GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

Naoko Ishii
CEO and Chairperson

January 14, 2016

Dear Council Member:

UNDP as the Implementing Agency for the project entitled: ***Sudan: Promoting the Use of Electric Water Pumps for Irrigation*** , has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with UNDP procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by Council in March 2014 and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by UNDP satisfactorily details how Council's comments and those of the STAP have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at www.TheGEF.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Naoko Ishii
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee

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REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: FULL-SIZED PROJECT
TYPE OF TRUST FUND: GEF TRUST FUND

For more information about GEF, visit TheGEF.org

PART I: PROJECT INFORMATION

Project Title: Promoting the use of electric water pumps for irrigation in Sudan			
Country(ies):	Sudan	**GEF Project ID:**[1]	5673
GEF Agency(ies):	UNDP	**GEF Agency Project ID:**	5324
Other Executing Partner(s):	Ministry of Water Resources and Electricity	**Submission Date:** **Resubmission Date:**	December 7, 2015 December 21, 2015
GEF Focal Area (s):	Climate Change	**Project Duration(Months)**	60
Name of Parent Program (if applicable): ➢ For SFM/REDD+ ☐ ➢ For SGP ☐ ➢ For PPP ☐	n/a	**Project Agency Fee ($):**	414,747

A. FOCAL AREA STRATEGY FRAMEWORK[2]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
CCM-3	**Renewable Energy:** Promote investment in renewable energy technologies	Renewable energy capacity installed Renewable energy policy and regulation in place	GEFTF	4,365,753	20,150,000
		Total project costs		4,365,753	20,150,000

B. PROJECT FRAMEWORK

Project Objective: To replace diesel-based irrigation water pumping through the promotion of photovoltaic pumps						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Cofinancing ($)**
1. Pump installation programme enabled through targeted subsidies and the design and implementation of micro-finance lending	INV	Financing and dissemination mechanism established and operational to support a PV pump installation programme	1.1 28 pumps installed as part of a pilot phase 1.2 National PV Fund and coordinated loan facility established and capitalized to promote concessional lending to farmers for PV pump equipment 1.3 A minimum of 1,468 [3]off-grid PV pumps ranging in size from 3.12-29.6 kWp installed in farms in the Northern State of Sudan with support from the National PV Fund	GEFTF	2,755,853	17,000,000

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the Focal Area Results Framework and LDCF/SCCF Framework when completing Table A.
[3] The 1,468 pumps include the 28 pumps installed as part of a pilot phase under Output 1.1.

2. PV pump installation programme put on a sustainable footing through risk reduction measures	TA	Financing and dissemination mechanism de-risked through technical standards and demand-side support	2.1 Development and implementation of technical quality standards for PV pump components by the National Energy Research Centre (NERC), augmented by enforcement support from SSMO, Customs and relevant market observers 2.2 SSMO test and certification laboratories strengthened to test and label PV pump components 2.3 Software tool for pump sizing according to farm and hydrological conditions developed and implemented 2.4 Training and certification scheme for PV pump installers (including local retailers, technicians and pump rental companies) developed and implemented. 2.5 Research on development of the most relevant, water efficient, irrigation techniques directly applicable in the North State at minimal cost and dissemination of techniques to farmers. 2.6 Promotion of sustainable pumping practices based on outputs of the Nubian Sandstone Aquifer System from a separate GEF project (ID 4736).	GEFTF	746,544	1,106,875
3. Mitigation instrument design elaborated and implemented in support of the PV pump installation programme	TA	Mitigation instrument design elaborated and implemented in support of the PV pump installation programme	3.1. Development of a standardized baseline for pump fuel-switching, applicable to Sudan and the wider region 3.2. Implementation of the standardized baseline within a NAMA	GEFTF	396,310	123,000
4. Supportive enabling environment and scaled-up implementation	TA	Supportive enabling environment and scaled-up implementation	4.1. Inclusion of PV pumps in the fiscal concessions lists of the Investment Law and the Agricultural Implements Regulation 4.2. Structured replication programme for other states designed and implemented, including strengthened integration of PV pumping in the Government's national energy roadmap and rural energy access strategy	GEFTF	259,243	769,000
			Subtotal		4,157,950	18,998,875

Project management Cost (PMC)[4]	GEFTF	207,803	1,151,125
Total project costs		4,365,753	20,150,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
National Government	Ministry of Water Resources and Electricity	Cash	1,500,000
National Government	Ministry of Environment, Higher Council for Environment & National Resources	Cash	500,000
National Government	Ministry of Petroleum	Cash	200,000
National Government	Ministry of Finance and National Economy	Cash	3,000,000
Local Government	Ministry of Agriculture, Animal Resources and Irrigation , North State	In-kind	150,000
Private Sector	Sudanese Banks (Al Nile, Al Shamal Islamic, Baraka, Family, Farmer's Commercial, Savings and Social Development, Sudanese Islamic)	Soft Loan	14,000,000
GEF Agency	UNDP	Cash	550,000
Others	National Energy Research Center	Cash	250,000
Total Co-financing			20,150,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in $)		
				Grant Amount (a)	Agency Fee (b)[2]	Total c=a+b
UNDP	GEFTF	CCM-3	Sudan	4,365,753	414,747	4,780,500
Total Grant Resources				4,365,753	414,747	4,780,500

[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	135,000	45,000	180,000
National/Local Consultants	110,000	62,000	172,000

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

(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

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

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[5]

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc. The project is anticipated to be developed within the national policies and guidelines described in the PIF.

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 two relevant advents since the submission of the PIF are UNDP's initiative, presently in the PIF stage of submission to GEF, to enable implementation of the Regional Strategic Action Plan for the rational and equitable management of the Nubian Sandstone Aquifer System; and UNDP's GEF-supported initiative in Morocco, under the "Promoting the development of photovoltaic pumping systems for irrigation" project (presently in the PPG phase).

The Nubian Sandstone Aquifer System (NSAS), covering approximately 2.6 million square kilometers (approximately 1,600 km East to West and North to South) of Northeast Africa in Chad, Egypt, Libya and Sudan, is one of the largest fossil freshwater aquifer systems in the world with reserves estimated at over 500,000 km3. The thickness of the aquifer varies from a few hundred meters at the southern peripheries to several kilometers in the center and northern region. The four countries sharing the aquifer system face similar problems of arid climate, scarce surface water resources, persistent droughts and fragile ecosystems. The aquifer is a critically important source of water in this arid desert region and will be increasingly in demand in the future. A fossil resource recharge of the aquifer is believed to have last occurred during the last ice age. All four countries have given priority to linking the NSAS groundwater exploitation to national development strategies and plans. Growing pressures on the NSAS poses threats to both the quantity and quality of the resource and could, if not appropriately managed, lead to transboundary tension.

The four countries, with the support of the GEF, have undertaken a Transboundary Diagnostic Analysis (referred to as a Shared Aquifer Diagnostic Analysis - SADA) and developed a Strategic Action Programme (SAP) that was adopted by ministers from each country in September, 2013. The SADA identified five transboundary and/or shared problems: (i) Declining water levels; (ii) Damage or loss of ecosystem and biodiversity; (iii) Water quality deterioration; (iv) Climate change; and (v) Changes in groundwater flow regime (this last problem was not pursued further as it was recognized from the model's results that the problem did not occur outside the immediate area of well fields). These problems were then addressed through a high-level SAP with agreed outline mitigation measures.

The project being proposed to GEF, under a separate PIF (PIMS 4736), will enable implementation of the Regional Strategic Action Plan for the rational and equitable management of the Nubian Sandstone Aquifer System.

Implementation of the proposed NSAS project will strengthen UNDP's ability to execute this project by providing greater local involvement of UNDP staff and projects in the region and by providing added information and insight into the sustainability of the underground water aquifer which will inform the design of the pumping systems and possibly suggest limits on pumping if necessary. The information obtained from the proposed NSAS project will help support decisions under this project on where to install pumps, how many, and in what pumping capacities.

The "Promoting the development of photovoltaic pumping systems for irrigation" project in Morocco seeks to create a conducive framework conducive to the implementation of the Moroccan national programme of photovoltaic pumping for drip irrigation. The project strengthens the capacities of the various actors concerned, raises awareness of operators and farmers on economic and environmental

[5] 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.

benefits of solar pumping, puts in place financing mechanisms facilitating the acquisition of PV pumping systems, standardizes solar installations for irrigation, develops skills of private operators to ensure supply of quality services and implements a monitoring framework of project impacts as regards GHG emission mitigation. Many of these activities are very similar to the present project. Both projects are under the same regional office and it can be expected that experience from the projects will significantly benefit each other. As soon as both projects start implementation a more structured platform for collaboration and knowledge sharing between them will be established.

Finally also worth noting is the development of a Diesel to Solar (D2S) Initiative in several Arab States supported by UNDP and the Cairo-based Regional Center for Renewable Energy and Energy Efficiency (RCREEE), an independent not-for-profit regional organization that aims to enable and increase the adoption of renewable energy and energy efficiency practices in the Arab region. The D2S initiative – launched this year - is part of UNDP and RCREEE's ongoing efforts to enable private investments in sustainable energy solutions. This market-based initiative aims to scale up the market of diesel to solar retrofits through the promotion of scalable, sustainable business models suitable for the region. To understand the market potential for diesel to solar (D2S) retrofits, a group of researchers at RCREEE conducted a market Assessment in four countries: Djibouti, Egypt, Sudan and Yemen. The study included a preliminary assessment of solar PV pumping technologies and market development. Funding is currently being sought to develop a regional project and – if successful – collaboration between this project and the D2S will be established when appropriate.

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

The baseline project and the problem it seeks to address remain largely unchanged compared with the information in the PIF. The only material change has been the preparation of a GEF PIF (as already mentioned) on "Enabling implementation of the Regional SAP for the rational and equitable management of the Nubian Sandstone Aquifer System (NSAS)". As a result, the present project does not include any components to study underground water sources and will instead rely on the outputs of the NSAS project. Study of underground water sources was not a component of this project at the PIF phase, but was originally intended to be undertaken early in the PPG phase.

Table 1 – Changes in co-finance from PIF to CEO Endorsement Request (by donor/funding source)

Source of Co-Financing	PIF Amount (US $)	Actual Amount at CEO ER (US $)	Description
Ministry of Water Resources and Electricity	1,500,000	1,500,000	No change.
Ministry of Environment, Higher Council for Environment & Natural Resources	500,000	500,000	At the PIF stage it was envisioned that this amount would be split between Ministry of Environment, Higher Council for Environment & Natural Resources; Ministry of Petroleum; Ministry of Agriculture; and Sudan Standards & Metrology Organisation. Instead, the entire amount has been contributed by Ministry of Environment, Higher Council for Environment & Natural Resources. Additional funds are contributed by Ministry of Petroleum, Ministry of Agriculture of the North State. The National Ministry of Agriculture and Sudan Standards & Metrology Organisation have not contributed.
Ministry of Finance and National Economy	3,000,000	3,000,000	Originally planned to contribute 50,000 in-kind, the Ministry of Finance has pledged to contribute 3,000,000 in cash to support the creation of a National PV Fund.
Government of the	1,400,000	150,000	Originally intended to contribute 1,400,000, the

Source of Co-Financing	PIF Amount (US $)	Actual Amount at CEO ER (US $)	Description
North State			Government of the North State through its Ministry of Agriculture will contribute 150,000 to be directed towards the development and implementation of water-efficient pumping techniques.
Sudanese Banks	19,507,484	14,000,000	The following banks: Al Nile, Al Shamal Islamic, Baraka, Family, Farmer's, Savings and Social Development Bank, and Sudanese Islamic Bank have each pledged to contribute 2,000,000 in soft loans to a PV fund to help finance PV pumps. The total capital required to install the proposed 1,468 pumps is $24,190,000. This is achieved through a revolving fund of $19,419,000, consisting of $2,419,000 of GEF funds (grants) which will provide a decreasing subsidy to pump units over the life of the project, and $17,000,000 of co-finance ($14,000,000 from banks, and $3,000,000 from MoF) to provide loans. A detailed calculation of the subsidy amount and scheme is provided in the UNDP Project Document.
Ministry of Petroleum	--	200,000	Originally intended to contribute to the 500,000 that the Ministry of Environment has pledged, the Ministry of Petroleum has made a separate pledge for $200,000 through its General Directorate of Energy Affairs.
Elrumayla	1,000,000	--	A private firm, Al Rumayla was originally intended to contribute 1,000,000 in-kind, but has not made a contribution due to the present business climate.
UNDP	550,000	550,000	No change
National Energy Research Center	Part of 2,250,000 in-kind	250,000 in-cash	Originally intended to be part of a group of other contributors in-kind, NERC will be a cash contributor in the amount of 250,000 and will play a significant role in providing the technical expertise
Total	**26,757,484**	**21,150,000**	The change reflects a decrease of $5,607,484, or approximately one fifth of the original amount. Half this amount is a decrease in in-kind co-finance. It is nonetheless possible to maintain the installed capacity target by using a revolving fund such that repayments on the early pumps help to fund later pumps. There has been a slight increase in National Government co-finance, with the Ministry of Petroleum's Directorate of Energy Affairs pledging $200,000 independently of HCENR's $500,000.

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:

A comparison of project outputs at the PIF and the CEO Endorsement Request stages is detailed in the table below. There are two material changes. The first is the installation of 28 pilot pumps has been included as an explicit output. This was part of the project at the PIF stage, but was not stated as an explicit and independent output. The supply and installation of these pumps will be one of the first activities under the project and is intended to create a demonstration case and serve as proof-of-concept to create demand for the follow-on technology diffusion activities. The second change is the inclusion of a water efficiency output under Outcome 2. This output will serve to decrease the overall cost of the pump and increase the sustainability of water use.

Table 2 - Comparison in Outputs (disaggregated by Component) from PIF to CEO Endorsement Request

Component	Outputs at PIF stage	Outputs at CEO ER	Comments
Outcome 1	1.1 National PV Fund and coordinated loan facility established and capitalized to promote concessional lending to farmers for PV pump equipment 1.2 A minimum of 1,468 off-grid PV pumps ranging in size from 3.12-29.6 kWp installed in farms in the Northern State of Sudan	1.1 28 pumps installed as part of a pilot phase 1.2 National PV Fund and coordinated loan facility established and capitalized to promote concessional lending to farmers for PV pump equipment. 1.3 A minimum of 1,468 off-grid PV pumps ranging in size from 3.12-29.6 kWp installed in farms in the Northern State of Sudan with support from the National PV Fund	The installation of 28 pilot pumps, which was already part of the project at the PIF stage, has been made an explicit output (1.1)
Outcome 2	2.1 Development and implementation of technical quality standards for PV pump components by the Sudan Standards & Metrology Organisation (SSMO), augmented by enforcement support for SSMO, Customs and relevant market observers 2.2 SSMO test and certification laboratories strengthened to test and label PV pump components 2.3 Software tool for pump sizing according to farm and hydrological conditions developed and implemented 2.4 Training and certification scheme for PV pump installers (including local retailers, technicians and pump rental companies) developed and implemented 2.5 Strengthening (or creation) of water user groups as reliable credit counterparties, accompanied by training	2.1 Development and implementation of technical quality standards for PV pump components by the National Energy Research Centre (NERC), augmented by enforcement support from SSMO, Customs and relevant market observers 2.2 SSMO test and certification laboratories strengthened to test and label PV pump components 2.3 Software tool for pump sizing according to farm and hydrological conditions developed and implemented 2.4 Training and certification scheme for PV pump installers (including local retailers, technicians and pump rental companies) developed and implemented. 2.5 Research on development of the most relevant, water efficient, irrigation techniques directly applicable in the North	An additional output has been added to promote sustainable pumping practices (2.6)

	for farmers and water user groups on siting, installation, operation and maintenance of PV pumps	State at minimal cost and dissemination of techniques to farmers. 2.6 Promotion of sustainable pumping practices based on outputs of the Nubian Sandstone Aquifer System from a separate GEF project (ID 4736).	
Outcome 3	3.1 Development of a standardized baseline for pump fuel-switching, applicable to Sudan and the wider region 3.2 Implementation of the standardised baseline within a NAMA	3.1 Development of a standardized baseline for pump fuel-switching, applicable to Sudan and the wider region 3.2 Implementation of the standardized baseline within a NAMA	No change
Outcome 4	4.1 Inclusion of PV pumps in the fiscal concessions lists of the Investment Law and the Agricultural Implements Regulation 4.2 Structured replication programme for other states designed and implemented, including strengthened integration of PV pumping in the Government's national energy roadmap and rural energy access strategy 4.3 Sustainable market dynamic for PV pumps (and other mitigation technologies) created through structured awareness-raising and capacity development activities and through synergies with Government irrigation programmes	4.1 Inclusion of PV pumps in the fiscal concessions lists of the Investment Law and the Agricultural Implements Regulation 4.2 Structured replication programme for other states designed and implemented, including strengthened integration of PV pumping in the Government's national energy roadmap and rural energy access strategy 4.3 Sustainable market dynamic for PV pumps (and other mitigation technologies) created through structured awareness-raising and capacity development activities and through synergies with Government irrigation programmes	No change

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

Table 2 - Comparison of GEF Fund allocation at PIF and CEO Endorsement stages.

Component	GEF Funds at PIF stage (US$)	GEF Funds at CEO Endorsement (US$)
Component 1: Financing and dissemination mechanism established and operational to support a PV pump installation programme	2,695,852	2,755,853
Component 2: Financing and dissemination mechanism de-risked through technical standards and demand-side support	746,544	746,544
Component 3: Mitigation instrument design elaborated and implemented in support of the PV pump installation programme	456,221	396,310
Component 4: Supportive enabling environment and scaled-up implementation	259,243	259,243
Project Management	207,893	207,803
Total	**4,356,753**	**4,356,753**

There is very little overall change in the allocation of GEF funds, with the only change being transfer of 60,000 from Component 3 to Component 1. This is in response to comments from GEFSEC advising on the reduction of budget for Component 3.

The project provides excellent "incrementality" as it seeks to help create a revolving and self-sustaining National PV fund that will support the long-term finance of solar PV pumps, even after the conclusion of the project.

The project has been extended from the initially envisioned four years to five years to allow additional time for the uptake of the solar PV pumps and adjustment of the financial scheme according to operational field data collected once the pumps are installed.

Direct GHG Emission Reductions

The calculated global GHG reduction benefits of the project will consist of a combination of:

- Direct GHG emission reduction benefits from the replacement of diesel engines with solar panels through 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 data on which the ERs are based is provided below:

Parameter	Value
Specific Diesel Consumption[6]	11 L/day for 3.12 kW pump equivalent 16 L/day for 5.12 kW pump equivalent

[6] As measured by M. Adeen and reported by A. El Amin at two different farms for three days and averaged and for a diesel pump equivalent to a 5.12 kW solar PV pump. Rates for other pumps are extrapolated based on these measurements.

Parameter	Value
	96 L/day for 29.6 kW pump equivalent
Irrigation days per year	270
Emission Factor for Diesel energy conversion	2.66 kg CO2/liter
Installed capacity	1276 × 3.12 kW pumps 128 × 5.12 kW pumps 64 × 29.6 kW pumps
Diesel savings (liters) – lifetime	5,886,720
Total emission reductions due to diesel displacement over lifetime of system (direct)	313,174 tCO_2
Total indirect emission reductions from project – Replication factor of 4 in post-project period (Bottom Up)	1,252,694 tCO_2
Total indirect emission reductions from project – Top Down	2,160,005 tCO_2

Direct CO_2 reductions =
(270 days/year × (1276 × 11 L/day + 128 × 16 L/day + 64 × 96 L/day) × 2.66 kg CO2/L)) × 20 years

The direct CO_2 emission reductions attributed to the replacement of diesel pumps with solar pumps by the UNDP-implemented, GEF-financed project, are calculated to be 15, 659 tCO_2/year, or 313,174 tCO_2 over the 20 year life of the pumps. With a GEF financial contribution of $4,365,753, this translates to a cost of GEF US$13.94/$tCO_2$ abated directly, and US$2.02 - US$3.49/tCO_2 abated indirectly. This does not include reduced diesel consumption by those who may adopt the water saving measures to be promoted by the project even if they do not adopt the solar pumping.

If we further assume, based on data collected, total irrigation days per year of 270 days/year, then the project can be expected to save a total of 5.9 million liters of diesel per year, which translates to an annual GHG reduction of 15,659 tCO_2/year.

The calculation represents the most conservative scenarios in two ways. First, diesel consumption varies widely for pumps depending on usage, age, condition, etc. The calculation uses the most conservative figures by using the lowest reasonable scenarios encountered during the PPG. Other reasonable scenarios exist which could indicate almost twice the carbon reduction. Second, the calculation does not take into account any lifting of customs duties or tariffs on the pump which would have the effect of wider adoption and increased capacity to finance through the National PV fund. Similarly, the estimates for installed capacity are considered conservative. Simple calculation shows that available co-finance could potentially support a larger installed based however the original target is kept with additional funds left as a contingency to for risks such as currency fluctuations.

The project will take appropriate precautions that the old diesel pumps replaced by solar pumps are not recirculated on the market as very low-cost alternatives for pumping water. Such precautions may eventually include a scrapping programme or requiring farmers to turn-in their diesel pumps as part of entering into a finance agreement for a solar PV pump, potentially after a trial period to ensure the solar pump is working adequately. Initially, farmers may be allowed to keep their diesel pump, provided that it is connected on the same well or source as the solar pump and therefore would only be used as backup or when solar radiation is not sufficient. It is entirely plausible that a farmer would legitimately wish to retain their diesel pump as backup. The matter is sensitive because farmers could risk loss of crop if for any reason the solar pump were not to pump for an extended period. Hence, the matter is not easily decided and will take a few years of

operation to adequately sort in a way that gives farmers appropriate assurance and at the same time ensures there is not "leakage" of emissions reductions through the availability of scrap diesel pumps on the market.

Indirect GHG Emission Reductions

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, a further 1,252,694 tCO_2 can be calculated as indirect GHG emission reductions.

Top-Down analysis:

There are an estimated 6,500 pumps in the Northern State. Assuming conservatively that one quarter of these can be converted to solar, this provides a further 1,625 pumps. Further assuming that in each of Sudan's 17 states one third of this figure, 500 pumps, will be converted to solar PV this provides a total of 10,125 pumps. Assuming a pump size distribution similar to that proposed in the Northern State, this results in a reduction of 2,160,005 tCO_2 over the 20 year lifetime of the pumps.

Under a business-as-usual scenario, farmers would continue to use diesel pumps where electricity from the grid cannot be connected. This would result in further increase of diesel usage and the corresponding diesel supply chain. The pumps also require intensive use of lubricants, oils, and rubber belts to transmit power. Hence, an overall reduction of materials and oil based goods can be achieved.

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:

A detailed risk assessment is presented in the Project Document. The table below summarizes those risks as well as those presented at the PIF stage.

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
1	The security situation in Sudan may pose some risks or perceived risks. Without general security, the ability to travel, transport goods and work will be restricted. With renewable energy equipment, where the entire capital is procured and installed upfront, theft or damage can mean a complete loss of invested capital.		Political/ Operational	May prevent access to certain areas for implementation of projects. P[7] = 2 I[8] = 3	Advice on secure travel routes within Sudan. An escort from MWRE will be provided where necessary. The location of main activities in the project (Dongola, in the North State) is secure.	Project Board		N/A	N/A
2	The Government may fail to subsidize the programme or the Banks may require an interest rate too high to make the project attractive, or diesel subsidies may continue to make diesel artificially inexpensive.		Regulatory	Lack of policy basis to catalyze adoption of solar energy P = 2 I = 5	Policy reform and decision making can be slow in Sudan. UNDP will rely on close relations with MWRE and other counterparts. Through close participation, UNDP will aim to spur action. The need to replace diesel, and increase agricultural output provides a strong incentive for the adoption of solar pumping.	Government		N/A	N/A
3	Currency risk		Financial	The price of diesel is fixed in local currency while the price of pumps (which are imported) fluctuates with the currency. P=3 I=3	By establishing a low-cost financing mechanism and removing taxes and duties from PV pumps, the pumps can be shown to be competitive with the price of diesel pumping today. Farmers are eager for an easier to use alternative to				

[7] Probability from 1 (low) to 5 (high)
[8] Impact from 1 (low) to 5 (high)

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
					diesel pumps. If solar PV pumps can be shown to be effective they may be willing to pay a premium for them, given an efficient financing mechanism.				
4	Falling oil prices may mean that diesel prices continue to be low and incentives for Government to lift subsidies on diesel are reduced.		Financial	P=2 I=4	As with currency risk, if PV pumps can be established as a viable technology with efficient financing mechanism, they may be adopted even at a premium to diesel.				
5	Climate change risk		Environmental	P=1 I=2	Climate change impacts may manifest through one of two ways. Reduced rain water will mean increased reliance on irrigation for pumping. Reduced Nile water flows will mean increased power needed for pumping. The project helps mitigate both aspects by providing a renewable energy source for pumping.	NA			
6.	Novelty and adoption risk – individual farmers or banks may be slow to adopt new technology and take-up unfamiliar business models.		Organizational	Slow uptake of solar water pumping by market participants. P = 2 I = 4	Farmers are eager to be rid of the burden of diesel fuel and mechanical pumps. If an alternative can be demonstrated to work reliably, they are expected to switch. Banks are apprehensive given the unknowns in the project. Once initial loans are being repaid, the banks will regard this as another money	Project Board		N/A	N/A

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
					generating investment.				
7	Technology risk – Technical failures, either due to equipment failure or bad installation, or bad design/sizing can be ruinous for the farmer and lead to lack of adoption by others and lack of finance by the banks.		Technological	Lower than anticipated water volumes out of the pumps installed. P = 2 I = 3	Consultants hired for the project will be tasked with studying and emphasizing appropriate design/sizing. Pumps may be procured with certain guarantees.	NA		N/A	N/A
8	Financial Risks – The capital required remains significant. The interest rates typically charged by the banks are too high to make solar pumping attractive.		Financial	Lack of financing is likely to mean low adoption rates as farmers are not likely to have the capital to purchase solar pumps. P = 2 I = 4	The project will work closely with the banks to provide the confidence they need to lend and with Government and the Bank of Sudan to achieve affordable finance rates and make the investment in solar pumping attractive for farmers.	Government			
9	Lack of adequate and reliable market data to facilitate the monitoring of project impacts and planning of further policy measures.		Operational	Reduced information on the reaction of the market to the measures implemented. P = 2 I = 2	Close cooperation with the main participants in the local solar pumping market, in particular the local distribution companies and NERC to obtain the required data will be emphasized. Robust MRV arrangements will be put in place, in particular for the NAMA. GHG monitoring can allow estimations of avoided costs (fuel imports, avoided thermal generation capacity, etc.) to be derived with a fair degree of accuracy.	National Project Manager (NPM)			
10	Inadequate and/or non-capacitated human resources to successfully implement the		Operational	Project not meeting the stated targets.	Solar pumping is not terribly complex and relies mainly on concepts and components	National Project Manager (NPM)		N/A	N/A

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
	project and support the mainstreaming of its results.			P = 1 I = 5	already available – driving electric motors. The remaining parts – solar panels and controller, are encapsulated at the manufacturer. Required local human capacity is limited to “plug and play” interaction. It is expected that technicians servicing diesel pumps will be entirely capable of providing all services. The project includes significant capacity building and outreach components to help overcome this risk. The project will use the individuals trained to implement solar pumps under the project, thereby providing immediate use for the knowledge they have acquired and providing them with immediate income from it.				

In addition, the Project Document identifies the following social and environmental risks

QUESTION 2: What are the Potential Social and Environmental Risks? *Note: Describe briefly potential social and environmental risks identified in Attachment 1 – Risk Screening Checklist (based on any "Yes" responses).*	**QUESTION 3: What is the level of significance of the potential social and environmental risks?** *Note: Respond to Questions 4 and 5 below before proceeding to Question 6*			**QUESTION 6: What social and environmental assessment and management measures have been conducted and/or are required to address potential risks (for Risks with Moderate and High Significance)?**
Risk Description	***Impact and Probability (1-5)***	***Significance (Low, Moderate, High)***	***Comments***	***Description of assessment and management measures as reflected in the Project design. If ESIA or SESA is required note that the assessment should consider all potential impacts and risks.***
Risk 1: Extraction of Ground Water	I = 5 P =5	Moderate	The project is based on using solar pumps to irrigate where there is no grid. A large portion of these will pump ground water. Despite this, significance is rated as moderate because this ground water would be pumped with diesel powered pumps in many cases. While solar pumping is "free" once the pump is installed. It is also self-limiting in that it runs only during the day. The implementation of the project will reduce water extraction by employing efficient irrigation techniques. But will also allow cultivation of larger land area, extracting more water.	A separate project is being undertaken (in the PIF stage to GEF) to study in detail the Nubian Sandstone Aquifer System which the pumps would extract water from and determine sustainable levels of extraction. The project is expected to proceed largely in parallel with this project. As part of the PPG process, a study of underground water wells and pumping rates was undertaken. The study indicates based on the drawdown rates that the wells can support the present extraction rates. The solar pumps are not expected to increase the extraction rates but rather decrease it as a result of efficient irrigation methods that will be put in place as part of the project implementation.
Risk 2: Forced evictions	I = 5 P = 1	Low	Forced eviction may occur where a farmer uses his land as collateral for a loan to buy a pump and for any reason is unable to repay the loan triggering repossession of the land by the lender.	The project is undertaking measures to provide banks with alternative collateral, such as the pump itself, thereby insulating farmers from this risk while still providing the bank with the guarantees needed to lend and ensuring the farmers are sufficiently engaged.

Risk 3: Inequitable adverse impacts on farmers living in poverty	I = 2 P =2	Low	Impoverished farmers may not be able to obtain loans from banks thereby leaving them at a competitive disadvantage to farmers who are able to use solar pumping and reduce their cost.	The project seeks to enable all those who can benefit from loans to obtain them. Farmers unable to obtain loans may apply through cooperatives or other means. The impact of the probability and impact are rated as moderately low because farming on credit is the prevailing method, so all impoverished commercial farmers rely on some form of credit for things like fertilizer. Those who do not likely engage in some kind of subsistence farming and are not likely to be directly affected. These farmers are also unlikely to be planting plots of land using a dedicated pump. Still, the project will explore possibilities for providing these farmers with a mechanism to obtain solar pumps as a cooperative.

A.7. Coordination with other relevant GEF financed initiatives

In addition to the coordination with other relevant GEF financed initiatives presented in the PIF, the project will coordinate with the GEF initiatives described under Section A.3.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

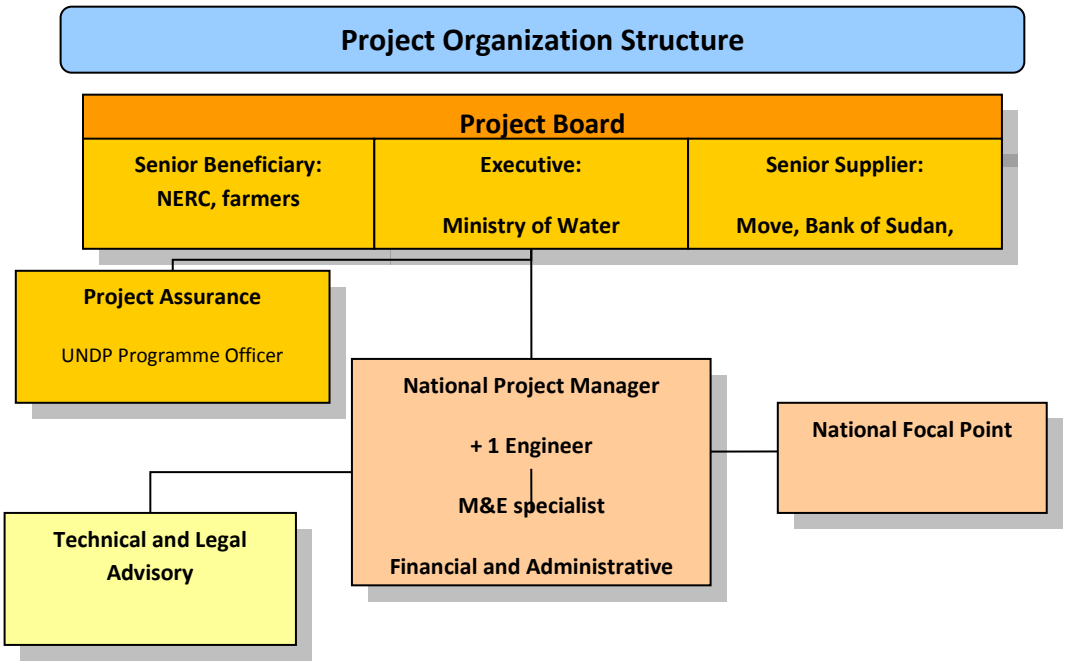
B.1 Describe how the stakeholders will be engaged in project implementation.

Extensive stakeholder consultations were carried out during the PPG phase, including two visits to Dongola, in the North State where the project will be carried out. These included stakeholder consultation workshops there with attendees from Local Government, Civil Society, Farmers Association, and the general public.

