 4.1 Capacities of selected stakeholders, such as ADEREE, the Ministries of Energy and Agriculture, agricultural water users' associations, Regional Agricultural Development Agencies and individual farmers, enhanced to build local awareness and technical capability in solar pumping technology, business planning, life-cycle costing, quality assurance, maintenance, procurement and marketing	Output 4.1 Capacities of selected stakeholders enhanced to build local awareness and technical capability in solar pumping technology, business planning, life-cycle costing, quality assurance, maintenance, procurement and marketing	No changes (simplification of the text)
	Output 4.2 Capacity for national manufacturing of equipment and components built through strengthening of local private sector fabrication facilities	Output 4.2 Capacity for national manufacturing of equipment and components built through strengthening of local private sector fabrication facilities	No changes

Component	Outputs at PIF stage	Outputs at CEO ER	Comments
	Output 4.3 Trained PV pumping system technicians for designing, installing, operating and maintaining PV pumping system	Output 4.3 Technicians trained for designing, installing, operating and maintaining PV pumping systems	Sentence structure edited
	Output 4.4 Finance professionals trained on the evaluation of bankable solar pumping projects	Output 4.4 Finance professionals trained on the evaluation of bankable solar pumping projects	No changes
	Output 4.5 Capacities in the application of optimal fertigation practices strengthened among farmers, water user associations, Regional Agricultural Development Agencies, RESCOs and banks	Output 4.5 Capacities in the application of optimal fertigation practices strengthened among farmers, water user associations, Regional Agricultural Development Agencies, RESCOs and banks	No changes

A summary of the budget allocations (disaggregated by component) at PIF stage compared with those at CEO Endorsement stage (with explanations for material variance) are provided below.

TABLE 4 - COMPARISON OF GEF FUND ALLOCATION AT PIF AND CEO ENDORSEMENT STAGES

Component	GEF Funds at PIF stage (US\$)	Grant type at PIF stage	GEF Funds at CEO Endorsement (US\$)	Grant type at CEO Endorsement	Comments
Component 1: Demonstration of technical and economic viability of solar pumping for irrigation	1,392,040	INV	959,025 of which 547,000 in TA and 412,025 in investment	TA and INV	In terms of Output 1.2 at PIF stage GEF funds were intended to, inter alia, provide 50% cost subsidies – for a total of approximately US\$ 922,000 – to 7 larger-scale (29.6 kW) PV pump systems for medium- and large-scale farms. The number and capacity of pilot projects have been revised at PPG stage after extensive consultation with the key stakeholders. GEF funds will now subsidize 50% of 10 large-scale (each with a capacity of 20 to 30 kW, with a total capacity of 250 kW) PV pump systems for an investment cost total of

Component	GEF Funds at PIF stage (US\$)	Grant type at PIF stage	GEF Funds at CEO Endorsement (US\$)	Grant type at CEO Endorsement	Comments
					US\$ 412,025 (less than half of what was allocated at PIF stage). Other outputs budgets (now classified as TA) have more or less remained the same.
Component 2: Sustainable implementation framework and standards for solar pumping and drip-irrigation fertigation practices developed	450,000	TA	540,000	TA	Now includes procurement of testing and laboratory equipment for which an additional amount of the GEF grant was allocated.
Component 3: Supportive financing mechanisms	390,000	TA	342,000	TA	GEF funding has been reduced as a result of cancelling activities related to deleted Output 3.4 – the assessment will now be done under the MTR which is already budgeted under M&E
Component 4: Capacity development of stakeholders	281,985	TA	673,000	TA	The funding balance allocated for investment co-sharing costs in pilot projects under component 1 was allocated to component 4 to finance related activities.
Project management	125,701		125,701		No change
Total	2,639,726		2,639,726		

Global environmental benefits

The Project's direct greenhouse gas emission reduction calculations are based on the modeling results using the selected plots. A comprehensive economic and financial model was developed at PPG stage for the envisioned evaluation of the Project's results and benefits. The modeling carried out within the framework of the PPG covered 441,430 ha concerning 72,370 irrigated plots. Comparative economic evaluations were done for solar pumping use as regards replacement of three fuel type systems: gasoil, butane and electricity (see Section 2.6 of the Prodoc). A selection of 19,000 ha covering 3,750 irrigated plots using gasoil and butane was made based on the most favorable payback period. The selected irrigated plots are considered for using solar pumping systems within the framework of the Project's activities. The Project's greenhouse gas emissions reduction calculation is based on the modelling results using the selected plots. The global GHG reduction benefits of the Project will result from the direct and indirect emissions reductions namely:

- Direct GHG emission reduction benefits from the replacement of diesel and butane pumping systems with solar ones through support of the Project.

- Indirect GHG reduction benefits resulting from broader adoption of solar pumping and solar power on the market as a result of project activities.

The project's greenhouse gas emission targets and assumptions are listed in detail in Annex E of the Prodoc. The project's environmental impacts include:

- A saving of 6,750 TOE/year of fossil fuels (gasoil and butane) in aggregate and 4,050 TOE/year (applying a 60% GEF causality factor to baseline). The simulations done demonstrated that the use of solar pumping in the selected plots will result in a total saving of 6,750 TOE/year of fossil fuels (gasoil and butane). In order to be conservative in assessing the impact of the GEF project – given that the National Promotion Programme for Solar Irrigation Water Pumping is part of the baseline – we estimate 60% savings or 4,050 TOE/year are attributed to the favourable implementation framework created by the GEF Project
- A direct reduction in GHG emissions (based on the above) through the use of solar pumping estimated at 11,697 tCO₂/year or 233,940 tCO₂e (based on the 4,050 TOE/year savings) during the equipment lifetime period of 20 years.
- Further indirect (bottom-up) emissions reduction of 935,760 tCO₂e during the solar pumping life period (see Annex E of the Prodoc).

Bottom-up analysis

The GEF guidelines provide a formula for bottom-up emissions assessment as:

CO₂ indirect BU = CO₂ direct * RF, where RF is a Replication Factor.

Assuming a replication factor of 4 (given support for financial mechanisms and confirmed support for the grant incentive scheme post-project), a further 935,760 tCO₂ can be calculated as indirect GHG emission reductions.

Top-Down analysis

The National Program of Irrigation Water Conservation aims at improving water conservation in agriculture by supporting the conversion to more efficient irrigation technologies of 555,000 hectares of surface gravitational irrigation to drip irrigation. The national program includes 354,000 hectares in private irrigation plots comprising around 56,000 plots located in main ground water areas. Assuming the same specific direct GHG emissions reduction per hectare as for the Project (12.31 t CO₂/ha over 20 years) and that one third of the total irrigated areas targeted by the national program (by 2030) will use solar pumps, the total expected GHG emissions reduction is thus estimated at: 354,000 ha/3*12.31 tCO₂/ha = 1,452,580 tCO₂.

The bottom up analysis is thus more conservative. Accordingly, the Project activities will result, besides the 233,940 tCO₂ direct emissions reduction, in a further 935,760 tCO₂ indirect emissions reduction during the solar pumps life time.

The following table summarizes the GEF contribution to emissions abatement costs as detailed in Annex E of the Prodoc, taking into account both direct and indirect emissions reductions resulting from the Project's activities⁷.

