



# PROJECT IDENTIFICATION FORM (PIF)

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: <sup>1</sup>	5539
GEF Agency(ies):	UNDP (select) (select)	GEF Agency Project ID:	5284
Other Executing Partner(s):	National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)	Submission Date:	13 August 2013
		Resubmission Date:	30 October 2013
		Resubmission Date:	14 January 2014
GEF Focal Area (s):	Climate Change	Project Duration (Months)	48
Name of parent program (if applicable):		Project Agency Fee (\$):	250,774
<ul style="list-style-type: none"> <li>For SFM/REDD+ <input type="checkbox"/></li> <li>For SGP <input type="checkbox"/></li> <li>For PPP <input type="checkbox"/></li> </ul>			

## A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK<sup>2</sup>:

Focal Area Objectives	Trust Fund	Indicative Grant Amount (\$)	Indicative Co-financing (\$)
CCM-3 (select)	(select)	2,639,726	49,100,000
(select) (select)	(select)		
(select) (select)	(select)		
(select) (select)	(select)		
(select) (select)	(select)		
(select) (select)	(select)		
(select) (select)	(select)		
(select) (select)	(select)		
(select) (select)	(select)		
Total Project Cost		2,639,726	49,100,000

## B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To promote the take-up of PV-powered drip irrigation pumping systems in Morocco.						
Project Component	Grant Type <sup>3</sup>	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Cofinancing (\$)
1. Demonstration of technical and economic viability of solar pumping for irrigation	Inv	PV pump units covering a range of configurations designed, assessed, installed and under implementation	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	GEFTF	1,392,040	46,300,000

<sup>1</sup> Project ID number will be assigned by GEFSEC.

<sup>2</sup> Refer to the reference attached on the [Focal Area Results Framework and LDCF/SCCF Framework](#) when completing Table A.

<sup>3</sup> TA includes capacity building, and research and development.

			<p>1.2 Seven larger-scale (29.6 kW) demonstration PV pump units installed to demonstrate the potential of solar energy for larger farms</p> <p>1.3 Pump scrapping and recycling scheme implemented to reduce the GHG leakage potential of the National Promotion Programme for Solar Irrigation Water Pumping</p> <p>1.4 Monitoring systems and indicators designed and operationalized to reliably track energy consumption and GHG emission reductions</p>			
2. Sustainable implementation framework and standards for solar pumping and drip-irrigation fertigation practices developed	TA	Conducive implementation framework and quality standards in place	<p>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>2.2 ADEREE test and certification laboratories strengthened to test and label pumps, generators and associated equipment</p> <p>2.3 Certification,</p>	GEFTF	450,000	290,000

			<p>verification and enforcement system designed and implemented for supported PV pump installations</p> <p>2.4 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>2.5 NAMA design elaborated and implemented in support of the PV pump installation programme</p>			
3. Supportive financing mechanisms	TA	Supportive financing mechanisms and incentive schemes identified, designed and implemented	<p>3.1 Local private sector banks enabled to design and offer tailored financial products to farmers to support PV pump take-up</p> <p>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</p>	GEFTF	390,000	85,000

			<p>operational</p> <p>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 &amp; Finance</p> <p>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 degression regime</p>			
4.Capacity development of stakeholders	TA	Capacities enhanced in developing, implementing and managing solar pumping and associated drip irrigation systems	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	GEFTF	281,985	170,000

			marketing			
			4.2 Capacity for national manufacturing of equipment and components built through strengthening of local private sector fabrication facilities			
			4.3 Trained PV pumping system technicians for designing, installing, operating and maintaining PV pumping systems			
			4.4. Finance professionals trained on the evaluation of bankable solar pumping projects			
			4.5 Capacities in the application of optimal fertigation practices strengthened among farmers, water user associations, Regional Agricultural Development Agencies, RESCOs and banks			
Subtotal					2,514,025	46,845,000
Project Management Cost (PMC) <sup>4</sup>				GEFTF	125,701	2,255,000
Total Project Cost					2,639,726	49,100,000

**C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)**

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount (\$)
National Government	National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)	Grant	8,000,000

<sup>4</sup> To be calculated as percent of subtotal.

National Government	National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)	In-kind	400,000
National Government	Ministry of Energy, Mines, Water and the Environment (MEMEE) – National Energy Development Fund	Grant	3,500,000
National Government	Ministry of Agriculture – National Agricultural Development Fund	Grant	25,000,000
National Government	Ministry of Agriculture	In-kind	100,000
GEF Agency	UNDP	Grant	200,000
National Government	Crédit Agricole du Maroc (CAM)	Soft Loan	11,800,000
National Government	Crédit Agricole du Maroc (CAM)	In-kind	100,000
Private Sector	Commercial banks	Hard Loan	To be identified after PPG
<b>Total Cofinancing</b>			49,100,000

#### D. INDICATIVE TRUST FUND RESOURCES (\$) REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY<sup>1</sup>

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (\$) (a)	Agency Fee (\$) (b) <sup>2</sup>	Total (\$) c=a+b
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
<b>Total Grant Resources</b>				0	0	0

<sup>1</sup> 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.

<sup>2</sup> Indicate fees related to this project.

#### E. PROJECT PREPARATION GRANT (PPG)<sup>5</sup>

Please check on the appropriate box for PPG as needed for the project according to the GEF Project Grant:

	<u>Amount Requested (\$)</u>	<u>Agency Fee for PPG (\$)<sup>6</sup></u>
• No PPG required.	-- 0--	--0--
• (upto) \$50k for projects up to & including \$1 million		
• (upto)\$100k for projects up to & including \$3 million	100,000	9,500
• (upto)\$150k for projects up to & including \$6 million		
• (upto)\$200k for projects up to & including \$10 million		
• (upto)\$300k for projects above \$10 million		

#### PPG AMOUNT REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES) FOR MFA AND/OR MTF PROJECT ONLY

Trust Fund	GEF Agency	Focal Area	Country Name/	(in \$)	
				Agency	Total

<sup>5</sup> On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

<sup>6</sup> PPG fee percentage follows the percentage of the GEF Project Grant amount requested.

			<b>Global</b>	<b>PPG (a)</b>	<b>Fee (b)</b>	<b>c = a + b</b>
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
<b>Total PPG Amount</b>				<b>0</b>	<b>0</b>	<b>0</b>

MFA: Multi-focal area projects; MTF: Multi-Trust Fund projects.

## **PART II: PROJECT JUSTIFICATION<sup>7</sup>**

### **PROJECT OVERVIEW**

A.1. Project Description. Briefly describe the project, including ; 1) the global environmental problems, root causes and barriers that need to be addressed; 2) the baseline scenario and any associated baseline projects, 3) the proposed alternative scenario, with a brief description of expected outcomes and components of the project, 4) incremental/additional cost reasoning and expected contributions from the baseline , the GEFTF, LDCF/SCCF and co-financing; 5) global environmental benefits (GEFTF, NPIF) and/or adaptation benefits (LDCF/SCCF); 6) innovativeness, sustainability and potential for scaling up

### **Baseline scenario and project**

Morocco's energy consumption has been growing at an average rate of 5%/year since 2004, with electricity demand expected to quadruple by 2030. As the only North African country with no natural oil resources, Morocco is the largest energy importer in the region: 96% of the country's primary energy is imported, with energy import costs amounting to US\$10.6 billion in 2011. The Moroccan energy mix continues to be dominated by fossil fuels: 72% hydrocarbon fuels, 16% coal and 4% gas, with small contributions from biomass (4%), hydro-power (1%), wind (1%) and imported electricity (2%).