In addition, two extensive workshops were held in Khartoum at the headquarters of the Ministry of Water Resources and Electricity

Project Stakeholder	Relationship With The Project
Ministry of Water Resources & Electricity (MWRE)	The principal role of MWRE is to formulate policies, strategies and action plans for the supply of electricity in Sudan, with a key focus on diversifying Sudan's electricity mix to include renewables. MWRE has been undertaking a pump switching programme in Northern State, assisting farmers to switch from diesel-powered irrigation pumps to grid-connected electric pumps. With the opportunities for further on-grid switching almost exhausted, MWRE is promoting the use of off-grid PV pumps instead. MWRE will be responsible for implementing the GEF project.
Ministry of Environment, Forestry & Physical Development (MEFPD)	MEFPD is the national focal point for the GEF and, under its subsidiary HCENR, the UNFCCC. MEFPD will be involved in technical assistance on the coordinated loan mechanism and on the climate finance elements of the project.
Higher Council for Environment and Natural Resources (HCENR)	As the national focal point for climate change under the UNFCCC, HCENR is responsible for coordinating National Communications, the development of Climate Change Action Plans, NAPAs, Technology Needs Assessments and NAMAs. The GEF project will build on a number of HCENR initiatives, including the development of standardized baselines, the elaboration of a national Low Emission Development Strategy, and the analysis of sectoral NAMA opportunities.
Ministry of Petroleum, Renewable Energy Directorate (MoP)	The Renewable Energy Directorate of MoP has a national mandate for renewable energy resource mapping and off-grid renewables applications. MoP has developed an expertise in rooftop PV systems and has begun to experiment with a limited number (7 to date) of PV irrigation pump units. MoP will assist the GEF project with advisory support, local capacity development and national policy formulation.
Ministry of Agriculture (MoA)	MoA is the implementing body for the Agricultural Strategic Plan (2007-2015), which has the central objective of increasing the amount of farming land in Sudan by 70% and – within that overall target – doubling the amount of irrigated land. MoA operates a number of support programmes for farmers on agricultural practices, including irrigation and water pumping. The GEF project will coordinate its PV pump installations, capacity development and replication programme with MoA's support activities. MoA is also expected to play a key role in the context of liaising with water user groups and coordinating the NAMA, in ensuring inclusion of PV pumps in the Agricultural Implements Regulation.
Ministry of Finance & National Economy (MoF)/Bank of Sudan	MoF will support the establishment of a National PV Fund with technical and financial assistance and may be the custodian of the fund. MoF will assist with finance-related aspects of the project, notably the support to banks and oversight of banks' micro-finance lending and inclusion of PV pumps in the fiscal concessions list of the Investment Law and the Agricultural Implements Regulation. The Ministry also works closely with the Customs Administration, which will enforce the technical standards for PV hardware that will be

	developed by the Sudan Standards & Metrology Organisation. MoF will also assist in establishing National Fund to support the deployment of solar pumps.
National Energy Research Centre (NERC)	NERC (formerly the Energy Research Institute, ERI), under the Ministry of Science and Communication, is the primary institute at the national level for conducting research on renewables in Sudan, as well as pilot project implementation. The Solar PV Encapsulation & Manufacturing Unit is the implementation arm of NERC: it has undertaken a number of PV pump installations in Nile State and Darfur, accompanied by system monitoring and technical performance assessments. NERC will support the GEF project in understanding farmers' technical and operational pumping needs, in designing a pump sizing software tool, in installing and monitoring demonstration PV pump units, and in capacity development.
Sudan Standards & Metrology Organisation (SSMO)	SSMO is a Government body established to coordinate Sudan's engagement with the International Standards Organisation (ISO), the African Regional Organisation for Standardization (ARSO) and the Arab Standards and Metrology Organisation (ASMO). SSMO operates 15 testing and certification laboratories across Sudan. The GEF project will build upon SSMO's mandate and expertise to support SSMO in developing technical standards for the PV pump hardware that will be deployed in Northern State (and subsequently nationally).
Northern State Government	Sudan has a federal governance structure, made up of 18 states with delegated functions and powers. The Northern State Government has been actively promoting grid-connected irrigation pumps as a means of improving farmers' livelihoods and reducing their (and the State's) reliance on diesel fuel, and is now extending this support to off-grid PV pumps in areas where grid extension is infeasible. The GEF project will build on the State Government's established support programme for electric pumps, and will harness the State Government's institutions (e.g. the State Ministry of Agriculture) and agricultural stakeholder networks.
Commercial banks	The Agricultural Bank of Sudan, the Farmers Bank, the Savings Bank and the Islamic Bank have together financed – through ad hoc (uncoordinated) loans to farmers – the installation of approximately 2,000 grid-connected electric pumps in Northern and Nile States since 2011. Seven banks have committed to providing US$2 million each in loans to support the financing mechanism supported under the project. The GEF project will work with the State Government and the banks to coordinate their lending for this purpose, to develop the internal capacities of the banks to structure loan packages and assess loan risks, and to market innovative financial products to drive farmer take-up of PV pump technology.



The project will be nationally executed by the Ministry of Water Resources and Electricity, under the National Implementation Modality (NIM). UNDP will be accountable for the disbursement of funds and the achievement of the project goals, according to the approved work plan. A Government Project Coordinator (GPC) will be appointed by MWRE, to coordinate project operations and support the NPM with overall administration, oversight, coordination of activities and maintaining a liaison with UNDP. The GPC will: (i) coordinate the project activities with activities of other Government entities; and (ii) certify the expenditures are in line with approved budgets and work-plans and his remuneration will be incurred by the government.

The project includes funding for grant mechanism which will be operated by MWRE and the Central Bank in parallel to the project. The selection procedures and eligibility for how targeted beneficiaries can access grant subsidies under Outcome 1 will be done according to transparent and pre-defined criteria established under year 1 of the project and codified as part of the establishment of the national PV fund. The contribution of GEF funds (for subsidies) is likely to be in tranches, based on performance. The funds may either be directed to the Central Bank's national PV fund (at the request and formal delegation of MWRE) and will then be disbursed or advanced against the eligible purchase of each individual solar PV pump and then reconciled on a regular (e.g. quarterly basis) following certification by the PB that proper procedures were followed for selection of beneficiaries. Alternatively a dedicated bank account for the grant subsidies will be set up at UNDP Sudan country office and then the funds could be advanced or disbursed to MWRE (or the Central Bank based on their delegation) following the same procedures and rules.

In the former case the transfer of any GEF funds for equipment subsidies to the national PV fund will only happen upon the provision of proof of the legal establishment of the fund by the executing agency (or their delegated financial custodian) with all requisite fiduciary and legal conditions 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 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 operation of the national PV fund based on a self-sustaining business model and the continued monitoring of solar pump utilization by beneficiaries of grants funded by the project.

A Project Board (PB) will be established at the inception of the project to monitor project progress, to guide project implementation and to support the project in achieving its listed outputs and outcomes. It will be chaired by an MWRE representative and will include representatives from MoF, Bank of Sudan, NERC, SSMO, HCENR, and a Project Assurance Officer from UNDP. Other members can be invited at the decision of the PB on an as-needed basis, but taking due regard that the PB remains sufficiently lean to be operationally effective. The final list of the PB members will be completed at the outset of project operations and presented in the Inception Report by taking into account the envisaged role of different parties in the PB. The national project manager will participate as a non-voting member in the PB meetings and will also be responsible for sharing required documents sufficiently in advance of the meeting and compiling a summary report of the discussions and conclusions of each meeting.

The coordination of the above stakeholders will be carried out by MWRE with the support of UNDP. The coordination will begin with the establishment of a Local Project Appraisal Committee (LPAC) and the invitation of stakeholders to an inception meeting. The PB will identify and put in place steps for initial activities to support, for example, the technical capacity building in the period when the regulatory and financial structures are being developed. One goal of project coordination will be to ensure that the various components of the project are in place when they are needed: e.g. financial instruments are ready when regulations come into place; technical capacity and equipment supply are available at the appropriate time, etc.

The PB will meet semi-annually during project implementation, and it will have the responsibility of coordinating and harmonizing the actions of all the key stakeholders.

The day-to-day management of the project will be carried out by a Project Management Unit (PMU) under the overall guidance of the PB. The PMU will be established within MWRE and will coordinate its work with UNDP, MoP, HCENR, and other stakeholders. The National Project Manager will report to MWRE and the PB. The Terms of Reference of the key project personnel are presented in Annex 8.3 of this Project Document. The project personnel will be selected on a competitive basis in accordance with the relevant rules and procedures and in consultation with the UNDP Country Office, Ministry of Finance, and Government.

The national project manager will be supported by international and national experts taking the lead in the implementation of specific technical assistance components of the project. Contacts with experts and institutions in other countries that have already gained experience in developing and implementing renewable energy policies and financial support mechanisms are also to be established.

UNDP will maintain the oversight and management of the overall project budget. It will be responsible for monitoring project implementation, timely reporting of the progress to the UNDP Regional Centre and the GEF, as well as organizing mandatory and possible complementary reviews and evaluations on an as-needed basis. It will also support the executing agency in the procurement of the required expert services and other project inputs and administer the required contracts. Furthermore, it will support the coordination and networking with other related initiatives and institutions in the country.

To successfully reach the objective and outcomes of the project, it is essential that the progress of different project components is closely monitored both by the key local stakeholders and authorities as well as by project's international experts, starting with the finalization of the detailed, component-specific work plans and implementation arrangements and continuing through the project's implementation phase. The purpose of this is to facilitate early identification of possible risks to successful completion of the project together with adaptive management and early corrective action, when needed.

In order to accord proper acknowledgement to the GEF for providing funding, a GEF logo should appear on all relevant GEF project publications, including any hardware purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgement to the GEF in accordance with the relevant GEF guidelines.

The international experiences and lessons-learned from catalyzing local renewable energy development have been taken into account in the design of this new project. The activities of other donors and the foreseen synergies and opportunities for cooperation have been discussed in detail in Chapter 1.4 of this project document. During implementation, proper care will be taken to have adequate communication and coordination mechanisms in place to ensure that areas of common interest can be addressed in a cost-efficient way.

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 (LDCF/SCCF):

Once the initial cost of the 1,468 pumps installed under this project is paid, over a 10 year period, the farmers who own these pumps stand to save a collective US$56 million in avoided diesel costs over 15 years of essentially free pump operation (assuming a 25 year life). From the date of installation of the pumps, farmers will be insulated from fluctuations in the price of diesel, oil, and spare parts. They will also be able to more constructively employ their time and effort. Several farmers surveyed as part of the PPG process indicated the time and effort wasted maintaining and operating the diesel pump as a significant nuisance and impediment to their productivity. A somewhat unquantifiable but very noticeable benefit is reduced noise pollution. The silence of the country-side is often shattered by the sound of diesel engines pumping water. The ability for farmers to irrigate and work without the nuisance of noise pollution is perhaps one of the more understated benefits of electric pumping in general, and solar PV pumping in particular.

As a result of the project, capacity will be built in Sudan around solar PV. This is both at the national level and local level. A the national level, institutions such as NERC and SSMO will receive equipment, training, exposure to new technology and a new role within society to support the deployment and adoption of solar PV pumping.

At the local level, new means of employment will be created in sizing and installing solar PV pumps. The technical skills developed in carrying out such tasks will transfer directly to the use of solar PV technology for other applications creating opportunities beyond solar pumping. If the estimated installation rate for pumps is 360 pumps per year (one quarter of the target amount per year), this equates to almost 1.6 pumps per working day assuming 220 working days per year. It takes approximately 3 people 3 days to install a pump. It will take approximately 3,600 man-days per year to install the pumps targeted under the present project (9 man-days for 3.12, and 5.12 kW pumps, 25 man-days for a 30 kW pump). Assuming 200 work days per year, and that installers are occupied with installations two-thirds of their working time, this means the direct creation of some 27 jobs for skilled technicians installing PV to meet the project targets in the Northern State. With national replication, this translates to a minimum of 184 skilled technical jobs around the country for PV installation pumps alone. The supply chain to provide the pumps will likely employ a similar number of persons to size, buy, import and handle logistics. Thus, a total of 368 jobs can be expected to be created directly.

Other benefits that can be expected include reduced tanker truck transportation on public roads (transport of some 5.9 million liters of diesel will be avoided, or some 300 tanker loads) as the need to transport diesel from the main cities and ports to agricultural areas is reduced. Also reduced is the risk of soil and ground water contamination due to diesel spillage. Associated national and local benefits include reduced local pollution from the burning of fossil fuels, strengthened national energy security through reduced dependency on imported fuels.

These developments and capacity building will catalyze the adoption of solar technology in general and provide a foundation that allows the widespread use of solar energy either in response to regulatory or market stimuli or simply to provide power where diesel in not cost-effective or not readily available and solar may already be advantageous but is not utilized due to a lack of capacity or awareness.

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

The GEF financing for Outcome 1 (US$2,755,853), represents the bulk of the GEF financing for the project and has been allocated to support the development of pilot solar PV projects. These are seen as the most critical step in launching solar pumping in Sudan by demonstrating to farmers that solar pumping is viable and demonstrating to bankers that it is a reliable, financeable activity. The success of these solar pumping demonstrations will translate to future projects while a failure will setback solar pumping in Sudan by several years.

At present, no entity is willing or capable of putting forth the finance and technical support necessary for such a demonstration. Hence, UNDP-GEF support will be critical in implementing these demonstration systems and doing it in a way that can prove successful and inspire the confidence of future stakeholders. The GEF investment of $2,755,853 in this component will directly mobilize a total $24,190,000 in investments in solar pumps. This financing will in-turn result in fuel savings over the life of the pump of some $90 million, of which $56 million will be retained by farmers once they have paid off the value of their pumps.9

The GEF financing for Outcome 2 ($746,544) assures cost-effectiveness in two principal ways. First, it will serve to guarantee the quality of the $24,190,000 worth of pumps purchased under the project and that they are suitably sized and selected for the conditions of their application. Second, the water efficiency component will ensure that the amounts of water needed are optimized and therefore the pump size, and

[9] Figures are based on 25 year pump life and 10 years loans at 9% cost of finance.

associated capital cost can be minimized for a given crop and area.

The GEF financing for Outcome 3 ($396,310) consists of technical assistance to develop a standardized baseline and Nationally Appropriate Mitigation Actions (NAMA) to secure international carbon finance to support the long term development of solar pumping in Sudan.

The GEF financing for Outcome 4 ($259,243) consists of technical assistance to enable documentation and dissemination of experience gained in the present project in the North State for replication in other areas.

The proposed project is extremely cost-effective as it will utilize relatively limited GEF funds to leverage investments in agriculture throughout Sudan. The potential for replication in Sudan and other areas is significant. Water pumping is problematic and costly in most of Africa and relies on imported, hard to obtain, diesel. With a demonstrated alternative, adoption can be expected to spread quickly. The cost-effectiveness of the project is reflected in its GHG abatement cost of $13.94/tCO2 of direct emissions; and US$2.02 - US$3.49/tCO2 of indirect emissions.

C. DESCRIBE THE BUDGETED M &E PLAN:

The project will be monitored through the following M& E activities. The M& E budget is provided in the table below.

Project start

A Project Inception Workshop will be held within the first 2 months of project signature with those with assigned roles in the project organization structure, UNDP Country Office and, where appropriate/feasible, regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:

Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.

Based on the project results framework and the relevant SOF (e.g. GEF) Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.

Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.

Discuss financial reporting procedures and obligations, and arrangements for annual audit. Propose implementation and financial arrangement for grant component under Outcome 1 and prepare execution of required agreements or delegation of responsible parties. Prepare roadmap for establishment of an Independent Review Mechanism that will review and endorse the selection of all grant recipients funded by GEF and regularly assess the performance of these beneficiaries in managing the assets subsidized by the grants over the course of the project

Plan and schedule Project Board meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly

Quarterly monitoring procedure includes:

Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.

Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, micro-finance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical). Quarterly reports will include regular monitoring on the grant component under Outcome 1.

Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.

Other ATLAS logs can be used to monitor issues, lessons learned etc. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually

Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and SOF (e.g. GEF) reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lessons-learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle

The project will undergo an independent Mid-Term Review at the mid-point of project implementation (2017). The Mid-Term Review will determine progress being made toward the achievement of outcomes and will

identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-Term Review will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Centre (ERC).

The relevant SOF (GEF) Focal Area Tracking Tool will also be completed during the Mid-Term Review cycle.

End of Project

An independent Final Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and SOF (e.g. GEF) guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Review, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Final Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Centre (ERC).

The relevant SOF (e.g. GEF) Focal Area Tracking Tool will also be completed during the final evaluation.

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

Learning and knowledge sharing

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons-learned. The project will identify, analyze, and share lessons-learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at http://intra.undp.org/coa/branding.shtml, and specific guidelines on UNDP logo use can be accessed at: http://intra.undp.org/branding/useOfLogo.html. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at http://intra.undp.org/coa/branding.shtml.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf

Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

M&E work plan and budget

Type of M&E activity	**Responsible Parties**	**Budget US$** *Excluding project team staff time*	**Time frame**
Inception Workshop and Report	▪ National Project Manager ▪ UNDP CO, UNDP-GEF	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	▪ Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on *output and implementation*	▪ Oversight by National Project Manager ▪ Project team	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	▪ National Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP GEF	None	Annually
Periodic status/ progress reports	▪ National Project Manager and team	None	Quarterly
Mid-term Review (with particular emphasis on evaluation of Outcome 4 to guide future replication and expansion)	▪ National Project Manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 40,000	At the mid-point of project implementation.
Final Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost : 40,000	At least three months before the end of project implementation
Project Terminal Report	▪ National Project Manager and team ▪ UNDP CO ▪ local consultant	0	At least three months before the end of the project
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year:	Yearly

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
		3,000	
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF-supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US$ 105,000 (~2% of total budget)	

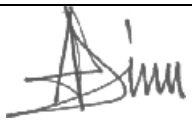
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

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)*
Dr Babiker Abdalla Ibrahim	Under-Secretary, Ministry of Environment, Forestry & Physical Development; GEF OFP	MINISTRY OF ENVIRONMENT, FORESTRY & PHYSICAL DEVELOPMENT	01/20/2014

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		December 21, 2015	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 Programme Outcome as defined in CPAP or CPD: Expected CPAP Output (2.2): Investment in green energy and access by needy communities to sustainable energy improved					
Country Programme Outcome Indicators: Number of communities with access to alternative sources of renewable energy-based services /Baseline: Limited access to renewable energy /Target: 50 communities					
Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one): 1. Mainstreaming environment and energy OR 2. Catalyzing 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: GEF-5 FA Objective # 3 (CCM-3): "Promote Investment in Renewable Energy Technologies".					
Applicable GEF Expected Outcomes: Total avoided GHG emissions from off-grid PV pumping.					
Applicable GEF Outcome Indicators: Avoided GHG emissions from off-grid PV pumping (tons CO_2).					
Strategy	**Indicator**	**Baseline**	**Targets**	**Source of Verification**	**Assumptions and risks**
Project Objective: Financing and dissemination mechanism established and operational to support a PV pump installation programme	• Amount of reduced CO_2 emissions reductions from water pumps for irrigation (compared to the project baseline) installed EOP, in tons $CO2_{eq}$	• 0	• 313,174[10]	Project's annual reports, GHG monitoring and verification reports	- It is assumed that the price of diesel fuel will increase through the continued lifting of subsidies. If the price of diesel does not increase, the adoption of solar pumps will be slowed or may be minimal. - Similarly, a drop in the value of the Sudanese
	• Cumulative installed capacity of off-grid PV solar pumps (kWp) • Fuel saved	• 0	• 6,531 kWp as 1,468 pumps • 5.9 million liters/year	Project final evaluation report	
	• Number of banks providing finance for solar PV pumps	• 0	• 7	Project final evaluation report	
	• Reduction of down-time and farmer's time lost to pump repair • Savings due to avoided diesel cost after pumps have been paid off (over 15 years remaining technical life)[11] • Number of new suppliers (partnerships) providing equipment financed by National PV Fund mechanism	• 0 • 0 • 0	• 80% • US$56 million • At least 7 (representing a business volume of approximately 200	Baselines surveys and monitoring information from installed pumps and comparison diesel pumps. Calculation based on installed pump capacity, and actual savings observed in the field.	

[10] GHG emissions reductions are calculated per GEF methodology and reflect GHG reductions from equipment installed during the GEF project over its lifetime, which extends beyond the GEF project. Calculations are for equipment life of 20 years, per GEF guidelines.

[11] Assumes technical lifetime of equipment of 25 years, per manufacturer warranty for solar modules are present diesel prices.

			pumps/supplier, or 50/year)		Pound would increase the cost of solar pumps and likewise inhibit their adoption.
	• Extent of change in modern energy coverage by users and specific sectors	• 0	• 22.5% (representing 1,468 pumps out of an estimated 6,500 existing)		
Outcome 1: Financing and dissemination mechanism established and operational to support a PV pump installation programme	• Investment mobilized for purchase of solar pumps by EOP	• 0	• US$24,190,000	Terminal impact assessment	
	• Dedicated mechanism for finance of PV pumps established	• None	• At least one national PV pump fund	Interviews with banks, farmers, and suppliers. Importation records from SSMO, or MoF	
Outcome 2: Financing and dissemination mechanism de-risked through technical standards and demand-side support	• Technical quality standards developed and enforced for PV pumps	• None	• Reasonable standards in place to assure quality	Interview with NERC, SSMO. Failure rate of solar pumps.	Assumption: the use of water at present is not optimal and substantial improvements can be made.
	• Number of entities trained and capable of specifying and supplying solar pumps	• 0	• 3	Market survey and adequacy of pumps for their purpose as determined by farmers' reports.	
	• Number of pumping system using water efficient irrigation methods	• 0	• 1,468	Report on water consumption and pumped volumes	
Outcome 3: Mitigation instrument (NAMA) design elaborated and implemented in support of the PV pump installation programme	• Development of a standardized baseline for solar PV pumping in Sudan	• None	• Standardized baseline developed and submitted to UNFCCC	UNFCCC database on standardized baselines	
	• Development of an MRV mechanism for solar water pumping	• No MRV mechanism	• An MRV mechanism developed and implemented	Project final evaluation report	
Outcome 4: Supportive enabling environment and scaled-up implementation	• Inclusion of solar pumps in fiscal concessions lists of the Investment Law and the Agricultural Implements Regulation such that they receive preferential financial treatment	• PV pumps are not included and receive no preferential treatment	• PV pumps exempt from customs and taxes, receive benefits afforded to other agricultural implements	National publication of laws and regulations	Cooperation of Government and regulatory bodies
	• PV Pumping integrated in National Energy Roadmap and Rural Energy Access Strategy	• PV pumping not a part of NER or REAS	• PV pumping integrated into NER and REAS	Review of the National Energy Roadmap and Energy Access Strategy	
	• Awareness raising and capacity		• At least one workshop	Project record or	

	building carried out		and demonstration held with the Ministry of Agriculture in each State in Sudan	workshops	

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).

GEFSec Comments at the PIF Work Program Inclusion	Response	Reflection in the Full Project Design
*2.Has the **operational focal point** endorsed the project?* Please provide a letter of endorsement clarifying the source of fund requested, the focal area concerned and the GEF Agency in the financing table.	The GEF Operational Focal Point has re-issued the Letter of Endorsement (attached to this re-submission).	Revised LoE attached to the re-submission – see Prodoc.
5. *Is the project consistent with the recipient **country's national strategies and plans** or reports and assessments under relevant conventions, including NPFE, NAPA, NCSA, NBSAP or NAP?* No. The recent National Communication and Technology Needs Assessments do not mention PV pumping as a priority for the country. Also, emissions from irrigation represent a marginal part of the country's GHG emissions. Please clarify. Please also consider whether a modification of the project scope could be considered to encompass some of the prioritized technologies of the recent TNA for the agricultural/rural sector, (such as improved cook stoves and biogas units).	Water pumping is critical to Sudan's ongoing development. As early as 1992, the Government conducted a national study to explore the techno-economic performance of diesel, solar and wind pumping technologies. The resulting National Comprehensive Strategy (1992-2002) included support to the use of PV pumps for rural water pumping (lack of funds unfortunately hampered implementation of the Comprehensive Strategy). The Renewable Energy Master Plan (2012-2031) specifically includes off-grid solar electrification, as does the Agricultural Strategic Plan (2007-2015). The Assessment of GHG Mitigation Options for NAMAs (2011) identifies solar pumping for irrigation as one of six priority PV applications. The Second National Communication (2013) notes that Sudan's GHG emissions increased by 8% between 1995 and 2000, driven in part by a 10% increase in energy-related fossil fuel emissions. The agricultural sector's importance is highlighted, both in terms of its economic prominence (accounting for more than one-third of GDP and providing 80% of employment and household income in rural areas) and as the second-largest source (after transport) of petroleum product - gasoline, diesel, residual fuel oil, kerosene – CO_2 emissions. The SNC identifies the vulnerability of non-irrigated farming to future climate change, due to expected reductions in rainfall and higher rates of evapo-transpiration. The SNC also identifies Sudan's "immense" solar resource, which it estimates as averaging 6 kWh/m^2, as having a key mitigation role. Both the GEF OFP and the UNFCCC Focal Point have issued letters of support to the project (see attached), emphasizing the project's alignment with Sudan's development and mitigation priorities. Regarding the potential expansion of the project scope to encompass other technologies – such as cook stoves	Please see Section 2.5, Project rationale and conformity, and 2.8 Theory of Change, of the Project Document. Supporting letters from the GEF OFP and the UNFCCC Focal Point attached to the re-submission.

	and biogas units – this was discussed during PIF stakeholder consultations (and again with the GEF OFP and UNFCCC FP this week) and rejected. While there are clear needs with respect to these other technologies, the Government of Sudan and the Government of Northern State believe that the project benefits from a dedicated focus on PV pumping, and builds on the firm baseline projects described in the PIF. The project is innovative in its deployment of micro-finance, climate finance (the NAMA modality) and level of ambition, and the associated implementation risks are more effectively addressed in the context of a focused project. Nonetheless, Sudan does have nascent cook stove and biogas digester 'sectors'. The Technology Needs Assessment identifies upfront cost as being a significant barrier to take-up of these technologies, particularly in the context of digesters (a family biogas digester costs approximately $2,500, as opposed to $5 for a basic improved stove). To date, these sectors have largely been grant-supported by the Government and donors. To achieve genuine sustained market growth, there is a need for commercial financing models to be introduced. Given that, in the context of the GEF project, banks will be enabled to develop and offer standardized finance products for one particular climate change mitigation technology (PV pumps), there may be potential for the banks to extend this learning to other technologies, such as cook stoves and biogas digesters. Consequently, an activity will be incorporated into Output 4.3 to help banks to connect to stakeholders involved in these other technologies for the purpose of catalyzing the development of additional micro-finance credit products.	
7. *Are the components, outcomes and outputs in the* ***project framework*** *(Table B) clear, sound and appropriately detailed?* Component 1: a) Please clarify what are the innovative financial products to be developed by the project to drive farmer take-up of PV pump technology.	As part of a general strategy to broaden the population's access to finance for poverty reduction purposes, the Central Bank of Sudan issued an instruction in 2011 to all commercial banks to allocate 12% of their lending to micro- and small-finance for non-traditional credit consumers. This attention to micro-finance reflects recommendations to this effect made by the Second National Communication, the National Adaptation Programme of Action and the National Capacity Self-Assessment (among others). However, banks have struggled to meet the 12% quota (with preliminary indications suggesting that just 5% of loans have met the definition), largely because of the lack of structured, replicable lending opportunities: the transaction costs of screening and processing individualized, ad hoc micro-finance loan applications	Please see revised project framework.

	covering a diverse range of clients and sectors have proved prohibitively expensive. Although the pumps in the project are beyond the size of "micro-loans", the project will strengthen the banks' ability to lend to individuals, particularly for renewable energy and energy efficiency applications. It will enable banks to systematize their micro-finance lending for PV irrigation pumps, to develop the internal capacities of the banks to structure micro-finance loan packages and assess loan risks, and to market innovative financial products to drive farmer take-up of PV pump technology, thereby opening up a significant and unprecedented opportunity to leverage private sector finance to facilitate the transition to solar pumping. The proposed National PV fund, though not new as a concept, will be innovative in its terms, conditions, and application (typically used for seasonal loans for crops).	
b) The project is designed on the assumption that a limited subsidy (13%) to 1,123 PV pump units will be enough to kick start autonomous market deployment. Since this may not be the case, please consider (i) a robust monitoring of the market develop trends initiated by the project, (ii) a prolonged subsidy scheme with a decreasing subsidy level and support to secure the financing needed for such prolonged subsidy if needed.	In its original design, the project was intending to establish and maintain a central register of qualifying loans so as to monitor PV pump take-up. This monitoring will now be augmented by complementary regular surveys of consumer awareness, customer satisfaction (among farmers who have acquired PV pumps), PV pump equipment market prices, PV pump equipment quality (see Response 7d below) and retailer sentiment. Such robust, broad-based and regular monitoring is intended to facilitate early detection of market developments and to enable programme design adjustments as and where necessary. The subsidy scheme has been amended so as to incorporate a degression scheme. The proposed subsidy level and degression will be validated according to the operational data gathered in the first year of the project, and will continue to be monitored throughout the project. Subsidies are envisioned to commence at 13% in the first year of operation of the finance scheme (Year 2) of the project and will decline by 2% increments annually, such that by the end of the GEF project subsidies are at 7%. The impact of this degression scheme is likely to be a 'fast start' to PV pump take-up (as farmers hurry to benefit from the higher initial subsidies) and freed-up financial resources for subsidizing more pump units. Specifically, the subsidy degression scheme will allow subsidies to be applied to 1,468 units (1,276 3.12 kW units, 128 5.12 kW units and 64 29.6 kW units) at a cost of GEF\$12.1/tCO_2. Compared with the original	Please see Section 2.1 of the Project Document and Annex 9.7 for subsidy calculations and financial analysis.

	project design, this represents a 28% increase in pump numbers and a reduction in carbon cost of GEF$3.4/t$CO_2$. The loan co-finance associated with these 1,468 units is $17 million. The market monitoring scheme to be established by the project will be used to monitor the impact of falling subsidies on adoption and loan default rates.	
c) According to the PIF figures, one PV pump is five times more expensive than a diesel pump and represents 4 years of annual income of a small-scale irrigation farmer. Please clarify how this very high investment level compares to the gains in reduced production costs that may benefit farmers. Please also clarify how such investment can be economically feasible for the targeted small-scale farmers.	Discussion with stakeholders indicates that there is a desire for solar water pumping to relieve the financial pain associated with operating diesel pumps. In addition, the project will help establish a revolving PV fund that will provide continuous finance post-project. Sudan has experience with such funds to finance the production requirements for agriculture. Economic evaluation of using solar pumps instead of diesel pumps shows that with an appropriate loan of 9% cost of finance and 10 year repayment period, the monthly installments on a solar PV pump can be comparable to the operating cost of a diesel pump. As suggested, a prolonged subsidy scheme with decreasing subsidy level and support is envisioned and supported by a revolving National PV Fund which will provide finance to the farmers purchasing the pumps. To be economically feasible to small-scale farmers, such farmers must have access to low-cost loans with extended tenors (the purpose of the finance elements of the project) and must have confidence in the quality and reliability of the pump hardware (the purpose of the certification elements of the project).	Please see Annex 9.2 of the Project Document, Stakeholder Involvement Plan
Component 2: d) Please clarify how the project will ensure the enforcement of the PV pump certification scheme during and beyond project implementation.	Sudan is currently working on the formulation of a Renewable Energy Law, which will include a requirement for certification of all renewable technologies. The project will build on this law to create PV technical specifications (which currently do not exist in Sudan) in conjunction with the Sudan Standards and Metrology Organization (SSMO). SSMO and the Customs Administration are responsible for the clearance of any imported goods into Sudan. For all imported goods, SSMO must issue a letter of Investigation Clearance (IC) confirming compliance with the set standards and specifications. The IC is then presented to the Customs Administration to release the imported goods. The project will provide training for SSMO personnel	Please see Ministry of Finance co-finance letter

	responsible for issuing the Investigation Clearances and also support the provision of measuring and testing equipment. The technical standards developed will also apply to locally-produced components such as solar modules. The project will work with the Consumer Protection Organization, a national and much-respected NGO, to build its capacity to observe the specifications of locally-produced hardware and to work with SSMO and law-enforcement agencies where local firms are found to be producing non-compliant products. This monitoring activity will be embedded in the expanded market monitoring scheme to be established by the project (see Response 7b above). The technical standards established for PV pump components will apply nationally, not just to project participants. As an additional safeguard in the specific context of the project, the banks that issue micro-finance loans to farmers will be required to verify that the farmers are using certified equipment.	
e) Please clarify how the project will ensure that the means (human and financial) for continued training can be sustained beyond project completion, especially for the expected replications.	The project builds on baseline initiatives, such as agricultural extension services, to deliver its training and awareness-raising activities. In doing so, the baseline initiatives will themselves have their capacities strengthened and will be enabled to continue offering capacity development support. The Northern State Government, the Federal Ministry of Agriculture and the Higher Council for Environment and Natural Resources (which has a network of offices in every state) are all committed to sustaining training and technical support beyond project completion. All banks involved in the project have branches located nationwide, in all states. The business processes, learning and capacities developed by the banks in Northern State can therefore be readily transferred to the other states (indeed Component 4 of the project will support them in doing so).	
Component 3: f) Please note that the GEF cannot fund mitigation activities that would lead to CDM credits. The PIF should clarify how the project may mobilize the carbon finance without leading to a risk of double-counting of mitigation efforts.	Acknowledged. Given the current subdued and uncertain state of the carbon market, it is unclear how viable CDM revenues would be even if allowed. The project will continue to develop a standardized baseline according to the UNFCCC approach – which offers a transparent and internationally-recognized means of assessing project additionality and emissions reductions – but will use this standardized baseline in the context of a NAMA, not a CDM project. Since such a NAMA will lead to emission reductions (not emission offsets), there will be no double-counting of mitigation efforts and no CDM credits will be	All references to carbon finance have been removed from the project design.