⁷ Applying a 60% GEF causality factor
GEF5 CEO Endorsement Template-February 2013.doc

Description	unit	Direct emissions reduction	Indirect emissions reduction (bottom-up)	Total emissions reduction
Emissions reduction	tCO ₂	233,940	935,760	1,169,700
GEF Contribution	\$	2,639,726		
Abatement cost	\$/tCO ₂	11.28	2.82	2.26

Considering the GEF financial contribution of \$2,639,726 the Project's emissions reduction will translate in a GEF direct emissions abatement cost of US\$ 11.28/tCO₂. Taking into account the Project's total estimated global emissions reduction (direct and indirect) the abatement cost is US\$ 2.26 per tCO₂.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

The principal risks identified relating to the successful implementation of the project include:

- Delay in the operationalization of the national program of solar pumping implementation. However in this case many of the Project activities can still be implemented, pending resumption of the grants program.
- Risks of adverse climate change impacts which can be translated in a decrease in precipitation with an average of 20-30% reduction by 2030. However by promoting a switch from traditional to drip irrigation techniques, the project is clearly also a major CC adaptation measure aligned with the expected impacts Morocco will face from climate change. Furthermore, the solar resources being promoted by the project will generally be unaffected.
- Environmental risks associated with waste generation of replaced diesel and butane pump systems and with the possible increase in the quantity of water pumped by the solar installations. With regard to waste generation, the project includes a pump scrapping and recycling scheme of the replaced pumps. The water use increase risk can be mitigated by the water extraction permit delivered by the River Basin Agency to the eligible farmers which limits the water volume to be extracted. Moreover, the solar pumping systems will be sized and regulated in such a way as to respect this threshold.
- Institutional risks linked to any unexpected change in the commitment of the key institutional partners of the project, in particular Ministry of Economy and Finance and Ministry of Agriculture. However their strong and systematic involvement in the project steering committee will reduce this risk
- Financial risks linked mainly to the conservative regulatory environment and to the non-payment risk. Although the regulatory environment is conservative, the sector does provide a complete range of financial products, ranging from bank credit, micro-finance, leasing, and agricultural insurance. The project will explicitly address banks' lending risks by putting in place a number of risk mitigation mechanisms: use of labelled equipment and accredited RESCOs; use of drip irrigation systems which can be shown to improve the profitability of the farmer activities; capacity development support to farmers and banks; assistance to banks to screen bankable projects; and implementation of MRV systems which will also serve as early-warning systems of difficulties that farmers may face with adoption of the technologies, etc.

The full matrix of risks and their mitigation measures is presented in Section 8 of the Prodoc and also Annex F – Social and Environmental Screening.

A.7. Coordination with other relevant GEF financed initiatives:

The synergies between this particular project and other GEF-financed initiatives at the national level are as follows:

It is worth mentioning that Sudan will implement a similar UNDP/GEF project on Promoting the use of electric water pumps for irrigation in Northern State of Sudan (*Promoting the use of electric water pumps for irrigation in Sudan* – PIMS 5324 – the submission to GEFSEC is imminent). That project is comprised of four components: 1. Pump installation programme enabled through targeted subsidies and the design and implementation of micro-finance lending; 2. PV pump installation programme put on a sustainable footing through risk reduction measures; 3. Mitigation instrument design elaborated and implemented in support of the PV pump installation programme; and 4. Supportive enabling environment and scaled-up implementation.

The two projects have similar objectives and have been designed in parallel. They both aim at the establishment of a favorable environment for the development of solar pumping for irrigation in their respective countries. The difference in national contexts can be a source of a valuable experience exchange between the two countries on the projects' operational barriers and the lessons learned overcoming them. To this end, the Project's team will collaborate through UNDP/GEF with the Sudan project's PMU to maintain a regular exchange on operational experience gained and potential synergies between the two projects.

As regards linkages with NAMA development, is also worth mentioning the UNDP GEF project "Mainstreaming Climate Change in the National Logistics Strategy and Roll-Out of Integrated Logistics Platforms" (PIMS 5358). The objective of this project is to reduce GHG emissions in Morocco's logistics sector by developing the concept of low carbon logistics while still prioritizing development of the Logistics Regional Plan of Great Casablanca. This will entail the development of a pilot set of mitigation measures to be replicated in other Multi-Flow Logistics Zones MFLZ, with a view to contributing to Morocco's overall goal of a 35% reduction in freight CO2 emissions by 2020 relative to 2009 emissions. The project works on two levels: 1) strengthening Moroccan policy and the regulatory and institutional framework for low-carbon development of the Moroccan logistics industry and 2) the development of a model project from GC Logistics Regional Plan as a NAMA, based on the design and operationalization of its MRV system. The NAMA and MRV development of that project will be consulted so as to standardize the approaches in both projects, particularly for streamlined reporting on progress towards the INDC.

Although not funded by GEF, it should be noted that Morocco benefits from the support of UNDP Low Emission Capacity Building (LECB) and that project has supported several activities of relevance to this project. Various mitigation and adaptation activities have been supported in Morocco by the LECB program. In this regard it is worth mentioning the development of a NAMA under the program on the promotion of 'Arganiculture': Sustainable Argan Tree Orchards. In Morocco the native argan forest is endangered due to unsustainable use and climate change. Argan cultivation in orchards in association with forage crops provide the opportunity for oil production while contributing to animal feeding. The NAMA comprises four main components i) cultivation of select argan plants together with fodder crops; ii) organization of local population in cooperatives focusing on argan orchard, oil production and fodders production; iii) production of processed fodder from fodder crops and argan oil by-products and iv) training of farmers for efficient argan orchard management and fodder production.

Despite the fact that this NAMA aims at different activity type, it shares with the Project the following common objectives of i) sustainable development of Agriculture; ii) productive agriculture activity and

income-generation for small farmers; iii) mitigation of GHG emissions and adaptation to climate change; and iv) alleviation of emigration from rural areas.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

The management arrangements of the Project are detailed in Section 6 of the Prodoc. A Project Management Unit (PMU) will be established at ADEREE (see diagram in Section 6). The PMU will be responsible for the management of the project under the direct supervision of the ADEREE Head of Renewable Energy and Energy Efficiency Pole and the National Project Director.

The Steering Committee is responsible of decisions relating to the strategic direction of the project. The steering Committee of the project consists of the following institutions:

- The National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE);
- UNDP;
- The Ministry of Agriculture and Maritime Fishing (MAPM);
- The Ministry of Energy, Mines, Water and Environment (MEMEE);
- The Ministry of Economy and Finance;
- The Ministry of Foreign Affairs and Cooperation;
- The Ministry delegated for Water;
- The Crédit Agricole du Maroc Group (GCAM).

The main public (non-governmental or public-private) actors in the project will be:

- 1) **RESCOs and private solar operators and installers** – There are several dozen private actors/suppliers in Morocco that operate in the photovoltaic sector. They offer a variety of services ranging from simple equipment supply to technical advice for the design and installation. These operators typically offer services and products related to solar pumping systems. Most of these operators are grouped in the Moroccan Association of Solar and Wind Industries (AMISOLE) which aims to promote the interests of Moroccan industrials and professionals in the renewable energy sector. They will be major beneficiaries of the project.
- 2) **Farmers and local community groups** – In Morocco, nearly 70% of the agricultural sector consists of small and medium farms with a large majority characterized by their economic vulnerability excluding them from the traditional bank financing scheme. Farmers are relatively aware of the benefits of solar pumping systems, but are hampered by the high investment cost of such systems and their difficulties in accessing bank financing. Farmers are the main target of the National Promotion Programme for Solar Irrigation Water Pumping and the Project. Individual farmers, agricultural water user associations (AUEAs), Regional Agricultural Development Authorities (ORMVAs), women's associations and cooperatives, and locally-based firms (e.g. suppliers and maintainers of water pumping equipment) will be involved in various activities. The direct impact of project activities on farmers is discussed in CEO ER Section, B.2
- 3) **Local Banks** – Crédit Agricole du Maroc Group (GCAM) was created in partnership with the Government and the Finance Company for Agricultural Development "Tamwil El Fellah" to give access to finance for farmers excluded from the traditional banking system. It is a major stakeholder in the project, particularly Components #1 and #2.

Stakeholder involvement in the grant mechanisms

The project includes INV funding for a limited amount of grants (Output 1.2). The Project will provide GEF funding for 50% cost subsidies to 10 large solar pumping units (between 20 and 30 kW) for average and large farms. The GEF grant will be used to subsidize these ten pilot pumping PV systems which will be selected on the basis of transparent and competitive selection criteria established by the Project's steering committee. The grant scheme will be operated by the Agriculture development fund (FDA) in close collaboration with Crédit Agricole under the oversight of (and by delegation of) ADEREE and the project steering committee. It is worth noting that the FDA and Crédit Agricole both have extensive past operational experience channeling subsidies to farmers including those provided within the framework of the National Irrigation Water Efficiency Plan (subsidies for the purchase of drip irrigation systems).