The Government of Morocco has indicated a strong commitment to energy efficiency and diversification. Morocco's energy strategy aims to achieve a penetration of renewables in electricity production of 42% of total installed capacity by 2020, and to reduce final energy consumption by 15% by 2030. The country has a significant solar resource, one that is among the highest in the world. Average direct normal irradiance (DNI) is in the range of 2,200-2,800 kWh/m<sup>2</sup>/year, and even the wettest regions average only 10cm of rainfall per year. Recent studies, such as 'Réalisation d'une étude sur l'opportunité de l'utilisation du photovoltaïque résidentiel à grande échelle' financed by the European Commission (October 2012), have attempted to quantify the solar photovoltaic (PV) potential. According to the most realistic scenario, PV-installed capacity in Morocco could reach 1.5 GW by 2030 with suitable policy and market conditions in place for investment and if some light support schemes (e.g. value-added tax exemption, direct/indirect incentives for investments, etc.) were to be provided.

Solar water pumping for irrigation offers a particularly promising opportunity for PV application. Agriculture contributes 19% of Morocco's GDP, employs more than 4 million rural inhabitants and accounts for 85% of water use. Approximately 1.7 million hectares of land are irrigated, 70% (1.2 million ha) of which are managed with public funds and 30% (0.5 million ha) with private funds (farmers and private companies). Although irrigated areas represent only 16% of the country's crop area, they account for 45% of agricultural value-added (ranging up to 75% in bad crop years with low rainfall) and 75% of total agricultural exports. They also help to provide about half the employment in the agricultural sector. There are three types of irrigation areas: (i) nine Large-Scale Waterworks Areas, covering 683,000 ha, which are managed by the Government through nine Regional Agricultural Development Authorities (ORMVAs); (ii) Small-and-Medium-

<sup>7</sup> Part II should not be longer than 5 pages.

Scale Waterworks Areas, which currently cover 640,000 ha; and (iii) Private Irrigation, covering nearly 500,000 ha.

Diesel and LPG have hitherto been heavily subsidized by the Government for irrigation pumping purposes. But, with such subsidies now reaching \$3.8 billion (approximately 6% of GDP), the Government has commenced a programme of substantial subsidy reduction that will adversely impact large numbers of farmers. PV offers an alternative technology that could support the subsidy reduction agenda – a 2012 study undertaken by the National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE) estimated that for every Dirham invested in solar energy the state could save Dh 4.3 in fuel subsidies – while ensuring farmers' livelihoods are not threatened.

In order to promote solar water pumping, ADEREE, the Ministry of Energy, Mines, Water and Environment (MEMEE), the Ministry of Agriculture and the state-owned agricultural bank, Crédit Agricole du Maroc (CAM), have recently (April 2013) signed an agreement to implement the 'National Promotion Programme for Solar Irrigation Water Pumping'. Phase 1 of the Programme will run for 5 years, from 2014 to 2019. This Programme represents the baseline project for GEF purposes. Under the Programme, a total of US\$36.5 million (Dh 314 million) grant resources will be mobilized to cover a fraction of the cost of solar pumping equipment (including the PV panels, the pump unit and connection) – with the subsidy degressing over time, from 50% of the equipment cost in Year 1 (US\$8,900) to 40% (US\$7,120) in Year 5 – for small-scale farms (less than 5 ha). Only drip irrigation or supplemental irrigation systems – i.e. highly water-efficient irrigation techniques – will be eligible for support. State grants for the PV equipment will be supplied by ADEREE (\$8 million), the National Energy Development Fund (US\$3.5 million), which is administered by MEMEE, and by the National Agricultural Development Fund (\$25 million). Additional grants amounting to \$11 million will be supplied by the National Agricultural Development Fund for the drip irrigation, piping and associated farm equipment. All grant payments will be channeled through CAM as part of CAM's established disbursement role for Government support to Moroccan farmers. CAM will also provide soft loans, amounting to approximately \$11.8 million, to enable farmers to top-up the PV grants.

Phase 1 of the National Promotion Programme is intended to benefit up to 5,000 small-scale farmers, with commensurate fuel savings, water conservation, reduced fertigation (application of water-dissolved fertilizers) and sustainable rural livelihood benefits. In principle, PV pumps represent sound economic investments. Diesel/butane pumps present considerable challenges to farmers: on average, the engines need to be replaced every 2-3 years; farmers must purchase 20 fuel bottles or more per week (equivalent to approximately 240 kg) for a standard system; and mechanical breakdowns are common. Farmers consulted by ADEREE and Crédit Agricole du Maroc during the consultation phase of the National Promotion Programme for Solar Irrigation Water Pumping have expressed considerable interest in switching to PV-based pump systems, particularly with the financial incentives that will be offered to them through the Programme. (This growing disaffection with diesel/butane pumps also explains the commercial interest of two of Morocco's three largest commercial banks, Groupe Banques Populaires and Attijariwafa Bank, in exploring lending opportunities for solar pumps). Assuming US\$0.98 per litre of diesel, the levelised cost of electricity (LCOE) from a small diesel-powered pump in the Moroccan context is approximately \$0.1/kWh (with fuel representing approximately 95% of the total system cost), whereas the LCOE of a small PV pump is approximately \$0.02/kWh (with capex representing approximately 90% of the total system cost over an assumed 25-year equipment lifetime). Without grant support from the Programme, the payback time to a farmer of switching from a diesel-powered pump to a PV pump should, in theory, be approximately 4.5-6 years.



The National Promotion Programme is modelled on the extremely successful approach pioneered by the Promasol (PROgramme national de développement du MArché de chauffe-eau SOLaire) initiative for solar water heaters in Morocco, which was executed by ADEREE with UNDP support. Through a market transformation effort involving hardware quality certification, technical capacity development and financial support (in the form of a ‘Solar Industry Accompaniment’ (SIA) that covered 20% of the costs relating to SWH purchasing and installation), between 2002-2008 the cost of solar water heater units fell from \$1,700 to \$650. At the same time as SWH prices fell rapidly through the economies of scale permitted by mass production, the overall expansion of the market enabled suppliers/distributors to increase their profit margins (by 13% on average). Selling more SWHs than they used to, even with lower prices, contributed to boosting the overall profitability of these firms. ADEREE considers it perfectly feasible that, with the market stimulus created by the National Promotion Programme, the cost of PV pump units will be brought down such that farmers’ payback periods are reduced to 3 years.

The National Promotion Programme will target small-scale farmers as: (a) they represent the vast majority of Moroccan irrigation users and account for 44% of the total irrigated area of Morocco, and (b) are most in need of financial and technical support. The Programme forms an integral, bridging component of two flagship Government policies covering the energy and agriculture sectors respectively: the National Energy Strategy and the Green Morocco Plan. The Establishment Agreement of the National Promotion Programme explicitly references these two policies as providing the framework for the Programme’s activities. Both policies are heavily referenced in the Second National Communication to the UNFCCC (2010): the National Promotion Programme is the Government’s newly-developed mechanism for operationalizing these policies. The Government presented the National Promotion Programme as a flagship initiative at the Facility for Euro-Mediterranean Investment and Partnership (FEMIP) conference in April 2013, and is investing high-level political efforts in its launch and implementation. The Third National Communication, which is currently under development, includes solar PV systems (including for pumping) as an identified priority.