	generated.	
g) Please justify the relatively high cost of the activities of component 3.	Technical certification will be pursued through NERC and SSMO. These were attributable to the project attempting to address the combined needs of the carbon finance and NAMA modalities. With the carbon finance element now removed from the project design, $60,000 of GEF funding has been removed from Component 3 and re-allocated to Component 2 (broader market monitoring, greater assistance to enforcement of technical standards) and to Component 4 (strengthened national replication support).	$60,000 removed from Component 3 and reallocated to Component 1.
Component 4: h) Please clarify who would benefit from the proposed fiscal concessions. Please also clarify how these concessions would support the replication of PV pumps deployment.	The fiscal concessions granted by the Sudan Investment Act and the exemption from taxes and duties once PV pumps are classified as 'agricultural equipment' will serve to lower hardware prices and will benefit consumers (i.e. farmers), equipment suppliers/retailers seeking to grow the market, and banks providing finance to farmers (shortening loan repayment times and reducing risk exposure). Inclusion in the concessions list will reduce the import duty on small pumps (less than 10 kW in size) from 25% to 10%. For a typical 2kW pump, that will represent a cost saving of approximately $1,700 (compared with a typical annual income of a small-scale farmer of $2,650). How much of that saving is passed onto farmers (as opposed to being held as profit by wholesalers/retailers) will depend on the elasticity of demand. This issue will be explored during the PPG. For conservativeness, the impact of the reduction in import duty has not been incorporated into the pump dissemination/subsidy calculations. But, qualitatively, it is clear that the fiscal benefit will allow more (cheaper) pumps to be subsidized and hence increase the emissions reduction impact of the project. The concessions will have national force and will, therefore, also promote nationwide take-up of PV pumps. Certification enforcement is the duty of SSMO and the Customs Administration as part of their routine work. As discussed above, the project builds on baseline initiatives, such as agricultural extension services, to deliver its training and awareness-raising activities. In doing so, the baseline initiatives will themselves have their capacities strengthened and will be enabled to continue offering capacity development support. The	

	federal Ministry of Agriculture and the Higher Council for Environment and Natural Resources (which has a network of offices in every state) are committed to sustaining training and technical support beyond project completion in all relevant states. The project will also work with the Ministry of Water Resources and Electricity, the Ministry of Petroleum (Renewable Energy Directorate) and the Ministry of Agriculture to embed PV irrigation pumping in the Government's national energy roadmap, rural energy access strategy and national irrigated agriculture strategy so as to – among other benefits – open up a channel for standard, ongoing Government financial support and a window for potential donor funding.	
i) Please clarify how the project will secure the financing necessary for effective replications of its results beyond the Northern State (to cover for the initial subsidy, the training expenses, and the certification enforcement).	All banks involved in the project have branches located nationwide, in all states. The business processes, learning and capacities developed by the banks in Northern State can therefore be readily transferred to the other states to enable replication of the micro-finance lending products. With regard to the initial subsidies that may be required in other states, the Ministry of Finance & National Economy and the Ministry of Agriculture are committed to establishing a national fund (provisionally titled the 'National PV Fund') for this purpose. Both Ministries have hands-on experience establishing such special funds, notably in the context of the Wheat Fund (*Mahfazat El Gamh*) for irrigated agriculture. Given the fact that Sudan is an LDC and Government resources are limited, the likelihood is that the national fund will rely on donor funding for replenishment. If climate finance materializes through the NAMA, climate income will also be channeled into the national fund. The institutional architecture, governance and funding modalities of the national fund will be detailed during the project preparation phase. So as to promote learning-by-doing (effective fund management) prior to national scale-up, the national fund will be established at the beginning of the project and the Northern State subsidies will be channeled through the fund.	
8. *(a) Are global environmental/ adaptation benefits identified? (b) Is the description of the incremental/additional reasoning sound and appropriate?*	With the introduction of a degression scheme for the PV pumps subsidy (see Response 7b above), the subsidies will be able to be applied to 1,468 units (1,276 x 3.12 kW units, 128 x 5.12 kW units and 64 x 29.6 kW units) at a cost of GEF\$13.94/tCO_2. The reduction is not larger because measurements conducted during the PPG phase have shown that fuel	

The project efficiency is rather low compared to other projects ($15/tCO2e). Please address Q5 and Q7 i) and see if this may help improve the estimated emission reduction efficiency.	consumption for pumps is somewhat less than anticipated and was earlier reported. Such estimates will be validated by the large-scale operation data to be collected during the project implementation. The calculation represents the most conservative scenarios in two ways. First, diesel consumption varies widely for pumps depending on usage, age, condition, etc. The calculation uses the most conservative figures by using the lowest reasonable scenarios encountered during the PPG. Other reasonable scenarios exist which could indicate almost twice the carbon reduction but again it was decided to be conservative. Second, the calculation does not take into account any lifting of customs duties or tariffs on the pump which would likely have the effect of wider adoption and increased capacity to finance through the National PV fund. Similarly, the estimates for installed capacity are considered conservative. Simple calculation shows that available co-finance could potentially support a larger installed capacity target; however the original target is kept with additional funds left as a contingency to for risks such as currency fluctuations.	
11. *Does the project take into account potential major risks, including the consequences of climate change, and describes sufficient risk mitigation measures? (e.g., measures to enhance climate resilience).* a) Please clarify what are the water scarcity risks the targeted irrigated zone may face (especially due to climate change).	Climate change is expected to reduce the overall amount of rainfall received in the north of Sudan and also to increase its variance (i.e. rainfall will become more erratic). Irrigation represents an effective adaptation strategy to the increasing risks facing rain-fed agriculture, and is being heavily promoted by the Government for this reason. The water scarcity risk that in turn faces irrigated agriculture is low for the project, for the following reasons: - The project will switch existing or planned pumping systems from diesel to solar power. The project is not expected in itself to expand the area under irrigation beyond what would already happen in the baseline. - For newly-established farms along the Nile, Sudan has still not completely exhausted the country's legal share of Nile waters. According to the Nile Basin Initiative, about 25% of Sudan's share (18 billion cubic meters) of Nile water is not currently exploited. - Nile water flow is regulated through storage dams, of which Sudan has built 5 for power generation and irrigation purposes. - Moreover, the probability of water scarcity is also low due to fact that farms pump water from shallow wells that are annually replenished from the Nile. - The project will put in place water savings methods both to reduce overall water usage and to reduce the size and therefore capital cost of	Output 2.5 modified to focus on efficient water use; Output 2.6 added to integrate information from the study of the underground aquifer (under a separate proposed UNDP GEF project).

	solar pumps. - A parallel project is being undertaken by UNDP in Sudan to study the underground aquifer and threats to its sustainability.	
b) Please clarify what impact the project may have on an eventual overuse of water resources.	The project will have little impact on the overuse of water in Northern State due to the excess capacity from the Nile and the annually replenished shallow wells. However, in the long-run, with expansion of irrigated agriculture in the other states, seasonal draw-down of water levels might be possible. It is, however, important to emphasize that the project itself will have no direct impact on overuse of water levels since it will support sustainable, low-emission pumping in irrigated (or already planned-to-be-irrigated) areas; it will not itself expand the area under irrigation beyond what would already happen in the baseline (only make the irrigation more efficient and low-carbon).	Please see above.
c) Please clarify how the project will mitigate the two risks	The project's focus on appropriate pump sizing (Output 2.3) will ensure that PV pump sizes are designed to cater for seasonal fluctuations in water levels. Moreover, as part of the structured replication programme developed under Component 4, a state-by-state water risk analysis will be undertaken to identify potential water stress hotspots. Where risks are identified, the project will work with the appropriate state and national authorities to put in place mitigation measures (e.g. use of lined water channels, drip irrigation, etc.). An activity has been included in the project to promote efficient water use. In addition, a parallel GEF project has been developed to sustainably manage water in aquifers.	
12. *Is the **project consistent and properly coordinated** with other related initiatives in the country or in the region?* Please strongly consider involving the ministry in charge of taxes and fiscal issues to ensure that the proposed reforms in that domain may be effectively implemented.	Agreed. It was not sufficiently highlighted in the PIF but the Ministry of Finance is one of the project partners. The Ministry will take the lead role in relation to fiscal matters. In addition, the Ministry will support the project with co-finance of US$3 million and will support the exemption of PV pumps from customs duties	See Section B.1 of the CEO ER and Prodoc. Please see MoF co-finance letter.

13. *Comment on the project's* ***innovative aspects, sustainability, and potential for scaling up***. Please address Q5 and Q7.	Please see responses above.	Please see responses above.
16. *Is the GEF funding and cofinancing as indicated in Table B appropriate and adequate to achieve the expected outcomes and outputs?* Please address Q7 g).	Please see responses above. .	Please see responses above.
17. *At PIF: Is the indicated amount and composition of co-financing as indicated in Table C adequate? Is the amount that the Agency bringing to the project in line with its role?* UNDP is bringing 1% of the total cofinancing of $26 million. Please consider increasing the UNDP co-financing.	The UNDP cash co-financing has been increased from $250,000 to $550,000, an increase of 120%. This represents a significant 14% share of UNDP Sudan's total environment programming budget over the 5-year duration of the project.	Table C amended.
25. Items to consider at CEO endorsement/approval. *Details are expected by CEO endorsement request on the following:* *a) The proposed micro-finance products, how they will be made economically attractive to private banks and economically feasible for small-scale farmers given they level of income.*	Numerous examples have been provided showing that with GEF support, loans for PV can be financially viable for the banks and feasible for small-scale farmers. The banks have the precedent of being involved in similar schemes when supported by national funds (as is being proposed in the national PV fund). The financial viability of solar pumping is directly related to the cost of diesel. A premise of the project is that as solar pumps become a known technology in Sudan, and as they are given preferential treatment (removal of customs duties – a part of the project and supported by MoF) the price of solar pumps will become less prohibitive. At the same time, with the already announced removal of subsidies, the price of diesel will increase. These two actions will result in solar pumping becoming more financially attractive..	Please see ProDoc section 2.1.1 – 2.1.6 and Annex 9.7 for financial analysis
b) The proposed subsidy scheme and national PV fund: how they will be implemented and how they will be sustained beyond project completion.	This is addressed in detail in Section 2 of the Prodoc. Sudan has previous experience with national funds similar to the proposed PV fund which have been initiated and supported locally. The project envisions a descreasing subsidy to 7% in the final year. Project sustainability will depend to a large extent on the relative prices of diesel and solar pumping. Even if the price of diesel remains as it is, the anticipated reduction in the price of solar pumping	Please see Section 2.1.8 for information on the operation of the proposed financing mechanism.

	through the life of the project should be sufficient to make a 7% subsidy unnecessary and therefore make the finance of solar pumps viable without a subsidy, and therefore sustainable.	
c) The market monitoring scheme of the project.	Through the loan scheme, the project will be able to track the number of pumps, their specifications, and their pricing. In addition, the project supports the National Energy Research Centre and the Standards Organization which is responsible for approving imports through customs. With these sources of data, the project will be able to monitor development of the market.	
d) How the project may mobilize the carbon finance without leading to a risk of double-counting of mitigation efforts.	The envisaged carbon finance is through the establishment of a NAMA that has a dedicated Monitoring, Reporting, and Verification structure. Carbon finance references are now removed. A NAMA structure would appropriately count reductions and avoid any double-counting in a verifiable manner.	Please see ProDoc page 42, paragraph 111.
e) How the project will facilitate the banks involved in supplying microfinance credit products to extend their lending to other technology categories, such as improved cook stoves and biogas digesters.	The project provides for some innovation in financing similar equipment, for example, by making it registered agricultural equipment. One of the challenges faced during meetings with the banks was to uniquely identify equipment such that it was traceable to its owner. Small cook stoves and biogas digesters are (on average) significantly less capital intensive than solar pumps and thus fall into existing micro-lending schemes which the solar pumps do not qualify for. Nevertheless, the success of the solar pumping project is expected to indirectly open the door as a model for lending to these types of equipment.	
STAP Comments	**Response**	**Reflection in the Full Project Design**
1. It is acknowledged that water scarcity is a problem and will be worse in the future due to increased demand as well as potential impacts of climate change. This project claims that it will not expand the area under irrigation beyond what would happen in the baseline. However, in an earlier section on "Innovativeness, sustainability and potential for scaling up", it is stated that the irrigated sector is expected to grow rapidly - the Government is planning a doubling in spatial extent by 2015. If so, and if that's the baseline, what will be the impact on the water table and water resources in general?	Future water scarcity is certainly a concern as noted. Much of the pumps will be used near the Nile where water is replenished by the flow of the Nile. The use of solar pumps can help to address water scarcity because there is an incentive to use the smallest feasible pump to reduce the initial capital. The role of the National Energy Research Centre is to help put in place the mechanisms and technical know-how for this sizing. In addition, the project has put in place a new output, 2.6, which is aimed at promoting sustainable irrigation practices and water management. This includes	Output 2.5 has been modified to focus on adoption of water efficient irrigation methods Output 2.6 has been added to address sustainable irrigation practices and their impact on the water aquifer. A separate project is

	altering the present flood irrigation methods to methods that use less water, and waste less water (through reduced evaporation and other means). A separate GEF project is being undertaken (at the PIF stage) to study in detail the Nubian Sandstone Aquifer System, from which the pumps would extract water from, and help determine sustainable levels of extraction.	being undertaken to study the Nubian Sandstone Aquifer System.
2. A cost comparison between diesel and solar water pumping for a range of pumped water volumes is not provided but should be undertaken to determine the level of subsidy required. Recent lower PV prices will help the cost effectiveness but balance-of-plant may be costly. It is not clear whether pumping will occur only when solar radiation is available or whether some battery storage for irrigating during the night will be necessary. (Evaporation losses are usually less when irrigating at night). If diesel pumps work 24 hours a day and solar pumps only operate during daytime, larger solar pumps will be needed to pump the same volume of water per day. Therefore, development of the pump sizing software is an important component of the project (though many similar tools already exist).	A cost comparison is provided and used to suggest subsidy levels and loan terms. It demonstrates a an appropriate level of subsidy, loan term, and interest rate that results in financial viability for all stakeholders, is within the proposed project resources, and can be expected to be sustained after project end. Pumping is only expected to occur during sunlight hours. It is correct that evaporation is less at night; however the cost and complexity of battery storage would make solar pumps prohibitively expensive. The present BAU irrigation practices include irrigation during the day and flood irrigation, which leads to large losses over days. As an alternative the project proposes to introduce water efficient irrigation methods to reduce evaporative and other losses. It is correct that larger pumps would be needed to pump the same volume of water during a shorter period. However, the project seeks to reduce the volume of water needed and therefore reduce the size of the solar pump needed and the associated capital cost. The development of pump sizing methods, whether through the use of existing software or new software, is central to the success of the project. This is a main objective of the significant involvement of the National Energy Research Centre.	Please see ProDoc Sections 2.1.1 – 2.1.6 and Annex 9.7 for financial analysis. Please see Annex 9.2 Stakeholder Involvement Plan for NERC's role in developing pump sizing methods. Output 2.5 focuses on developing and disseminating water efficient irrigation methods.
3. It is assumed in the proposal that diesel fuel costs will rise in future years (partly due to the removal of government subsidies). However, other analyses show crude oil prices may not eventuate during the next decade or two, hence a sensitivity analysis should be undertaken. Providing technical support and product certification designed to de-risk the project makes sense.	If diesel prices remain at current levels but solar pump prices are reduced as a result of market dissemination and reduction in import duties and taxes, solar pumps would be viable alternatives to diesel pumps, in particular when the overall cost of ownership is taken into account. Farmers are eager to replace their diesel pumps with solar pumps which are seen as being more reliable and requiring less hassle.	

	Technical support and product certification to de-risk the products are central aspects of the project. In order for the banks to lend, the solar pumps must be on the list of units to be approved by NERC.	
4. GHG emission reduction calculations are relatively simple (not including full life cycle analyses - e.g. for manufacturing, transport of diesel fuel etc.) but are acceptable given the uncertainties involved.	An updated calculation has been presented in line with GEF Guidelines on GHG reduction calculations; however it does not include a life cycle analysis. Per GEF GHG guidelines, emissions factors for generation technologies are used based on the relevant combusted fuel type. It would be more encompassing to include life-cycle analysis; neglecting manufacturing and transport of diesel results in a more conservative estimate. We could not provide accurate full life cycle analyses given the lack of accurate data but will seek to ascertain and track this if possible during project implementation.	Please see Annex 9.4 of the ProDoc for GHG reduction calculation
Council Comments	**Response**	**Reflection in the Full Project Design**
Germany generally supports the STAP's comments and would like to put emphasis on some of them: *• A cost comparison between diesel and solar water pumping for a range of pumped water volumes should be provided in order to determine the subsidy level required.*	Please see response to STAP comments 2 and 3.	Please see above.
• The proposal explains how water scarcity is a problem that will be worse in the future due to increased demand as well as potential impacts of climate change. Therefore, Germany recommends factoring in vulnerability analyses due to climate change, and taking this into consideration when planning the pumping in such a way to avoid overusing available water sources.	Please see response to STAP Comment 1	Please see above.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[12]

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

PPG Grant Approved at PIF: **100,000**			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent Todate***	***Amount Committed***
Development of Prodoc	62,000.00	62,000.00	0
Institutional and Management Arrangements	18,000.00	18,000.00	0
Finalization and Validation of Key Outputs	20,000.00	16,574.44	3,425.56
Total	100,000.00	96,574.44	3,425.56

[12] If 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.

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

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)

n/a

United Nations Development Programme

Country: Sudan
PROJECT DOCUMENT*

Project Title: Promoting the use of electric water pumps for irrigation in Sudan

UNDP Strategic Plan Primary Outcome:

Relevant Strategic Plan Outcomes and Indicators:

Outcome 1: Growth and development are inclusive, and sustainable, incorporating productive capacities that create employment and livelihoods for the poor and excluded

IRRF Output 1.5: Inclusive and sustainable solutions adapted to achieve increased energy efficiency and/or sustainable energy solutions targeting undiscovered communities/groups and women.

Indicator 1.5.1: Number of new development partnerships with funding for improved energy efficiency and/or sustainable energy solutions targeting underserved communities/groups and women.

Indicator 1.5.2: Extent of change in: a) energy efficiency and/or b) modern energy coverage by users and specific sectors

UNDAF Outcome(s):

UNDAF Outcome 2: Populations vulnerable to environmental risks and climate change become more resilient, and relevant institutions are more effective in the sustainable management of natural resources.

Indicator 1.1: Comprehensive integrated natural resource management framework, including climate change, disaster risk, water, forest and biodiversity management and environmental protection, developed, approved and adopted

Target: At least 5 initiatives supported to develop legal and policy framework related to climate change mitigation/adaptation, water and forest resource management, environmental protection

Expected CP Outcome(s):

Expected CPAP Output (2.2): Investment in green energy and access by needy communities to sustainable energy improved

Executing Entity / Implementing Partner:

Ministry of Water Resources and Electricity (MWRE)

* For UNDP-supported, GEF-financed projects as this includes GEF-specific requirements

Brief Description

The project aims to support the adoption of solar PV technology for water pumping for irrigation in agriculture in Sudan, particularly in the North State. Adoption of renewable energies has been identified as a priority in Sudan, as is reduction of dependence on fossil fuels which are imported. The application of solar PV to pumping has been on a relatively limited scale globally, but is seeing increased commercial interest in the past years. Solar PV technology in general is not widespread in Sudan.

The project includes four components: the development of pilot projects as a demonstration of the viability of the technology and an accompanying financing mechanism for continued finance of projects; development of standards and guidelines to promote quality and sustainability of water pumping; development of a NAMA to support solar water pumping; and developing a supporting environment to encourage scaling up and further replication.

The project aims to help Sudan and Sudanese farmers reduce their reliance on fossil fuels, reduce their cost of production (via decreased diesel expenditures), increase the sustainability of water use, and increase their income. Give that agriculture is a main component of the economy in Sudan, the project will help increase Sudan's energy security and decouple its GDP from fluctuations in fossil fuel prices and availability. The project has been designed to play a catalytic role in the transformational scaling up of solar power for productive use in Sudan's agricultural sector.

The project implementing partner is the Ministry of Water Resources and Electricity. The project is expected to last 60 months.

Management Arrangements	NIM
PAC Meeting Date	TBD

Total resources required		US$ 24,515,753
Total allocated resources:		
o	GEF	US$ 4,365,753
o	Banks	US$ 14,000,000
o	MWRE	US$ 1,500,000
o	MoFNE	US$ 3,000,000
o	HCENR	US$ 500,000
o	MoP	US$ 200,000
o	NERC	US$ 250,000
o	MOAARI	US$ 150,000
o	UNDP	US$ 550,000

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

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List of Acronyms

CO	UNDP Country Office
CO_2	Carbon dioxide
CSP	Concentrating Solar Power
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
ha	Hectare, a unit of measure of land area equal to 10,000 square meters
HCENR	Higher Council for Environment and Natural Resources
IEA	International Energy Agency
M&E	Monitoring and Evaluation
MEFPD	Ministry of Environment, Forestry and Physical Development
MoP	Ministry of Petroleum
MoSC	Ministry of Science and Communications
MWRE	Ministry of Water Resources and Electricity
MFNE	Ministry of Finance and National Economy
MOAARI	Ministry of Agriculture Animal Resources & Irrigation - Northern State
MRV	Monitoring, Reporting and Verification
MW	Megawatt
NAMA	Nationally Appropriate Mitigation Action
NEC	National Electricity Corporation
NERC	National Energy Research Centre
NGO	Non-Governmental Organization
O&M	Operations & Maintenance
PIR	Project Implementation Review
PMU	Project Management Unit
PPG	Project Preparation Grant
PPP	Public Private Partnership
PB	Project Board
PV	Photovoltaic
QPR	Quarterly Progress Report
RCU	UNDP Regional Coordination Unit
RE	Renewable Energy
RTA	UNDP Region-Based Technical Advisor
SWH	Solar water heater
TPR	Tripartite Review
TTR	Terminal Tripartite Review
TWh	Terawatt-hour
WB	World Bank
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. Situation analysis

1.1 Context and Global Significance

1. 0The agricultural sector contributed approximately 30% of Sudan's Gross Domestic Product (GDP) in 2013[1], and is reported to employ 80% of the workforce.[2,3] Although a significant portion of Sudan's cultivated area depends on rainfall for water, the irrigated lands contribute approximately 75% of the added value from agriculture. There are three irrigation systems within the country; pumped, gravity-driven and flood irrigation. The focus of the proposed UNDP-GEF project is the replacement of small and medium diesel pumps with solar pumps. Historically rising costs of energy have been one of the main drivers of high inflation in Sudan. Given the importance of the agricultural sector to the overall economy, reducing the cost of energy, particularly for small farmers, is a major priority for continued growth of the sector.

2. Sudan has significant potential for development in the agricultural sector. The country has promising water and arable land resources; however, these resources are not fully exploited. Sudan utilizes around 20% of its total potential arable land. Sudan consumes 15.6 million m3 of Nile water, which represents 84% of the country's share of Nile River water.[4]

3. The Second Stage for Agricultural Strategic Plan (2012-2014) states that the government will dedicate at least 20% of its expenditure to the agricultural sector to increase the annual growth rate for agriculture by 10%. The plan also aims to encourage investors to invest in the agriculture sector in order to increase the investment share in agricultural sector from 4% to 20%.[5]

4. Because of the size of employment in the agricultural sector, its development is one of the main contributors to poverty alleviation in Sudan. Figure 1 shows the percentage of population whose main income is from agriculture and livestock in each of the North States. Agriculture represents 80% of non-petroleum export revenues of the country. The cultivated land area in Sudan ranges between 12.5 and 17 million hectares based on annual rainfall intensity and its distribution.[6]

[1] Reported at 35.4% in the African Economic Outlook, 2013 pp. 3. The CIA World Fact Book estimates that agriculture contributed 27.4% of Sudan's GDP in 2013.
[2] CIA World Fact Book 2013
[3] World Food Programme Crop and Food Security Assessment Mission, January 2011
[4] Agricultural Strategic Plan (2008-2011)
[5] Second Stage for Agricultural Strategic Plan (2012-2014)
[6] Sudan Transition to Green Economy

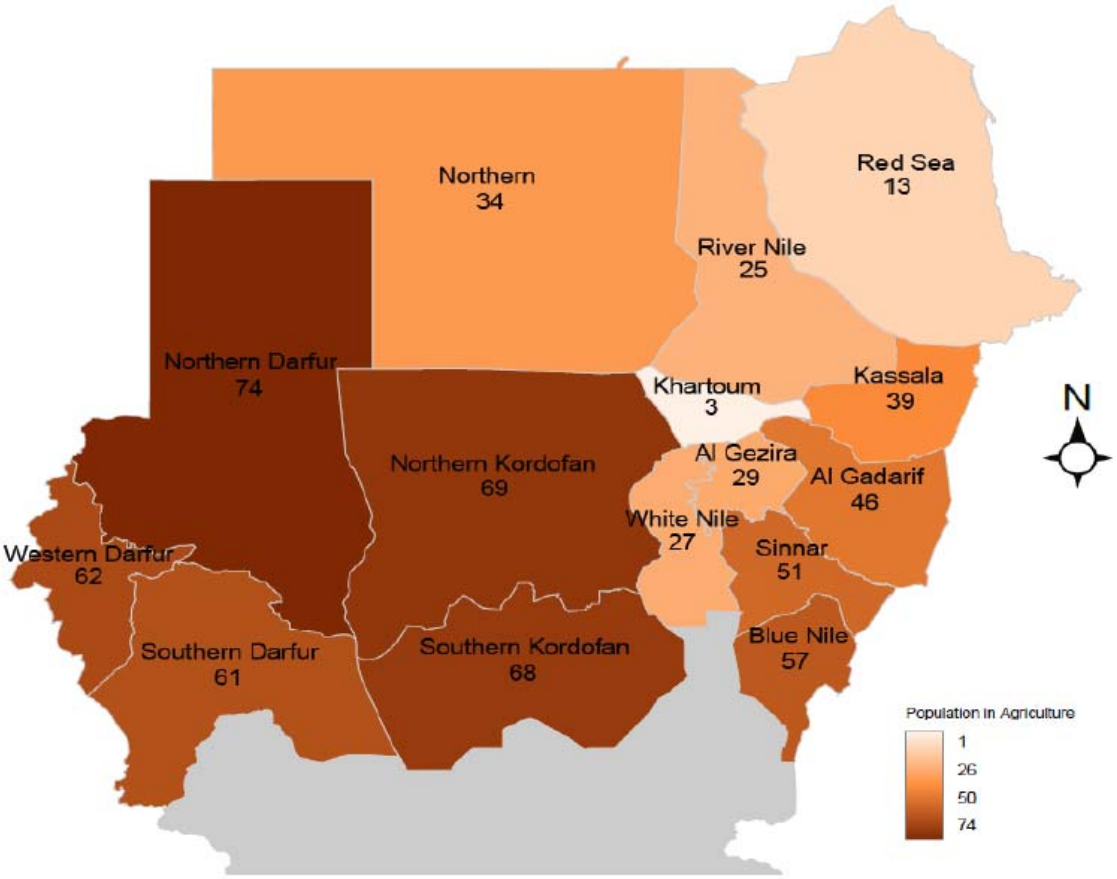
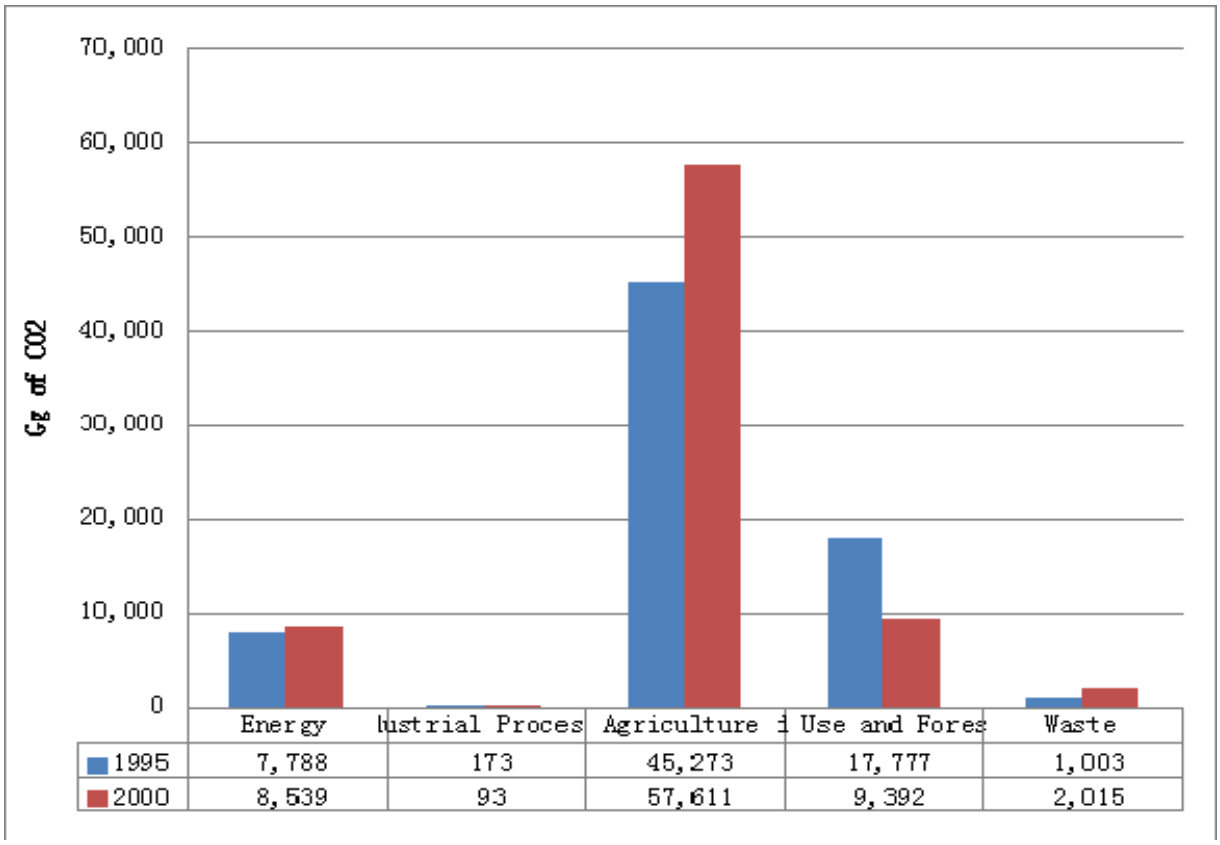


Figure 1 Percentage of population whose main Income is from agriculture and livestock in North States[7]

5. The agricultural sector has by far the largest share of CO_2e emissions in Sudan as shown in Figure 2. In 2000, the emissions from agriculture sector represented approximately 74% of the total emissions produced in the country.[8] The GHG emissions as reported are mainly from enteric fermentation and manure management with no GHG emissions attributed to the use of diesel for pumping water.

[7] The World Bank, "A Poverty Profile for the Northern States of Sudan", May 2011.
[8] Sudan's Second National Communication under the United Nations Framework Convention on Climate Change, January 2013.



	Energy	ustrial Proces	Agriculture	i Use and Fores	Waste
1995	7,788	173	45,273	17,777	1,003
2000	8,539	93	57,611	9,392	2,015

Figure 2 CO_2 equivalent emissions for different sectors in Sudan[9]

6. The most common crops grown in Sudan are Sorghum, millet, wheat, rice and maize. In FY 2010/2011, the northern states produced 5.7 million MT of cereals; broken down into 4.6 million MT of sorghum, 667 thousand MT of millet, 433 thousand MT of wheat, 25 thousand MT of rice and 42 thousand MT of maize.

7. Sudan is largely dependent on imported fossil fuels. Hence, there is an urgency to implement Sudan's Renewable Energy Master Plan (REMP) and reduce Sudan's dependence on fossil fuel. Sudan has abundant wind and solar resources, as shown in the resource maps below, but largely lacks the capacity to utilize these resources for power generation.

8. Sudan has recently been awarded a UNDP-GEF project (PIMS 4726, GEF Project 4745) "Promoting Utility Scale Power Generation from Wind Energy", which aims to help Sudan utilize its abundant wind resources. A main aim of the project is the development of a 100 MW wind farm in Dongola in the North State, which will feed directly into the grid. The project will also support the development of grid connected wind capacity on the Red Sea.

[9] Sudan's Second National Communications under the United Nations Framework Convention on Climate Change, January 2013.