The transfer of any GEF funds for equipment subsidies to the FDA will be conditional on the signature of an agreement between ADEREE, FDA and Crédit Agricole that specifies all requisite fiduciary and legal conditions and ensures the appropriate disbursement and monitoring of the GEF grant according to its intended use and in compliance with UNDP's micro-capital grant policy. The selection procedures and eligibility for how the targeted beneficiaries can access grant subsidies by FDA will be done according to transparent and pre-defined criteria established under year 1 of the project and codified as part of the agreement mentioned above. A standard UNDP grant agreement will be provided and will be modified to suit the project circumstances. The contribution of GEF funds (for subsidies) is likely to be in tranches, based on performance. The funds may either be directed to the FDA (at the request and formal delegation of ADEREE) and will then be disbursed or advanced against the eligible purchase of individual pumping units and then reconciled on a regular (e.g. quarterly basis) following certification by the PSC that proper procedures were followed for selection of beneficiaries. Alternatively a dedicated bank account for the grant subsidies will be set up at UNDP Morocco country office and then the funds could be advanced or disbursed to ADEREE (or FDA on their delegation) following the same procedures and rules. In the former case the transfer of any GEF funds for equipment subsidies to FDA will only happen upon the provision of proof that all requisite fiduciary and legal conditions are in place to ensure appropriate disbursement and monitoring of the GEF funds by the fund vehicle according to its intended use. In that case the project will itself not manage the fund but will ensure compliance of fund operations with UNDP/GEF guidelines.

Moreover it is recommended that an Independent Review Mechanism be established by the project for Outcome 1 (within the project and ring-fenced) that will review and endorse the selection of all grant recipients under the grant component (1.2) and regularly assess the performance of these beneficiaries in managing the assets subsidized by the grants over the course of the project. This mechanism will be established during the first six months of the project and will be condition precedent for the disbursement of any GEF funds for grants. Finally, an exit strategy will be prepared during the last year of the project that will ensure the continued monitoring of asset utilization by beneficiaries of grants funded by the project.

The following matrix presents the responsibilities of the main stakeholders disaggregated by Outcome:

Outcome	Responsible/stakeholders
Outcome 1: PV pump units covering a range of configurations designed, assessed, installed and under implementation	ADEREE ADA Ministry of Economy & Finance Ministry in charge of the Environment GCAM AMISOL (Moroccan Association of solar and renewable energy) RESCOs

Outcome 2: Sustainable implementation framework and standards for solar pumping and drip-irrigation fertigation practices developed	ADEREE ADA GCAM Ministry in charge of the Environment AMISOL IMANOR
Outcome 3: Supportive financing mechanisms and incentive schemes identified, designed and implemented	ADEREE Ministry of Agriculture MEMEE ADA Ministry of Economy and Finance Banks and financing institutions GCAM AMISOL
Outcome 4: Capacities enhanced in developing, implementing and managing solar pumping and associated drip irrigation systems	ADEREE Ministry of Agriculture ADA GCAP Banks and financing institutions RESCOs IRESEN AMISOL

Budget Revision and Tolerance: As per the UNDP requirements outlined in the UNDP POPP, the project board can agree on a budget tolerance level for each plan under the overall annual work plan allowing the project manager to expend up to the tolerance level beyond the approved project budget amount for the year without requiring a revision from the project board. Should the following deviations occur, the Project Manager and UNDP Country Office will seek the approval of the UNDP-GEF team as these are considered major amendments by the GEF: a) budget re-allocations among components in the project with amounts involving 10% of the total project grant or more; b) introduction of new budget items/or components that exceed 5% of original GEF allocation.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCE/SCCF):

At the national level, the project will have a major positive impact on the country's imported energy bill. The project is envisioned to save 4,050 TOE/year of what would otherwise be subsidized imported fossil fuels (equivalent to 942,020 MWh over the lifetime of the systems).

At local level, the program's implementation will have a significant impact on farmers' incomes. The solar pump systems will significantly reduce fossil-fuel based energy costs for pumping water. It is important to remember that small farms in Morocco are mostly for subsistence agriculture and are often vulnerable to increases in energy prices. The estimated savings (after pay back) to farmers from the installed pumps is **\$58 million over the lifetime of the assets, equivalent to yearly savings of \$3.625 million.** The number of people benefiting from improved access to sustainable energy from the pumps supported via the project is estimated at 18,750 (3,750 solar pumping systems benefiting to 3,750 rural households composed of on average of 5 persons each).

On the social level, the implementation of this solar pumping program will create jobs for the equipment, installation and maintenance of solar pumping systems. Project activities are estimated to have the following impacts as noted in the results framework:

- Number of actors whose technical capabilities are enhanced for PV technology, maintenance and marketing – 400 persons
- Number of trained technicians specialized in the design, installation, operation and maintenance of solar pumping systems – 30 persons
- Number of financial professionals whose evaluation pumping capacity projects are reinforced – 40 persons
- Number of actors whose capabilities are enhanced for optimal control of fertigation practices (Farmers, associations of water users, regional agencies for agricultural development, RESCO and banks) – 160 persons

B.3. Explain how cost-effectiveness is reflected in the project design:

Rationale for Choice of Solar Pumping versus other alternative approaches to achieve similar benefits

Concerning the use of other renewable energy pumps, at present only solar can provide an effective small scale renewable energy solution for underground water pumping in Morocco (the focus of the project). The selected plots are located in areas where surface water resources cannot be used for irrigation. Thus small hydro is not technically feasible in the targeted areas.

As for wind, it is possible to envision the use of small wind turbines for electrical or mechanical water pumping in windy areas. However small scale wind turbines are not currently used in Morocco and there is no data on their capital costs to compare them on an LCOE with solar. Their possible use in windy areas will require a full local deployment strategy, dissemination, demonstration projects, etc which is beyond the scope of this project. At present the government has prioritized solar pumping. This is why the proposed Project is targeting solar pumping for which the renewable source is largely available; a national baseline initiative already exists; and the technology is ready for large scale local deployment.

As mentioned, GEF activities (funding \$2,639,726) will leverage co-financing of \$25,800,000 from public sector and banking sector actors during project lifetime and an additional \$45,103,000 after 2019. Considering the GEF financial contribution of \$2,639,726 the Project's emissions reduction will translate in a GEF direct emissions abatement cost of US\$11.28/tCO₂. Taking into account the Project's total estimated global emissions reduction (direct and indirect) the abatement cost is US\$ 2.26 per tCO₂.

In absence of the GEF support, the national solar pumping program for drip irrigation would not achieve its objective of mobilizing private farmers to adopt solar pumping systems and of ensuring the required supervision for the dissemination of quality solar systems. The capacity-building and accreditation activities of RESCOs to ensure quality service and establish the confidence of private farmers to adopt technology that is new to them are not provided for under the national program. Similarly, the mobilization of financial operators and awareness-raising on the benefits of solar pumping is essential to expand the grants' complementary financing element and thus enable stakeholders to overcome the major constraint to the development of solar systems, namely the initial investment. Under these conditions it is clear that in the absence of the Project activities the national program magnitude would be sub-optimal as regards impact and scope.

Sustainability

The sustainability of project activities is ensured in several ways. The implementation of a quality management system within the program – through an accreditation system of operators, and standardization

and certification of equipment – will ensure an adequate and highly qualified range of services including systems installation. In addition, the integration of the private sector through the development of energy service companies (RESCOs) will help provide a quality service offering by creating a structured local supply chain of solar pumping equipment, as well as maintenance and installation services. The development of such an offer will in turn stimulate demand and lower prices for installations through competition, which in turn will strengthen market expansion. This will result in the creation of a sustainable market in the medium to long-term. The market will also benefit from the GEF support as part of this project through pilot demonstration projects that will be used to demonstrate the feasibility of such solar pumping systems for larger farms. The market is therefore not limited to small scale farms.

The Project will also help develop appropriate and sustainable financial mechanisms for the financing of solar pumping projects by farmers regardless of the subsidies (which are limited). Furthermore, the institutional capacity building of ADEREE for the standardization and certification of equipment (and other stakeholders in terms of financing, development, implementation and management of solar pumping systems) will enhance the sustainability of the national solar pumping program once the GEF support is completed.

Finally, the development of a NAMA concept specific to solar pumping in Morocco will also ensure the sustainability of the program well beyond the GEF support. Indeed, a NAMA will establish robust monitoring, reporting and verification mechanisms of the program results on an ongoing basis. The NAMA will also bring potentially new climate finance funding opportunities to the national program for solar pumping and maintain a strict management system to ensure the sustainable success of this program. In this way the project is similar to the recently approved UNDP/GEF project “Mainstreaming climate change in the National Logistics Strategy and Roll-Out of Integrated Logistics Platforms” which also targets the development of a NAMA.