However, the baseline project does not address the full range of barriers (and opportunities) associated with solar water pumping in Morocco. Specifically, the Programme suffers from the following deficiencies:

1. *Lack of tailored products.* PV pump irrigation systems are not off-the-shelf products. Rather, they need to be considered as integrated technology and management packages with associated (and significant) learning curves. Under the National Promotion Programme for Solar Irrigation Water Pumping, as it is constituted in the baseline, small-scale (and largely unsophisticated) farmers who qualify for a grant will be required to select, install and operate PV equipment of their own choosing. No assistance will be provided with site surveys, equipment selection, maintenance or training. Equipment may be inappropriate, expensive, inefficient or short-lived. Moreover, opportunities to maximize solar efficiencies through bespoke, site-specific designs (such as the use of adjustable mounts, tracking systems, solar concentrators, AC motors, cooling systems, batteries, sand shrouds, etc.) will be lost.
2. *Limited ambition with respect to PV system numbers and scale.* The baseline envisages Programme support being provided solely to small-scale farmers. While this is understandable on the basis of social need, it must also be acknowledged that such farmers are least able to install and maintain PV systems (owing to lack of expertise and free cash flow). Moreover, it should be noted that the baseline for medium- and large-scale farms is very similar to that of small-scale farmers: the vast majority use diesel or butane pumps. Most medium- and large-scale farms use exactly the same

pump systems as small-scale farms, the only difference being that they use multiple (i.e. more than one) pump units to cover their larger areas. Consequently, the market creation/assistance work undertaken by the baseline project could, with some incremental GEF support, also straightforwardly assist medium- and large-scale farms to switch to PV pump systems.

3. *Limited provision for equipment standards.* Under the terms of the Programme, ADEREE has been assigned a role of establishing minimum equipment standards to which all PV equipment procured using Programme grants should conform. This component was specifically included in the National Promotion Programme as a result of ADEREE's positive experiences with Promasol. However, the funds for this standards and certification component of the Programme are extremely limited. The criteria against which equipment will be certified have not been developed, and nor have equipment manufacturers been consulted so that a reliable supply of certified equipment in the market can be assured. The mechanism by which farmers will be informed of which equipment is certified (and hence eligible for purchase/use under the Programme) has not been detailed. GEF support is needed to augment this baseline co-finance and to extend support to areas not included in the baseline National Promotion Programme, including strengthening of ADEREE's hardware testing facilities and support for RESCOs as a mechanism for introducing *implementation* quality as well as simply hardware quality.
4. *Limited role for the private sector.* The Government's national agriculture strategy (the Green Morocco Plan, 2008) and the National Energy Strategy (2009) both explicitly acknowledge that, despite the current reliance on grant funding, sustained (and much-needed) investment in the agricultural and energy sectors will need to be driven by the private sector. Indeed, the Green Morocco Plan foresees the private sector as "playing the role of locomotive". Nonetheless, the baseline project provides only a limited role for the private sector – principally as an after-the-fact supplier of PV equipment. Despite the reliance of the Programme on intrinsically-limited state grants and soft loans, there is no provision in the Programme for catalysing private-sector expertise or investment, or for enhancing the private-sector credit environment for small-scale farmers. Nor is there any provision for experimenting with different commercial delivery mechanisms – such as equipment leasing, hire-purchase or concessions – to lower take-up costs to farmers and thereby maximizing the impact of the limited grant funds.
5. *No policy support for small-scale distributed renewable energy.* The National Energy Strategy sets a target of 42% renewable installed electricity capacity by 2020, made up of 14% solar, 14% hydro and 14% wind energy. The Government's focus to date has been on utility-scale renewable energy. The solar component of the Strategy, for example, consists of five large-scale CSP plants to be undertaken on a public-private partnership (PPP) basis and overseen by a dedicated agency, the Moroccan Agency for Solar Energy (MASEN). In supporting PV irrigation pumping, the National Promotion Programme for Solar Irrigation Water Pumping represents a welcome recognition by the Government of the potential for small-scale, distributed renewable energy to complement the hitherto almost-exclusive focus on large-scale renewables. However, the baseline Programme focuses solely on financial support (grants and soft loans) for farmers to adopt PV pumping systems without recognizing the parallel role policy support could play in increasing stakeholder awareness and capacity to use the technology, in catalyzing a role for the private sector to ensure sustained PV adoption, and in lowering the costs of the technology and promoting technological innovation.

6. *No assessment of climate mitigation benefits.* The baseline Programme contains no provisions or mechanisms for assessment of the success of the initiative (e.g. in terms of hours of usage of the PV pumps, frequency of break-downs and other technical problems) or of the amount of greenhouse gas avoided (i.e. no assessment of baseline fuel types/usage, the displacement of fuel consumption by PV or energy efficiency savings). Nor does the baseline project contain any provisions for the avoidance of leakage – i.e. on-selling of old fossil fuel pumps by farmers adopting PV pumps. Such omissions also prevent the Programme, as constituted in the baseline, from potentially tapping into sources of climate finance such as NAMAs.

Without GEF support, the baseline project is inherently unsustainable (reliant on grants and state-supplied loans for its support to PV pumping systems); runs a high risk of failure (lack of equipment quality assurance, untrained farmers, no maintenance and support regimes in place); and fails to address climate change mitigation needs.

#### GEF project scenario

The GEF project is designed to offer pragmatic support to the baseline National Promotion Programme for Solar Irrigation Water Pumping while also addressing the identified weaknesses in the Programme. The project consists of 4 components:

*Component 1: Demonstration of technical and economic viability of solar pumping for irrigation*

*GEF funding: \$1,392,040*

*Co-financing: \$46,300,000<sup>8</sup> (ADEREE: \$8,000,000; MEMEE: \$3,500,000; Ministry of Agriculture: \$23,000,000; CAM: \$11,800,000; Commercial banks: To be determined after PPG).*

This component will support the baseline project's installation of small-scale (approximately 2 kW<sup>9</sup>) off-grid PV pumps for drip irrigation on small farms. GEF support will be provided in:

(i) Developing guidelines and tools for optimizing the siting and orientation of PV panels. Simple literature will be developed for farmers and farmer associations who choose to directly access the grant funds provided by the National Promotion Programme for Solar Irrigation Water Pumping. More sophisticated literature and tools (including a software tool based on a GIS/GPS platform) will be developed for the Renewable Energy Service Companies (RESCOs) supported by the GEF project (see below) to augment pre-installation RESCO site visits.

(ii) Designing a modular configuration of standardized components that can be 'mixed and matched' according to site characteristics, farm requirements and the farmer's budget. The four standard elements of a PV irrigation pumping system – the PV panels, the pump, the controller and the electric motor – will be augmented by optional components such as solar concentrators, adjustable mounts, solar tracking systems, cooling systems, batteries and ablation protection. Certification criteria for each of these components will be developed under Component 2 to ensure minimum performance standards in the Moroccan context. Under Component 1, a decision-tree tool will be developed to allow farmers and RESCOs

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<sup>8</sup> The co-financing breakdowns are indicative and will be confirmed during the PPG stage.