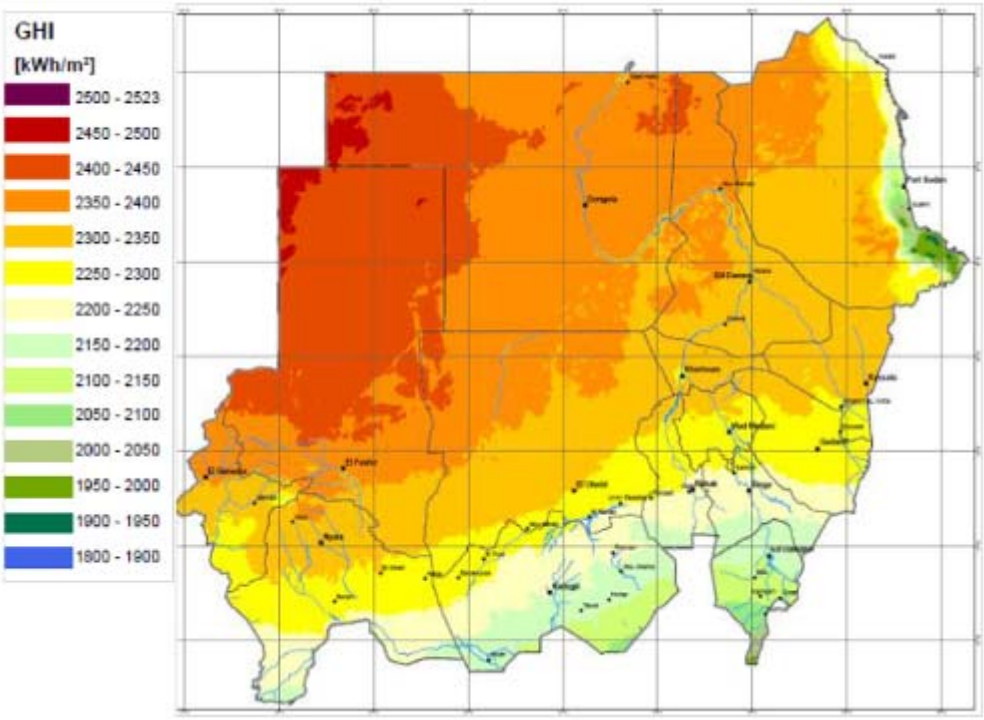


Figure 3 Annual available global horizontal irradiation in Sudan[10]

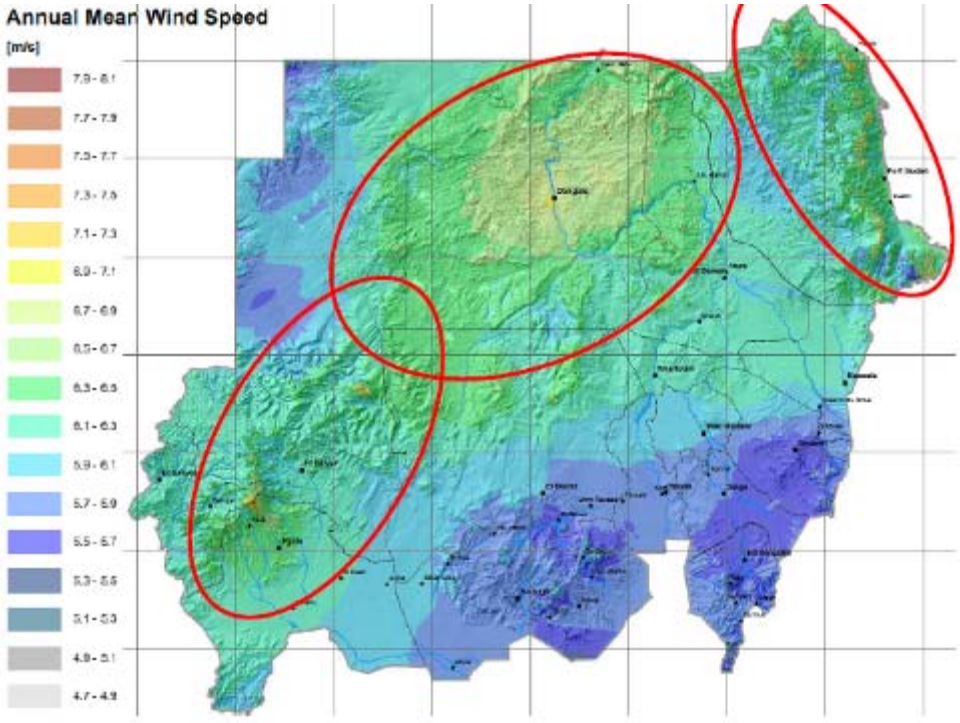


Figure 4 Calculated annual average wind speed at 50 m height in Sudan. Red ovals show areas with the highest potential[11]

[10] Lahmeyer International (2013), Long and Medium Term Power System Plans.

9. Fossil fuels are subsidized in Sudan, with oil subsidies representing 15% of the total government expenditure in 2012. There has been a steady reduction in subsidies, which has resulted in a 45% increase in diesel price in 2011, and a further 114% increase in 2013.[12] Further increases in fossil fuel price are expected as subsidies are lifted.

10. Sudan currently has a generation capacity of 2,723 MW of power; it has practically no grid connected solar or wind generation capacity and very little off-grid solar capacity. Figure 5 shows the installed generation capacity in Sudan by technology. To meet the Government's target of 75-80% electrification by 2031, the Government plans to install 12,000 MW of additional generation capacity by 2031. This is to include 1,582 MW of renewable energy (other than large-scale hydro-power).13 This projects aims to install 1,468 PV pumps in off-grid regions with a total installed capacity of 6.5 MW. This potential capacity represents 0.2% of the current generation capacity and 0.4% of the planned non-hydro generation capacity.

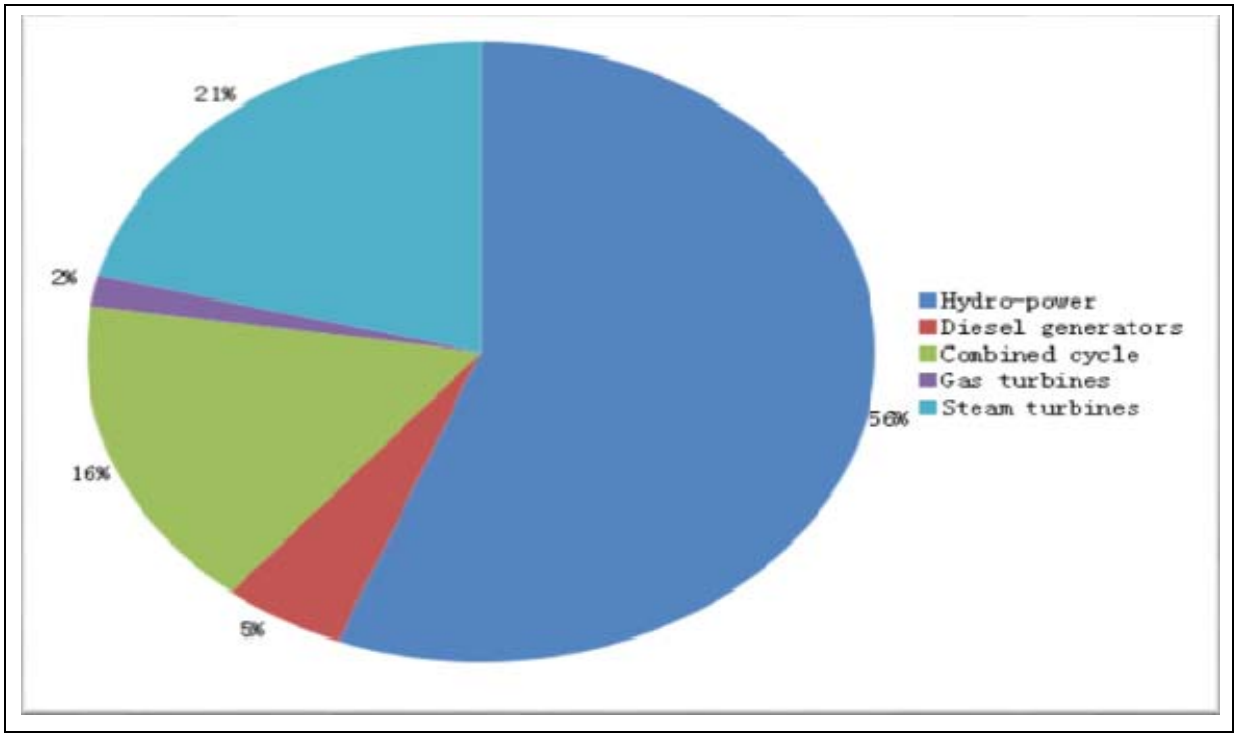


Figure 5 Installed power capacity in Sudan[14]

[11] Lahmeyer International (2013), Long and Medium Term Power System Plans of Sudan.
[12] Promoting the use of electric water pumps for irrigation in Sudan PIF, January 2014
[13] Lahmeyer International (2013), Long and Medium Term Power System Plans of Sudan.
[14] Arab Union of Electricity (2012), Statistical Bulletin.

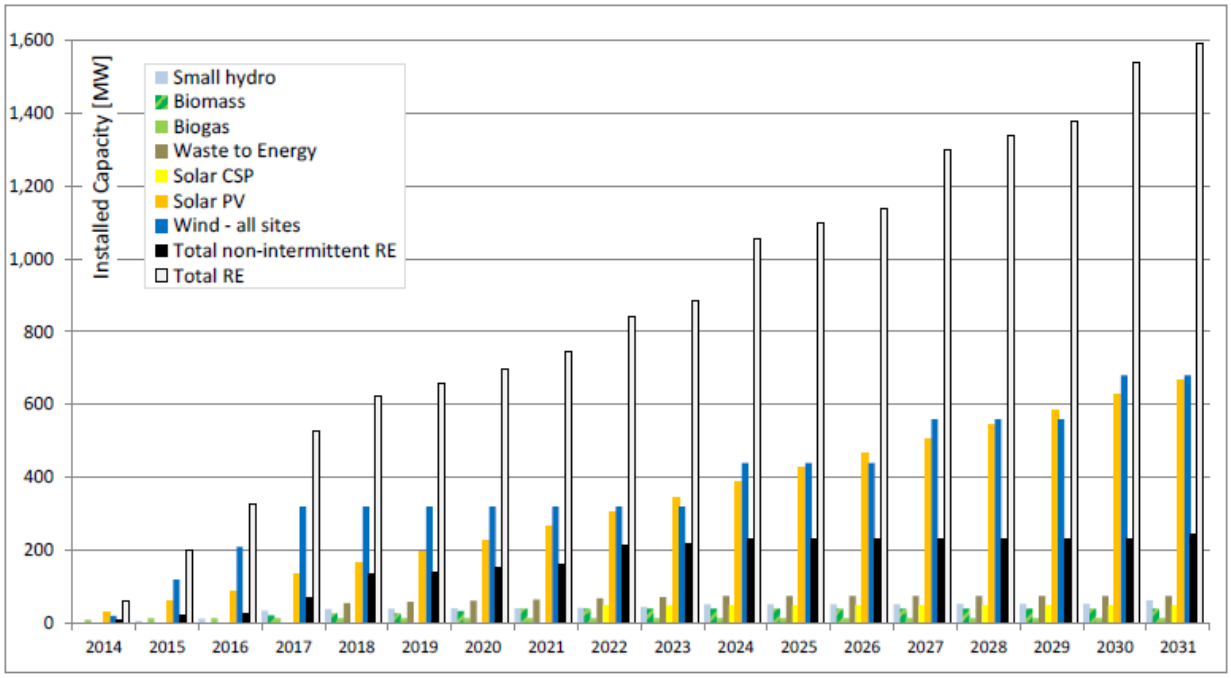


Figure 6 Cumulative projected installed renewable energy capacity by type, 2014 - 2031[15]

11. This project targets off-grid areas. Approximately 35% of Sudan's population has access to electricity.[16] In 2012, the power consumption per capita was 233 kWh/ year.[17] There are no independent power producers (IPPs) in the country, though initiatives are underway to promote private investment in power generation.[18]

12. The majority of Sudan's land areas receive solar irradiation greater than 2,300 kWh/m2/year, which is considered an excellent solar resource. To take advantage of Sudan's plentiful solar resources, the Government is planning to develop four solar projects with a total capacity of 20 MW: Khartoum PV plant (10 MW), Nyala PV plant (5 MW), Al Fashir PV plant (3 MW) and Al Geneina (2 MW).[19] Thus far, these projects have not been initiated.

1.2 Baseline, barriers and current government policy to address the root causes and threats

13. Pump irrigation is subdivided into small, medium and large scale systems. Large public pump systems (to supply areas larger than 20,000 ha) are mainly electric pumps and installed in New Halfa, Rahad and Suki areas. Medium sized pump systems (to supply areas between 420 ha and 20,000 ha) are found in the Northern, White Nile, Blue Nile, Sennar and Khartoum States. Small pumping systems (for areas less than 420 ha) are commonly located in Northern states and along the Nile

[15] Lahmeyer International (2013), Long and Medium Term Power System Plans of Sudan.
[16] UNESCO (2009), Electricity Access Rates.
[17] Arab Union of Electricity (2012), Statistical Bulletin.
[18] RCREEE (2013), Arab Future Energy Index.
[19] RCREEE (2012), Sudan Renewable Energy Country Profile.

where farmers may share the same pump. Small irrigation pumps are either diesel or electric pumps. There are a large number of small-sized pumps installed along the Blue Nile, White Nile, and the main Nile. Moreover, private owned-small irrigation pumps from underground water are abundant all over the Sudan desert.

14. In Northern States of Sudan, approximately 273,000 ha out of 12.9 million ha have irrigation pumps. There are a total of 24,800 water pumps in the Northern State. The Agricultural Strategic Plan allocated 2,893.5 million SDG (approximately USD 508 million) to improve the water pumping sector and increase the pump-irrigated area to 2.5 million ha by 2011.[20]

15. The Swedish Sudanese Association (SSA) implemented five PV water pumping stations in the Bara and El Obeid regions. The Red Sea State is working on providing PV pumps for rural communities. The State agreed to supply 50 PV water pumps. The Red Sea state has also provided solar panels for 10 PV pumps under the 1000 villages PV project.[21] Site visits were carried out during the PPG process to a private farm in Dongola with a solar pump for small-scale irrigation.

16. The National Energy Research Centre (NERC) has accumulated, over the years, some experience installing solar water pumps. A poster at NERC (shown below) illustrates solar installations around the country.

[20] ibid

[21] Hood Ahmed, "Report of Final Evaluation for Barrier Removal To Secure PV Market Penetration In Semi-Urban Sudan", UNDP/GEF, May 2006

Figure 7 Poster at NERC showing solar installations around the country. Red squares indicate solar water pumps, green dots lighting, and blue triangles communications.

- ***Regulatory Baseline***

17. A programme to provide grid-connected electric pumps to replaced diesel has been launched by the Ministry of Water Resources and Electricity (MWRE) together with the Northern States Government to promote electric pumping for large scale farms (with an area of 100 ha or more). The programme aims to replace 211 diesel pumps to electric pumps (30 kW and larger). To date, 106 electric pumps have been replaced under the programme.

18. Sudan does not have in place regulations specific to the use of solar PV pumping. It does however have in place several regulations of relevance to the project. According to the Investment Encouragement Act of 2013, Chapter 6, Articles 19, 20, and 21, all strategic projects, including electricity generation, are subject to exemption from customs duties on capital goods. The Agricultural Implements Regulation exempts agricultural implements from customs duties and taxes. Solar PV pumps are not

presently classified as agricultural implements. Customs duties and taxes are imposed, amounting to an approximate 25% increase in cost of the pumps.

19. In 2010 the Ministry of Water Resources and Electricity established a directorate for Renewable and Alternative Energy which is responsible for solar energy, wind energy, geothermal energy, and other alternative energies. Sudan published a solar atlas in 2012.

20. Sudan has a national Renewable Energy Master Plan, which includes plans for the development of solar energy but not specifically related to power for pumping.

21. The baseline for the proposed UNDP-GEF project is the use of off-grid, diesel powered pumps for irrigation. The UNDP-GEF project only targets those areas where the grid is unlikely to be extended in the foreseeable future (next 10 years) or where cost of extension is prohibitive (e.g. islands in the Nile, see Outcome 2). Pumps that are already connected to the grid, or expected to be connected to the grid in the reasonable future, are deemed to be more economically operated on grid electricity which in Sudan is 0.16 SDG/kWh (US$ 0.027/kWh).[22] The most competitive estimates for the cost of electricity from solar PV are not below US$0.06/kWh. In addition, connection to the grid has the advantage that electricity is available whenever the grid is functioning and is not limited by available sunlight as is the case for solar PV. Thus, the potential for solar PV pumps is prioritized for those areas which cannot be economically accessed by the grid. The baseline for these areas is the use of direct-drive diesel pumps (mechanical pumps driven directly by a diesel engine rather than electric pumps driven by a diesel-powered electric generator).

- ***Technical baseline***

22. Pumps may draw water either from underground wells or from open surface water sources (e.g. from the Nile). There three types of underground wells: dug wells, driven wells, and drilled or bored wells. Dug wells are simply holes dug into the ground. They are necessarily limited to areas where the water table is quite shallow. Driven wells are created by forcing a small pipe into soft earth to the water table. Driven wells are typically limited to 20 or so meters at most; Drilled or bored wells are drilled into the ground and maybe hundreds of meters deep. The figure below illustrates the difference schematically.

[22] RCREEE Sudan Country Profile 2012

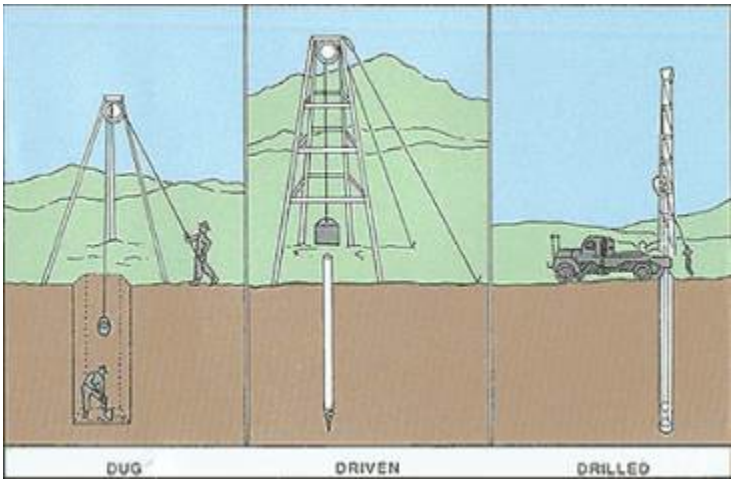


Figure 8 Illustration of the various well types[23]

23. Wells may be a combination of dug and driven, where a hole is dug into the ground to come closer to the water table and a pipe is then driven from the bottom of the hole reducing the distance that the pipe must be driven to reach water. An example is shown in

24.

25. *Figure 9* below.

26. There are two types of pumps: surface pumps and submersible pumps. Surface pumps, as the name implies, sit at the surface, draw water from below (whether from a well or surface water) and pump it to a higher position. Surface pumps are suitable when the pump can be located at or near the water surface. A majority of the pumps used in Sudan are surface pumps (in contrast to submersible pumps). The efficiency of surface pumps falls as the depth of water they're drawing from increases, as shown in Table 1. Surface pumps are limited to drawing water a depth 9 meters or less and cannot be used for applications where the water is more than 9 meters below the pump.[24]

[23] US Geological Survey figure, http://water.usgs.gov/edu/earthgwwells.html, accessed August 23, 2015.

[24] Surface pumps operate by creating a vacuum which sucks water up from a level lower than the pump. Since there is no such thing as a negative pressure, i.e., the minimum pressure is zero, the pumps can create a "suction" of at most 1 atmosphere, which is equivalent to approximately 10 metres of water height. By contrast submersible pumps "push" water up from below by creating positive pressure and there is no limit on the pressure that can be

Table 1 Efficiency of a surface pump as a function of suction depth[25]

Pumping Depth (m)	Pumping Efficiency (%)
4	60
5	54
6	48
7	39
8	21
8.5	10

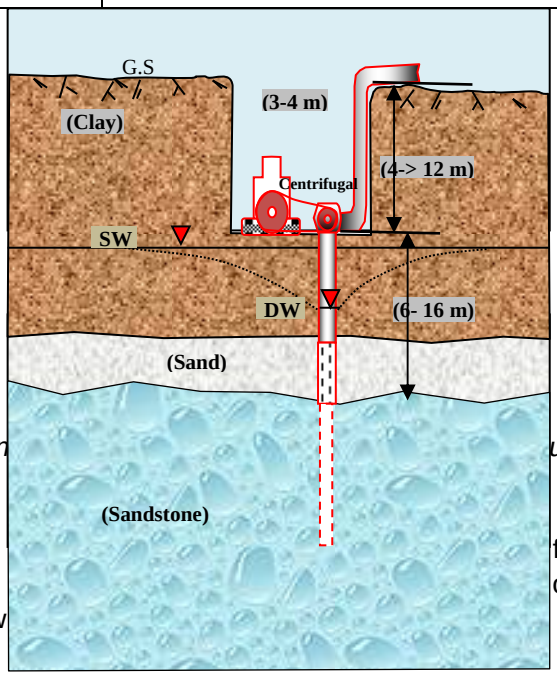


Figure 9 Schematic of a combination *ump. These are the most common*

27. Submersible pumps, as the face and pump water upwards by creating a o not suffer the efficiency losses associated w

created. Hence, submersible pumps may pump water up many hundreds of metres.

[25] Ahmed, A. "Ground Water Resources in the Northern State of Sudan", 2015

[26] Ahmed, A. "Ground Water Resources in the Northern State of Sudan", 2015

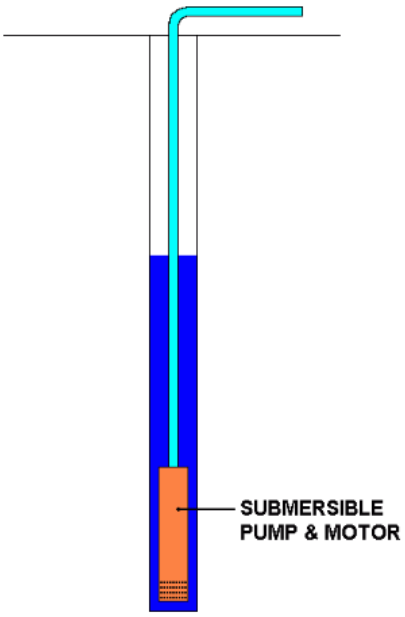


Figure 11 Schematic of a submersible pump sitting below the water surface and pumping up through a pipe.

Figure 10 Typical direct drive mechanical diesel pump

Figure 12 Typical combination dug well with driven pipe. The diesel engine and surface pump at the bottom suck water through a pipe driven into the ground (in the ground – not visible) and pump water up through the black hose shown fixed with ropes.

28. Despite their disadvantages, diesel pumps have been the most practical option for decades since they replaced animal driven water pumps. Diesel pumps are familiar to the farmers, reasonably robust, and acceptably simple in their operation. They are ubiquitous. Although some farmers have complained that finding people to come service the pumps when necessary was difficult, it is possible. No special skill is needed and most people are able to learn basic servicing on-the-job. Therefore these diesel pumps represent the technical baseline scenario.

29. Mechanically driven diesel pumps (such as shown in Figure 11 above) are often inefficient compared with electric pumps. They are often poorly maintained. The drive belt mechanism is a weak point often suffering slips which lead to wear of the belt, further efficiency losses and failures.

30. Direct drive diesel pumps are almost always surface pumps of the kind shown in the figures below. [27] These factors, combined with the inherent inefficiency in use of a surface pump to draw water from below (see Table 1), mean that overall pumping practices are highly energy inefficient. Trying to size solar pumps to simply replace the existing diesel motors will result in unnecessarily expensive solar pumps. A key to the success of solar water pumping then is taking advantage of the increased efficiency offered by electric pumps to reduce the size of the pump required and therefore reduce the initial cost. This is in addition to increased efficiency in water

[27] It is possible to engineer a shaft to provide direct drive from a diesel engine to a submersible pump but in practice this is not common. It is almost always the case that a submersible pump is electric and powered through an electric cable. The pump may be powered by a diesel generator.

use (discussed later in the document), to further reduce the capacity of the pump required.

❖ ***Economic Baseline***

31. Economically, the baseline is that the farmers typically (already) own their diesel pumps or can buy them. They are able to pay the diesel costs and consumables as they use them, a sort of de facto pay-as-you-go scheme. The majority of farmers may be accustomed to taking out credit on a short-term basis for seeds or fertilizer, usually to be repaid with the sale of the harvest. They are typically unaccustomed to taking term loans for capital assets such as pumps.

32. The Central Bank of Sudan's policy since 2007 has been that banks should allocate 12% of their loans to micro-finance projects.[28] This has been a continuation of a policy that since 2000 that has seen the percentage of funds dedicated to micro-finance increase from 7% to 10%, then 12%. At the same time, the value of micro-finance loans has fallen from 7.2% of funds in 2000 to 1.8% in 2010.[29] Representatives from Sudanese banks interviewed as part of the PPG project indicated that on average 5% of their lending goes to micro-loans. Micro-loans are capped at SDG 20,000, roughly one fifth of the expected cost of the smallest solar pump. Loan repayment does not extend more than five years. As such microfinance loans are not a viable source of finance for the solar PV pump sub-sector.

33. The banks in Sudan follow a system of Islamic finance. As such, they do not provide loans outright, but rather engage in other mechanisms: murabaha (a deferred sale), mudaraba (capital investment), and musharaka (a profit sharing partnership). Murabaha is overwhelmingly the most common means of finance. It involves the bank buying from the vendor the equipment to be financed and reselling it to the client, after a mark-up which represents the bank's profit, payable through a deferred payment schedule.

34. The Central Bank of Sudan's 2011 policy[30] places the finance cost of a murabaha transaction at an estimated 9%, though banks are free to deviate. The 2012 policies, the latest available, leave the cost of finance entirely to the banks. During interviews as part of the PPG process, the banks indicated that they could not lend at a cost of finance less than 11%.

35. The main barriers facing the project implementation are:
- Relatively high capital expenditure required and associated risk;
- Lack of low cost finance and limited experience with long-term finance, especially for PV pumps;
- Novelty of the technology and lack of technical experience among all stakeholders; and

[28] Central Bank of Sudan Policies for the Year 2012
[29] Ali, A. E. S., The Regulatory and Supervisory Framework of Microfinance : Some Evidence from Sudan, Asian Social Science, Vol. 11 No. 15, 2015
[30] Central Bank of Sudan Policies for the year 2015

- Lack of accurate record keeping and baseline data for diesel irrigation, which inhibits ability to make well-informed cost-benefit analyses of other options (e.g. investing in solar pumps)

Each of these barriers is discussed below.

1.2.1 Relatively high capital expenditure required and associated risk

36. Compared with the initial cost of a diesel pump, the initial cost of a solar pump is significant larger. A basic comparison is made in the table below. While solar pumps have the advantage of no fuel costs and thus very low running costs over their lifetime, the initial capital investment is significant. The loss of the pump due to damage, theft, or a technical failure represents a significant loss of capital. This factor combined with the unfamiliarity of solar pumping technology in Sudan means that most farmers are reluctant to make an investment of this size.

Table 2 Cost of solar PV pumps and equivalent diesel pumps

Solar PV pump	Estimated solar PV pump cost (SDG)	Approximate equivalent diesel pump	Estimated equivalent diesel pump cost (SDG)
3.12 kW	100,000	5-6 hp	10,000
5.12 kW	175,000	8-10 hp	15,000 - 20,000
29.6 kW	680,000	60-65 hp	70,000

37. The cost of PV has come down tremendously in recent years, with a PV system today costing approximately 25% of what it did in 2010.

1.2.2 Lack of low cost finance and limited experience with long-term finance, especially for PV pumps

38. As noted in text above, Sudan follows a system of Islamic finance. The typical equivalent cost of finance is approximately 11% and typical payment tem is 5 years and very rarely more than 7 years. In addition, the bank requires collateral. It may use the equipment itself as collateral where such equipment can be uniquely identified and its ownership registered in a commercial register.

39. As banks are unfamiliar with PV pumps, and particularly as the pumps require long-term financing, they have many of the same concerns as farmers. If for any reason the pump should fail to perform (damage, theft, or technical mal-function), the farmer will be unable to repay the loan. Insurance can be purchased against damage or theft. This leaves technical mal-function or lack of suitability for the purpose (i.e. limited irrigation hours) as the main concerns.

1.2.3 Novelty of the technology and lack of technical experience among all stakeholders

40. This, coupled with the high investment cost, is one of the main barriers to adoption. The novelty of the technology means that few people are willing to assume the high investment cost to undergo the initial learning necessary. The novelty extends from initial sizing and selection of equipment, to concerns about operation, the system providing adequate water, and repairs in case of malfunction.

41. It must be noted that although solar water pumping is not new technology it has remained a limited niche technology until very recently. Very few suppliers (one or two) have been providing solar water pumping systems for any period of time. Perhaps one or two additional suppliers have been providing components for solar pumping systems but not complete systems, and at a prohibitive cost. The components that have been available have, with some exceptions, been for relatively small pumps. Only in the past two years have it been possible to buy components for larger pumping systems (3 kW and larger).

1.2.4 Lack of accurate record keeping and baseline data for diesel irrigation

42. Most farmers live day-to-day with little formal record keeping. As such, there are not accurate records for the amounts of diesel used, cost of maintenance, time lost to maintenance, other consumables, etc. The farmers do have general estimates but not well recorded data. Some quantities are not known at all, for example, the amount of water pumped. More importantly, the amount of water needed to irrigate the land area and crop is also unknown. There is nothing to indicate that the amounts of water presently used are ideal. One of the activities under this project is the promotion of water-efficient irrigation mechanisms, both as a means to reducing the cost required and to increasing the sustainability and longevity of the underground water aquifers.

43. The lack of data prevents an accurate cost-benefit analysis for the use of solar PV pumps. Even for the use of diesel pumps, practice is not consistent with various diesel engines installed for a given pump size. Thus, appropriate sizing or design of solar pumps is difficult and comparison with diesel pumps is not possible without first obtaining data on their operation.

44. This lack of baseline data means that there will be some learning involved in appropriately selecting solar PV pumps to replace the existing diesel pumps. As solar PV pumps only pump during sunlight hours they are usually sized somewhat larger than conventional diesel pumps which can operate for longer hours. This is such that they can deliver the same total volume of water during shorter operating hours. Farmers in the Northern State of Sudan report operating on average 7 - 8 hours/day. One of the main activities under this project will be developing the knowledge and experience to appropriately size PV pumps as replacements for diesel pumps.

1.3 Institutional framework and stakeholder analysis

45. The main stakeholders involved in carrying out agricultural and power projects in Sudan are:

- Ministry of Water Resources and Electricity (MWRE)
- National Energy Research Center (NERC)
- The Northern States government
- Ministry of Finance & National Economy (MoF)
- Sudan Standards and Metrology Organization (SSMO)
- Ministry of Agriculture (MoA)
- Ministry of Petroleum, Renewable Energy Directorate (MoP)
- Higher Council for Environment and Natural Resources (HCENR)

46. The **Ministry of Water Resources and Electricity (MWRE)** is the Government body responsible for electric power in Sudan. MWRE has been implementing the grid-electric pumps programme together with the Northern Sates government to promote electric pumping for large-scale farms. MWRE will be the main executing entity for the project.

47. MWRE hosts a General Directorate of Electricity Generation Using Atomic and Renewable Energy. It is through this directorate that MWRE will contribute to the present project. An organizational chart for MWRE is presented in the figure below, showing the General Directorate of Electricity Generation Using Atomic and Renewable Energy.

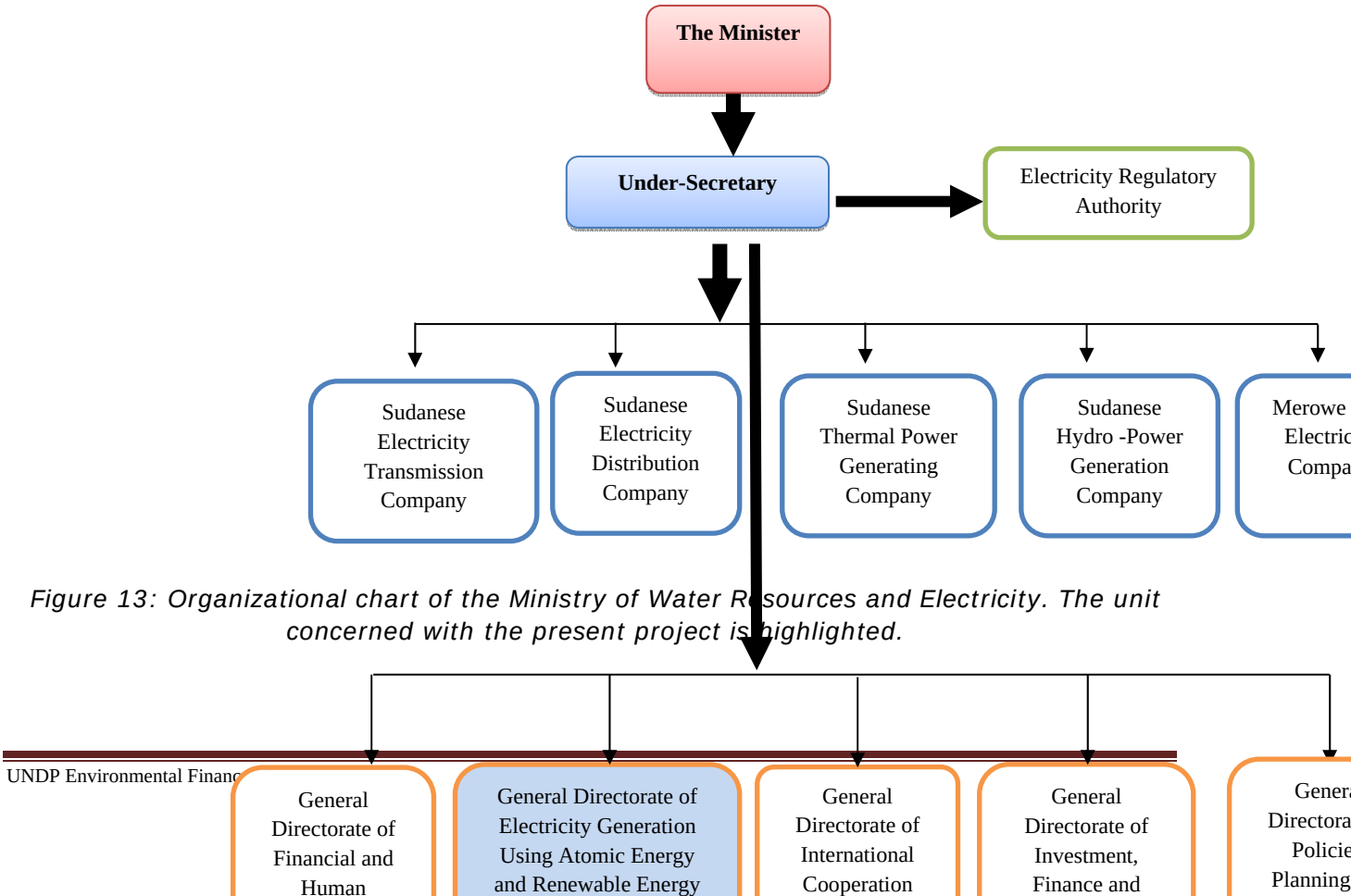


Figure 13: Organizational chart of the Ministry of Water Resources and Electricity. The unit concerned with the present project is highlighted.