Innovation

The project brings to Morocco solutions which are not yet widely adopted in the region. The coupling of solar pumping with water efficient irrigation methods is particularly innovative for small and medium scale agriculture. Solar PV pumps also free farmers from one of their main burdens – the time and cost of operating a fossil-fuel powered pump – and allows them to direct more of their energy towards income generating activities. Innovative elements include the renewable energy service company model (which has been addressed in the past in Morocco from an energy efficiency perspective but not through a renewable energy lens) and the investment de-risking activities to catalyse bank lending to the small-scale renewables sector

Replicability and Potential for Scale-up

Replicability of the Project will be ensured by several approaches that are part of the project components, namely capacity building, implementation of demonstration projects and the development of a NAMA.

Capacity building and training of persons and institutions will help to ensure dissemination of the program results.

A focus on larger size farms will help replicate the results of the Program to larger sizes farms that were not initially targeted. The development of a NAMA will further increase the possibilities for replication.

The project is inherently scale able. Although large in absolute number, the 3,750 small-scale PV pump units and ten larger systems targeted by the project represent a small fraction of the total replaceable pump population in Morocco. In agriculture, the potential for improved irrigation water saving is estimated at about 2.5 billion m³/year through:

- The conversion to drip irrigation: potential of 2 billion m³/year with a conversion rate of 44,000 ha / year and a target of 920,000 ha in 2030;

- Improved yields of adductions networks to irrigated areas: potential of about 400 million cubic meters per year;
- The adoption of a pricing system based on a volumetric metering;
- Awareness and supervision of farmers on the use of water saving techniques.

Moreover, the agricultural sector in Morocco is changing with the adoption by the Government in 2008 of the Green Morocco Plan (GMP). It aims to make agriculture a pillar of the Moroccan economy, with a focus on increasing levels of production of certain crops (olives, citrus, fruits), in order to reach a GDP of 100 billion dirham by 2020. It also aims to increase the efficiency of agricultural water use through improved irrigation infrastructure and adoption of best practices, as well as promoting high demand, low-water crops. All of this is an indication of the potential for massive scale-up and transformation of the sector.

C. DESCRIBE THE BUDGETED M&E PLAN:

The following activities will be implemented to ensure the monitoring and evaluation of the project (as outlined in Section 7 of the Prodoc).

The project results as outlined in the project results framework will be monitored annually and evaluated periodically during project implementation to ensure the project effectively achieves these results.

Project-level monitoring and evaluation will be undertaken in compliance with standard UNDP requirements as outlined in the [UNDP POPP and UNDP Evaluation Policy](#). Though these UNDP requirements are not detailed in the project document, the UNDP Country Office will ensure UNDP M&E requirements are met in a timely fashion and to high quality standards. The additional and mandatory GEF-specific M&E requirements as outlined in this section will be undertaken in accordance with the [GEF M&E policy](#) and GEF guidance materials. In addition to these mandatory UNDP and GEF M&E requirements, other M&E activities deemed necessary to support project-level adaptive management, and the exact role of project target groups and other stakeholders in project M&E activities, will be finalized during the Inception Workshop and will be detailed in the Inception Report.

Oversight and monitoring responsibilities:

The primary responsibility for day-to-day project implementation and regular monitoring rests with the Project Manager. The Project Manager will develop annual work plans based on the multi-year work plan included in the annexes, including annual targets at the output level to ensure the efficient implementation of the project. The Project Manager will ensure that the standard UNDP and GEF M&E requirements are fulfilled to the highest quality. This includes, but is not limited to, ensuring the results framework indicators are monitored annually in time for reporting (i.e. GEF PIR), and reporting to the Project Board at least once a year on project progress. The Project Manager will inform the Project Board and the UNDP Morocco Country Office of any delays or difficulties as they arise during implementation, including the implementation of the M&E plan, so that the appropriate support and corrective measures can be adopted. The Project Manager will also ensure that all project staff maintain a high level of transparency, responsibility and accountability in monitoring and reporting project results.

The UNDP Country Office will support the Project Manager as needed, including through annual supervision missions. The UNDP Country Office is responsible for complying with all UNDP project-level M&E requirements as outlined in the [UNDP POPP. This includes ensuring the UNDP Quality Assurance Assessment during implementation is undertaken annually; that annual targets at the output level are developed, and monitored and reported using UNDP corporate systems; and, updating the UNDP gender marker on an annual basis based on progress reported in the GEF PIR and UNDP ROAR reporting. Any quality concerns flagged by the process must be addressed by project management.](#) Additional M&E and

implementation quality assurance and troubleshooting support will be provided by the UNDP-GEF Regional Technical Advisor and the UNDP-GEF Unit as needed. The project target groups and stakeholders including the GEF Operational Focal Point will be involved as much as possible in project-level M&E.

Audit Clause: The project will be audited according to UNDP Financial Regulations and Rules and applicable audit policies on NIM implemented projects.

Additional GEF monitoring and reporting requirements:

Inception Workshop and Report: A project inception workshop will be held after the project document has been signed by all relevant parties to: a) re-orient project stakeholders to the project strategy and discuss any changes in the overall context that influence project implementation; b) discuss the roles and responsibilities of the project team, including reporting and communication lines and conflict resolution mechanisms; c) review the results framework and discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E plan; d) review financial reporting procedures and mandatory requirements, and agree on the arrangements for the annual audit; e) plan and schedule Project Board meetings and finalize the first year annual work plan. The Project Manager will prepare the inception report no later than one month after the inception workshop. The final inception report will be cleared by the UNDP Morocco Country Office and the UNDP-GEF Regional Technical Adviser, and will be approved by the Project Board.

GEF Project Implementation Report (PIR): The Project Manager, the UNDP Country Office, and the UNDP-GEF Regional Technical Advisor will provide objective input to the annual GEF PIR covering the reporting period July (previous year) to June (current year) for each year of project implementation. The Project Manager will ensure that the indicators included in the project results framework are monitored annually well in advance of the PIR submission deadline and are reported on accordingly in the PIR. The PIR that is submitted to the GEF each year must also be submitted in English and shared with the Project Board. The UNDP Morocco Country Office will coordinate the input of the GEF Operational Focal Point and other stakeholders to the PIR. The quality rating of the previous year's PIR will be used to inform the preparation of the subsequent PIR. The project's terminal PIR along with the terminal evaluation (TE) report and corresponding management response will serve as the final project report package. The final project report package shall be discussed with the Project Board during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.

GEF Focal Area Tracking Tools: In line with its objective and the corresponding GEF Focal Areas/Programs, this project has prepared the following GEF Tracking Tool(s): *Climate Change Mitigation Tracking Tool*. The baseline/CEO Endorsement GEF Focal Area Tracking Tool(s) –attached to the project document – will be updated by the Project Manager/Team and shared with *the mid-term review consultants* and terminal evaluation consultants before the required *review/evaluation* missions take place. The updated GEF Tracking Tool(s) will be submitted to the GEF along with the completed *Mid-term Review report* and Terminal Evaluation report.

Mid-term Review (MTR): An independent mid-term review process will begin after the second PIR has been submitted to the GEF, and the final MTR report will be submitted to the GEF in the same year as the 3rd PIR. The MTR findings and responses outlined in the management response will be incorporated as recommendations for enhanced implementation during the final half of the project's duration. The terms of reference, the review process and the final MTR report will follow the standard templates and guidance available on the [UNDP Evaluation Resource Center \(ERC\)](#). Additional quality assurance support is available from the UNDP-GEF Directorate. The final MTR report will be available in English and will be

cleared by the UNDP Country Office and the UNDP-GEF Regional Technical Adviser, and approved by the Project Board.

Terminal Evaluation (TE): An independent terminal evaluation (TE) will take place before operational closure of the project. The Project Manager will remain on contract until the TE report and management response have been finalized. The terms of reference, the evaluation process and the final TE report will follow the standard templates and guidance available on the [UNDP Evaluation Resource Center](#). Additional quality assurance support is available from the UNDP-GEF Directorate. The final TE report will be cleared by the UNDP Country Office and the UNDP-GEF Regional Technical Adviser, and will be approved by the Project Board. The TE report will be publically available in English on the UNDP ERC.