<sup>9</sup> The majority of PV pump systems are expected to be 2 kWp, though a number of larger systems up to a maximum of 8 kWp may also be subsidized. A market survey will be undertaken during project preparation to assess the frequency distribution of system sizes that will be supported. The number of beneficiary farmers will depend in part on this frequency distribution.

to optimally combine different components according to budgetary and technical constraints. Since PV panels, for example, account for approximately 80% of the total cost of the solar pumping system, there are significant opportunities to reduce up-front purchase costs and/or ongoing performance efficiencies through the replacement of PV panels with solar concentrators (which have the additional benefit that they can be locally manufactured), the use of hydrophilic coatings to enhance panel self-cleaning, deployment of water-based heat exchangers to reduce over-heating of panels, and so on. As theft and vandalism can be potential risks for rural PV projects, the system configuration guidance/tool will also incorporate security considerations – for example, guidance on how to enclose equipment; on how to mount PV modules in such a way that they would have to be physically damaged to be removed, thereby limiting their re-use/re-sale value; on how to mount equipment at such a height that it is inaccessible to casual intruders; to link PV systems to cell-phone SMS systems such that removal of the systems triggers a text alarm; on how to integrate built-in GPS trackers, etc. These solutions have varying levels of technical sophistication and cost associated with them, which will be explicitly considered.

(iii) GEF funds will not be used to contribute to the subsidies for the 5,000 2 kW off-grid PV pumps that will be disseminated through the National Promotion Programme. The subsidies, which will be progressively degressed over the course of Phase 1 of the Programme (from 50% in Year 1 to 40% in Year 5), will be wholly funded by the Programme's baseline budget. These subsidies, which are expected to amount to US\$39.7 million, will be augmented by commercial loans to farmers. The value of these loans will depend on a number of factors, notably the proportion of the unsubsidized pump costs that are financed through loans (as opposed to farmers' own financial resources), but are expected to be approximately US\$42.7 million (to be determined after the PPG). With GEF technical support, the design of the National Promotion Programme will be amended such 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 Component 2. The grants will be offered in conjunction with tailored financial products offered by Moroccan banks (see Component 3) to cover at least some of the remaining unsubsidised PV system costs and in conjunction with state subsidies available through the National Agricultural Development Fund to cover the costs of drip irrigation equipment. Precise criteria and modalities will be elaborated during the PPG phase. In addition to the 5,000 small-scale PV pumps to be disseminated in the baseline, GEF funds will be used to 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. 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.

(iv) Designing and implementing a collection scheme for old diesel/LPG pumps that are replaced by solar units under the Programme. This will serve to avoid potential greenhouse gas (GHG) leakage effects whereby farmers sell on their old pump units to other farmers, thereby undermining the mitigation benefits of the Programme. The precise modalities for the collection scheme will be determined during the PPG phase. If possible, recycling of pump components will be incorporated so as to reduce the 'environmental footprint' of the scheme.

(v) Designing and implementing monitoring systems and indicators to reliably track the energy consumption of the installed PV pump systems and to estimate GHG emission reductions. It is important to recognize that emissions savings will not derive solely from

fossil fuel displacement by solar power but also from greater efficiencies associated with the use of newer equipment and the better watering management (watering schedule, frequency, amount, etc.) associated with drip irrigation. Practical but nonetheless robust methods for teasing out the influence of these different factors on GHG emissions will be developed. MRV systems will be designed to be sufficiently robust for Nationally Appropriate Mitigation Action (NAMA) purposes.

*Component 2: Sustainable implementation framework and quality standards for solar pumping developed*

*GEF funding: \$450,000*

*Co-financing: \$290,000 (ADEREE: \$200,000; Ministry of Agriculture: \$20,000; UNDP: \$70,000).*

This component will serve to embed the on-the-ground PV installation activities of the project into a broader enabling environment:

(i) As noted above, the baseline Programme places considerable responsibility on small-scale farmers to purchase PV pumping systems, to operate them and to maintain them. The ability of such farmers to do so is extremely questionable, placing the sustainability of the Programme in doubt. In order to circumvent the informational, capacity and implementation barriers evident in the baseline, the GEF project will support the development of a Renewable Energy Service Company (RESCO) component of the Programme. Farmers will be obliged to use the services of a RESCO to access grant funds through the National Promotion Programme. Furthermore, use of a RESCO will be linked to accessing commercial credit from local banks (see below, Component 3), thereby providing farmers with a financial incentive to work with RESCOs. It is planned that, by the end of the GEF project, at least 15 RESCOs will be accredited and actively involved in the National Promotion Programme. This is a deliberately cautious target; if only two-thirds of the service companies already active in the Moroccan solar sector choose to become accredited, that would imply the involvement of more than 30 RESCOs.

RESCOs will require accreditation from ADEREE to work with the Programme but will operate on a commercial basis and will be free to offer tailored suites of services to farmers. 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. Business models may include an orthodox *dealer model* (whereby the RESCO purchases a PV pumping system tailored to the specific needs of a farmer, sells the system to the farmer and thereafter relinquishes responsibility for the system assets or operations – the value-add of the RESCO lying in the selection of an appropriate system and possible cost savings for the farmer deriving from the RESCO's bulk-buying capability); a *leasing model* (whereby the farmer can rent a PV pump system and operation/maintenance risks are borne by the RESCO); a *hire-purchase model* (whereby the RESCO retains ownership of the PV system until the farmer has completed payments over the lease period); or even a *concession model* (whereby one or more RESCOs are contracted on a fee-for-service basis by the Government to – for example – build the capacity of farmers, maintain equipment or check that the equipment being used under the Programme has been certified by ADEREE). No single business model provides unambiguous benefits vis-à-vis the others, and further work will be undertaken during the PPG phase to elaborate the design options for GEF RESCO support. Certainly, Morocco already has a well-developed leasing sector for vehicles, property and industrial equipment, with 20 leasing companies well established; lessons from these leasing applications can usefully be applied to the irrigation/small-scale renewable energy

sector. It is possible that an ‘ecosystem’ of different RESCO roles and models will be supported. In any case, it is anticipated that the injection of a private-sector ‘layer’ into the Programme will improve the Programme’s take-up, sustainability and level of innovation, as well as lowering long-term costs and risks.

(ii) It is imperative that the equipment funded and installed under the Programme meets minimum quality criteria so as to secure the potential energy and mitigation benefits of the Programme and, importantly, to ensure that bad experiences of early adopters (e.g. system breakdowns, poor power output) do not deter later waves of farmers from taking up PV systems. In this context, the GEF project will support ADEREE to develop certification criteria for the full range of hardware components of PV pumping systems – importantly, ensuring that a ‘modular-compatibility’ approach is adopted, whereby all components are inter-connectable and inter-operable (see above, Component 1). ADEREE is responsible for the dissemination of good practices and national/international technical standards for the energy sector in conjunction with IMANOR (the Moroccan National Standards Institute), the Ministry of Industry and the Ministry of Energy, Mines, Water and Environment. ADEREE already operates a testing laboratory for checking the performance of PV equipment complying with international standards. In consultation with AMISOLE (the national Solar & Wind Association, which represents private-sector firms), the GEF project will support ADEREE and IMANOR to develop certification criteria for the full range of hardware components of PV pumping systems; to strengthen ADEREE’s existing certification laboratory 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 is certified. Where feasible, certification criteria will be set such that local manufacturers and fabricators are capable of producing at least some of the system components. Capacity development activities under Component 4 (below) will be developed to allow local manufacturers and fabricators to start bringing certification-standard products to market. One of the key criteria that will be used to define the equipment standards will be the expected failure rate of the equipment (others will include ease of use and modular inter-operability). At this stage, it can be stated that the certification scheme will ensure a failure rate of the PV pump irrigation systems that is considerably lower than that currently found among diesel/butane pump units in the Moroccan context, the engines for which typically have to be replaced every 2-3 years.