48. The **Northern State Ministry of Agriculture (NS MoA)** is the governmental entity which is responsible for the implementation of the Agricultural Strategic Plan in the Northern State. The main target of the plan is to raise the percentage of agricultural land in the country by 70%. The NS MoA acts as the body responsible for the overall management of agricultural affairs in the Northern State and is the primary State Government liaison with the Farmer's Union of the Northern State.

49. The **Ministry of Petroleum (MoP)** was created in 2010 through the division of the Ministry of Energy and Mining into three separate ministries: the Ministry of Water Resources and Electricity, the Ministry of Petroleum, and the Ministry of Mining. Under the MoP's General Directorate of Energy Affairs is the Renewable Energy Directorate. MoP has installed seven PV solar pumps in the past. The organizational charge below shows the structure of the Ministry of Petroleum and highlights the Renewable Energy directorate which will be the main MoP focal point for the proposed UNDP-GEF project.

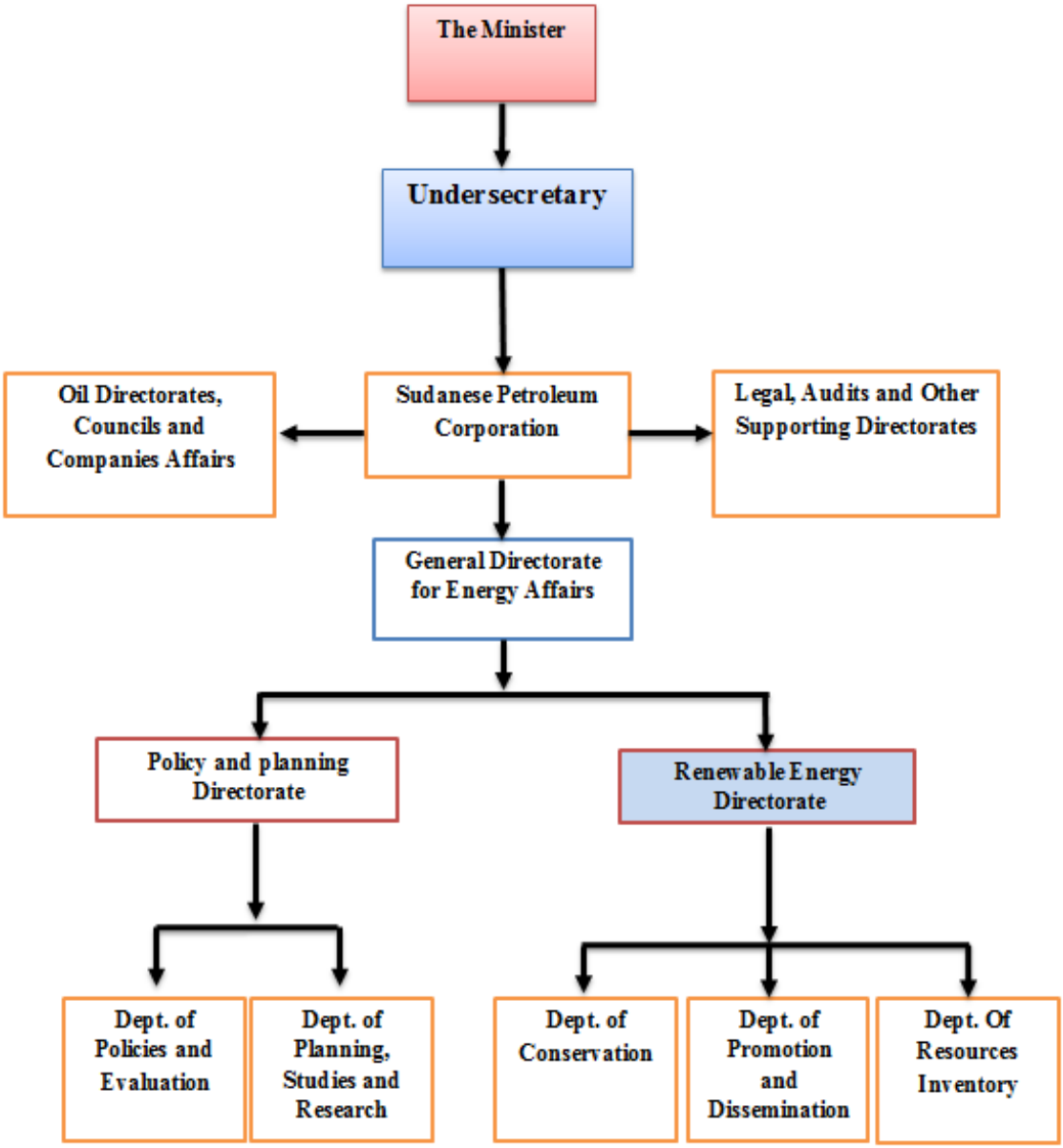


Figure 14: Organizational chart of the Ministry of Petroleum. The unit concerned with the present project is highlighted.

50. **Higher Council for Environment and Natural Resources (HCENR)** - The Higher Council for Environment and Natural Resources oversees the application of environmental laws and regulations to all development projects in Sudan, and has particular responsibilities in the climate change area. HCENR serves as the Designated National Authority (DNA) for the Clean Development Mechanism (CDM). It is also the NAMA Focal Point and UNFCCC Focal Point for Sudan. With UNDP support, HCENR has been developing standardized baselines for Sudan. HCENR has also developed a Technology Needs Assessment (TNA) for Climate Change Adaption and Mitigation, funded by the GEF. The Undersecretary of the Ministry directs HCENR and serves as the national GEF focal point. The organizational chart below indicates

the structure of the Ministry of Environment, Forestry, and Physical Development and HCENR's location within it.

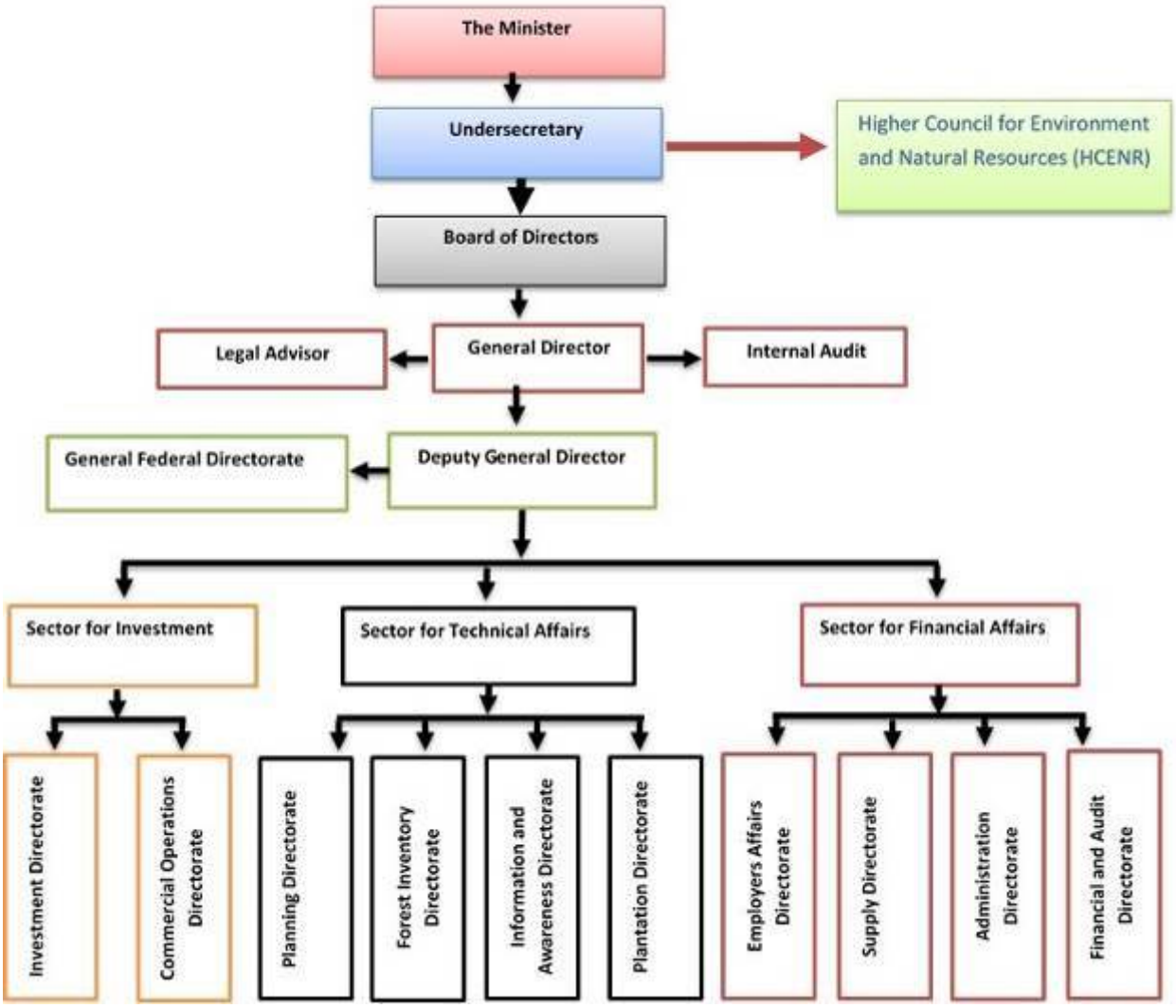


Figure 15: Organizational chart of the Ministry of Environment, Forestry and Physical Development

51. The **Ministry of Finance & National Economy (MoF)** has the general objective of developing the internal resources of Sudan and utilizing them in the most efficient way possible to support growth. The MoF also directs the customs and tax authorities and thus is responsible for taxation and for exempting strategic goods from customs duties and taxes, as agricultural implements are, for example.

52. The **National Energy Research Centre (NERC)** has been active in promoting and developing solar water pumping. NERC has a special department for solar energy equipped with instruments and a mechanical workshop. NERC has already participated in the installation of solar pumps around Sudan and is one of the most

experienced entities in this regard in the country. NERC is tasked with the development of Sudan's future energy resources and securing the energy needed for sustainable growth. It is hosted within the Ministry of Science and Communication.

53. The **Sudan Standards and Metrology Organization (SSMO)** is a government body was established to coordinate Sudan's engagement with the International Standards Organization (ISO), the African Regional Organization for Standardization (ARSO) and the Arab Standards and Metrology Organization (ASMO). SSMO is responsible for the development of technical standards and testing within Sudan and ensuring that equipment meet minimum standards for quality, safety, and functionality.

54. The **Farmer's Union of the Northern State** serves as the body representing Farmers' interests within the state and interfacing with the State Government. The Union coordinates with the Northern State Ministry of Agriculture on matters relating to farmers' demands and implementation of national programmes which impact farmers in the Northern State, such as the extension of the electric grid to reach pumps which can be economically electrified. The head of the Farmer's Union also represents the Union at workshops and stakeholder consultations giving a unified voice to farmers.

55. The banks provide general loans and finance to clients and in the case of solar water pumping will combine to form a fund (mahfaza) to support solar water pumping under unified terms. The banks in the Northern State expected to participate are: Bank of Sudan, Agricultural bank, Northern Islamic bank, Agricultural & commercial bank, Al Nile Bank, Sudanese Islamic Bank, Baraka Bank, Al Shamal Islamic Bank, Farmer's Commercial Bank, Family Bank.

2. Strategy

2.1 Project Objectives, Outcomes, and Outputs

56. The objective of the project is to replace diesel-based irrigation water pumping through the promotion of solar photovoltaic (PV) powered pumps.

57. The project consists of four outcomes. The first outcome is concerned with installing 28 pilot pumps (20 × 3.12 kWp units, 5 × 5.12 kWp units and 3 × 29.6 kWp units) to act as demonstration units, the creation of a financing mechanism with subsidy from GEF funds, and the subsequent financing and installation of 1,440 pumps. The focus of these activities is the dissemination of PV pumps in the Northern State.

58. The second outcome is aims to reduce the risks associated with (de-risking) solar PV pumping by providing quality standards, testing and certification, training and capacity building. The second outcome also includes activities to increase efficiency of water use, thereby increasing the overall sustainability of pumping practices and reducing the size (and therefore cost) of solar PV pumps.

59. The third outcome develops a UNFCCC standardized baseline for solar PV water pumping and implements it within a NAMA to support the development of appropriate MRV protocol for solar pumping.

60. The fourth outcome supports the scaling-up and expansion of the project to other states in Sudan. It makes the case to the relevant authorities for regulations to encourage solar PV pumping and exempt equipment from taxes and customs. It also includes a structured replication programme to replicate success in the Northern State in other states.

61. The Project will coordinate between the Northern State Government and the commercial banks to develop a customized lending mechanism for solar water pumping systems. The GEF project, together with the Northern State Government and other stakeholders will provide a series of initiatives to ensure the success of the project such as:

- Establishing a National PV Fund to help finance farmers;
- Establishing a set of criteria for PV pump loans;
- Developing and maintaining a monitoring system;
- Establishing a set of minimum hardware standards to qualify for loans; and
- Establishing technical standards to help assure quality of solar water pumping equipment.

62. The project is structured around four Components and Outcomes which together aim to achieve the project objective. These components and outcomes are described below.

Outcome 1:	***Financing and dissemination mechanism established and operational to support a PV pump installation programme***
GEF funding:	***US$2,755,852***

Co-financing:	***US$17,000,000 (MoF $3,000,000; $2,000,000 each of the following banks: Al Nile, Al Shamal Islamic, Baraka, Family, Farmer's, Savings and Social Development, Sudanese Islamic)***

63. In the current baseline the prevailing practice is the use of diesel engines to pump water in areas which are not connected to the grid. This outcome promotes the adoption of PV pumps in two ways:

a) Providing a pilot stage installation of 28 pumps to serve as a demonstration and to facilitate gathering of data on the operation of the pumps; and

b) Creating a National PV fund that provides a finance mechanism which removes the barrier of the large capital required. The fund aims to finance 1,440 pumps over the five year project lifetime.

64. The 28 demonstration pumps are expected to be installed within 6-9 months of project start. The financing mechanism is expected to be operational by the end of the first year of the project and to then finance 1,440 pumps over the remaining four years of the project.

65. During the first year, the data collected and the efforts to establish the National PV fund will establish the subsidy level to be offered, the loan term and cost of finance. The calculations presented here are preliminary based on the information available at the PPG phase.

❖ ***A 28 pump pilot phase***

66. The first activities under this outcome are the identification of 28 farmers to host 28 solar PV pumps on a "pay if satisfied" basis, and the appropriate specification of these pumps. The pumps will be installed at carefully selected farms[31] at no initial cost to the farmers. After one year of operation, if the farmers are satisfied, they can enter into a loan re-payment scheme and benefit from the subsidy offered. If the farmers are not satisfied, the pumps will be removed at no cost to them. In effect, the famers who receive the initial 28 pumps benefit from a free one year trial, and if they continue, a one-year grace period on their loan. This method achieves several objectives. It allows the farmers to try the pumps with no risk to them and popularize the technologies and provide a proof-of-concept. At the same time, they realize that if they choose to keep the pump they will have to pay for it; thus they have an incentive to honestly evaluate its performance and to ensure its safety.

67. The objectives of the 28 pilot pumps are: a) to make farmers familiar with solar technology and enable them to visit operating pump installations, see them in operation, and obtain feedback from fellow farmers; b) to provide data on the operation of the pumps to the project team which will inform the design and

[31] Farms to be selected to be representative and owned by individuals known to be trustworthy and upstanding members of the community.

selection of future pumps; and c) provide confidence to other stakeholders, such as lenders, on the effectiveness of solar pumps.

68. Upon selection of a farmer to host one of the trial pumps (to be done by the Northern State Government and Farmer's Association based on transparent criteria), the farmer will enter into a contract with one of the participating banks stipulating that the farmer will have the choice at the end of the year to either have the pump removed at no cost or purchase it, either through a the to-be established finance mechanism or outright with the farmer's own funds.

69. Farmers selected to be among the 28 pilot pump recipients will be nominated by the Northern State Government and Farmer's Association and approved by the project. The farmers will be meet certain criteria specified in advance, such as: they fit a geographical distribution to allow the greatest number of other farmers to see pumps in operation; they are a respected person within the community such that their testimony to the efficacy of PV pumps holds weight; the banks are prepared to enter into an agreement with them for finance of the solar PV pumps; and they agree to allow visitors to observe the pump and to collect all data from their present pumping activity and future PV pump available to the project and publicly (with appropriate anonymity).

70. The project can then collect data on the operation of the diesel pumps in the time period between when the farmers are identified and when the solar PV pumps are installed. Once farmers are identified, diesel and water flow meters will be installed to establish a more specific baseline. Farmers for the pilot phase are expected to be identified as soon as is practical after the project start. As it will take a few months for the solar PV pumps to be selected, procured, imported and installed, this should provide at least 3-6 months of data on the operation of diesel pumps to be replaced by a solar pump.

❖ ***Creating a national PV fund and finance mechanism***

71. It is not presently possible for banks to lend for PV pumps because the banks have no understanding of solar pumping and as such are apprehensive about financing it and lack an appropriate formulation for the structure of the finance. There are also practical difficulties, such as establishing collateral, establishing ownership of the PV system and pump, etc.

72. It is not the role of the banks to develop innovative finance instruments or to promote innovation in practice. Rather, it is their role to provide finance to known and proven technologies whose risks are limited and understood. The Project will fill the gap between the present state of practice with solar pumping and the needs of the banks in order to provide finance. At the same time, farmers are unfamiliar with the technology and do not wish to bear the risk of a loan to support technology which they do not know or trust. Among the questions which are to be addressed under this component are:

- How will the finance package be structured? In what amounts?
- How can the performance, quality and longevity of the pump be guaranteed in order to provide the borrower with the income needed to repay the loan?

- What can be used as collateral that is acceptable to the farmers and the banks?
- What happens in case of loss or theft?
- What are the risks, who bears them, and how can they be mitigated?

73. Sudan has experience in the formulation of special purpose funds (Mahfaza) such as funds established to encourage banks to finance strategic sectors (wheat, sugar, edible oils, medicines, cotton, livestock, gum Arabic, gold and minerals). The most notable of these has been the Wheat Fund (*Mahfazet el Gamh*). The fund is established and governed by the Central Bank of Sudan. The Central Bank fixes the finance terms and conditions, regulations and eligibility conditions. The Central Bank then collects funds from each of the participating banks. Each of the participating banks can then lend through its branches in accordance with fund rules. The fund is evaluated annually by the participating banks who determine the use of the accrued profit in the fund. This project will utilize this same existing model to establish a national PV fund as a mechanism to finance PV pumps. The Ministry of Finance has committed to supporting establishment of a national PV fund and has provided a letter of co-finance in the amount of US$3 million.

74. Following the same procedure the National PV Fund will aim to:
- Encourage the banks to expand their finance using different incentives, which lead to the increase in banks finance to PV pumps.
- Encourage the banks to finance the private sector focusing on PV pumps in the irrigated agriculture sector.

75. The PV fund will initially be jointly established by the Ministry of Finance and National Economy and the Ministry of Water Resources and Electricity. It will be open to all banks to participate in the fund. Seven banks (Al Nile, Al Shamal Islamic, Baraka, Family, Farmer's Commercial, Savings and Social Development, and Sudanese Islamic Bank), have already committed to support the fund with contributions of two million dollar each, and to lend through their branches in the Northern State. The Central Bank of Sudan will manage the fund on behalf of the Ministry of Water Resource and Electricity and determine the amount to be annually allocated, profit margins, and lending procedures following the Islamic Finance System in use in Sudan.

76. The Project will remove the barriers of the novelty of the technology, high initial capital and lack of finance two approaches under this Outcome: 1) providing the initial capital (funded by GEF) for 28 demonstration units to prove that solar pumping is an attractive alternative to diesel pumping and enable farmers to try for themselves and obtain experience from their peers whom they will naturally trust; and 2) providing a financing mechanism and subsidy to allow farmers to avoid the high initial capital cost of PV pumps. In this sense, the Project will absorb the risk that other parties are not presently prepared to absorb and act as a catalyst to kick-start the market.

77. After the initial 28 pumps, the Fund will provide a pre-determined subsidy to a further 1,440 pumps to help make them more financially attractive to farmers. The fund will also provide a central point to receive any additional support that can be

secured in the future, for example from international donors, the Green Climate Fund (GCF), or NAMA finance.

2.1.1 Establishing a finance and subsidy mechanism for PV pumps

78. As part of this outcome, the project will help put in place several elements to enable a sustainable finance mechanism for PV pumps. This mechanism will use the resources of the PV Fund and participating banks to enable farmers to finance their purchase of PV pumps. The elements the project will help establish are:
    a. A subsidy level, establishing a cost of finance and term for repayment
    b. Criteria for participation
    c. A collateral mechanism

2.1.2 Establishing a subsidy level, cost of finance, and term for repayment

79. Diesel pumps are relatively inexpensive as regards upfront cost. By contrast, comparable PV powered pumps are relatively expensive as regards upfront cost. Table 2 (reproduced below) provides indicative costs for both. Interviews and data collection by Local Consultants during the PPG process indicate that the operation cost of an 8 – 10 hp diesel pump is approximately 1,860 SDG/month. By contrast, the operational cost of a solar pump is practically zero.

Table 3 Estimated solar pump cost and the equivalent diesel pump cost

Solar PV pump	Estimated solar PV pump cost (SDG)	Approximate equivalent diesel pump	Estimated equivalent diesel pump cost (SDG)
3.12 kW	100,000	5-6 hp	10,000
5.12 kW	175,000	8-10 hp	15,000 - 20,000
29.6 kW	680,000	60-65 hp	70,000

80. Thus, the challenge of a financing scheme is to “levelize” the cost of a solar pump such that the repayment burden represents a monthly cost that is acceptable to farmers for the service they receive from a solar pump. We expect that such a cost will be not very dissimilar from the present cost of operating a diesel pump. This challenge in finding an appropriate level for the monthly cost of a solar pump has three components: 1- establishing the monthly cost of a comparable diesel pump, 2- establishing what farmers would be willing to pay monthly for a solar pump, and 3- establishing the monthly installment on the solar pump. Each of these points will be addressed in the first year of the project, as described below.

2.1.3 Establishing the cost of operation and level of service of a diesel pump

81. There is considerable variation in the cost of operation of diesel pumps reported by farmers. This is to be expected as there are little written records and most reports are simply based on farmer’s recollection, which is likely to underestimate the true

cost of operation. While surveys and interviews were undertaken and measurements conducted on one test pump as part of the PPG process, more extensive surveying and testing will be undertaken during the first year of the project with the aim of establishing the true cost of operation over a representative sample of farms operating under various conditions.

82. A similar challenge is establishing the level of service of a diesel pump – how much water is pumped over how many hours. This is necessary in order to establish the requirements of directly comparable solar PV pumps. While surveys were undertaken as part of the PPG process and used to establish initial estimates for selection of suitable PV pumps, more detailed information, as should be provided by sensors and measurements on flow rates and hours of operation. This information will be necessary when establishing water savings, under Component 2.

2.1.4 Establishing what farmers would be willing to pay for a solar pump

83. Assuming that the solar pump provides irrigation as effective as a diesel pump, the sum farmers are willing to pay should be at least the same as for a diesel pump. Still, many farmers do not make their decisions based solely on financial comparisons. Indeed, as above, most do not know with specificity their cost of operation. In addition, there are expected to be additional, perhaps intangible, benefits to the use of solar pumps. All farmers interviewed complained bitterly of being at the mercy of diesel repairmen to service their diesel pumps.

2.1.5 Establishing the monthly cost of a solar PV pump, subsidy level, total investment and fund sustainability

84. Given that the operational cost of a solar PV pump is practically zero, the monthly cost (installment) of a PV pump is a function of three variables: the initial cost, the cost of finance, and the term over which the cost of the pump will be paid (term). The cost of finance and the term of repayment will be established by the PV Fund. During discussions, banks have indicated that the cost of finance for standard loans is approximately 11%. Repayment terms are rarely longer than seven years. With these conditions, considerable subsidy is required to reduce the initial investment to where the monthly payments are similar to present estimates for the monthly cost of operating a diesel pumps. With the establishment of a National Fund and designation of PV pumps as a strategic initiative, it may be reasonable to obtain a 9% cost of finance and a 10 year re-payment term.

85. A detailed analysis in provided in Annex I. The summary is presented here. The figures below present the impact of subsidy, repayment term and cost of finance on the monthly installments for a solar pump. In both cases, the estimated monthly cost of operating a diesel pump is shown as a dotted black line. Points above the line are more costly than operating diesel. Points below the line are less costly. These plots can be used to determine combinations of finance cost, repayment term, and subsidy amount which can result in acceptable monthly payments, as determined by the cost of operating a comparable diesel pump and the amount a farmer would be willing to pay for the advantages of a solar pump. The subsidy amount would be revised

annually based on changes in the underlying factors, such as increase in the price of diesel or greater willingness by farmers to adopt solar pumps once they are more accepted.

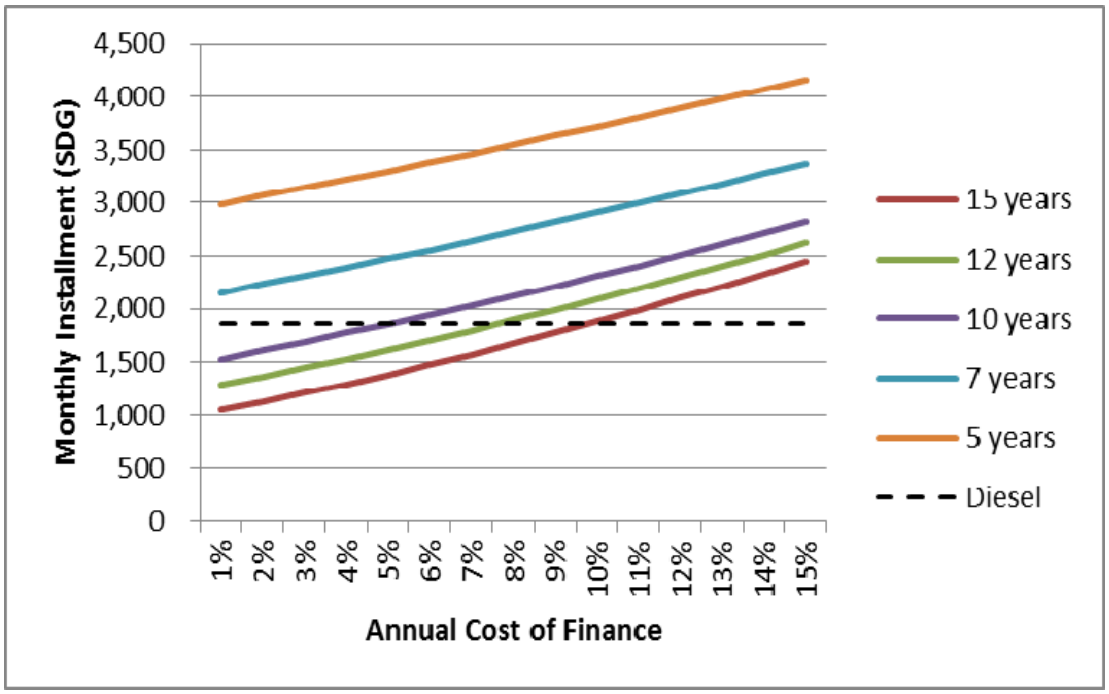


Figure 16 Fixed monthly installments for a 175,000 SDG solar pump as a function of cost of finance.

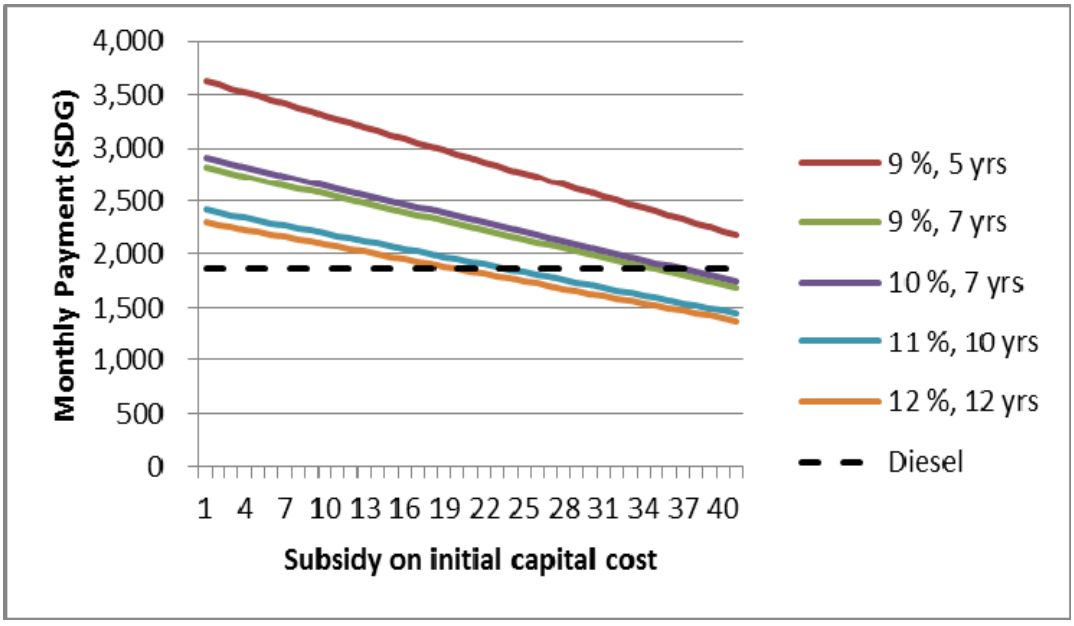


Figure 17 Monthly installments on a 175,000 SDG solar pump as a function of subsidy on initial cost for various finance scenarios. Note that finance scenarios where cost of finance is equal to repayment term (10% and 10 years, 11% and 11 years, 12% and 12 years) all fall on almost the same line, hence only one such case (12%, 12 years) is shown.

2.1.6 Required fund size and sustainability

86. The total cost of the 1,468 pumps envisioned to be installed under the project is US$24,190,000, as shown in the table below. It is assumed that one quarter of the target capacity will be installed during each of the four years of the project.

Table 4 Cost of supply and installation of 1,468 pumps

Pump capacity (kW)	Pump cost, installed (SDG)	Number to be installed	Number installed per year	Total cost (SDG)	Total Cost (USD)
3.12	100,000	1,276	319	127,600,000	15,950,000
5.12	175,000	128	32	22,400,000	2,800,000
29.6	680,000	64	16	43,520,000	5,440,000
Total		**1,468**		**193,520,000**	**24,190,000**

87. The fund's annual cash flow can then be expected to be as in the table below. The initial value of the fund is $19,419,000 consisting of US$2,419,000 of GEF finance[32], and US$17,000,000 of co-finance. The calculations below assume a 9% cost of finance and a 10 year repayment term.

Table 5 National PV Fund cash flow, based on assumed 9% cost of finance and 10 year repayment terms. All figures in USD.

	Year 2[33]	Year 3	Year 4	Year 5
Fund value at year end	19,419,000	14,171,255	9,741,468	6,148,343
Expenditures from fund (Cost of pumps)	6,047,500	6,047,500	6,047,500	6,047,500
Repayments on 3.12 kW units	527,307	1,066,577	1,618,287	2,181,960
Repayments on 5.12 kW units	92,592	187,296	284,112	383,088
Repayments on 29.6 kW units	179,856	363,840	551,976	744,240
Total loan repayments	**799,755**	**1,617,713**	**2,454,375**	**3,309,288**

88. Thus, fund resources are more than sufficient to cover the financing. Starting with a fund of US$19,419,000, it is possible to finance the US$24,190,000 worth of pumps because the loan repayments will be recycled into the fund to finance additional pumps. The fund ends at the end of year 5 of the project (end of the project) with a balance of US$6,148,343, sufficient to carry it through another two years of finance.

[32] GEF finance is set at the level required for subsidy at the proposed amounts. See following page.

[33] Years refer to project years as the fund is expected to start financing pumps at the start of year 2 of the project. Year 1 will be used to establish the fund.