The UNDP Morocco Country Office will include the planned project terminal evaluation in the UNDP Country Office evaluation plan, and will upload the final terminal evaluation report in English and the corresponding management response to the UNDP Evaluation Resource Centre (ERC). Once uploaded to the ERC, the UNDP Independent Evaluation Office will undertake a quality assessment and validate the findings and ratings in the TE report, and rate the quality of the TE report. The UNDP IEO assessment report will be sent to the GEF Independent Evaluation Office along with the project terminal evaluation report.

The UNDP Morocco Country Office will retain all M&E records for this project for up to seven years after project financial closure in order to support ex-post evaluations undertaken by the UNDP Independent Evaluation Office and/or the GEF Independent Evaluation Office.

Awareness and knowledge management:

The results generated by the project will be disseminated within and outside the project's intervention area through sharing information and using networks and forums at sub-national, national, regional and global levels. The project will identify, analyse, and share lessons learned that might be beneficial in the implementation of other projects with similar focus areas. There will be a two-way exchange of information between this project and other similar ones (such as the Sudan project).

The M&E budget is as follows:

Type of M&E activities	Responsible Parties	Budget US\$ Excluding project team staff time	Time frame
Inception Workshop	<ul style="list-style-type: none"> PMU UNDP 	Indicative Cost : 10,000 \$	Within first two months of project start up
Initial Report	<ul style="list-style-type: none"> PMU UNDP 	None	Right after inception workshop
PMU /Quality assurance UNDP Meetings	<ul style="list-style-type: none"> PMU Quality assurance UNDP 	None	Once a month
Monitoring Committee meetings: review of project progress	<ul style="list-style-type: none"> PMU Quality assurance UNDP 	None	Quarterly
Quarterly reports	<ul style="list-style-type: none"> PMU 	None	Quarterly
Mid-Term and annual Review	<ul style="list-style-type: none"> PMU Quality assurance UNDP 	None	Mid-term review on May/June Annual review on October/November of each year

ARR/PIR	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP 	None	Annually
Annual reports	<ul style="list-style-type: none"> ▪ PMU 	None	Annually
Steering Committee meetings	<ul style="list-style-type: none"> ▪ ADEREE ▪ UNDP 	None	Twice a year
Mid-term evaluation	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP ▪ External Consultants (i.e. review team) 	Indicative cost: \$20,000	Between 2 nd and 3 rd PIR.
Final Evaluation	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP ▪ External Consultants (i.e. evaluation team) 	Indicative cost: \$40,000	At least three months before operational closure As required. GEF will only accept reports in English.
Audit	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP 	\$5,000/year	Annually (Total \$20,000)
HACT : Micro evaluation	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP 	None	Once
HACT spot check Missions	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP 	None	Once a year
Site visits	<ul style="list-style-type: none"> ▪ UNDP ▪ Representatives of Government members of the Steering committee 	None	Annually
Project final workshop	<ul style="list-style-type: none"> ▪ PMU ▪ UNDP 	Indicative Cost : 10,000 \$	End of project activities
TOTAL indicative COST Excluding project team and UNDP staff time and travel expenses		US\$ 100,000	

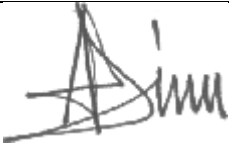
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

- A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):**
(Please attach the Operational Focal Point endorsement letter(s) with this form. For SGP, use this OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE(MM/dd/yyyy)
Mohamed Benyahia	Director of Partnerships, Communications & Cooperation; GEF OFP	MINISTRY OF ENERGY, MINES, WATER & ENVIRONMENT	08/23/2013

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Adriana Dinu, UNDP-GEF Executive Coordinator		March 9, 2016	Lucas Black UNDP/GEF Regional Technical Advisor – Arab States	+90 538 598 5172	E-mail: lucas.black@undp.org

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).

This project will contribute to achieving the following Country program Outcome: The principles of the "National Charter for the Environment for Sustainable Development" are implemented in coherence between sectoral strategies and priorities for the environment, climate change adaptation and risk management and by strengthening territorial convergence in areas and the most vulnerable populations with special attention to gender.					
Country Program Outcome Indicators: Indicator 5.1.1: Number of strategies produced / reviewed consistently and the principles of ESD charter integrated. Indicator 5.3.1: Number of strategies developed for mitigation and adaptation to CC. Indicator 5.3.2: Number of entities that have received capacity building in CC and risk management					
Primary applicable Key Environment and Sustainable Development Key Result Area: 1. Mainstreaming environment and energy OR 2. Catalysing environmental finance OR 3. Promote climate change adaptation OR 4. Expanding access to environmental and energy services for the poor.					
Applicable GEF Focal Area Objective: CCM 3 - "Promote investment in renewable energy technology"					
	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective: To promote the take-up of PV-powered⁸ drip irrigation pumping systems in Morocco.	Additional amount of tons of CO ₂ emissions reduced per year (above baseline and attributed to the project)	0	11,697 tCO ₂ /year Total of 233,940 tCO ₂ over the 20 years lifetime of all pumps	Quarterly progress monitoring reports (these reports will include a section dedicated to emission reduction monitoring). This section will be informed by the information system for the calculation and monitoring of emission reduction.	Assumption: Direct emission reduction on an annualized basis, applying a 60% GEF causality factor ⁹ . Risk : leakage associated to the reuse of substituted fuel pumps
	<ul style="list-style-type: none"> Number of solar pumps installed (cumulative) Fuel saved (TOE/year) 	1,500 2,700 TOE/year	3,750 4,050 TOE/year ¹⁰ (942,020 MWh lifetime)	Quarterly progress monitoring report	Assumption: applying a 60% GEF causality factor. Risk: refer to section 8.0 on risks of delay in implementing operational modalities of subsidy granting and

⁸ Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR

⁹ Due to the causality factor, the annual emission reduction associated with the Project are thus evaluated at 11,697 tCO₂: difference between target end of the Project (19,495 tCO₂) and baseline (7,798 tCO₂)

¹⁰ Using 60% causality factor equivalent to 47101.5 MWh (942,020 MWh lifetime) - <http://www.iea.org/statistics/resources/unitconverter/> -

					in implementing solar pumping projects
	Number of new RESCOs partnerships fostered for provision of improved energy efficiency and/or sustainable energy solutions targeting underserved communities/groups and women.	0	5 RESCOs created or assisted	Quarterly progress monitoring report List of RESCOs which benefited from the Project capacity building and technical assistance Statistics and activity reports of partner banks	Assumption: The project's interventions will successfully catalyse private sector RESCO interest in solar pump products and market opportunities
	Number of people benefiting from improved access to sustainable energy platforms	0	18,750 (3,750 solar pumping systems benefiting to 3,750 rural households composed on average of 5 persons each)	Quarterly progress monitoring report	Assumes installed solar pump target is met
Outcome 1¹¹: PV pump units covering a range of configurations designed, assessed, installed and under implementation	Cumulative capacity of installed solar pumps- kW	9,560 kW	23,900 kW	Quarterly progress monitoring report	Assumption: applying a 60% GEF causality factor Risk: refer to section 8.0 on risks of delay in implementing operational modalities of subsidy granting and in implementing solar pumping projects
	Number of large scale demonstration PV pump units installed	0	10	Quarterly progress monitoring report	
	Availability of an MRV system	None: Absence of procedures and monitoring & assessment system of emissions and programme impacts	Yes: MRV system designed and operationalized to reliably track project progress and GHG emission reductions	Design report of MRV system, Quarterly progress monitoring report	Assuming good cooperation between farmers targeted for reporting of operational information on installed solar systems

¹¹ All outcomes monitored annually in the APR/PIR. It is highly recommended not to have more than 4 outcomes.