(iii) Farmers’ cropping techniques and practices will adapt following the introduction of more efficient (drip) irrigation systems. The Government has identified reduced fertigation (the application of water-dissolved fertilizers) as an environmental co-benefit of the switch to drip irrigation. Reduced fertigation is likely to offer additional GHG mitigation benefits in the form of reduced N<sub>2</sub>O emissions. A specific activity will be included in the project preparation phase to credibly estimate these emission reductions using internationally-recognised (including IPCC) methodologies and tools. On the basis of the detailed analysis undertaken in the project preparation phase, a set of activities under dedicated outputs will be developed for the project implementation phase (captured in Outputs 2.4, 3.3 and 4.5). Under Component 2, (a) a fertigation management tool will be developed to inform farmers of the optimum fertilizer amount, type and frequency of application so as to avoid over-application; and (b) a basic cost-savings calculator will be developed to demonstrate to farmers the immediate financial benefits of switching from a business-as-usual to an optimal fertigation regime.

(iv) The GEF project will enhance the climate change mitigation aspect of the baseline Programme by developing the Programme as a Nationally Appropriate Mitigation Action (NAMA), with robust and credible mechanisms for assessing greenhouse gas (GHG)

benefits of the Programme and for undertaking Monitoring, Reporting and Verification (MRV) on an ongoing basis. Development of the Programme as a NAMA, recorded in the UNFCCC NAMA registry, will serve to raise the profile of the initiative within Government, open up potential climate finance opportunities, strengthen the Programme's mitigation benefits, and impose a level of managerial and technical rigour that serves to reduce possible risks – such as those associated with the inclusion of RESCOs and local commercial banks (see below).

### *Component 3: Supportive financing mechanisms*

*GEF funding: \$390,000*

*Co-financing: \$85,000 (ADEREE: \$25,000; Ministry of Agriculture: \$10,000; UNDP: \$20,000; CAM: \$30,000).*

To complement the supply-side barrier removal activities detailed above (equipment certification, RESCO technical expertise and commercial innovation, etc.), the GEF project will also provide demand-side assistance to encourage adoption of PV pump systems:

(i) The project will work with local banks and financial institutions to design and offer tailored financial products to farmers to support PV pump take-up. Two of Morocco's three largest commercial banks, Groupe Banques Populaires and Attijariwafa Bank, both of which have extensive branch networks with deep rural reach, have expressed interest in exploring such opportunities. MAMDA, a large agricultural insurer, is similarly interested. By explicitly involving and supporting such institutions in the Programme, the GEF project can address a key deficiency in the baseline project, which places great reliance on state-funded grants and soft loans – which are, by their very nature, limited and non-sustainable. Morocco has the best-developed banking sector in North Africa. 'Green products', including loans for solar panels, are beginning to appear on the market, though these are currently niche products. Local banks will be enabled – through capacity development and involvement in Programme design – to develop tailored leasing, risk capital and credit products to enable farmers to acquire PV pump systems. Financial products developed for this purpose may also include Islamic *Ijara*, *Moucharek* and *Mourabah* products (which do not involve payment of interest), which may be of appeal to conservative rural communities. With GEF support, the National Promotion Programme will explicitly address banks' lending risks (and thereby allow full involvement in the project by local banks) by putting in place a number of risk mitigation mechanisms:

- The subsidies applied to PV pump units will reduce the overall costs to farmers;
- Only drip irrigation or supplemental irrigation systems – i.e. highly water-efficient irrigation techniques – will be eligible for support. This will have the effect of reducing farmers' recurring water consumption costs, thereby releasing income for other purposes;
- Lending to farmers in the framework of the Programme will be limited to those farmers using quality-certified equipment and RESCO services for siting, installation or maintenance of the PV pump units;
- Farmers and banks will benefit from capacity development support, assisting farmers to understand and utilize PV pumping and banks to screen bankable projects;
- The use of farmer aggregation groups (such as local water collectives) will be explored during the project preparation phase in order to dilute credit risk;
- The MRV systems put in place primarily for GHG mitigation purposes will also serve as early-warning systems if particular types of PV system begin to fail or difficulties are encountered with operating the installed systems (thereby allowing solutions to be deployed rapidly and the value of farmers' investments preserved).

(ii) The project will work with ADEREE, the Ministry of Agriculture and the Ministry of Economy & Finance to design and implement ‘smart’ (targeted) fiscal incentives to enhance farmers’ willingness to acquire PV technology. Moroccan tax and depreciation rules are currently unfavourable to leasing, for example, and will be reviewed. Similarly, the value-added tax (VAT) and import tariff regime on PV technology will be improved from the farmers’ perspective. The analytical work underlying fiscal incentive design will be informed by a detailed system dynamics modelling (SDM) exercise – based on similar UNDP-supported initiatives in Kenya, Mauritius and Namibia – to model the economic costs and benefits, and cross-sectoral spill-over effects, of a range of potential fiscal adjustments to promote PV pump take-up and low-carbon development in the agricultural sector. In addition to the work on targeted financial incentives for PV technology, the project will also assist the Ministry of Agriculture and the Ministry of Economy & Finance to explore options for better alignment of fertilizer subsidies with sustainable fertigation practices under drip irrigation.

(iii) The project will also, at the mid-term of project implementation, conduct an assessment of the ongoing need for subsidies (and their calibration) for PV pump equipment under the National Promotion Programme. This assessment will be made on the basis of an econometric appraisal of the impact of the subsidies in the first 2 years of the Programme. The Government’s expectation is that subsidies will continue to be required for the second half of Phase 1 and for Phase 2 of the Programme but that: (a) they will continue to be progressively reduced according to a formal degression schedule; and (b) the rate of degression will be much accelerated in recognition of the greater market maturity brought about by the early actions of the National Promotion Programme.

#### *Component 4: Capacity development of stakeholders*

*GEF funding: \$281,985*

*Co-financing: \$170,000 (ADEREE: \$75,000; Ministry of Agriculture: \$40,000; UNDP: \$25,000; CAM: \$30,000).*

Awareness of, and the ability to technically appraise, PV pumping systems is lacking at all points in the Programme. In the baseline Programme (i.e. as constituted without GEF support), the onus is on individual farmers to purchase and operate equipment. In the GEF-enhanced Programme, additional expertise will be required – for ADEREE to certify and test equipment, and to operate a larger-scale grid-connected demonstration PV pump unit; for RESCOs to undertake site surveys, recommend tailored packages to farmers and be able to provide ongoing technical support; for local banks to evaluate solar pumping projects for loan purposes; and for farmers, water user associations, Regional Agricultural Development Agencies, RESCOs and banks to understand, recommend and apply optimal fertigation practices. The GEF project will, therefore, provide a comprehensive programme of awareness-raising and training activities, tailored to the needs of specific stakeholder groups. Additionally, in conjunction with the certification standard-setting under Component 1, local private sector manufacturers will receive technical support for producing certification-quality PV system components (solar concentrators are an obvious starting point) and for providing after-sales maintenance support. A full institutional mapping of training needs will be undertaken during the project preparation phase. The emphasis of the GEF project when supporting training will be on ensuring post-project sustainability. This is best achieved when it is in the interests of the actors (farmers, banks, Government institutions) themselves to continue with the training – i.e. when the benefits of the training are clear and are aligned with actors’ economic self-interest.