These calculations assume a 100% repayment rate, which in practice is likely to be less. They also do not include inflation, assuming the cost of a pump remains the same throughout the project lifetime. In practice, the cost is subject to conflicting pressures. While the cost may increase as a result of inflation, it is likely to decrease as solar technology becomes cheaper in general, and in particular in Sudan when solar PV pumps become exempted from customs duties and taxes.

89. The GEF subsidy amount is calculated on the basis of a decreasing subsidy beginning at 13% and falling by 2% each year to reach 7%. The calculations again assume that one quarter of the pumps are installed at each subsidy level (nominally, each year though for the purposes of subsidy calculation under present assumptions it does not matter).

Table 6 GEF Subsidy amounts (USD)

Subsidy level	3.12 kW pumps	5.12 kW pumps	29.6 kW pumps	Total subsidy amount
7%	279,125	49,000	95,200	
9%	358,875	63,000	122,400	
11%	438,625	77,000	149,600	
13%	518,375	91,000	176,800	
Total subsidy	**1,595,000**	**280,000**	**544,000**	**2,419,000**

90. At the subsidy levels above, with a 9% cost of finance and a 10 year payment term, the monthly costs for each pump are as below.

Table 7 Monthly cost for each pump at GEF subsidy level

	Monthly installment (SDG)		
Subsidy	**3.12 kW pump**	**5.12 kW pump**	**29.6 kW pump**
7%	1,178	2,062	8,011
9%	1,153	2,017	7,839
11%	1,127	1,973	7,666
13%	1,102	1,929	7,494

91. At the initial rate of 13%, the monthly installment for a 5.12 kW pump, of 1,929 SDG is 3% higher than the cost of operating an equivalent diesel pump calculated as part of the PPG (1,866 SDG).

92. While exact subsidy amounts, loan terms, and cost of finance will be established during the first year of the project, the above shows that under very reasonable assumptions, and the data available at this stage, it is possible to finance the

proposed 1,468 pumps, provide adequate subsidy to make their cost comparable to diesel pumps, and recuperate the funds to sustain financing beyond end of the project with a suitable margin of safety to account for any fluctuations in costs or currencies.

2.1.7 The role of water efficiency

93. When using a diesel pump, if a farmer desires more water it is possible to operate for longer hours. When using a solar pump, the pump must be sized in advance for a certain capacity. The size of the pump determines its cost, with the relationship between size and cost being almost linear. A reduction in the amount of water required translate directly to a reduction in the capacity of the PV system, and therefore directly to a reduction in the capital cost required. Thus, the efficient use of water has the potential to make solar PV pumps considerably more economical while reducing the impact on underground water sources. Water efficiency is further discussed under Outcome 2.

2.1.8 Operation of the financing mechanism

94. The proposed financing mechanism will take advantage of the extensive experience in Sudan with creating special purpose funds for the purpose of financing specific strategic objectives. The funds are managed by the Central Bank of Sudan, which establishes the funds, their rules, lending procedures, criteria, rates, and centrally oversees their operation. The funds are financed by participating banks and reviewed by the contributors annually. Finances from external organizations, such as UNDP, GEF, the GCF, or others, can contribute to this centrally managed fund with clarity on its rules operation.

95. The transfer of any GEF funds for equipment subsidies to the national PV fund will only happen upon the provision of proof of the legal establishment of the fund by the executing agency (or their delegated financial custodian) with all requisite fiduciary and legal conditions in place to ensure appropriate disbursement and monitoring of the GEF funds by the fund vehicle according to its intended use. The project will itself not manage the fund but will ensure compliance of fund operations with UNDP/GEF guidelines.

96. For each pump purchased under the financing mechanism, a subsidy amount contributed by GEF funds (through MWRE and the national PV fund) will subsidize the purchase in the appropriate amount, reducing the initial cost of the pump. The remaining amount will be re-paid by the farmer in installments over the term of the finance. Under the Murabaha system of Islamic finance, the bank purchases goods and resells them to the ultimate owner at a deferred payment schedule and higher cost.

97. The rules of the fund will evaluate the eligibility of those who wish to obtain the subsidy but not receive a loan for the pump. In order to ensure that subsidies are available equitably, all those who wish to obtain the subsidy must qualify for the subsidy through the Fund. This qualification process may be different from the

qualification process for the fund itself (i.e. they may not have to offer collateral or other evidence of creditworthiness as they will not receive credit). Only one subsidy will be available per farm or farmer.

2.1.9 Criteria for participation

98. In order to be eligible to receive subsidies and finance from the PV Fund, farmers should meet at least the following minimum criteria:

i. Have a farm in an area that the electricity grid will not reach within the coming 10 years
ii. Sign a declaration allowing the Project access to data from the pump for development purposes
iii. Sign a declaration that the farmer will not sell or otherwise use the PV system and pump for anything other than the intended purpose.
iv. Select a PV system which meets the criteria established (such systems will be identified by NERC)
v. Participation in a water efficiency programme[34]
vi. Meet any credit-worthiness or other criteria imposed by the banks

99. As a participant in establishment of the PV Fund, the UNDP-GEF project will have the opportunity to participate in creating equitable criteria and ensuring they are adequately applied.

2.1.10 A collateral mechanism

100. One of the items that has been raised in discussion with the banks during the PPG phase was the collateral that can be presented for the pumps. The pumps themselves were not considered collateral as their ownership is not uniquely registered. If the Project can establish that the pumps and associated PV systems become registered property (similar to a car), either by using manufacturer's numbers or by uniquely labeling the systems and components prior to their sale, this could be a significant advancement in facilitating a financing mechanism. The banks indicated willingness to accept the PV systems and pumps as collateral if they are uniquely identifiable and their ownership individually registered.

Outcome 1	Outputs	Activities
Financing and dissemination mechanism established and operational to support a PV pump installation	1.1 28 pumps installed as part of a pilot phase	1.1.1. Selection of 28 farmers to receive the pilot pumps 1.1.2. Installation of baseline monitoring equipment to establish baseline diesel consumption, water pumped, operating hours, and cost expenditure. 1.1.3. Specification, procurement, and installation of 28 pilot pumps

[34] The project team may decide at the appropriate time whether this should be a criteria for access to subsidies and finance or not.

programme		1.1.4. Monitoring performance of the pilot pumps
	1.2 National PV Fund and coordinated loan facility established and capitalized to promote concessional lending to farmers for PV pump equipment.	1.2.1. Support to Ministry of Finance to create national PV fund with appropriate fiduciary and legal standards in place for operation and monitoring 1.2.2. Coordination with North Government State and commercial banks to enact a loan program for PV pumps linked to the PV fund 1.2.3. Establish a set of criteria for PV pump loans 1.2.4. Establish and maintain a monitoring system
	1.3 A minimum of 1,468 off-grid PV pumps ranging in size from 3.12-29.6 kW installed in farms in the Northern State of Sudan with support from the national PV fund	1.3.1 Implement a subsidy scheme to support installation of 1,468 initial units 1.3.2 Provide support to the lenders and users on closing and implementing the initial projects

Outcome 2:	***Financing and dissemination mechanism de-risked through technical standards and demand-side support***
GEF funding:	***US$746,544***
Co-financing:	***US$1,106,875 (Energy Affairs MoP: $161,833; MWRE: $535,875; NERC: $141,605; Northern State Ministry of Agriculture: $60,688; UNDP: $206,875)***

101. This outcome focuses on establishing a set of measures to reduce the risk associated with solar water pumping and ensure the sustainability of the project. The project will help in raising the awareness and providing training and capacity building in order to encourage the private sector to install solar water pumps.

102. A barrier to implementation is the potential failure of low quality units which may impede adoption by spreading the impression of poor reliability of equipment. As the equipment is capital intensive farmers must be assured of the quality, longevity, and performance of the equipment. This will be addressed by the Project through development of technical standards for the solar pumping equipment that should be installed. Also this outcome includes providing training to the farmers on installing and maintaining the PV pumping system.

103. In order to ensure meeting the minimum standards for the solar pumping equipment, the components of PV pumping system (PV panels, the pump, the controller and the electric motor) will be tested in the country. The testing procedures will be developed as part of this outcome. Furthermore, training will be provided to the personnel in Sudan Standards & Metrology Organization (SSMO) on testing and evaluating this equipment. This outcome will assist in developing

certification criteria for the components of PV pumping system. The banks which will offer micro-finance loans will ensure that the PV pumping system will be certified.

104. To help in achieving the maximum efficiency and reduce the risks of installing poorly-sized pumps, this outcome includes the development of software to provide the appropriate characteristics of the PV pumping system according to the farm and the hydrological conditions.

105. Activities under this outcome will assist in the successful installation of PV pumping systems. The installers will be trained on the tools and equipment required for undertaking the installation process, handling and storing these equipment, the sequence of the process and the health and safety procedures. A certification scheme will be developed for the installers. To help encourage farmers to install PV pumps, this outcome will also establish a training program on siting, installation, operation and maintenance of PV pumps.

106. One of the main concerns about solar water pumping is that once the equipment is installed pumping of water becomes "free"; hence there is no incentive to limit water use. Similarly, a concern with pumping from underground aquifers is that they may be over-utilized causing the water levels to fall, the water or land to become saline, and ultimately the aquifer to become unusable. As a main component of the project the sustainable use of water from the underground aquifers will be explored.

107. Most irrigation in Sudan is presently done by flooding. The Project will evaluate and introduce water-efficient methods of irrigation. Participation in the solar pumping programme may be contingent on adoption of these methods (see criteria for inclusion under Outcome 1). Where drip-irrigation may be suitable it will be used. The present flood irrigation and water run in open, unlined canals, presents significant opportunity for economizing on the use of water.

108. Similarly, most well are so-called "dug-out" wells, where a hole is dug in the ground to bring the ground level closer to the underground water surface. A surface pump is then mounted to suck water out from the ground. The alternative is that deep wells are dug and submersible pumps installed below the water level which then pump water out of the well. These have the advantage of being far more efficient than suction motors but also more expensive. Where a typical dug-out well and diesel surface pump may cost 28,000 SDG, a deep-well and submersible pump may cost 80,000 SDG, but pump approximately double the flow rates.[35] The main determinant of the type of well type that is chosen is the depth of the ground water.

109. Solar water pumping can be demonstrated to be attractive in the long term compared with both diesel water pumping and connection of the grid to remote or difficult to access areas. For areas where connection of the grid is inexpensive and facile, the grid is more economical than solar pumping. Preliminary analysis indicates that a solar pump will have a payback of 5.8 years compared with a diesel pump.[36]

[35] Ahmed, A. "Ground Water Resources in the Northern State of Sudan", 2015

[36] El Amin, A. and Fageeri, R. "Comparison of the cost of grid connection, diesel pumping, and solar pumping", 2015

The table below compares the cost of solar PV pumps with connection of the grid to islands on the Nile.

Table 8 Cost comparison between grid connection and solar pumping for islands on the Nile

N0.	Name Of the Islands	Total Area in Feddans	Cost of connection to the grid(SDG)	Cost of Towers & cables (SDG)	Total connection cost (SDG)	Average total cost of connecting 10 Feddan to the grid(SDG)	Cost of connecting 10 Feddan by Solar#(SDG)	Saving when using solar (SDG)
1	Tuhtawi	290	2,,474,658	14,280,000.00	16,754,658	577,747	175,160	402,586
2	Orinti	1020	14,324,508	14,280,000.00	28,604,507	280,436	175,160	105,276
3	***Artigasha***	***2190***	***8,775,633***	***14,280,000.00***	***23,055,633***	***105,276***	***175,160***	***-69,883***
4	Labub	480	5,566,047	14,280,000.00	19,846,047	243,211	175,160	413,459
5	***Mgasir***	***1840***	***8,613,456***	***14,280,000.00***	***22,893,456***	***124,421***	***175,160***	***-50,739***
6	Tuhtawi	330	2,167,162	14,280,000.00	16,447,162	498,399	175,160	323,239
7	Komi	1480	6,854,,881	14,280,000.00	21,134,881	571,213	175,160	396,053
8	Artomaga	190	1,157,583	14,280,000.00	15,437,583	812,504	175,160	42,763
9	Akhowai Shrg Mulood	40	3,248,777	14,280,000.00	17,528,777	4,382,194	175,160	4,207,034

110. The following in particular should be noted with respect to Table 1:

1- Solar PV is cheaper than connecting the Islands to the national grid (saving between 105,586 SDG up to 4,207,034 SDG) except for the large islands such as Artigasha and Mgasir, where connecting to the grid is only less than solar by 69,883 SDG and 50,739 respectively.

2- Even for these two Islands when adding the cost of the electricity consumption to the cost of grid connection, solar PV will be less expensive since once it is installed there is no running cost.

3- The cost of electricity consumption is not included in the above.

Outcome 2	Outputs	Activities
Financing and dissemination mechanism de-risked through technical standards and demand-side support	2.1 Development and implementation of technical quality standards for PV pump components by the National Energy Research Centre (NERC), augmented by enforcement support from SSMO, Customs and relevant market observers	2.1.1. Development of technical standards for equipment for solar water pumping 2.1.2. Approval of initial equipment suppliers and providers 2.1.3. Training for NERC and SSMO on evaluation of equipment
	2.2. SSMO test and certification laboratories strengthened to test and label PV pump components	2.2.1. Evaluation of tests required to be carried out in-country 2.2.2. Establishment of basic testing protocols 2.2.3. Training of personnel to perform and develop tests
	2.3. Software tool for pump sizing according to farm and hydrological conditions developed and	2.3.1. Development or integration of solar resource assessment software 2.3.2. Development of a tool, or look-up table, to provide appropriate sizing for flow

	implemented	rate, informed by monitored parameters under Outcome 1.
	2.4. Training and certification scheme for PV pump installers (including local retailers, technicians and pump rental companies) developed and implemented.	2.4.1. Establishment of a training program for installers 2.4.2. Establishment of a testing and certification scheme for installers.
	2.5. Research on development of the most relevant, water efficient, irrigation techniques directly applicable in the North State at minimal cost and dissemination of techniques to farmers.	2.5.1. Development of water saving measures at the Agricultural Research Centre in the North State. 2.5.2. Dissemination of such measures to farmers to reduce their need for water and thus capacity and capital cost of a pump.
	2.6. Promotion of sustainable pumping practices based on outputs of the Nubian Sandstone Aquifer System from a separate GEF project (ID 4736).	2.6.1. Evaluation of underground water resource and determination of sustainable pumping rates relying on outputs from the Nubian Sandstone Aquifer System.

Outcome 3:	***Mitigation instrument design elaborated and implemented in support of the PV pump installation programme***
GEF funding:	***US$396,221***
Co-financing:	***US$123,000 (UNDP: $123,000)***

111. This outcome aims to implement the climate change mitigation tools to promote pump fuel switching in Sudan. In order to achieve this, the project will make use of a standardized baseline (already established with UNDP support) for pump fuel switching according to UNFCCC guidelines.

112. In cooperation with HCENR, a National Appropriate Mitigation Action (NAMA) will be developed for adoption of solar pumping. The main objective of the NAMA is to contribute to climate change mitigation by reducing greenhouse gas emissions. In order to measure the effectiveness of the NAMA, the emission reductions resulting from replacing the diesel pumps by PV pumps will be calculated and compared to the emissions standardized baseline. HCENR will act as the national coordinating institution for the NAMA.

113. A Monitoring, Reporting and Verification (MRV) system will be developed under this outcome. All relevant parameters that must be continuously monitored under the NAMA will be identified and their monitoring method will be developed. Furthermore, the institutions that will be responsible for the monitoring process should be

determined. The barriers and challenges that have been identified during the project preparation phase should be considered in order to provide a reliable MRV system.

Outcome 3	Outputs	Activities
Mitigation instrument design elaborated and implemented in support of the PV pump installation programme	3.1 Development of a standardized baseline for pump fuel-switching, applicable to Sudan and the wider region	3.1.1. Development of emissions standardized baseline according to UNFCCC guidelines 3.1.2. Establishment of additionality criteria according to UNFCCC guidelines 3.1.3. Submission of Standardized Baseline to the Sudan Designated National Authority for submission to UNFCCC
	3.2. Implementation of the standardized baseline within a NAMA	3.2.1. Implementation of a NAMA utilizing the Standardized Baseline 3.2.2. Development of an MRV protocol under the NAMA

Outcome 4:	***Supportive enabling environment and scaled-up implementation***
GEF funding:	***US$259,243***
Co-financing:	***US$769,000 (HCENR $247,083; MWRE $331,542; NERC: $60,687; Northern Stats Ministry of Agriculture: $60,688; UNDP:69,000)***

114. Outcome 4 is centered on scaling up and replication of the programme.

115. The Outputs under Outcome 4 provide for including of PV pumping in the fiscal concessions, investment laws, and agricultural regulations but developing and documenting the lessons and benefits of the PV programme.

116. Component 4 will develop a structured replication programme, built around the institutional architecture provided by the National PV Fund established under Component 1, the NAMA developed under Component 3 and the GEF-supported hardware certification standards developed under Component 2 (which will have national force), to transfer the pump dissemination model developed for Northern State to the other 17 states in Sudan. A degree of localized tailoring of the model will be required on a state-by-state basis in recognition of differing circumstances, particularly relating to the structure and regulation of micro-finance lending. The GEF project will also work with the Ministry of Water Resources and Electricity, the Ministry of Petroleum (Renewable Energy Directorate) and the Ministry of Agriculture to embed PV irrigation pumping in the Government's national energy roadmap, rural energy access strategy and national irrigated agriculture strategy so as to – among other benefits – open up a channel for standard, ongoing Government financial support and a window for potential donor funding.

117. The project will build on baseline initiatives, such as agricultural extension services, to deliver its training and awareness-raising activities. In doing so, the baseline initiatives will themselves have their capacities strengthened and will be enabled to

continue offering capacity development support. The Northern State Government, the federal Ministry of Agriculture and the Higher Council for Environment and Natural Resources (which has a network of offices in every state) are all committed to sustaining training and technical support beyond project completion. All banks involved in the project have branches located nationwide, in all states. The business processes, learning and capacities developed by the banks in Northern State can, therefore, be readily transferred to the other states.

118. Although the project will remain focused on PV pumping, it is recognized that there is significant potential for the banks involved in supplying micro-finance credit products to extend their lending to other technology categories, such as improved cook stoves and biogas digesters. Communication between the banks and relevant stakeholders will therefore be facilitated by the project.

119. The project will also work with the Ministry of Finance and the Ministry of Agriculture to include PV pumps in the fiscal concessions list of the Investment Law and the Agricultural Implements Regulation. The fiscal concessions granted by the Investment Law and the exemption from taxes and duties once PV pumps are classified as 'agricultural equipment' will serve to lower hardware prices and will benefit consumers (i.e. farmers), equipment suppliers/retailers seeking to grow the market, and banks providing finance to farmers (shortening loan repayment times and reducing risk exposure). For conservativeness, the impact of the reduction in import duty has not been incorporated into the pump dissemination/subsidy calculations. But, qualitatively, it is clear that the fiscal benefit will allow more (cheaper) pumps to be subsidized and hence increase the emissions reduction impact of the project. The concessions will have national force and will, therefore, also promote nationwide take-up of PV pumps.

120. Replication will be encouraged in other states and areas by demonstrating, documenting, and disseminating the avoided costs of infrastructure and fossil fuels, as well as the environmental benefits of avoiding diesel use, thereby incentivizing governments in other states to adopt measures, outlined under Output 4.1, to promote solar water pumping in place of diesel. The lessons will apply broadly to the use of solar PV in other applications, such as remote power for refrigeration or lightening.

Outcome 4	Outputs	Activities
Supportive enabling environment and scaled-up implementation	4.1 Inclusion of PV pumps in the fiscal concessions lists of the Investment Law and the Agricultural Implements Regulation	4.1.1. Develop a set of lessons learned through the implementation of the project 4.1.2. Demonstration of the value and savings in implementation of a PV pumping programme 4.1.3. Presentation to the relevant authorities for inclusion in the fiscal plan and concession lists
	4.2. Structured replication programme for other	4.2.1. Demonstration of national benefits and savings in implementation of PV

	states designed and implemented, including strengthened integration of PV pumping in the Government's national energy roadmap and rural energy access strategy	pumping, included avoided infrastructure costs 4.2.2. Presentation to the relevant authorities to support inclusion in national energy roadmap and rural energy access strategy

2.2 Key indicators, risks and assumptions

121. In accordance with GEF-5 Climate Change Focal Area Objective #3, to "Promote Investment in Renewable Energy Technologies", the key success indicators of the project are:
- The extent to which policies and regulations for RE are adopted and enforced;
- The volume of investment mobilized; and
- The number of tonnes of CO_2-equivalent avoided.

122. The project specifically aims to achieve the following:
- Installation of 28 pilot solar pumps funded by the GEF Project to be re-paid only if the farmer/owner is satisfied with performance.
- Installation of a further 1,440 solar pumps with decreasing subsidy over project life.
- Creation of a National PV Fund as a financing mechanism for solar PV pumps
- Creation of a regulatory environment to support development of solar pumping and exemption of solar PV pumps from taxes and customs
- Development of local capacity to size, install, and service solar pumps
- Implementation of water efficient irrigation techniques to promote the long-term sustainability of water use
- Replication of project components executed in the Northern State in Sudan's other states.

123. For further details about the related targets, see the project's results framework in Section 3.

124. The main risks identified to the successful implementation of the project include:
- Currency risk – Diesel price is fixed in local currency. Pumps are imported without price fixing and thus their price fluctuates with the local currency exchange rate. If the value of local currency falls, solar PV pumps will become increasingly unattractive compared with diesel pumps. This risk is mitigated by the Government's intentions to remove all subsidies from diesel. However this has not yet occurred and no clear timeline for implementation has been announced. The project will seek to mitigate this risk by removing taxes and import duties on solar PV pumps, and providing low-cost financing therefore making them more competitive and allowing a larger margin for currency fluctuation before solar PV pumps are unattractive compared with diesel.
- Falling oil prices, in the same manner as currency risk, impact the project. Reduced international oil prices make the continuation of diesel subsidies in Sudan more likely

as the cost of subsidy to Government is greatly reduced, or even removed. Long-term continuation of subsidies would threaten the long-term sustainability of the project. At present a small subsidy for PV pumps, provided by the GEF project, makes solar PV pumps financially attractive. If diesel subsidies are not lifted by the time the end of the project when the GEF subsidy stops, pumps may be financially unattractive compared with diesel. If PV pumps are adopted as a viable technology, and efficient financing mechanisms exist, farmers may be willing to adopt PV pumps even at a premium to diesel pumps in order to avoid the difficulties associated with operating a diesel pump.

- Lack of Government support – The project relies on Government support for the establishment of the National PV fund, as well as for modifications to legislation to include solar PV pumps among tax and customs duties exempt equipment. If such Government support should fail to materialize the project would run the risk of pumps being unattractive compared with the alternative. This risk is considered overall as low. A co-finance letter committing Ministry of Finance support to the project has been obtained (see Annex 9.6). The adoption of solar PV pumps reduces diesel consumption therefore reducing the overall diesel subsidy burden on the Government. So the Government has good incentives to support the project.

- Climate Change Risk – Climate change risk is manifest mainly in the risk of reduced water source for pumping, or reduced rainfall requiring increased pumping. Sudan presently does not utilize its entire allocation of Nile river water. Both scenarios, whether reduced rainfall, reduced water levels, or increased temperature require additional pumping capacity to support crops. Solar PV pumps are to a large extent modular. Thus increased pumping capacity, to an extent, may be realized with the addition of solar PV modules to existing pumping systems. The availability of solar PV pumping

- Technology – Technical risk is minimal. The main technical risk is in ensuring quality components fit for the purpose. The main counterpart in this activity will be NERC and SSMO who together will determine standards for pumps to be financed by the banks and develop a list of “approved” components.

- Performance risk – Solar pumping reduces irrigation hours to those when the sun is sufficiently strong. Compared with the use of diesel which allows pumping independent of the weather, solar pumping may not deliver the volume of water farmers are used to, or the pumps may need to be over-sized compared with the present diesel pumps. A combination of capacity building and testing to appropriately size the pumps and adoption of efficient irrigation techniques will help overcome this risk.

- Implementation capacity – Inadequate and/or non-capacitated human resources to successfully implement the project and support the mainstreaming of its results. The current capacity to implement and operate solar pumping in Sudan is very low because the market is small. However, with training (to be provided by the project)

those with basic technical skills can learn the skills necessary to install and service solar pumps.

125. Further details on these risks, with their probability and impact analysis and related mitigation measures, are presented in the "Offline Risk Log" in Annex 8-1.

126. To address the project management risks, a committed, full-time National Project Manager with adequate outreach and networking skills is absolutely essential for the success of the activities. The National Project Manager should have an ability: i) to engage the key stakeholders in constructive discussion about future renewable energy development needs; ii) to guide and supervise the studies undertaken and effectively co-operate with the international experts who are engaged to support this work; iii) to present their findings and recommendations in a convincing manner to key policy-makers and opinion leaders by taking into account the main macroeconomic and policy drivers for development of the solar pumping sector development; and iv) to identify areas of future work. During project implementation, the National Project Manager also needs to be supported by qualified technical and legal committee.

127. A typical risk for the training and capacity building activities is that, after the completion of training, there will be no real demand for the services of the trained experts. The integrated approach adopted by the project is expected to mitigate this risk by providing opportunities for those trained in solar pump installation and maintenance to support the development of the first units therefore immediately providing application and income from their training and encouraging replication.

2.3 Expected benefits, design principles and strategic considerations

128. The calculated global GHG reduction benefits of the project will consist of a combination of:

- Direct GHG emission reduction benefits from the replacement of diesel engines with solar panels through 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.

Table 9 Key Assumptions for Emission Reduction Estimates

Parameter	Value
Specific Diesel Consumption[37]	11 L/day for 3.12 kW pump equivalent 16 L/day for 5.12 kW pump equivalent 96 L/day for 29.6 kW pump equivalent

[37] As measured by M. Adeen and reported by A. El Amin at two different farms for three days and averaged and for a diesel pump equivalent to a 5.12 kWp solar PV pump. Rates for other pumps are extrapolated based on these measurements.

Parameter	Value
Irrigation days per year	270
Emission Factor for Diesel energy conversion	2.66 kg CO_2/liter
Installed capacity	1276 × 3.12 kW pumps 128 × 5.12 kW pumps 64 × 29.6 kW pumps
Diesel savings (liters) – lifetime	5,886,720
Total emission reductions due to diesel displacement over lifetime of system (direct)	**313,174 tCO_2**
Total indirect emission reductions (bottom-up) from project – Replication factor of 4 in post-project period	**1,252,694 tCO_2**
Total indirect emission reductions (top-down)	**2,160,005 tCO_2**

129. The direct CO_2 emission reductions attributed to the replacement of diesel pumps with solar pumps by the UNDP-implemented, GEF-financed project, are calculated to be 15,659 tCO_2/year, or 313,174 tCO_2 over the 20 year life of the pumps. With a GEF financial contribution of $4,365,753, this translates to a cost of $GEF US$13.94/tCO_2 abated directly, and US$2.02 – US$3.49/tCO_2 abated indirectly. This does not include reduced diesel consumption by those who may adopt the water saving measures to be promoted by the project even if they do not adopt the solar pumping. A top-down analysis of indirect emissions reductions indicates an indirect reduction of 2,160,005 tCO_2 over the 20 year pump life.[38] For further details about the assumptions and results of the project's GHG reduction analysis, see Annex 9.4.

130. Once the initial cost of the 1,468 pumps installed under this project is paid, over a 10 year period, the farmers who own these pumps stand to save a collected US$56 million in avoided diesel costs over 15 years of essentially free pump operation (assuming a 25 year life). From the date of installation of the pumps, farmers will be insulated from fluctuations in the price of diesel, oil, and spare parts. They will also be able to more constructively employ their time and effort. Several farmers surveyed as part of the PPG process indicated the time and effort wasted maintaining and operating the diesel pump as a significant nuisance and impediment to their productivity. A somewhat unquantifiable but very noticeable benefit is reduced noise pollution. The silence of the country-side is often shattered by the sound of diesel engines pumping water. The ability for farmers to irrigate and work without the nuisance of noise pollution is perhaps one of the more understated benefits of electric pumping in general, and solar PV pumping in particular.

131. As a result of the project, capacity will be built in Sudan around solar PV. This is both at the national level and local level. A the national level, institutions such as NERC

[38] 20 years is the renewable energy equipment life used for GHG calculations per GEF guidelines. Manufacturers of the solar panels, a major cost component, typically offer 25 year warranties.

and SSMO will receive equipment, training, exposure to new technology and a new role within society to support the deployment and adoption of solar PV pumping.

132. At the local level, new means of employment will be created in sizing and installing solar PV pumps. The technical skills developed in carrying out such tasks will transfer directly to the use of solar PV technology for other applications creating opportunities beyond solar pumping. If the estimated installation rate for pumps is 360 pumps per year (one quarter of the target amount per year), this equates to almost 1.6 pumps per working day assuming 220 working days per year. It takes approximately 3 people 3 days to install a pump. It will take approximately 3,600 man-days per year to install the pumps targeted under the present project (9 man-days for 3.12, and 5.12 kW pumps, 25 man-days for a 30 kW pump). Assuming 200 work days per year, and that installers are occupied with installations two-thirds of their working time, this means the direct creation of some 27 jobs for skilled technicians installing PV to meet the project targets in the Northern State. With national replication, this translates to a minimum of 184 skilled technical jobs around the country for PV installation pumps alone. The supply chain to provide the pumps will likely employ a similar number of persons to size, buy, import and handle logistics. Thus, a total of 368 jobs can be expected to be created directly.

133. Other benefits that can be expected include reduced tanker truck transportation on public roads (transport of some 5.9 million liters of diesel will be avoided, or some 300 tanker loads) as the need to transport diesel from the main cities and ports to agricultural areas is reduced. Also reduced is the risk of soil and ground water contamination due to diesel spillage. Associated national and local benefits include reduced local pollution from the burning of fossil fuels, strengthened national energy security through reduced dependency on imported fuels.

134. These developments and capacity building will catalyze the adoption of solar technology in general and provide a foundation that allows the widespread use of solar energy either in response to regulatory or market stimuli or simply to provide power where diesel in not cost-effective or not readily available and solar may already be advantageous but is not utilized due to a lack of capacity or awareness.

2.4 Project rationale and policy conformity

135. The project contributes to GEF Climate Change Focal Area Objective #3, to “Promote Investment in Renewable Energy Technologies”, recognizing that renewable energy plays an indispensable role not only in combating global climate change but also in addressing energy access, energy security, environmental pollution and sustainable development. In accordance with the adopted strategy, the GEF support goes beyond the creation of a financing scheme and promotes direct investment as well as mechanistic changes which will promote the adoption of solar water pumping.

136. The specific outcomes of the GEF-5 climate change strategy that the project will address are the following:

- Favorable policy and regulatory environment created for renewable energy investments.
- Investment in renewable energy technologies increased.
- GHG emissions avoided.

137. The project is consistent with Sudan's national strategies, as evidenced by the already-existing incentives for renewable power in Sudan's Investment Act. The project will help further the goals Sudan's national strategies by putting in place the overall framework that will make them effective. The Technology Needs Assessment (TNA) carried out by HCENR with GEF support points to renewable energy as one of Sudan's key priorities in climate change mitigation. Similarly, Sudan's Second National Communication to the UNFCCC includes renewable energy as "a key potential mitigation option". The objective of the project is also consistent with the views and objectives espoused by several stakeholders, especially from farmers in the North State and from the electricity distribution company, during the extensive consultation process carried out as part of the project preparation.

138. The project aims to develop and accelerate the adoption of off-grid solar pumping by providing demonstration units, technical capacity building, a quality assurance mechanism, and a financing mechanism. Sudan's development depends critically on the ability to reduce dependence on fossil fuels as Sudan is currently a fossil fuel-poor nation. The present lack of availability of alternatives to diesel pumping constrains farmers, often limiting the plot of the land which they can plant. Lack of locally tested and trusted technological alternative, lack of user experience with the technology, and lack of financing, has meant that adoption of alternatives to diesel pumping in off-grid areas is slow and limited.

139. The project will play a critical role in creating a market that does not presently exist and supporting it through a nascent stage to the point where it is self-sustaining and able to respond to the needs of the farmers.

2.5 Country ownership: country eligibility and country drivenness

140. According to the Instrument for the Establishment of the Restructured Global Environment Facility, Sudan qualifies for GEF financing on the following grounds:
- It has ratified the UN Framework Convention on Climate Change; and
- It receives development assistance from UNDP's core resources.

141. The objective of the project is consistent with the strategies of the Sudanese Government, particularly as outlined in the Renewable Energy Master Plan (2005). The project will provide the basis for Sudan to initiate the development of a NAMA to support renewable energy. It will thus provide Sudan with the opportunity to reinforce its engagement with the international climate change architecture and demonstrate its commitment to international efforts to reduce GHG emissions.

142. UNDP has considerable experience in deploying policy instruments to de-risk renewable energy investments in developing countries.[39] The project will be a direct application of UNDP's work in this area.

143. Sudan has already demonstrated strong country drivenness in implementation of its power projects and extension of the grid in recognition of the critical role they play in the development of the country. This has been true in particular of its hydro-power projects and extension of the grid for pumping where possible. The same can be expected for solar water pumping projects as today they represent not only a

[39] UNDP (2013), Derisking Renewable Energy Investment.

renewable means for pumping water, but also reduced dependence on fossil fuels and reduced need for grid extension.