Outcome 2 : Sustainable implementation framework and standards for solar pumping and drip-irrigation fertigation practices developed	Number of RESCOs created or assisted	0	5	Quarterly progress monitoring report which will capture list of RESCOs which benefited from the Project capacity building and technical assistance activities	
	Existence of Standardization and equipment labelling procedures (Yes/No)	None: Absence of standardization and labelling procedures of main solar pumping components	Yes: Standardization and labelling procedures adopted, tested and in place for main solar pumping components	Quarterly progress monitoring report, ADEREE activity reports	
	Existence of a quality audit and evaluation system for installations (Yes/No)	None: Absence of PV pumping systems control	Yes: Quality audit and evaluation system for PV pumping systems developed	Quarterly progress monitoring report	
	Existence of an information tool on optimal fertilizer regime under drip irrigation and cost-savings calculation for farmers (Yes/No)	None: Absence of information for farmers on optimal fertigation management and associated financial benefits	Yes: Information tool on optimal fertilizer regime under drip irrigation and cost-savings calculation for farmers designed and developed	Design report of fertigation information tool, Quarterly progress monitoring report	Active participation of regional agriculture ministry services in farmers awareness raising on the interest of optimizing fertigation
	Existence of an updated NAMA concept in support of the PV pump installation programme (Yes/No)	No: Absence of an updated NAMA concept in support of the national solar pumping system	Yes: NAMA concept updated and validated for submission to UNFCCC NAMA registry	NAMA document, Quarterly progress monitoring report	Government commitment to adopt, support, monitor and verify the proposed NAMA.
Outcome 3 : Supportive financing mechanisms and incentive schemes identified, designed and proposed in collaboration with the MEF for implementation	Number of banks involved in the programme	0: Local private banks are not involved in the program financing	4: Full involvement in program financing by 4 local private banks	Quarterly progress monitoring report Statistics and activity reports of partner banks	Assuming positive bank perception of this market segment
	Availability of fiscal incentives to solar pumping (Yes/No)	No: Absence of fiscal incentives for solar pumping	Yes: Relevant tax incentives/instrument designed in collaboration with the ministry of finance for adoption	Analytical work and dynamic modelling report Quarterly progress monitoring report	Ministry of finance commitment to the modelling approach and its endorsement for the approval of proposed instruments
	Alignment of fertilizer subsidies	No: Absence of an alignment of the fertilizer subsidies	Yes: Options for an alignment of fertilizer	Report on options analysis	Ministry of agriculture and ministry of finance

	with sustainable fertigation practices under drip irrigation (Yes/No)	with sustainable fertigation practices under drip irrigation	subsidies with sustainable fertigation practices under drip irrigation analysed	Quarterly progress monitoring report	commitment to the analysis
Outcome 4: Capacities enhanced in developing, implementing and managing solar pumping and associated drip irrigation systems	Number of actors whose technical capabilities are enhanced for PV technology, maintenance and marketing	0	400	Training reports, project reports, rapport de communication and awareness-raising report, minutes of project steering committee	
	Number of trained technicians specialized in the design, installation, operation and maintenance of solar pumping systems	0	30	Training reports, Quarterly progress monitoring report	Vocational training organizations commitment
	Number of financial professionals whose evaluation pumping capacity projects are reinforced	0	40	Training reports, Quarterly progress monitoring report	Commercial banks commitment to the project
	Number of actors whose capabilities are enhanced for optimal control of fertigation practices (Farmers, associations of water users, regional agencies for agricultural development, RESCO and banks)	0	160	Training reports, Outils de communication et de formation Quarterly progress monitoring report	Agricultural Development Agency and Ministry of Agriculture commitment

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).

Author	Date	Comment
GEFSEC	Jan 21, 2014	<p><i>It is expected that the CEO endorsement request will clarify how the project will go beyond "recommendations to better align fertilizer subsidies with sustainable fertigation practices and support the Algerian government into designing and implementing such alignment.</i></p> <p><u>Response:</u></p> <p>Several of the outputs under Components #2 and #3 have been modified and revised to further address this issue. The following outputs and activities are now included that address this issue:</p> <p>Output 2.3 Fertigation management tool developed to inform farmers of the optimal fertilizer regime under drip-irrigation; and development of a cost-savings calculator to demonstrate to farmers the immediate financial benefits of switching to an optimal fertigation regime.</p> <p>Activities:</p> <p><i>2.3.1. Development of a fertigation management tool to inform farmers of the optimum fertilizer amount, type and frequency of application so as to avoid over-application</i></p> <p><i>2.3.2. Development of a basic cost-savings calculator to demonstrate to farmers the immediate financial benefits of switching from business-as-usual practice to an optimal fertigation regime.</i></p> <p>Output 3.3 Options for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation analyzed and recommended to the Ministry of Agriculture and the Ministry of Economy & Finance</p> <p>Besides working on tax incentives, the Project will also assist the Ministry of Agriculture and the Ministry of Economy & Finance to explore various options and mechanisms for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation. Activities include:</p> <p><i>3.3.1. Analysis and consultation with main stakeholders on options for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation;</i></p> <p><i>3.3.2. Validation of selected options by line relevant ministries</i></p> <p><i>3.3.3. Drafting of a decree on operationalization of alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation</i></p>

		<p><i>The CEO endorsement request is expected to clarify and detail the co-financing of component 3 and its use</i></p> <p><u>Response:</u></p> <p>Co-financing of component 3 amounts to US\$ 120,000 with a \$40,000 contribution from ADEREE and the balance from GCAM and other banks. ADEREE co-financing is an in-kind contribution for working with relevant stakeholders, particularly the Ministry of the Economy and Finance, to design and implement targeted tax incentives to enhance farmers' willingness to acquire PV technology. GCAM co-financing is also an in-kind contribution for designing and operationalizing customized financial products to farmers to support increased PV pump purchases.</p>
Council (Germany)	March 25, 214	<p>• <i>The project proposal assumes that payback periods will decrease as deployment increases. We seek further information on the likelihood of achieving a quantity impact to the extent that payback periods can be reduced.</i></p> <p><u>Response:</u></p> <p>The decrease in payback period of individual system purchases will be ensured mainly by the reduction in prices for PV systems due to expected lower international PV module prices (see IEA forecasts, Annex A of Prodoc). The lower cost of solar pumping systems over the next 20 years is driven mainly by the PV panel price reductions which are estimated (according to the IEA) to fall ¹²from 0.8 USD / Wp in 2012 to 0.3-0.4 USD / Wp in 2035, a total decrease of 70 % and 4.2% per year over the same period. It is also expected that the creation of specialized RESCOs to service the market, the gradual increase in the number of systems installed and economies of scale, and the possible introduction of tax incentives from the Ministry of Finance during the period of implementation of the Project, will facilitate a further decline in local system costs and a reduction of payback time of projects.</p> <p>• <i>The availability of water is not discussed. A discussion would be desirable especially in the light of the economic feasibility. Further, the costs of maintenance and the availability of maintenance services for this rather new technology are not described in sufficient detail.</i></p> <p><u>Response:</u></p> <p>Projects funded under the National Solar Pumping Programme in Water Saving Irrigation Projects (SWSPP - to which this project is linked) must have wells authorized by Hydraulic Basin Agencies in order to control pumping flow rates. In addition, as shown in the technical and economic analysis in the Prodoc (Section 2.6), there is a very large difference in pumping costs according to the depth of the wells (0.2 to 2 Dh / m³). It is clear that projects that will be carried out as part of SWSPP (2016-2019) will have lower costs and will be located in areas where water is available at shallow depths.</p> <p>Concerning maintenance, the area equipped for irrigation are about 1.4 million hectares of which 50% will be converted to drip irrigation as part of the National Water Saving Irrigation Program (PNEEI). There are a wide range of installer and maintenance of irrigation equipment in Morocco including a dozen companies in the solar pumping sector. The project intends to strengthen the capacities of these companies and contribute to the creation and supervision of RESCOs</p>

¹² Technology roadmap Solar PV energy 2014 Edition, IEA
GEF5 CEO Endorsement Template-February 2013.doc