### Environmental and social benefits

The National Promotion Programme for Solar Irrigation Water Pumping targets small farms (< 5ha), which are overwhelmingly owned and operated by low-income farmers. In enhancing the sustainability and impact of the Programme, the GEF project will directly benefit poor rural communities by reducing their dependence on fossil fuel-powered pumps (the fuel cost of which will rise significantly in the coming years). In simultaneously promoting the switch to drip irrigation, the project will reduce water usage (and losses); will reduce the need for fertigation (the application of water-dissolved fertilizers); and will promote switching from low value-added crops (such as cereals) to high value-added crops such as olives, citrus fruits and strawberries – thereby assuring further cost savings and new revenue opportunities for farmers. Women account for more than 50% of the rural population, and agriculture accounts for 92% of the jobs held by rural working women. In generating positive socio-economic impacts for the smallholder agriculture sector, the project will serve to create jobs and raise incomes for women. Women will also benefit, alongside other stakeholder groups, from capacity development activities supported by the project.

With regard to the mitigation benefits of the project, a conservative estimate is presented here (which will be firmed up during project preparation). Conservativeness is ensured through: (a) considering only the direct emission reductions associated with the 5,000 PV pump units to be disseminated through the National Promotion Programme with GEF support – other pump installations enabled by the project and indirect emission reductions (e.g. associated with the project's support to national hardware standards and capacity development) are disregarded; and (b) applying a causality factor of 60% to these direct emission reductions, in recognition of the fact that the baseline – though characterized by weaknesses and gaps – would have witnessed limited PV pump installations. Direct emission reductions can be estimated as follows:

- Assuming that 60% of replaced small-scale pumps are diesel-powered and 40% are butane-powered<sup>10</sup>, the project is expected to achieve emission reductions of approximately 313,200 tonnes of CO<sub>2</sub> (tCO<sub>2</sub>) over the assumed (conservative) 15-year lifetime of the PV equipment. Applying a 60% GEF causality factor leads to GEF-attributable emission reductions of 188,000 tCO<sub>2</sub>, at a cost of GEF\$14/tCO<sub>2</sub>.

Moreover, cropping techniques and practices will be adapted following the introduction of more efficient (drip) irrigation systems. The Government has identified reduced fertigation (the application of water-dissolved fertilizers) as an environmental co-benefit of the switch to drip irrigation. Reduced fertigation is likely to offer additional GHG mitigation benefits in the form of reduced N<sub>2</sub>O emissions. These GHG benefits will be a function of 4 key factors:

- The baseline amount of nitrogenous fertilizer currently applied by farmers using traditional irrigation systems;
- The changes in agricultural practices that will result from switching to drip irrigation – which could simply be reduced water application and reduced fertigation but could be as fundamental as a change of crop and cropping regime (the Government is anticipating that many farmers will switch from their current low value-added crops (such as cereals) to high value-added crops such as olives, citrus fruits and

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<sup>10</sup> This is a reasonable assumption based on local knowledge of the Moroccan irrigation sector. A more detailed and accurate baseline will be determined during the project preparation phase. Both types of pump are assumed to be 2 kW, to pump 50 m<sup>3</sup> of water per day and to operate for 300 days per year. Diesel pumps are assumed to require 0.09 litres of fuel per m<sup>3</sup> of water pumped; butane pumps are assumed to require 0.11 litres of fuel per m<sup>3</sup> of water pumped. The emission factors of diesel and butane are assumed to be 0.004 tCO<sub>2</sub>/litre and 0.002 tCO<sub>2</sub>/litre respectively.

- strawberries);
- The type of drip irrigation employed (e.g. surface vs. sub-surface); and
- The amount of nitrogenous fertilizer applied using the new, drip, irrigation system.

Additional factors, such as the degree of aeration of soils and their acidity, also regulate N<sub>2</sub>O emissions, but are secondary in impact. The scientific literature reports N<sub>2</sub>O emission reductions in the order of 50% for plots that switch from furrow irrigation to surface drip irrigation, though such studies tend to neglect confounding factors such as switching of crops and cropping regimes.

Data for all four factors are currently lacking in the Moroccan context; consequently, a specific activity will be included in the project preparation phase to credibly estimate emission reductions using internationally-recognised (including IPCC) methodologies and tools. On the basis of the detailed analysis undertaken in the project preparation phase. Since farmers pay for fertilizer, the Government subsidises fertilizer and banks wish to maximize farmers' income (so as to facilitate loan repayment), all the key actors' interests are aligned in supporting the switch to efficient fertigation practices and thereby reducing N<sub>2</sub>O emissions..

#### Innovativeness, sustainability and potential for scaling-up

The GEF project seeks to build on a new baseline Government initiative, the National Promotion Programme for Solar Irrigation Water Pumping, to enhance the scope, ambition and sustainability of the Programme. The project's central thrust – that of involving the private sector in the Programme in the form of RESCOs, local financial institutions and local manufacturers – is specifically geared to moving the Programme onto a more sustainable footing, less reliant on grant finance. Innovative elements include the 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 private-sector bank lending to the small-scale renewables sector. The project is inherently scaleable. Although large in absolute number, the 5,000 small-scale PV pump units to be installed under the GEF project represent a small fraction (approximately 1%) of the total replaceable pump population.

A.2. Stakeholders. Identify key stakeholders (including civil society organizations, indigenous people, gender groups, and others as relevant) and describe how they will be engaged in project preparation:

Project Stakeholder	Relationship With The Project
National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)	ADEREE is a public institution with a mandate to promote the take-up of renewable energy and energy efficiency in Morocco. Among other functions, it is responsible for renewable energy resource assessments, equipment standards and labeling, capacity development and international coordination on sustainable energy matters. ADEREE is, with the Ministry of Energy, Mines, Water and Environment, the Ministry of Agriculture and Crédit Agricole du Maroc, one of the four implementing agencies of the baseline project, the 'National Promotion Programme for Solar Irrigation Water Pumping'. ADEREE will be the Executing Partner of the GEF project.
Ministry of Energy, Mines, Water and Environment (MEMEE)	MEMEE is responsible for the development and implementation of Government policy relating to energy, water and climate change (including NAMAs), and is ultimately responsible for ADEREE. The National Energy Strategy, the National Charter for Environment and Sustainable Development, and the National Plan Against Global Warming (PRNC) fall under the Ministry's mandate. The Ministry is one of the four implementing agencies of the baseline project, the 'National Promotion Programme for Solar Irrigation Water Pumping'. The Ministry will work closely with ADEREE on the development of equipment standards for PV pumping equipment and on institutional liaison with the Ministry of Agriculture

	and other entities in the context of the National Promotion Programme. MEMEE will be a member of the Project Steering Committee.
Ministry of Agriculture	The Ministry of Agriculture is responsible for developing and implementing Government policy in agriculture, guided principally by the Green Morocco Plan. A significant element of the Ministry's work relates to the rationalization of water use for irrigation, and the Ministry has undertaken considerable work on the technologies and working practices needed for drip irrigation to work in the Moroccan context. The Ministry is one of the four implementing agencies of the baseline project, the 'National Promotion Programme for Solar Irrigation Water Pumping'. The Ministry will be a member of the Project Steering Committee.
Crédit Agricole du Maroc (CAM)	Crédit Agricole du Maroc (CAM) was established in 1961 as a state-owned bank for rural and agricultural development. A significant proportion of its lending activity continues to revolve around agriculture and agro-processing, aligned with the Green Morocco Plan. CAM also distributes Government agricultural grant funds to eligible farmers. CAM has extensive networks in rural areas and a deep understanding of rural needs, opportunities and risks, which will prove invaluable in designing and tailoring GEF support. CAM will be a member of the Project Steering Committee.
Commercial banking sector	The GEF project will include local commercial banks as central stakeholders, augmenting the baseline National Promotion Programme for Solar Irrigation Water Pumping with private-sector credit and product innovation. Two of Morocco's three largest commercial banks, Groupe Banques Populaires and Attijariwafa Bank, both of which have extensive branch networks with deep rural reach, have expressed interest in exploring such new opportunities. Attijariwafa Bank is already active in renewable energy finance and 'green investment'. Financial products developed may include Islamic finance instruments that appeal to often-conservative rural farmers.
Irrigation stakeholders	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 widely consulted, involved in project design and – crucially for project sustainability purposes – allocated agreed project implementation roles backed up by relevant capacity development and other technical assistance.