	<p>(Component 2 of the project). The Project's input will consist in maximizing the impact of the public subsidies from the national Programme, notably through:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Developing guidelines and tools for optimizing the sizing, siting and orientation of PV panels supported under the National Programme; <input type="checkbox"/> Designing a modular configuration of standardized components that can be 'mixed and matched' according to site characteristics, farm requirements and the farmer's budget; <input type="checkbox"/> Amending the design of the National Promotion Programme so that the subsidies only apply to systems that: (a) meet the hardware certification criteria developed under Component 2, and (b) which are channeled through the Renewable Energy Service Companies (RESCOs) established under Outcome 2. <p>See Section 3.2 for a full description of project components, outputs and activities.</p> <hr/> <p><i>The synergy effects with climate change adaptation and food security (what crops are to be irrigated) could be further elaborated.</i></p> <p><u>Response:</u> The following text was added to the Prodoc (see 3.2.1 Objectives, Results and Products of the Project):</p> <p><i>"The Project will primarily target fruit plantations and legume crops grown by small and medium private operators through gravity irrigation. Given Morocco's vulnerability to climate change and the impact of rainfall variability on the economy (particularly in the agriculture sector), the Project will allow water saving by converting gravity irrigation to drip irrigation. It will thus contribute to improving plantation productivity, adaptation to climate change and contributing to the strategic objective of the Green Morocco Plan to strengthen the food security of Morocco."</i></p> <hr/> <p>• <i>Germany seeks clarification why areas managed by public funds, representing 56% of irrigated areas in Morocco, are not addressed.</i></p> <p><u>Response:</u></p> <p>Concerning the question raised, it should be noted that there is not many agricultural areas managed by public funds in Morocco. It's almost all private or collectively owned by local tribes according to their ancestral right to the land.</p> <p>To support the GMP, the Ministry of Agriculture launched the National Water Saving Irrigation Program (PNEEI) which is in coherence with the National Water Strategy objectives. This program is aimed at a massive conversion to drip irrigation at an average rate of nearly 55,000 ha / year with a total target of 550,000 ha to be achieved by 2020. The PNEEI has a budget of 37 billion dirham including 30 billion dirham for physical investments and 7 billion dirham for supporting measures, capacity building, etc.</p> <p>The overall objective of the National Water Saving Irrigation Program (PNEEI) to convert 550,000 ha in drip irrigation is broken down as follows:</p> <ul style="list-style-type: none"> • 218,000 ha in large collective hydraulic;
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	<ul style="list-style-type: none"> • 172,000 ha in large private Hydraulic; • 160,000 ha in small and medium private hydraulic. <p>The repartition of the 550,000 ha is based on the type of water source used. The 218,000 ha from dams (surface irrigation, public irrigation infrastructure), 172,000 ha is from dams and/or ground water pumping (private pumping) and for the 160,000 ha it applies to small plots using private wells.</p> <p>The project is supporting the third category of plots that have been targeted by the agreement between the Government and ADEREE/GCA. Those are plots managed by private small farmers that need public financial support to switch to drip irrigation and hopefully to solar pumping also.</p> <hr/> <p><i>Germany seeks clarification on the criteria according to which demonstration sites will be identified.</i></p> <p><u>Response:</u></p> <p>The Project will provide GEF funding for 50% cost subsidies to 10 large solar pumping units (between 20 and 30 kW) for average and large farms. These larger-scale systems will be used for assessment, sizing, monitoring and training purposes, and represent a unique opportunity to leverage the institutional and technical architecture of the baseline National Promotion Programme to extend the benefits of PV pumping to the larger-scale irrigated farm sector.</p> <p><u>The GEF grant will be used to subsidize the ten pilot pumping PV systems selected on the basis of criteria established by the Project's steering committee during the first year of the project.</u></p> <p>It is envisioned that the pilot projects will be selected on the basis of eight to ten criteria to be established by the PSC informed by five main categories:</p> <ul style="list-style-type: none"> • Project description: location and size of the plot to be equipped with drip irrigation (example, size less than 30 kW pumping system, water source vulnerability, etc.); • Reference state: Current production, irrigation technique and water use (fuel type; m3/ha/year, etc) and compliance with Water Basin Agency (ABH) permit • Future water use: Irrigation water needs / Size of water storage (water savings achieved) • Project's sizing, equipment to be acquired, cost and financing plan (Farmer contribution/ha, grant requested /ha) • Project's benefit: job creation, energy savings <p>The grant scheme will be operated by the Agriculture development fund (FDA) in close collaboration with Crédit Agricole under the oversight of ADEREE. It is worth noting that the FDA and Crédit Agricole both have extensive past operational experience channeling subsidies to farmers including those provided within the framework of the National Irrigation Water Efficiency Plan (subsidies for the purchase of drip irrigation systems).</p> <p>The transfer of any GEF funds for equipment subsidies to the FDA will be conditional on the signature of an agreement between ADEREE, FDA and Crédit Agricole that specifies all requisite fiduciary and legal conditions and ensures the appropriate disbursement and monitoring of the GEF grant according to its intended use. The project will itself not manage</p>
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		<p>the fund or disburse the grants to beneficiaries but rather transfer the equipment funds to ADEREE for on-granting to FDA; however the project will ensure compliance of fund operations with steering committee procedures and UNDP/GEF guidelines</p>
		<p>• <i>The proposal declares the development of a NAMA proposal. It does not describe whether costs of NAMA development, implementation, and especially MRV pay out the potential benefits, especially when taking into account the National Programme that would be included in the NAMA.</i></p> <p><u>Response:</u></p> <p>A NAMA concept related to the solar pumping program was developed by the Department of Energy as part of the FIRM project activities. The Project will update the concept of the NAMA and adapt it to the project objectives and the MRV system for monitoring its activities. The activities to be supported under Output 2.4 (NAMA concept updated and operationalized in support of the PV pump installation programme) are as follows:</p> <ul style="list-style-type: none"> 2.4.1 Update of the NAMA concept and content 2.4.2 Calculation update of the NAMA and baseline emissions 2.4.3 Update of costs and financing needs for the NAMA 2.4.4 Consistency analysis of the MRV system with respect to the monitoring system of the emissions reduction associated with the project activities 2.4.5 Submission of NAMA concept to Ministry in charge of environment for validation
		<p><i>How will the project ensure that the RESCOs sell the appropriate solution to farmers and not the most profitable one? This question is of outstanding importance when taking into account the lack of experience of farmers with this technology.</i></p> <p><u>Response:</u></p> <p>At least five RESCOs will be supported by the Project. Section 3.2 (Project Objectives, Outcomes and Outputs) of the Prodoc describes the various activities of the project that will support RESCOs. That section notes that:</p> <p><i>“As part of the development of the RESCO business model supported under the project, criteria will be established for the types of RESCOs that will benefit from Project support. One of the criteria (to be monitored by the Project) will be that the RESCOs do not engage in excessive profiteering in selling pumping systems to unsophisticated farmers. Additionally, only Solar pumping equipment and systems that are approved on the basis of standards for PV pumping developed under Result 2 of the project, can benefit from the support of the Project.”</i></p>
STAP Scientific and Technical screening of the Project	February 24, 2014	<p><i>1. The use of abundant solar resources to displace heavily subsidized diesel and LPG used to pump water is commendable. Only drip irrigation is supported which is okay for row crops but less so for cereals and pasture. The crops to be irrigated are not fully described (though olives, citrus and strawberries are mentioned on page 16). It is assumed that sprinkler</i></p>

Identification Form (PIF)	<p><i>irrigation systems are currently used, in which case the water (and hence energy) savings from drip irrigation could be substantial. Please define more clearly.</i></p> <p><u>Response:</u></p> <p>The Project aims at supporting the objectives of the national programme on solar pumping for drip irrigation while also addressing the identified weaknesses in the Programme. In this respect, the Project was sized for the categories of plots for which the use of solar PV pumping is sufficiently profitable for small-scale farmers, the main target of the national program of solar pumping. More specifically the regions targeted by the project are those where the payback time of PV compared to diesel and butane is below or equal to 3 years.</p> <p>The Project will primarily target fruit plantations and vegetable crops grown by small and medium private operators who are generally using gravity irrigation. Given Morocco's vulnerability to climate change and the impact of rainfall variability on the economy and especially the agriculture sector, the Project will allow water saving by converting gravity irrigation to drip irrigation. It will therefore contribute to improving plantation productivity, adaptation to climate change and the fulfillment of the strategic objective of the Green Morocco Plan to strengthen the food security of Morocco. Additional information can be found in Sections 2 and 3 of the Prodoc.</p>
	<p><i>2. The argument to reduce payback periods as deployment increases makes sense, particularly with recent price reductions for solar PV panels (though the balance-of-plant has not had the same cost savings).</i></p> <p><u>Response:</u></p> <p>Taking into account the subsidized tariffs of conventional electricity and butane in Morocco, the solar pumping solution remains relatively unattractive from the financial point of view for most farmers. Indeed, the weighted payback time of PV compared to diesel is 3.4 years, 8.3 years compared to butane and 9.2 years compared to electricity, with a downward trend for large areas farms. For the smaller plots, payback times are even higher than 10 years compared to butane and electricity for farms of less than 1 ha.</p> <p>Payback periods for PV pumping systems are expected to be significantly reduced as a result of the following project activities or conditions going forward:</p> <ul style="list-style-type: none"> ✓ The expected decrease in solar pumping system costs over the next 20 years, which is sustained substantially by PV panel which according to the IEA¹³ will drop from 0.8 USD/Wp in 2012 to à 0.3-0.4 USD/Wp in 2035, i.e. a total decrease of 70% and an annual one of 4.2% over the same period. ✓ The GEF project will increase the national capacity of production of PV pumping equipment and components, which will allow local industry to better control the ER technology and to reduce the costs; ✓ The GEF project will support the creation of a structured local supply industry of solar pumping equipment and installation and maintenance services. The development of such a value chain will in turn allow for increased demand thanks to competition, which will in turn strengthen the market expansion

¹³ Technology roadmap Solar PV energy 2014 Edition, IEA

		<ul style="list-style-type: none"> ✓ The GEF project will support the creation of long-term high quality PV pumping market on the basis of sound and balanced public private partnerships by putting in place a management system within the program, through an equipment standards system, operator certification, skills training for installers and equipment labelling ✓ The project will focus on capacity-building and accreditation activities of RESCOs to ensure quality service and establish the confidence of private farmers to adopt technology that is new to them.
		<p>3. <i>What is not clear is the source of water, how reliable are waterways during the summer season, depth of water table a solar pump will need to handle, etc. Will new wells need to be drilled to source groundwater or will existing wells simple be converted from diesel-power pumps to PV pumps? It is not clear how small-scale concentrating solar systems could replace PV as is advocated (page 12). It is also not clear how many litres per year a 2 kW PV system could typically provide for a range of groundwater or stream systems under Moroccan conditions, and whether irrigation demand is seasonal or all-year-round.</i></p> <p><u>Response:</u></p> <p>As regards water resource supply, the amount of water to be pumped is already known and State-controlled as farmers who will benefit from the program will be required to have a permit to pump water from their wells. This authorization is issued by the corresponding Water Basin Agency (ABH) and is issued with respect to a threshold volume of water to be pumped. Solar pumping systems will be designed to meet this threshold. As the Project will primarily target fruit plantations and vegetable crops, irrigation demand is expected all-year-round.</p>
		<p>4. <i>It is also not clear how the PV systems will be sized. Studies show that proper sizing depends on, inter alia, detailed information about local climate, soil properties, depth of well, characteristics of the crop (GajiÄž et al. (2010) A simple method estimates and economic indicators of photovoltaic systems for drip irrigation. Economics of Agriculture (60)2; 223 â€“ 236.) Where will project developers obtain necessary data to optimize individual systems?</i></p> <p><u>Response:</u></p> <p>The project will support the development of Renewable Energy Service Companies (RESCO) within the framework of the program. These establishments will have a central role to play in the management of the program since they will ensure the quality and the performance of the systems to be installed, including efficient system sizing and will be the primary interface with the farmers to facilitate their access to investment grants of the national program and to bank commercial loans (see Outcome 3). These entities will operate on a commercial basis and will offer services tailored to the farmer needs. These services will include PV pumping feasibility studies for farmers, site visits to design optimal system positioning/configuration, and innovative business models to reduce costs and/or displace risks for farmers and also of the after-sale, care and maintenance services.</p> <p>Furthermore, two types of information will be developed under the project: simple literature materials will be developed for farmers and farmer associations who choose to directly access the grant funds provided by the solar pumping national program for drip irrigation. More sophisticated literature and tools (including a software tool based on a GIS/GPS platform) will be developed for RESCOs supported by the Project.</p>

		<p>5. <i>The GHG emission reductions of the scheme are presented with uncertainties described. The projected performance of a 2 kW solar pumping system compared with the existing diesel pumps is not compared, nor the maintenance involved with maintaining a drip irrigation scheme.</i></p> <p><u>Response:</u> Detailed GHG emission reductions assessments for project activities were done during the PPG phase coupled with technical-economic modeling of different pumping systems. Please refer to the following sections of the Prodoc: Section, Annex A and Annex E.</p>
		<p>6. <i>Even though 5000 small systems are only a small percentage of total irrigation systems, some consideration could be given to learning from installing and monitoring maybe 100 pilot projects initially before the rest are deployed</i></p> <p><u>Response:</u> The Project input will focus on maximizing the impact of the public subsidies (which have been set independent of the project), notably through inter alia developing guidelines and tools for optimizing the sizing, siting and orientation of PV panels and designing a modular configuration of standardized components that can be ‘mixed and matched’ according to site characteristics, farm requirements and the farmer’s budget. Once guidelines and modular configuration of standardized components are designed, the first installations (50-100 pilot projects) will be sized, sited and optimized accordingly. A remote monitoring system will be also installed to facilitate the MRV of the projects and allow farmers to remotely follow by internet via phones or PCs the performance of their solar pumping systems. The software and equipment will be tested within the framework of these pilot installations which will in turn inform practices for the rest of the systems to be targeted.</p>
		<p>7. <i>Overall the project proposal could be improved if the impacts from the practical application of the PV technology displacing diesel pumps are better determined (as outlined above).</i></p> <p><u>Response:</u> To ensure a continuous monitoring of pumping system operation and as part of monitoring, reporting and verification of the national program of solar pumping, a remote monitoring system will be adapted for all pumping stations to be installed. Such system would facilitate the MRV of the systems, practically assessing project impacts and allowing farmers to remotely follow by Internet via phones or PC the performance of their solar pumping systems (flow, volume pumped per day, stock of in the basin, etc.). The remote monitoring system as well as its software and equipment will be tested within the framework of the first pilot 50-100 installations.</p>
		<p>8. <i>What analysis will be done to site the PV systems? The project mentions a GIS/GPS platform to optimize the siting and orientation of PV panels – what type of data will be collected to aid in this effort? For example, higher levels of solar radiation can lead to higher ambient air temperatures and if the PV panels are black, they may overheat resulting in a loss of PV cell efficiency. Will the project developers use the GIS/GPS platform or another method to take this and other factors into account? Has a country or region-wide resource assessment been done either by this project or in the past? Where will project developers obtain the necessary data required siting specific systems?</i></p>

		<p><u>Response:</u> Optimizing the sizing, siting and orientation of PV panels will be ensured by RESCOs (Renewable Energy Service Companies) within the project framework. RESCOs will have a central role to play in the management of the program since they will ensure the quality and the performance of the systems to be installed and will be the primary interface with the farmers to facilitate their access to investment grants of the national program and to bank commercial loans. These entities will operate on a commercial basis and will offer services tailored to the farmer needs. These services will include PV pumping feasibility studies for farmers, site visits to design optimal system positioning/configuration, and innovative business models to reduce costs and/or displace risks for farmers and also of the after-sale, care and maintenance services. Sophisticated literature and tools (including a software tool based on a GIS/GPS platform) will be developed to help RESCOs perform the abovementioned tasks.</p>
		<p><i>9. Under environmental and social benefits, it could be noted that small holder irrigation is frequently cited as a strategy for poverty reduction, climate adaptation and food security (Burney, J. et al (2010) Solar-powered drip irrigation enhances food security in the Sudano-Sahel. PNAS, 107(5); 1848 – 1853, Polak, P., Yoder, R (2006) Creating wealth from groundwater for dollar-a-day farmers: Where the silent revolution and the four revolutions to end rural poverty meet. Hydrogeol J, 14:424-432). Will this project contribute to reduction in food security and climate adaptation? Does it fit within Morocco national strategies related to these issues?</i></p> <p><u>Response:</u> The Project will primarily target fruit plantations and vegetables crops grown by small and medium private operators generally using gravity irrigation. Given Morocco's vulnerability to climate change and the impact of rainfall variability on the economy and especially in the agriculture sector, the Project will allow water savings by converting gravity irrigation systems to drip irrigation systems. It will thus contribute to improving plantation productivity, adaptation to climate change and contributing to the strategic objective of the Green Morocco Plan to strengthen the food security of Morocco. The Project is thus fully consistent with the Government's plans and strategies.</p>

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS¹⁴

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF: 100,000.00 USD			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF/NPIF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
<i>Project Preparation Grant to formulate a full-size project</i>	100,000.00	93,861.23	6,138.77
Total	100,00.00	93,861.23	6,138.77

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used) N/A

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

¹⁴If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue 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.