A.3 Risk. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable):

<b>Risk</b>	<b>Risk Category</b>	<b>Mitigation Approach</b>
Climate change risks	L	Morocco is highly vulnerable to climate change. There is consensus among climate models that in coming decades Morocco's climate will be warmer and drier, with declines in average precipitation of 20-30% in the 2030s projected. This will exacerbate the growing water scarcity problems in some areas of Morocco. Rain-fed agriculture is expected to particularly suffer, with declines in productivity of over 30% possible. In promoting a switch from traditional to drip irrigation techniques, the project is clearly aligned with the needs imposed on Morocco by anticipated climate change. Further, the solar resource being promoted by the project will be unaffected (or will even improve given reduced precipitation) by climate change – unlike hydro-power, which is likely to experience declines in coming years due to reduced rainfall and greater siltation of dams.
Lack of coordination between Government	M	In 2010, a thematic group, the Agriculture Thematic Group (GTA), was instituted to bring together key stakeholders – Government and non-Government – to coordinate support to the Green Morocco Plan. The GTA has proved itself to be a valuable coordination mechanism. As it is

entities, private-sector stakeholders and donors		steered by the Ministry of Agriculture – one of the four implementing agencies of the baseline project, the National Promotion Programme for Solar Irrigation Water Pumping, and also a member of the GEF project Steering Committee – it is envisaged that the infrastructure and networks of the GTA will be leveraged with relative ease by the GEF project. Similarly, the close involvement of MEMEE and ADEREE in the project is expected to draw in the Moroccan renewable energy community. CAM, another of the baseline project implementing agencies, has – through its parastatal role of disbursing Government agricultural grants – extremely close connections with farmers, agricultural water user associations and Regional Agricultural Development Authorities (ORMVAs). Local commercial banks are probably the least embedded in these pre-existing energy and agriculture sector networks, but they track CAM's activities closely and they have indicated a strong interest in developing financial products for farmers.
Financial sector culture and constraints	M	<p>The Moroccan agricultural sector receives extensive financial support from the Government. Since the 1970s, farmers have been required to pay for their own water consumption but non-payment rates are high and a culture of the Government stepping in with debt-forgiveness programmes and term lending has developed. The Moroccan Government auditing body, the Cour des Comptes (CdC), itself concluded in 2010 that small farmer debt alleviation programmes had adversely affected the financial viability of CAM (as the state agricultural bank) and had led to a situation where “other categories of farmers” (i.e. those actually able to pay water bills and outstanding loans) were led to “not reimburse” which “considerably increased unpaid [credits].” The CdC noted that “building a culture of repayment constitutes one of the principal conduits for developing agricultural credits and the agricultural sector.” In addition to the risk of non-payment, commercial lending to farmers is further constrained by a conservative regulatory environment (lending activities are legally required to pass through only establishments licenced by the central bank) and by the presence of an interest rate cap (approximately 14%) imposed by the central bank on bank loans, rendering some forms of lending – particularly unsecured lending – to small-scale farmers problematic as the risks cannot be covered.</p> <p>In other respects, however, the financial sector is well developed. Although the regulatory environment is conservative, the sector does provide a complete range of financial products, ranging from bank credit, micro-finance, leasing, factoring and agricultural insurance. Morocco also has the largest venture capital market in the MENA region. The GEF project will explicitly address banks' lending risks (and thereby allow full involvement in the project by local banks) by putting in place a number of risk mitigation mechanisms: lending to farmers in the framework of the Programme will be limited to those farmers using certified equipment and using the services of accredited RESCOs, thereby lowering PV pumping implementation risks; farmers and banks will benefit from capacity development support, assisting farmers to understand and utilize PV pumping and banks to screen bankable projects; the use of farmer aggregation groups will be explored in order to dilute credit risk; and the MRV systems put in place primarily for GHG mitigation purposes will also serve as early-warning systems if particular types of PV system begin to fail or difficulties are encountered with operating the installed systems (thereby allowing solutions to be deployed rapidly and the value of farmers' investments preserved).</p>
RESCO model risks	M	The generic weaknesses of the RESCO model are well known and include RESCO capacity weaknesses (e.g. inability to properly design,

		<p>install and maintain systems), business model failings (e.g. high rates of payment default by farmers undermining revenue forecasts) and principal-agent informational problems (in the case of a concession model, the RESCO is not incentivized to report service problems to the Government licensing authority). Certainly, the empirical record of ESCOs in a Moroccan energy efficiency context has, in the past, been mixed. The GEF project will consider, but is unlikely to recommend, the concession model, partly because of the information asymmetries that characterize this approach and partly because the GEF project is seeking to reduce and focus the role of Government in the National Promotion Programme for Solar Irrigation Water Pumping, not to extend it. Instead, the GEF project will likely support a leasing or hire-purchase model in which RESCOs have more freedom to enter and exit the Programme and to compete for customers (providing they meet to-be-determined basic accreditation criteria). The Government's role will, then, be more hands-off than would be required under a concession model and therefore information asymmetry risks are significantly reduced. With regard to the other risks associated with RESCOs, the project will mitigate risks through: detailed analysis and consultations on potential RESCO models to be deployed in conjunction with the Programme; development of accreditation criteria whereby ADEREE can screen RESCOs for technical and financial viability; tailored capacity development for RESCOs and farmers (including the development of tools for PV system design and other purposes); ongoing support and monitoring of RESCOs to flag up emerging needs or problems; and use of the MRV system deployed by the GEF project as a de facto RESCO early warning system that can monitor RESCO/RESCO customer performance.</p>
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#### A.4. Coordination. Outline the coordination with other relevant GEF financed and other initiatives:

The project will be implemented in close cooperation and coordination with ADEREE, MEMEE, the Ministry of Agriculture, CAM and private-sector stakeholders, and complements past and on-going assistance from UNDP and other agencies. A full audit of related initiatives will be undertaken during the project preparation phase, but key initiatives include: the highly-successful UNDP-GEF-ADEREE **Promasol** project (2002-ongoing), promoting the uptake of solar water heaters in Morocco, which has built up considerable experience on supporting small-scale, distributed renewable energy, particularly in the context of financing models to sustain market-driven take-up – including, of particular relevance to the proposed GEF project, the design and calibration of leasing models. The **UNDP Low Emission Capacity Building Programme** (LECBP, 2011-2014, \$749,000), being implemented by the Ministry of Energy, Mines, Water and Environment. In Morocco, the LECBP is supporting (a) the development and implementation of a Low Emission Development Strategy (LEDS) to provide a framework for mitigation actions, including in the agricultural sector; (b) to identify and support the implementation of selected NAMAs; (c) to implement MRV systems for mitigation policies, plans and programmes, and (d) to facilitate knowledge sharing and communication. The **UNEP-Risoe Facilitating Implementation and Readiness for Mitigation (FIRM) project** (2013-2014, \$300,000) is coordinating with the LECBP to develop the legal and institutional frameworks for NAMA development: the GEF project will both benefit from and inform this work, particularly in relation to the practical, 'on the ground' barriers identified by the GEF project during preparation of the PV irrigation NAMA. The **UNDP-GEF Energy Efficiency Codes in Residential Buildings and Energy Efficiency Improvement in Commercial and Hospital Buildings in Morocco** (2009-2014, \$3 million GEF funding and \$15.7 million co-finance), executed by ADEREE, has the principal objective of introducing mandatory minimum energy performance standards (MEPS) in the Moroccan residential, commercial and hospital sectors through the introduction of an Energy Efficiency Building Code, with associated barrier

removal, capacity development and outreach activities. The proposed GEF project will build on the ongoing GEF project's support to ADEREE testing facilities and standards-setting. The recently-approved **EBRD-GEF South Eastern Mediterranean EE/ESCO Markets Platform regional programme** includes Morocco as one of its four participating countries. Although it is focused on energy efficiency (rather than renewable energy), the EBRD-GEF project's support to private-sector energy service companies – and the development of viable business models associated with energy services – nonetheless clearly offers significant synergies with the proposed GEF project, and these synergies will be explored in considerable detail during the PPG phase. The **African Development Bank** has four ongoing agricultural sector operations in Morocco involving total loans and grants of \$72 million, three of which – support to the National Irrigation Water Conservation Programme (PNEEI), technical support for irrigation infrastructure development and technical support to the promotion of young agricultural entrepreneurs – are likely to be highly relevant and will be closely consulted. **USAID's Moroccan Economic Competitiveness (MEC) Programme** is assisting the Green Morocco Plan to improve financing in the agricultural sector to enable improved investment in water-saving technologies, particularly for small-holder farmers. MEC has undertaken detailed scoping studies in a variety of areas – technological, financing and stakeholders – and shares an ambition with the proposed GEF project to ensure greater private sector participation in irrigation services. In October 2012, the **European Investment Bank (EIB)**, under the umbrella of the Facility for Euro-Mediterranean Investment and Partnership (FEMIP), provided a \$56 million loan to the Government of Morocco to assist with implementation of the National Irrigation Water Conservation Programme (PNEEI) component of the Green Moroccan Plan. This loan represents part of the grant contribution to the baseline project from the National Agricultural Development Fund. The GEF project will build on and enhance the baseline project, and will coordinate technical assistance activities with EIB to maximize Programme impacts.

Description of the consistency of the project with:

B.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAs, NAPs, NBSAPs, national communications, TNAs, NCSAs, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.:

The project has the strong support of the Government of Morocco and is aligned with, and supportive of, a number of Government policies and strategies. The **National Charter for Environment and Sustainable Development** (2010) provides the framework for national environmental laws, particularly those relating to water resource management (which is considered a national priority). The **National Promotion Programme for Solar Irrigation Water Pumping**, which represents the baseline project for GEF purposes, serves to link two key Government sectoral strategies – the National Energy Strategy and the Green Morocco Plan. The **National Energy Strategy** (2009) makes the promotion of renewable energies a national priority, setting a target of renewable electricity production to account for 42% of total capacity by 2020. The focus of the Strategy to date has largely been on utility-scale power generation, including the development of a roadmap for the development of five large CSP plants. Nonetheless, the Government has indicated an interest in extending the Strategy to better encompass smaller-scale, distributed renewable energy. The **Green Morocco Plan** (2008) is a comprehensive development strategy aimed at transforming the agricultural sector into a driver of development. It consists of two pillars: Pillar 1 concerns the development of modern, efficient and high value-added agriculture in a market-based context, and Pillar 2 supports smallholder agriculture through income support and improvement. The Plan contains a specific cross-cutting strategic programme, the **National Irrigation Water Conservation Programme (PNEEI)**, to convert conventional irrigation to high-efficiency drip irrigation. The **National Plan Against Global Warming (PRNC)** outlines the Government's sectoral plans for mitigating and adapting to climate change, and includes detailed action plans for renewable energy, including

specifically in the agriculture sector. The **Second National Communication to the UNFCCC** identifies Morocco's heavy reliance (96%) on imported fossil fuels as being a source of national vulnerability; identifies the energy (50%) and agricultural (32%) sectors as being the two largest sources of greenhouse gas emissions in Morocco; identifies Morocco's current low level of efficiency in the use of irrigation water (52% of such water is wasted through evaporation, leakage and over-application) as being a source of vulnerability in the context of expected climate change (reduced water availability); and recommends investments in renewable energy (mitigation) and drip irrigation (adaptation) as urgently needed climate change responses. The **National Capacity Self-Assessment** identifies a lack of inter-sectoral coordination as being a key challenge to developing 'joined-up' and effective responses to climate change challenges – an issue that the GEF project directly addresses through supporting the linkages between the National Energy Strategy and the Green Morocco Plan.

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

Morocco is a Non-Annex 1 Party to the UNFCCC. The project addresses the objectives of the GEF-5 Climate Change Mitigation Focal Area Strategy:

- Strategic Objective 3: Promote investment in renewable energy technologies.  
Investment in renewable energy technologies increased.

The project is fully in line with the recommendations of the Second National Communication to the UNFCCC (2010) and the National Capacity Self-Assessment (2006).

**B.3 The GEF Agency's comparative advantage for implementing this project:**

The proposed project is fully aligned with Signature Programme 1 (clean energy access) of UNDP's Energy, Infrastructure, Transport and Technology (EITT) group. UNDP has maintained a Country Office in Morocco since the 1950s, and since that time has implemented hundreds of projects and programmes across the country and has played a transformational role in Morocco's climate change agenda. UNDP's work in Morocco is guided by the United Nations Development Assistance Framework (UNDAF - for the period 2012-2016) and the Country Planning Document (CPD - for the period 2012-2016). The UNDAF states: "The principles of the National Charter for Environment and Sustainable Development are implemented in coherence with sector-based strategies and the priorities in the field of environment, climate change adaptation, and risk management, and in an approach aimed to strengthen the territorial synergy in the most vulnerable areas." The expected CPD output is: "Capacity for development and coordination of strategies and programmes for mitigation and adaptation to climate change and management of natural and technological risks are developed and strengthened."


The annual programming budget of the UNDP Morocco Country Office does not exceed \$700,000/year, and the Environment & Energy budget does not exceed \$200,000/year. The UNDP co-financing for the GEF project of \$200,000 over the course of the 4-year lifetime of the project therefore represents a significant fraction (one-quarter) of total UNDP Environment & Energy spending, reflecting the strategic importance that UNDP and the Government attach to the project.

**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 template. 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	08/28/2013

**B. GEF AGENCY(IES) CERTIFICATION**

<b>This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.</b>					
Agency Coordinator, Agency name	Signature	DATE (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Adriana Dinu, UNDP-GEF Executive Coordinator and Director a.i.		1/14/2014	Robert Kelly	+421 915 725 069	Robert.kelly@undp.org