144. The GEF Operational Focal Point for Sudan endorsed the project with a letter signed on 25-11-2013.January 20, 2014.

2.6 Cost-effectiveness

145. The GEF financing for Outcome 1 (US$2,755,852), represents the bulk of the GEF financing for the project and has been allocated to support the development of pilot solar PV projects. These are seen as the most critical step in launching solar pumping in Sudan by demonstrating to farmers that solar pumping is viable and demonstrating to bankers that it is a reliable, financeable activity. The success of these solar pumping demonstrations will translate to future projects while a failure will setback solar pumping in Sudan by several years.

146. At present, no entity is willing or capable of putting forth the finance and technical support necessary for such a demonstration. Hence, UNDP-GEF support will be critical in implementing these demonstration systems and doing it in a way that can prove successful and inspire the confidence of future stakeholders. The GEF investment of $2,755,852 in this component will directly mobilize a total $24,190,000 in investments in solar pumps. This financing will in-turn result in fuel savings over the life of the pump of some $90 million, of which $56 million will be retained by farmers once they have paid off the value of their pumps.[40]

147. The GEF financing for Outcome 2 ($746,544) assures cost-effectiveness in two principal ways. First, it will serve to guarantee the quality of the $24,190,000 worth of pumps purchased under the project and that they are suitably sized and selected for the conditions of their application. Second, the water efficiency component will ensure that the amounts of water needed are optimized and therefore the pump size, and associated capital cost can be minimized for a given crop and area.

148. The GEF financing for Outcome 3 ($396,221) consists of technical assistance to develop a standardized baseline and Nationally Appropriate Mitigation Actions (NAMA) to secure international carbon finance to support the long term development of solar pumping in Sudan.

149. The GEF financing for Outcome 4 ($259,243) consists of technical assistance to enable documentation and dissemination of experience gained in the present project in the North State for replication in other areas.

150. The proposed project is extremely cost-effective as it will utilize relatively limited GEF funds to leverage investments in agriculture throughout Sudan. The potential for replication in Sudan and other areas is significant. Water pumping is problematic and costly in most of Africa and relies on imported, hard to obtain, diesel. With a demonstrated alternative, adoption can be expected to spread quickly. The cost-effectiveness of the project is reflected in its GHG abatement cost of $13.94/$tCO_2$ of direct emissions; and $3.49/$tCO_2$ of indirect emissions.

[40] Figures are based on 25 year pump life and 10 years loans at 9% cost of finance.

2.7 Sustainability

151. The sustainable adoption of PV pumping will depend largely on two factors. The second is the technical ability of the pumps to deliver pumping to the satisfaction of the farmers. There may be some learning with regards to this aspect, but it is expected that this is a readily solvable technical problem, in particular if the farmers as willing to adopt water saving measures. The second factor is the availability of adequate financing. This is in most circumstances and locations around the world a determining factor. Thus, the Project has provided specific consideration for the PV financing mechanism and allocated the bulk of project resources towards developing a sustainable financial mechanism and providing subsidies to encourage adoption of the first wave of pumps. The subsidy levels needed will be determined dynamically and evolve throughout the project.

152. An important factor in the sustainability of solar PV pumping is the cost of diesel, as it is the main alternative. Diesel remains subsidized in Sudan though subsidies have been reduced in the past and are expected to be lifted completely in the future though the time schedule for this is not clear. If such subsidies are lifted solar pumping would become considerably more economical than diesel and with an appropriate financing mechanism in place would be expected to see widespread adoption.

153. The project provides mechanisms to reduce the up-front risks of adoption of PV pumps for all market participants: farmers, financiers, and suppliers. It also has the benefit of reducing diesel consumption therefore reducing the burden of supply on the national infrastructure and reducing the subsidy burden on the State budget (for as long as diesel is subsidized).

154. The Project takes a market based approach supporting a regulated supply-chain, building technical expertise, and a financing mechanism. With these elements in place, the adoption of PV pumping can be expected to be self-sustaining. The major risk to this sustainability is the stability of the Sudanese pound. If the pound loses value, the price of solar pumps increases as they are imported. If diesel continues to be subsidized, the subsidy burden on the State increases but the attractiveness of solar pumping to individual farmers is reduced.

155. In addition to the sustainability from the energy perspective the water saving measures that the Project will put in place will have the effect of reducing water withdrawal from the underground aquifer thereby increasing its longevity.

2.8 Theory of Change

156. The Theory of Change for the project presents a semi-structured map to link strategic actions with desired outcomes. The proposed project seeks to enable *transformative change*[41]. The project seeks to transform the way irrigation is done within the North State in Sudan, and ultimately, within Sudan and beyond.

[41] Transformative in the sense described in Theory of Change as “Crisis and stagnation prepare the ground for change. This type of change is based on un-learning and liberating oneself from those mindsets, relations,

157. The Theory of Change sets out to identify explicitly assumptions underlying the proposed actions and how we believe reality could unfold in the near future subject to certain strategic actions that we intend to take (and thus believe are within our capability).

158. This project rests specifically on certain assumptions about the present and about what is likely to happen in the future. These assumptions we hold to be true, or self-evident as reported by the stakeholders who are most directly affected by them. They are:
   a. Water pumping is necessary for irrigation which is in-turn necessary for the agriculture on which the targeted stakeholders depend.
   b. The presently common method of irrigation is by diesel powered pumps, which replaced earlier forms of pumping because they were more attractive to the users.
   c. The cost of pumping using diesel as an energy source is artificially low because of Government subsidies and can be expected to rise.
   d. The use of solar energy as an alternative to source of energy to diesel provides several advantages, such as reduced maintenance, increased reliability, and reduced effort and hassle from the farmer.

159. Despite the above, solar energy has not been widely adopted as an alternative to diesel. We also hold assumptions about why this is the case. These are:
   a. As a relatively new technology, solar pumping is not well known or easily supplied, i.e., a farmer cannot acquire a solar pump as he can acquire a diesel pump.
   b. As an unknown technology, it is seen as being an inherent risk to obtain a solar pump. Its performance is unknown, hence, inherently risky.
   c. The capital investment required for a solar pump, being a large investment to most farmers and large in comparison with diesel, prohibits experimentation to remove the perceived risks associated with solar pumping.
   d. There are no players in the market with the combination of vision, capital, and potential benefit from the proliferation of solar pumps, that they are willing to undertake the cost and hassle of developing a solar pump programme to demonstrate to farmers that the perceived risk will not materialize. Hence, there is a clear role for GEF and UNDP to play that other entities are unwilling or unable to play.

160. With the above assumptions, we also hold assumptions about how the future is likely to unfold, in particular based on actions which we believe we can take. These assumptions are:
   a. If solar pumping is demonstrated, it will prove to be more desirable than conventional diesel pumping and farmers will desire it.
   b. The capital cost will still be prohibitive to many. If financing is available, farmers would be willing to seek it to enable them to obtain a solar pump in place of a diesel pump.
   c. Thus, if the project bears the cost and risk of early demonstration pumps, enables a financing mechanism, and provides support to the supply chain to ensure that poor quality pumps are not used, then it is likely that solar pumping will be adopted.

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identities, formal and non-formal institutions, etc. which hinder and delay the probability of enacting new realities that are more just and fair in economic, social and political terms."

161. If solar pumping is adopted on a large scale, the result will be a transformational change in how irrigation for agriculture is practiced similar to the change that happened when irrigation changed from animal driven waterwheels to diesel engines and will spread spontaneously.

2.9 Gender Marker

162. The project supports the improved participation of women in agriculture by removing one of the barriers which is the labor intensive operation of diesel pumps. The stakeholder workshops conducted during the PPG phase were attended by several women supportive of the project both in Dongola in the North State, and in Khartoum.

163. Women account for 51% of the rural population, and agriculture accounts for 78% 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.

3. Replicability

164. The project has strong potential for replicability as the circumstances which make the project attractive in the Northern State of Sudan prevail throughout much of Sudan and much of Africa. Those conditions are: the need to pump water for irrigation, the high cost of diesel and lack of easy access, and the difficulty in operating diesel machinery. Where solar can be effectively demonstrated to remove these barriers, the project can be expected to be replicated.

165. Component 1, 2 and 3 of the project will focus on implementation in the Northern State of Sudan. However, the activities of these components are to a large extent on a national scale (e.g. National PV fund, NAMA, technical know-how developed largely at NERC). Component 4 then focuses on expanding and replicating the outcomes and activities under the previous three components in the remaining 17 states of Sudan. As much of the conditions and barriers are the same in all states, the formulas applied and lessons learned in the Northern State should be readily transferable. With the national frameworks put in place by the project the transfer to other states should be readily transferable to other states.

166. Component 4 also establishes solar pumping in the national agenda, such as the national energy access roadmap, to support the national scaling of the projects objectives. Although it is not a part of this project, the adoption of solar PV as an energy source for pumping is expected to promote the spread of solar PV for other applications.

4. Project Results Framework

4.1 Project Outputs and Related Target(s)/Sub-target(s), as applicable

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: Expected CPAP Output (2.2): Investment in green energy and access by needy communities to sustainable energy improved					
Country Programme Outcome Indicators: Number of communities with access to alternative sources of renewable energy-based services /Baseline: Limited access to renewable energy /Target: 50 communities					
Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one): 1. Mainstreaming environment and energy OR 2. Catalyzing 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: GEF-5 FA Objective # 3 (CCM-3): "Promote Investment in Renewable Energy Technologies".					
Applicable GEF Expected Outcomes: Total avoided GHG emissions from off-grid PV pumping.					
Applicable GEF Outcome Indicators: Avoided GHG emissions from off-grid PV pumping (tons CO_2).					
Strategy	**Indicator**	**Baseline**	**Targets**	**Source of Verification**	**Assumptions and risks**
Project Objective: Financing and dissemination mechanism established and operational to support a PV pump installation programme	• Amount of reduced CO_2 emissions reductions from water pumps for irrigation (compared to the project baseline) installed EOP, tons $CO2_{eq}$	• 0	• 313,174[42]	Project's annual reports, GHG monitoring and verification reports	- It is assumed that the price of diesel fuel will increase through the continued lifting of subsidies. If the price of diesel does not
	• Cumulative installed capacity of off-grid PV solar pumps (kWp) • Fuel saved	• 0	• 6,531 kWp as 1,468 pumps • 5.9 million liters/year	Project final evaluation report	
	• Number of banks providing finance for solar PV pumps	• 0	• 7	Project final evaluation report	

[42] GHG emissions reductions are calculated per GEF methodology and reflect GHG reductions from equipment installed during the GEF project over its lifetime, which extends beyond the GEF project. Calculations are for equipment life of 20 years, per GEF guidelines.

	• Reduction of down-time and farmer's time lost to pump repair • Savings due to avoided diesel cost after pumps have been paid off (over 15 years remaining technical life)[43] • Number of new suppliers (partnerships) providing equipment financed by National PV Fund mechanism • Extent of change in modern energy coverage by users and specific sectors	• 0 • 0 • 0 • 0	• 80% • US$56 million • At least 7 (representing a business volume of approximately 200 pumps/supplier, or 50/year) • 22.5% (representing 1,468 pumps out of an estimated 6,500 existing)	Baselines surveys and monitoring information from installed pumps and comparison diesel pumps. Calculation based on installed pump capacity, and actual savings observed in the field.	increase, the adoption of solar pumps will be slowed or may be minimal. - Similarly, a drop in the value of the Sudanese Pound would increase the cost of solar pumps and likewise inhibit their adoption.
Outcome 1: Financing and dissemination mechanism established and operational to support a PV pump installation programme	• Investment mobilized for purchase of solar pumps by EOP	• 0	• US$24,190,000	Terminal impact assessment	
	• Dedicated mechanism for finance of PV pumps established	• None	• At least one national PV pump fund	Interviews with banks, farmers, and suppliers. Importation records from SSMO, or MoF	
Outcome 2: Financing and dissemination mechanism de-risked through technical standards and demand-side support	• Technical quality standards developed and enforced for PV pumps	• None	• Reasonable standards in place to assure quality	Interview with NERC, SSMO. Failure rate of solar pumps.	Assumption: the use of water at present is not optimal and substantial improvements can be made.
	• Number of entities trained and capable of specifying and supplying solar pumps	• 0	• 3	Market survey and adequacy of pumps for their purpose as determined by farmers' reports.	
	• Number of pumping system using water efficient irrigation methods	• 0	• 1,468	Report on water consumption and pumped volumes	

[43] Assumes technical lifetime of equipment of 25 years, per manufacturer warranty for solar modules are present diesel prices.

Outcome 3: Mitigation instrument (NAMA) design elaborated and implemented in support of the PV pump installation programme	• Development of a standardized baseline for solar PV pumping in Sudan	• None	• Standardized baseline developed and submitted to UNFCCC	UNFCCC database on standardized baselines	
	• Development of an MRV mechanism for solar water pumping	• No MRV mechanism	• An MRV mechanism developed and implemented	Project final evaluation report	
Outcome 4: Supportive enabling environment and scaled-up implementation	• Inclusion of solar pumps in fiscal concessions lists of the Investment Law and the Agricultural Implements Regulation such that they receive preferential financial treatment	• PV pumps are not included and receive no preferential treatment	• PV pumps exempt from customs and taxes, receive benefits afforded to other agricultural implements	National publication of laws and regulations	Cooperation of Government and regulatory bodies
	• PV Pumping integrated in National Energy Roadmap and Rural Energy Access Strategy	• PV pumping not a part of NER or REAS	• PV pumping integrated into NER and REAS	Review of the National Energy Roadmap and Energy Access Strategy	
	• Awareness raising and capacity building carried out		• At least one workshop and demonstration held with the Ministry of Agriculture in each State in Sudan	Project record or workshops	

5. Total budget and work plan

Award ID:	**00087168**	**Project ID(s):**	**00094271**
Award Title:	**Promoting the use of electric pumps for irrigation in Sudan**		
Business Unit:	**SDN10**		
Project Title:	**Promoting the use of electric pumps for irrigation in Sudan**		
PIMS no.	**5324**		
Implementing Partner (Executing Agency)	**Ministry of Water Resources and Electricity**		

GEF Outcome /Atlas Activity	Responsible Party/	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Total (USD)	See Budget Note:
Outcome 1	**MWRE**	**62000**	**GEF**	72600	Grants for equipment	614,375	0	601,542	601,542	601,542	2,419,001	a
				72200	Equipment (Testing instruments and data loggers)	150,000	0	0	0	0	150,000	b
				71200	Intl. Consultants	30,000	0	0	0	0	30,000	c
				71300	Local Consultants	10,000	10,000	5,000	10,000	0	35,000	d

				71400	Contr. services – individuals	23,602	9,250	5,000	9,250	0	47,102	e
				74100	Professional Services	3,250	750	10,750	750	10,750	26,250	v
				71600	Travel	15,000	20,000	4,250	5,000	4,250	48,500	f
				Sub-total GEF		**846,227**	**40,000**	**626,542**	**626,542**	**616,542**	**2,755,853**	
				Total Outcome 1		**846,227**	**40,000**	**626,542**	**626,542**	**616,542**	**2,755,853**	
Outcome 2	**MWRE**	**62000**	**GEF**	72200	Equipment (SSMO- Solar laboratory)	0	200,000	100,000	100,000	100,000	500,000	
				71200	International Consultants	0	20,000	0	0	0	20,000	g
				71300	Local Consultants	0	10,000	10,000	5,000		25,000	h
				71400	Contr. services – individuals	11,750	14,250	4,250	14,250	4,250	48,750	i
				71600	Travel	0	10,000	0	0	0	10,000	j
				74100	Professional Services	3,250	750	10,750	750	10,750	26,250	v
				75700	Training, Workshops and Confer.	16,544	25,000	25,000	25,000	25,000	116,544	k
				Sub-total GEF		**31,544**	**280,000**	**150,000**	**145,000**	**140,000**	**746,544**	
		4000	**UNDP**	75700	Workshops and meetings	15,000	15,000	15,000	15,000	15,000	75,000	k
				71200	International Consultants	10,000	0	0	0	0	10,000	g

				71300	Local Consultants	15,000	0	0	0	0	15,000	h
				71400	Contr. services – individuals	21,000	21,000	21,000	20,000	23,875	106,875	i
				Sub-total UNDP		**61,000**	**36,000**	**36,000**	**35,000**	**38,875**	**206,875**	
				Total Outcome 2		**92,544**	**316,000**	**186,000**	**180,000**	**178,875**	**953,419**	
Outcome 3	**MWRE**	**62000**	**GEF**	71200	Intl. Consultants	20,000	20,000	20,000	0	0	60,000	l
				71300	Local Consultants	10,000	10,000	10,000	0	0	30,000	m
				71400	Contr. services – individuals	36,750	40,000	29,250	39,250	29,250	174,500	n
				75700	Workshops and meetings	13,000	12,560	10,000	10,000	15,000	60,560	o
				74100	Professional Services	3,250	750	10,750	750	10,750	26,250	v
				71600	Travel	15,000	15,000	15,000	0	0	45,000	p
				Sub-total GEF		**98,000**	**98,310**	**95,000**	**50,000**	**55,000**	**396,310**	
		4000	**UNDP**	71200	International Consultants	15,000	10,000				25,000	l
				71300	Local Consultants	10,000	5,000	5,000	5,000	5,000	30,000	m
				71600	Travel	5,000	5,000	7,000	3,000	3,000	23,000	p
				75700	Workshops and meetings	10,000	5,000	10,000	10,000	10,000	45,000	o
				Sub-total UNDP		**40,000**	**25,000**	**22,000**	**18,000**	**18,000**	**123,000**	
				Total Outcome 3		**138,000**	**123,310**	**117,000**	**68,000**	**73,000**	**519,310**	

				71200	International Consultants	0		25,000			25,000	q
				71300	Local Consultants			20,000	0	0	20,000	r
		62000	**GEF**	71400	Contr. services – individuals	21,750	19,250	4,204	5,095	7,447	57,747	s
				75700	Workshops and meetings	20,000	20,000	20,000	20,000	10,000	90,000	t
				74100	Professional Services	3,250	750	7,796	6,905	7,796	26,497	v
Outcome 4	**MWRE**			71600	Travel	0	0	15,000	20,000	5,000	40,000	u
				Sub-total GEF		**45,000**	**40,000**	**92,000**	**52,000**	**30,243**	**259,243**	
				71200	International Consultants	0	0	10,000	0	0	10,000	q
				71300	Local Consultants	0	0	10,000	3,000	4,000	17,000	r
		4000	**UNDP**	71600	Travel	0	0	15,000	2,000	2,000	19,000	u
				75700	Workshops and meetings	0	6,000	15,000	1,000	1,000	23,000	t
				Sub-total UNDP		**0**	**6,000**	**50,000**	**6,000**	**7,000**	**69,000**	
				Total Outcome 4		**45,000**	**46,000**	**142,000**	**58,000**	**37,243**	**328,243**	
				71300	Local Consultants	12,166	31,183	31,183	27,620	31,183	133,335	ab
				74598	DPC	12,082	4,547	4,671	3,588	4,129	29,017	ac
Project management	**MWRE**	**62000**	**GEF**	71600	Travel	5,000	6,634	10,000	5,000	5,000	31,634	w
				72800	IT Equipment	11,817	0	1,000	0	1,000	13,817	x

				Sub-total GEF		**41,065**	**42,364**	**46,854**	**36,208**	**41,312**	**207,803**	
		4000	**UNDP**	72400	Communication		825	825	762	825	3,237	y
				72500	Office supplies		453	329	0	0	782	z
				72200	Project Vehicle	64,743	2,000	2,000	1,412	4,371	74,526	aa
				71300	Local Consultants	29,017	10,000	10,000	13,563	10,000	72,580	ab
				Sub-total UNDP		**93,760**	**13,278**	**13,154**	**15,737**	**15,196**	**151,125**	
				Total Management		**134,825**	**55,642**	**60,008**	**51,945**	**56,508**	**358,928**	
				TOTAL GEF		**1,061,836**	**500,674**	**1,010,396**	**909,750**	**883,097**	**4,365,753**	
				TOTAL UNDP		**194,760**	**80,278**	**121,154**	**74,737**	**79,071**	**550,000**	
				GRAND TOTAL		**1,256,596**	**580,952**	**1,131,550**	**984,487**	**962,168**	**4,915,753**	

Summary of funds[44]						
	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Amount Year 5	Total
GEF	1,061,836	500,674	1,010,396	909,750	883,097	4,365,753
UNDP	194,760	80,278	121,154	74,737	79,071	550,000
TOTAL	1,256,596	580,952	1,131,550	984,487	962,168	4,915,753

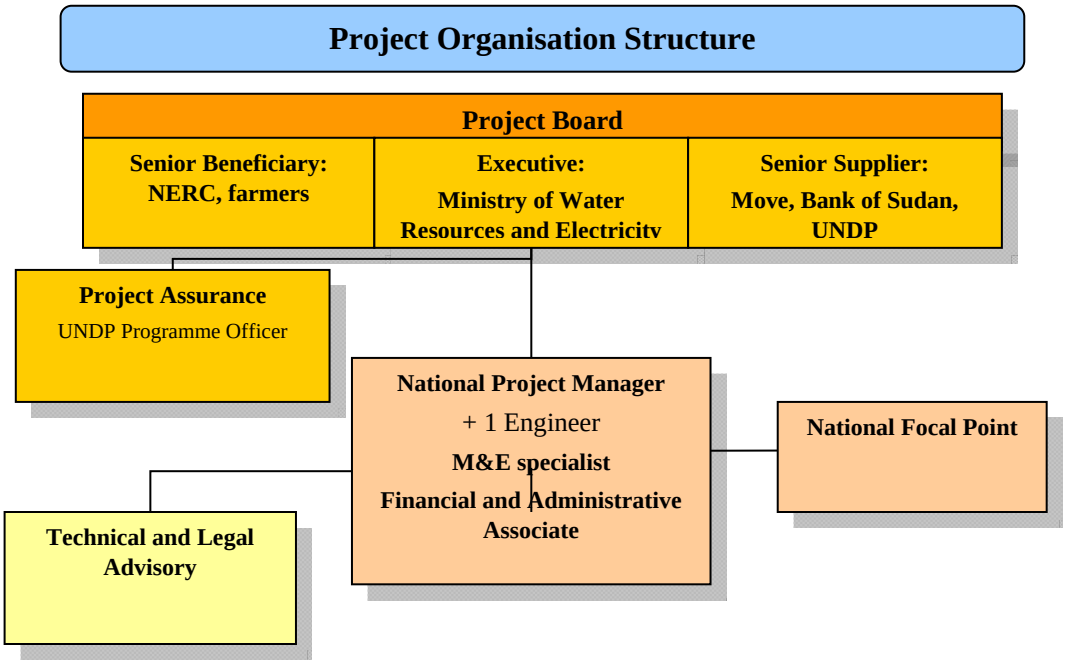
Budget Note	Description of cost item
a.	Grants (INV) for Demonstration PV pumps + subsidy scheme connected to National Solar PV fund (for 1,468 pumps). The use of grants and transfer of funds from the project for the grants will be subject to UNDP/GEF guidelines on such mechanisms.
b.	Testing equipment to support NERC in establishing, maintaining, and controlling standards
c.	Intentional consultants to support Outcome 1
d.	Local consultants to support Outcome 1
e.	Individual contractors to support Outcome 1, including contracting services for wells and pumps
f.	Travel expenses to support Outcome 1, primarily to and from the Northern State
g.	International consultants to support Outcome 2
h.	Local consultants to support Outcome 2
i.	Individual contractors to support Outcome 2
j.	Travel expenses under Outcome 2, primarily to and from the Northern State
k.	Meetings under Outcome 2
l.	International consultants to support Outcome 3
m.	Local consultants to support Outcome 3
n.	Individual contractors to support Outcome 3
o.	Meeting under Outcome 3
p.	Travel to support Outcome 3, for international consultants and to and from public workshops in support of the NAMA.
q.	International consultants to support Outcome 4
r.	Local consultants to support Outcome 4
s.	Individual contractors to support Outcome 4
t.	Meetings under Outcome 4
u.	Travel to support Outcome 4 for international consultants to Sudan, and otherwise around Sudan to promote and replicate solar pumping
v.	Monitoring and Evaluation: $10,000 inception workshop; $40,000 mid-term evaluation; $40,000 terminal evaluation; $3,000 annual audit.
w.	Travel to as part of project management, primarily to workshops and to the Northern States

[44] Summary table should include all financing of all kinds: GEF financing, co-financing, cash, in-kind, etc...

x.	IT equipment as part of project management, computers, office network equipment, software, printers for the PMU.
y.	Communication as part of project management
z.	Office supplies
aa.	Vehicle to support project staff
ab.	Staff salaries - Project Manager
ac.	Direct Project Costs

6. Management Arrangements

(SEE UNDP POPP FOR FURTHER DETAILS)



167. The project will be nationally executed by the Ministry of Water Resources and Electricity, under the National Implementation Modality (NIM). UNDP will be accountable for the disbursement of funds and the achievement of the project goals, according to the approved work plan. A Government Project Coordinator (GPC) will be appointed by MWRE, to coordinate project operations and support the NPM with overall administration, oversight, coordination of activities and maintaining a liaison with UNDP. The GPC will: (i) coordinate the project activities with activities of other Government entities; and (ii) certify the expenditures are in line with approved budgets and work-plans and his remuneration will be incurred by the government.

168. The project includes funding for grant mechanism which will be operated by MWRE and the Central Bank in parallel to the project. The selection procedures and eligibility for how targeted beneficiaries can access grant subsidies under Outcome 1 will be done according to transparent and pre-defined criteria established under year 1 of the project and codified as part of the establishment of the national PV fund. A standard UNDP grant agreement is included in Annex 9.8 for reference 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 Central Bank's national PV fund (at the request and formal delegation of MWRE) and will then be disbursed or advanced against the eligible purchase of each individual solar PV pump and then reconciled on a regular (e.g. quarterly basis) following certification by the PB that proper procedures were followed for selection of beneficiaries. Alternatively a dedicated bank account for the grant subsidies (budget line a) will be set up at UNDP Sudan country office and then the funds could be advanced or disbursed to MWRE (or the Central Bank based on their delegation) following the same procedures and rules.

169. In the former case the transfer of any GEF funds for equipment subsidies to the national PV fund will only happen upon the provision of proof of the legal establishment of the fund by the executing agency (or their delegated financial custodian) with all requisite fiduciary and legal conditions 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.

170. 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 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 operation of the national PV fund based on a self-sustaining business model and the continued monitoring of asset utilization by beneficiaries of grants funded by the project.

171. A Project Board (PB) will be established at the inception of the project to monitor project progress, to guide project implementation and to support the project in achieving its listed outputs and outcomes. It will be chaired by an MWRE representative and will include representatives from MoF, Central Bank of Sudan, NERC, SSMO, HCENR, and a Project Assurance Officer from UNDP. Other members can be invited at the decision of the PB on an as-needed basis, but taking due regard that the PB remains sufficiently lean to be operationally effective. The final list of the PB members will be completed at the outset of project operations and presented in the Inception Report by taking into account the envisaged role of different parties in the PB. The national project manager will participate as a non-voting member in the PB meetings and will also be responsible for sharing required documents sufficiently in advance of the meeting and compiling a summary report of the discussions and conclusions of each meeting.

172. The coordination of the above stakeholders will be carried out by MWRE with the support of UNDP. The coordination will begin with the establishment of a Local Project Appraisal Committee (LPAC) and the invitation of stakeholders to an inception meeting. The PB will identify and put in place steps for initial activities to support, for example, the technical capacity building in the period when the regulatory and financial structures are being developed. One goal of project coordination will be to ensure that the various components of the project are in place when they are needed: e.g. financial instruments are ready when regulations come into place; technical capacity and equipment supply are available at the appropriate time, etc. The PB will meet semi-annually during project implementation, and it will have the responsibility of coordinating and harmonizing the actions of all the key stakeholders.

173. The day-to-day management of the project will be carried out by a Project Management Unit (PMU) under the overall guidance of the PB. The PMU will be established within MWRE and will coordinate its work with UNDP, MoP, HCENR, and

other stakeholders. The National Project Manager will report to MWRE and the PB. The Terms of Reference of the key project personnel are presented in Annex 8.3 of this Project Document. The project personnel will be selected on a competitive basis in accordance with the relevant rules and procedures and in consultation with the UNDP Country Office, Ministry of Finance, and Government.

174. The national project manager will be supported by international and national experts taking the lead in the implementation of specific technical assistance components of the project. Contacts with experts and institutions in other countries that have already gained experience in developing and implementing renewable energy policies and financial support mechanisms are also to be established.

175. UNDP will maintain the oversight and management of the overall project budget. It will be responsible for monitoring project implementation, timely reporting of the progress to the UNDP Regional Centre and the GEF, as well as organizing mandatory and possible complementary reviews and evaluations on an as-needed basis. It will also support the executing agency in the procurement of the required expert services and other project inputs and administer the required contracts. Furthermore, it will support the coordination and networking with other related initiatives and institutions in the country.

176. 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.

177. To successfully reach the objective and outcomes of the project, it is essential that the progress of different project components is closely monitored both by the key local stakeholders and authorities as well as by project's international experts, starting with the finalization of the detailed, component-specific work plans and implementation arrangements and continuing through the project's implementation phase. The purpose of this is to facilitate early identification of possible risks to successful completion of the project together with adaptive management and early corrective action, when needed.

178. In order to accord proper acknowledgement to the GEF for providing funding, a GEF logo should appear on all relevant GEF project publications, including any hardware purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgement to the GEF in accordance with the relevant GEF guidelines.

179. The international experiences and lessons-learned from catalyzing local renewable energy development have been taken into account in the design of this new project. The activities of other donors and the foreseen synergies and opportunities for cooperation have been discussed in detail in Chapter 1.4 of this project document. During implementation, proper care will be taken to have adequate communication

and coordination mechanisms in place to ensure that areas of common interest can be addressed in a cost-efficient way.

7. Monitoring Framework and Evaluation

180. The project will be monitored through the following M& E activities. The M& E budget is provided in the table below.

7.1 Project start

181. A Project Inception Workshop will be held within the first 2 months of project signature with those with assigned roles in the project organization structure, UNDP Country Office and, where appropriate/feasible, regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

182. The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.

b) Based on the project results framework and the relevant SOF (e.g. GEF) Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.

c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.

d) Discuss financial reporting procedures and obligations, and arrangements for annual audit. Propose implementation and financial arrangement for grant component under Outcome 1 and prepare execution of required agreements or delegation of responsible parties. Prepare roadmap for establishment of an Independent Review Mechanism that will review and endorse the selection of all grant recipients funded by GEF and regularly assess the performance of these beneficiaries in managing the assets subsidized by the grants over the course of the project

e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

183. An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

7.2 Quarterly

184. Quarterly monitoring procedure includes:

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.

- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, micro-finance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical). Quarterly reports will include regular monitoring on the grant component under Outcome 1.
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

7.3 Annually

185. Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and SOF (e.g. GEF) reporting requirements.

186. The APR/PIR includes, but is not limited to, reporting on the following:
- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lessons-learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

7.4 Periodic Monitoring through site visits

187. UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

7.5 Mid-term of project cycle

188. The project will undergo an independent Mid-Term Review at the mid-point of project implementation (2017). The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this

review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-Term Review will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Centre (ERC).

189. The relevant SOF (GEF) Focal Area Tracking Tool will also be completed during the Mid-Term Review cycle.

7.6 End of Project

190. An independent Final Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and SOF (e.g. GEF) guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Review, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

191. The Final Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Centre (ERC).

192. The relevant SOF (e.g. GEF) Focal Area Tracking Tool will also be completed during the final evaluation.

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

7.7 Learning and knowledge sharing

194. Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

195. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons-learned. The project will identify, analyze, and share lessons-learned that might be beneficial in the design and implementation of similar future projects.

196. Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

7.8 Communications and visibility requirements

197. Full compliance is required with UNDP's Branding Guidelines. These can be accessed at http://intra.undp.org/coa/branding.shtml, and specific guidelines on UNDP logo use can be accessed at: http://intra.undp.org/branding/useOfLogo.html. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at http://intra.undp.org/coa/branding.shtml.

198. Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf

199. Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

200. Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

7.9 M&E work plan and budget

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
Inception Workshop and Report	▪ National Project Manager ▪ UNDP CO, UNDP-GEF	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	▪ Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on *output and implementation*	▪ Oversight by National Project Manager ▪ Project team	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	▪ National Project manager and team ▪ UNDP CO ▪ UNDP RTA	None	Annually

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
	▪ UNDP GEF		
Periodic status/ progress reports	▪ National Project Manager and team	None	Quarterly
Mid-term Review (with particular emphasis on evaluation of Outcome 4 to guide future replication and expansion)	▪ National Project Manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 40,000	At the mid-point of project implementation.
Final Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost : 40,000	At least three months before the end of project implementation
Project Terminal Report	▪ National Project Manager and team ▪ UNDP CO ▪ local consultant	0	At least three months before the end of the project
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 3,000	Yearly
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF-supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US$ 105,000 (~2% of total budget)	

8. Legal Context

201. This document, together with the CPAP signed by the Government and UNDP which is incorporated by reference, constitutes a Project Document as referred to in the Standard Basic Assistance Agreement [or other appropriate governing agreement] and all CPAP provisions apply to this document.

202. Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

203. The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

204. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

205. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via:
http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm.

206. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

207. This project will be audited in accordance with UNDP Financial Regulations and Rules and applicable audit policies.

9. Annexes

9.1 Risk Analysis

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
1	The security situation in Sudan may pose some risks or perceived risks. Without general security, the ability to travel, transport goods and work will be restricted. With renewable energy equipment, where the entire capital is procured and installed upfront, theft or damage can mean a complete loss of invested capital.		Political/ Operational	May prevent access to certain areas for implementation of projects. P[45] = 2 I[46] = 3	Advice on secure travel routes within Sudan. An escort from MWRE will be provided where necessary. The location of main activities in the project (Dongola, in the North State) is secure.	Project Board		N/A	N/A
2	The Government may fail to subsidize the programme or the Banks may require an interest rate too high to make the project attractive, or diesel subsidies may continue to make diesel artificially inexpensive.		Regulatory	Lack of policy basis to catalyze adoption of solar energy P = 2 I = 5	Policy reform and decision making can be slow in Sudan. UNDP will rely on close relations with MWRE and other counterparts. Through close participation, UNDP will aim to spur action. The need to replace diesel, and increase agricultural output provides a strong incentive for the adoption of solar pumping.	Government		N/A	N/A
3	Currency risk		Financial	The price of diesel is fixed in local currency while the price of pumps fluctuates with the currency.	By establishing a low-cost financing mechanism and removing taxes and duties from PV pumps, the pumps can be shown to be competitive with the price of				

[45] Probability from 1 (low) to 5 (high)

[46] Impact from 1 (low) to 5 (high)

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
				P=3 I=3	diesel pumping today. Farmers are eager for an easier to use alternative to diesel pumps. If solar PV pumps can be shown to be effective they may be willing to pay a premium for them, given an efficient financing mechanism.				
4	Falling oil prices may mean that diesel prices continue to be low and incentives for Government to lift subsidies on diesel are reduced.		Financial	P=2 I=4	As with currency risk, if PV pumps can be established as a viable technology with efficient financing mechanism, they may be adopted even at a premium to diesel.				
5	Climate change risk		Environmental	P=1 I=2	Climate change impacts may manifest through one of two ways. Reduced rain water will mean increased reliance on irrigation for pumping. Reduced Nile water flows will mean increased power needed for pumping. The project helps mitigate both aspects by providing a renewable energy source for pumping.	NA			
6.	Novelty and adoption risk – individual farmers or banks may be slow to adopt new technology and take-up unfamiliar business models.		Organizational	Slow uptake of solar water pumping by market participants. P = 2 I = 4	Farmers are eager to be rid of the burden of diesel fuel and mechanical pumps. If an alternative can be demonstrated to work reliably, they are expected to	Project Board		N/A	N/A

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
					switch. Banks are apprehensive given the unknowns in the project. Once initial loans are being repaid, the banks will regard this as another money generating investment.				
7	Technology risk – Technical failures, either due to equipment failure or bad installation, or bad design/sizing can be ruinous for the farmer and lead to lack of adoption by others and lack of finance by the banks.		Technological	Lower than anticipated water volumes out of the pumps installed. P = 2 I = 3	Consultants hired for the project will be tasked with studying and emphasizing appropriate design/sizing. Pumps may be procured with certain guarantees.	NA		N/A	N/A
8	Financial Risks – The capital required remains significant. The interest rates typically charged by the banks are too high to make solar pumping attractive.		Financial	Lack of financing is likely to mean low adoption rates as farmers are not likely to have the capital to purchase solar pumps. P = 2 I = 4	The project will work closely with the banks to provide the confidence they need to lend and with Government and the Bank of Sudan to achieve affordable finance rates and make the investment in solar pumping attractive for farmers.	Government			
9	Lack of adequate and reliable market data to facilitate the monitoring of project impacts and planning of further policy measures.		Operational	Reduced information on the reaction of the market to the measures implemented. P = 2 I = 2	Close cooperation with the main participants in the local solar pumping market, in particular the local distribution companies and NERC to obtain the required data will be emphasized. Robust MRV arrangements will be put in place, in particular for the NAMA. GHG monitoring can allow	National Project Manager (NPM)			

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Management response	Owner	Submitted, updated by	Last Update	Status
					estimations of avoided costs (fuel imports, avoided thermal generation capacity, etc.) to be derived with a fair degree of accuracy.				
10	Inadequate and/or non-capacitated human resources to successfully implement the project and support the mainstreaming of its results.		Operational	Project not meeting the stated targets. P = 1 I = 5	Solar pumping is not terribly complex and relies mainly on concepts and components already available – driving electric motors. The remaining parts – solar panels and controller, are encapsulated at the manufacturer. The required local human capacity to operate the systems is limited to "plug and play" interaction. It is expected that technicians servicing diesel pumps will be entirely capable of providing all services. The project includes significant capacity building and outreach components to help overcome this risk. The project will use the individuals trained to implement solar pumps under the project, thereby providing immediate use for the knowledge they have acquired and providing them with immediate income from it.	National Project Manager (NPM)		N/A	N/A

9.2 Stakeholder involvement plan

Project Stakeholder	Relationship With The Project
Ministry of Water Resources & Electricity (MWRE)	The principal role of MWRE is to formulate policies, strategies and action plans for the supply of electricity in Sudan, with a key focus on diversifying Sudan's electricity mix to include renewables. MWRE has been undertaking a pump switching programme in Northern State, assisting farmers to switch from diesel-powered irrigation pumps to grid-connected electric pumps. With the opportunities for further on-grid switching almost exhausted, MWRE is promoting the use of off-grid PV pumps instead. MWRE will be responsible for implementing the GEF project.
Ministry of Environment, Forestry & Physical Development (MEFPD)	MEFPD is the national focal point for the GEF and, under its subsidiary HCENR, the UNFCCC. MEFPD will be involved in technical assistance on the coordinated loan mechanism and on the climate finance elements of the project.
Higher Council for Environment and Natural Resources (HCENR)	As the national focal point for climate change under the UNFCCC, HCENR is responsible for coordinating National Communications, the development of Climate Change Action Plans, NAPAs, Technology Needs Assessments and NAMAs. The GEF project will build on a number of HCENR initiatives, including the development of standardized baselines, the elaboration of a national Low Emission Development Strategy, and the analysis of sectoral NAMA opportunities.
Ministry of Petroleum, Renewable Energy Directorate (MoP)	The Renewable Energy Directorate of MoP has a national mandate for renewable energy resource mapping and off-grid renewables applications. MoP has developed an expertise in rooftop PV systems and has begun to experiment with a limited number (7 to date) of PV irrigation pump units. MoP will assist the GEF project with advisory support, local capacity development and national policy formulation.
Ministry of Agriculture (MoA)	MoA is the implementing body for the Agricultural Strategic Plan (2007-2015), which has the central objective of increasing the amount of farming land in Sudan by 70% and – within that overall target – doubling the amount of irrigated land. MoA operates a number of support programmes for farmers on agricultural practices, including irrigation and water pumping. The GEF project will coordinate its PV pump installations, capacity development and replication programme with MoA's support activities. MoA is also expected to play a key role in the context of liaising with water user groups and coordinating the NAMA, in ensuring inclusion of PV pumps in the Agricultural Implements Regulation.
Ministry of Finance & National Economy (MoF)/Bank of Sudan	MoF will support the establishment of a National PV Fund with technical and financial assistance. MoF will assist with finance-related aspects of the project, notably the support to banks and oversight of banks' micro-finance lending and inclusion of PV pumps in the fiscal concessions list of the Investment Law and the Agricultural Implements Regulation. The Ministry also works closely with the Customs Administration, which will enforce the technical standards for PV hardware that will be developed by the Sudan Standards & Metrology Organization. MoF will also assist in establishing National Fund to support the deployment of solar pumps.
National Energy Research Centre (NERC)	NERC (formerly the Energy Research Institute, ERI), under the Ministry of Science and Communication, is the primary institute at the national level for conducting research on renewables in Sudan, as well as pilot project implementation. The Solar PV Encapsulation & Manufacturing Unit is the implementation arm of NERC: it has undertaken a number of PV pump installations in Nile State and Darfur, accompanied by system monitoring and technical

	performance assessments. NERC will support the GEF project in understanding farmers' technical and operational pumping needs, in designing a pump sizing software tool, in installing and monitoring demonstration PV pump units, and in capacity development.
Sudan Standards & Metrology Organization (SSMO)	SSMO is a Government body established to coordinate Sudan's engagement with the International Standards Organization (ISO), the African Regional Organization for Standardization (ARSO) and the Arab Standards and Metrology Organization (ASMO). SSMO operates 15 testing and certification laboratories across Sudan. The GEF project will build upon SSMO's mandate and expertise to support SSMO in developing technical standards for the PV pump hardware that will be deployed in Northern State (and subsequently nationally).
Northern State Government	Sudan has a federal governance structure, made up of 18 states with delegated functions and powers. The Northern State Government has been actively promoting grid-connected irrigation pumps as a means of improving farmers' livelihoods and reducing their (and the State's) reliance on diesel fuel, and is now extending this support to off-grid PV pumps in areas where grid extension is infeasible. The GEF project will build on the State Government's established support programme for electric pumps, and will harness the State Government's institutions (e.g. the State Ministry of Agriculture) and agricultural stakeholder networks.
Commercial banks	The Agricultural Bank of Sudan, the Farmers Bank, the Savings Bank and the Islamic Bank have together financed – through ad hoc (uncoordinated) loans to farmers – the installation of approximately 2,000 grid-connected electric pumps in Northern and Nile States since 2011. Now, acting on an instruction from the Northern State Government that 12% of all commercial lending must be in the form of micro-finance to support electric and PV pumps, the banks are under pressure to systematize and scale-up their lending, with a particular emphasis on PV pumps. Ten banks have committed to providing US$2 million each in loans to support the GEF project's initiatives. The GEF project will work with the State Government and the banks to coordinate their lending for this purpose, to develop the internal capacities of the banks to structure loan packages and assess loan risks, and to market innovative financial products to drive farmer take-up of PV pump technology.

9.3 Terms of Reference for Project Personnel

Project Board

Duties and responsibilities:

The Project Board (PB) is the main body to supervise the project implementation in accordance with UNDP rules and regulations and referring to the specific objectives and the outcomes of the project with their agreed performance indicators.

The main functions of the PB are:

- General monitoring of project progress in meeting its objectives and outcomes and ensuring that they continue to be in line with national development objectives;
- Facilitating the co-operation between the different Government entities, whose inputs are required for successful implementation of the project, ensuring access to the required information and resolving eventual conflict situations raising during the project implementation when trying to meet its outcomes and stated targets;

- Supporting the elaboration, processing and adoption of the required institutional, legal and regulatory changes to support the project objectives and overcoming of related barriers;
- Facilitating and supporting other measures to minimize the identified risks to project success, remove bottlenecks and resolve eventual conflicts;
- Approval of the annual work plans and progress reports, the first plan being prepared at the outset of project implementation;
- Approval of the project management arrangements; and
- Approval of any amendments to be made in the project strategy that may arise due to changing circumstances, after careful analysis and discussion of the ways to solve problems.

PB Structure and Reimbursement of Costs

The PB will be chaired by MWRE. The PB will include representatives from the key Ministries and Agencies involved in the project and, as applicable, representatives of the project's other co-financing partners.

The costs of the PB's work shall be considered as the Government's or other project partners' voluntary in-kind contribution to the project and shall not be paid separately by the project. Members of the PB are also not eligible to receive any monetary compensation from their work as experts or advisers to the project.

Meetings

It is suggested that the PB will meet at least once a year, including the annual Tripartite Review (TPR) meeting. A tentative schedule of the PB meetings will be agreed as a part of the annual work plans, and all representatives of the PB should be notified again in writing 14 days prior to the agreed date of the meeting. The meeting will be organized provided that the executing agency, UNDP and at least 2/3 of the other members of the PB can confirm their attendance. The National Project Manager shall distribute all materials associated with the meeting agenda at least 5 working days in prior to the meeting.

National Focal Point

As a representative of the Government and the project's executing agency, the National Focal Point has the main responsibility to ensure that the project is executed in accordance with the Project Document and the UNDP guidelines for nationally executed projects.

His/her main duties and responsibilities include:

- Coordinate and guide the work of the National Project Manager with the work of the national implementing agency through meetings at regular intervals to receive project progress reports and provide guidance on policy issues;
- Certifying the annual and, as applicable, quarterly work plans, financial reports, and ensuring their accuracy and consistency with the project document and its agreed amendments;

- Taking the lead in developing linkages with the relevant authorities at national, provincial and governmental level and supporting the project in resolving any institutional- or policy-related conflicts that may emerge during its implementation.

National Project Manager (full-time)

Duties and responsibilities:

Operational project management in accordance with the Project Document and the UNDP guidelines and procedures for nationally implemented projects, including:

- General coordination, management and supervision of project implementation;
- Managing the procurement and the project budget under the supervision of UNDP to assure timely involvement of local and international experts, organization of training and public outreach, purchase of required equipment etc. in accordance with UNDP rules and procedures;
- Submission of annual Project Implementation Reviews and other required progress reports (such QPRs) to the PB, Executing Agency and the UNDP in accordance with the section "Monitoring and Evaluation" of the Project Document;
- Ensuring effective dissemination of, and access to, information on project activities and results, (including a regularly updated project website);
- Supervising and coordinating the contracts of the experts working for the project;
- As applicable, communicating with the project's international partners and attracting additional financing in order to fulfill the project objectives; and
- Ensuring otherwise successful completion of the project in accordance with the stated outcomes and performance indicators summarized in the project's log frame matrix and within the planned schedule and budget.
- Lead the setting up of standards and technical specifications of the solar pumps to be procured

Expected Qualifications:

- Advanced university degree and at least 6 years of professional experience or university degree with 2 years of professional experience in the specific areas the project is dealing with, such as solar farms, solar development, including solid knowledge of international renewable energy experiences, state-of-the-art approaches, and best practices in catalyzing the renewable energy market (by applying different policy measures, new financing mechanisms, etc.)
- Experience in managing projects of similar complexity and nature, including demonstrated capacity to actively explore new, innovative implementation and financing mechanisms to achieve the project objective;
- Demonstrated experience and success in the engagement of, and working with, the private sector and NGOs, creating partnerships and leveraging financing for activities of common interest;
- Good analytical and problem-solving skills and the related ability to adaptively manage with prompt action on the conclusion and recommendations coming out from the project's regular monitoring and self-assessment activities as well as from periodic external evaluations;

- Ability and demonstrated success to work in a team, to effectively organize it, and to motivate its members and other project counterparts to effectively work towards the project's objective and expected outcomes;
- Good communication skills and competence in handling project's external relations at all levels;
- Fluent/good knowledge of the Arabic and English languages;
- Experience in developing countries, and preferably in North Africa; and
- Familiarity and prior experience with UNDP is considered an asset.

Project Engineer

Duties and responsibilities:

Technical assistance and support to the project and National Project Manager, including:

- General coordination, management and supervision of project implementation;
- Coordination of technical needs and requirements with partners;
- Follow-up with on-site implementation; and
- Ensuring otherwise successful completion of the project in accordance with the stated outcomes and performance indicators summarized in the project's log frame matrix and within the planned schedule and budget.
- Participate in setting up of standards and technical specifications of the solar pumps to be procured.

Expected Qualifications:

- University degree in the natural sciences or engineering and at least 2 years of technical professional experience.
- Experience in solving novel technical problems;
- Good analytical and problem-solving skills and the related ability to adaptively manage with prompt action on the conclusion and recommendations coming out from the project's regular monitoring and self-assessment activities as well as from periodic external evaluations;
- Ability and demonstrated success to work in a team, to effectively organize it, and to motivate its members and other project counterparts to effectively work towards the project's objective and expected outcomes;
- Good communication skills and competence in handling project's external relations at all levels;
- Fluent/good knowledge of the Arabic and English languages;
- Experience in developing countries, and preferably in North Africa; and
- Familiarity and prior experience with UNDP is considered an asset.

Project Financial and Administrative Assistant (full-time)

Duties and responsibilities:

Supporting the National Project Manager in the implementation of the project, including:

- Responsibility for logistics and administrative support of project implementation, including administrative management of the project budget, required procurement support, etc.
- Maintaining up to date business and financial documentation, in accordance with UNDP and other project reporting requirements;
- Organizing meetings, business correspondence and other communications with the project partners;
- Supporting the project outreach and PR activities in general, including keeping the project web-site up to date;
- Managing the projects files and supporting the National Project Manager in preparing the required financial and other reports required for monitoring and supervision of the project progress;
- Supporting the National Project Manager in managing contracts, in organizing correspondence and in ensuring effective implementation of the project otherwise.

Expected Qualifications:

- Fluent/good knowledge of the Arabic and English languages.
- Demonstrated experience and success of work in a similar position
- Experience working in developing countries, preferably Sudan.
- Good administration and interpersonal skills.
- Ability to work effectively under pressure.
- Good computer skills.
- University degree is required

9.4 GHG Reduction Calculations

Direct GHG Emission Reductions

The calculated global GHG reduction benefits of the project will consist of a combination of:

- Direct GHG emission reduction benefits from the replacement of diesel engines with solar panels through 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 data presented in the table below:

Parameter	Value
Specific Diesel Consumption[47]	11 L/day for 3.12 kW pump equivalent 16 L/day for 5.12 kW pump equivalent 96 L/day for 29.6 kW pump equivalent
Irrigation days per year	270
Emission Factor for Diesel energy conversion	2.66 kg CO_2/liter
Installed capacity	1276 × 3.12 kW pumps 128 × 5.12 kW pumps 64 × 29.6 kW pumps
Diesel savings (liters) – lifetime	5,886,720
Total emission reductions due to diesel displacement over lifetime of system (direct)	**313,174 tCO_2**
Total indirect emission reductions from project – Replication factor of 4 in post-project period	**1,252,694 tCO_2**

Direct CO_2 reductions =
(270 days/year × (1276 × 11 L/day + 128 × 16 L/day + 64 × 96 L/day) × 2.66 kg CO_2/L)) × 20 years

The direct CO_2 emission reductions attributed to the replacement of diesel pumps with solar pumps by the UNDP-implemented, GEF-financed project, are calculated to be 15,659 tCO_2/year, or 313,174 tCO_2 over the 20 year life of the pumps. With a GEF financial contribution of $4,365,753, this translates to a cost of $GEF US$13.94/tCO_2 abated directly, and US$3.49/$tCO_2$ abated indirectly. This does not include reduced diesel consumption by those who may adopt the water saving measures to be promoted by the project even if they do not adopt the solar pumping.

Indirect GHG Emission Reductions

Bottom-up analysis:

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

$CO_{2\ indirect\ BU} = CO_{2\ direct} * RF$

[47] As measured by M. Adeen and reported by A. El Amin at two different farms for three days and averaged and for a diesel pump equivalent to a 5.12 kWp solar PV pump. Rates for other pumps are extrapolated based on these measurements.

where RF is a Replication Factor.

Assuming a replication factor of 4, a further 1,252,694 tCO_2 can be calculated as indirect GHG emission reductions.

Top-Down analysis

There are an estimated 6,500 pumps in the Northern State. Assuming conservatively that one quarter of these can be converted to solar, this provides a further 1,625 pumps. Further assuming that in each of Sudan's 17 states one third of this figure, 500 pumps, will be converted to solar PV this provides a total of 10,125 pumps. Assuming a pump size distribution similar to that proposed in the Northern State, this results in a reduction of 2,160,005 tCO_2 over the 20 year lifetime of the pumps.

The calculation represents the most conservative scenarios in two ways. First, diesel consumption varies widely for pumps depending on usage, age, condition, etc. The calculation uses the most conservative figures by using the lowest reasonable scenarios encountered during the PPG. Other reasonable scenarios exist which could indicate almost twice the carbon reduction. Second, the calculation does not take into account any lifting of customs duties or tariffs on the pump which would have the effect of wider adoption and increased capacity to finance through the National PV fund. Similarly, the estimates for installed capacity are considered conservative. Simple calculation shows that available co-finance could potentially support a larger installed based however the original target is kept with additional funds left as a contingency to for risks such as currency fluctuations.

The project will take appropriate precautions that the old diesel pumps replaced by solar pumps are not recirculated on the market as very low-cost alternatives for pumping water. Such precautions may eventually include a scrapping programme or requiring farmers to turn-in their diesel pumps as part of entering into a finance agreement for a solar PV pump, potentially after a trial period to ensure the solar pump is working adequately. Initially, farmers may be allowed to keep their diesel pump, provided that it is connected on the same well or source as the solar pump and therefore would only be used as backup or when solar radiation is not sufficient. It is entirely plausible that a farmer would legitimately wish to retain their diesel pump as backup. The matter is sensitive because farmers could risk loss of crop if for any reason the solar pump were not to pump for an extended period. Hence, the matter is not easily decided and will take a few years of operation to adequately sort in a way that gives farmers appropriate assurance and at the same time ensures there is not "leakage" of emissions reductions through the availability of scrap diesel pumps on the market.

9.5 Social and Environmental Screening

The completed template, which constitutes the Social and Environmental Screening Report, must be included as an annex to the Project Document. Please refer to the Social and Environmental Screening Procedure for guidance on how to answer the 6 questions.]

Project Information

Project Information	
1. Project Title	Promoting the use of electric water pumps for irrigation in Sudan
2. Project Number	PIMS 5324
3. Location (Global/Region/Country)	Sudan

Part A. Integrating Overarching Principles to Strengthen Social and Environmental Sustainability

QUESTION 1: How Does the Project Integrate the Overarching Principles in order to Strengthen Social and Environmental Sustainability?
Briefly describe in the space below how the Project mainstreams the human-rights based approach
The project provides farmers with solar power in place of diesel thus liberating them from the diesel supply chain and enabling them to freely access the sun's energy to grow crops and earn their livelihood. Access to the pumps will not be affected by race, gender, or religion. As part of the PPG process, public stakeholder consultations were held in Khartoum and the North State and attended by several women.
Briefly describe in the space below how the Project is likely to improve gender equality and women's empowerment
By reducing reliance on diesel the project in principle is likely to enable more women to farm. PV pump maintenance is in principle more accessible to women than diesel pump maintenance. The PV project is likely to increase household income therefore giving women more disposable income for their households.
Briefly describe in the space below how the Project mainstreams environmental sustainability
By replacing diesel pumps, with their associated fuel use, grease and lubricant use, air emissions, spillage, and ground contamination, with clean solar power the project help promote environmental sustainability. The project also aims to minimize water use, further promoting environmental sustainability.

Part B. Identifying and Managing Social and Environmental Risks

QUESTION 2: What are the Potential Social and Environmental Risks? *Note: Describe briefly potential social and environmental risks identified in Attachment 1 – Risk Screening Checklist (based on any "Yes" responses).*	**QUESTION 3: What is the level of significance of the potential social and environmental risks?** *Note: Respond to Questions 4 and 5 below before proceeding to Question 6*			**QUESTION 6: What social and environmental assessment and management measures have been conducted and/or are required to address potential risks (for Risks with Moderate and High Significance)?**
Risk Description	***Impact and Probability (1-5)***	***Significance (Low, Moderate, High)***	***Comments***	***Description of assessment and management measures as reflected in the Project design. If ESIA or SESA is required note that the assessment should consider all potential impacts and risks.***
Risk 1: Extraction of Ground Water	I = 5 P =5	**Moderate**	**The project is based on using solar pumps to irrigate where there is no grid. A large portion of these will pump ground water. Despite this, significance is rated as moderate because this ground water would be pumped with diesel powered pumps in many cases. While solar pumping is "free" once the pump is installed. It is also self-limiting in that it runs only during the day. The implementation of the project will reduce water extraction by employing efficient irrigation techniques. But will also allow cultivation of larger land area, extracting more water.**	**A separate project is being undertaken (in the PIF stage to GEF) to study in detail the Nubian Sandstone Aquifer System which the pumps would extract water from and determine sustainable levels of extraction. The project is expected to proceed largely in parallel with this project.** **As part of the PPG process, a study of underground water wells and pumping rates was undertaken. The study indicates based on the drawdown rates that the wells can support the present extraction rates. The solar pumps are not expected to increase the extraction rates but rather decrease it as a result of efficient irrigation methods that will be put in place as part of the project implementation.**
Risk 2: Forced evictions	I = 5 P = 1	**Low**	**Forced eviction may occur where a farmer uses his land as collateral for a loan to buy a pump and for any reason is unable to repay the loan triggering repossession of the land by the lender.**	**The project is undertaking measures to provide banks with alternative collateral, such as the pump itself, thereby insulating farmers from this risk while still providing the bank with the guarantees needed to lend and ensuring the farmers are sufficiently engaged.**

Risk 3: Inequitable adverse impacts on farmers living in poverty	I = 2 P =2	**Low**	**Impoverished farmers may not be able to obtain loans from banks thereby leaving them at a competitive disadvantage to farmers who are able to use solar pumping and reduce their cost.**	**The project seeks to enable all those who can benefit from loans to obtain them. Farmers unable to obtain loans may apply through cooperatives or other means. The impact of the probability and impact are rated as moderately low because farming on credit is the prevailing method, so all impoverished commercial farmers rely on some form of credit for things like fertilizer. Those who do not likely engage in some kind of subsistence farming and are not likely to be directly affected. These farmers are also unlikely to be planting plots of land using a dedicated pump. Still, the project will explore possibilities for providing these farmers with a mechanism to obtain solar pumps as a cooperative.**

QUESTION 4: What is the overall Project risk categorization?		
Select one (see SESP for guidance)		**Comments**
Low Risk	☐	
Moderate Risk	✓	**The project is low risk except for the risk of groundwater extraction which has been addressed preliminarily in the PPG phase and will be address in detail as part of a dedicated project on the sub-soil aquifer.**
High Risk	☐	

QUESTION 5: Based on the identified risks and risk categorization, what requirements of the SES are relevant?		
Check all that apply		**Comments**
Principle 1: Human Rights	☐	
Principle 2: Gender Equality and Women's Empowerment	☐	
1. Biodiversity Conservation and Natural Resource Management	•	A separate project is being undertaken to study in detail the available water resource and propose appropriate management techniques. Water is already being drawn from the underground aquifer. The current project will replace diesel pumping with solar-powered pumping and will put in place water conversation measures.
2. Climate Change Mitigation and Adaptation	☐	

	3. Community Health, Safety and Working Conditions	☐	
	4. Cultural Heritage	☐	
	5. Displacement and Resettlement	☐	
	6. Indigenous Peoples	☐	
	7. Pollution Prevention and Resource Efficiency	☐	

Final Sign Off

Signature	***Date***	***Description***
QA Assessor		UNDP staff member responsible for the Project, typically a UNDP Programme Officer. Final signature confirms they have "checked" to ensure that the SESP is adequately conducted.
QA Approver		UNDP senior manager, typically the UNDP Deputy Country Director (DCD), Country Director (CD), Deputy Resident Representative (DRR), or Resident Representative (RR). The QA Approver cannot also be the QA Assessor. Final signature confirms they have "cleared" the SESP prior to submittal to the PAC.
PAC Chair		UNDP chair of the PAC. In some cases PAC Chair may also be the QA Approver. Final signature confirms that the SESP was considered as part of the project appraisal and considered in recommendations of the PAC.

9.5.1 SESP Attachment 1 Social and Environmental Risk Screening Checklist

Checklist Potential Social and Environmental Risks		
Principles 1: Human Rights		**Answer (Yes/No)**
1.	Could the Project lead to adverse impacts on enjoyment of the human rights (civil, political, economic, social or cultural) of the affected population and particularly of marginalized groups?	No
2.	Is there likelihood that the Project would have inequitable or discriminatory adverse impacts on affected populations, particularly people living in poverty or marginalized or excluded individuals or groups? [48]	Yes
3.	Could the Project potentially restrict availability, quality of and access to resources or basic services, in particular to marginalized individuals or groups?	No
4.	Is there likelihood that the Project would exclude any potentially affected stakeholders, in particular marginalized groups, from fully participating in decisions that may affect them?	No
5.	Are there measures or mechanisms in place to respond to local community grievances?	No
6.	Is there a risk that duty-bearers do not have the capacity to meet their obligations in the Project?	No
7.	Is there a risk that rights-holders do not have the capacity to claim their rights?	No
8.	Have local communities or individuals, given the opportunity, raised human rights concerns regarding the Project during the stakeholder engagement process?	No
9.	Is there a risk that the Project would exacerbate conflicts among and/or the risk of violence to project-affected communities and individuals?	No
Principle 2: Gender Equality and Women's Empowerment		
1.	Is there a likelihood that the proposed Project would have adverse impacts on gender equality and/or the situation of women and girls?	No
2.	Would the Project potentially reproduce discriminations against women based on gender, especially regarding participation in design and implementation or access to opportunities and benefits?	No
3.	Have women's groups/leaders raised gender equality concerns regarding the Project during the stakeholder engagement process and has this been included in the overall Project proposal and in the risk assessment?	No
3.	Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and positions of women and men in accessing environmental goods and services? *For example, activities that could lead to natural resources degradation or depletion in communities who depend on these resources for their livelihoods and*	No

[48] Prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or other opinion, national or social or geographical origin, property, birth or other status including as an indigenous person or as a member of a minority. References to "women and men" or similar is understood to include women and men, boys and girls, and other groups discriminated against based on their gender identities, such as transgender people and transsexuals.

	well being	
Principle 3: Environmental Sustainability: Screening questions regarding environmental risks are encompassed by the specific Standard-related questions below		
Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management		
1.1	Would the Project potentially cause adverse impacts to habitats (e.g. modified, natural, and critical habitats) and/or ecosystems and ecosystem services? *For example, through habitat loss, conversion or degradation, fragmentation, hydrological changes*	No
1.2	Are any Project activities proposed within or adjacent to critical habitats and/or environmentally sensitive areas, including legally protected areas (e.g. nature reserve, national park), areas proposed for protection, or recognized as such by authoritative sources and/or indigenous peoples or local communities?	No
1.3	Does the Project involve changes to the use of lands and resources that may have adverse impacts on habitats, ecosystems, and/or livelihoods? (Note: if restrictions and/or limitations of access to lands would apply, refer to Standard 5)	No
1.4	Would Project activities pose risks to endangered species?	No
1.5	Would the Project pose a risk of introducing invasive alien species?	No
1.6	Does the Project involve harvesting of natural forests, plantation development, or reforestation?	No
1.7	Does the Project involve the production and/or harvesting of fish populations or other aquatic species?	No
1.8	Does the Project involve significant extraction, diversion or containment of surface or ground water? *For example, construction of dams, reservoirs, river basin developments, groundwater extraction*	Yes
1.9	Does the Project involve utilization of genetic resources? (e.g. collection and/or harvesting, commercial development)	No
1.10	Would the Project generate potential adverse transboundary or global environmental concerns?	No
1.11	Would the Project result in secondary or consequential development activities which could lead to adverse social and environmental effects, or would it generate cumulative impacts with other known existing or planned activities in the area? *For example, a new road through forested lands will generate direct environmental and social impacts (e.g. felling of trees, earthworks, potential relocation of inhabitants). The new road may also facilitate encroachment on lands by illegal settlers or generate unplanned commercial development along the route, potentially in sensitive areas. These are indirect, secondary, or induced impacts that need to be considered. Also, if similar developments in the same forested area are planned, then cumulative impacts of multiple activities (even if not part of the same Project) need to be considered.*	No

Standard 2: Climate Change Mitigation and Adaptation		
2.1	Will the proposed Project result in significant[49] greenhouse gas emissions or may exacerbate climate change?	No
2.2	Would the potential outcomes of the Project be sensitive or vulnerable to potential impacts of climate change?	No
2.3	Is the proposed Project likely to directly or indirectly increase social and environmental vulnerability to climate change now or in the future (also known as maladaptive practices)? *For example, changes to land use planning may encourage further development of floodplains, potentially increasing the population's vulnerability to climate change, specifically flooding*	No
Standard 3: Community Health, Safety and Working Conditions		
3.1	Would elements of Project construction, operation, or decommissioning pose potential safety risks to local communities?	No
3.2	Would the Project pose potential risks to community health and safety due to the transport, storage, and use and/or disposal of hazardous or dangerous materials (e.g. explosives, fuel and other chemicals during construction and operation)?	No
3.3	Does the Project involve large-scale infrastructure development (e.g. dams, roads, buildings)?	No
3.4	Would failure of structural elements of the Project pose risks to communities? (e.g. collapse of buildings or infrastructure)	No
3.5	Would the proposed Project be susceptible to or lead to increased vulnerability to earthquakes, subsidence, landslides, erosion, flooding or extreme climatic conditions?	No
3.6	Would the Project result in potential increased health risks (e.g. from water-borne or other vector-borne diseases or communicable infections such as HIV/AIDS)?	No
3.7	Does the Project pose potential risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during Project construction, operation, or decommissioning?	No
3.8	Does the Project involve support for employment or livelihoods that may fail to comply with national and international labor standards (i.e. principles and standards of ILO fundamental conventions)?	No
3.9	Does the Project engage security personnel that may pose a potential risk to health and safety of communities and/or individuals (e.g. due to a lack of adequate training or accountability)?	No
Standard 4: Cultural Heritage		
4.1	Will the proposed Project result in interventions that would potentially adversely impact sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g. knowledge, innovations, practices)? (Note: Projects intended to protect and conserve Cultural Heritage	No

[49] In regards to CO_2, 'significant emissions' corresponds generally to more than 25,000 tons per year (from both direct and indirect sources). [The Guidance Note on Climate Change Mitigation and Adaptation provides additional information on GHG emissions.]

	may also have inadvertent adverse impacts)	
4.2	Does the Project propose utilizing tangible and/or intangible forms of cultural heritage for commercial or other purposes?	No
Standard 5: Displacement and Resettlement		
5.1	Would the Project potentially involve temporary or permanent and full or partial physical displacement?	No
5.2	Would the Project possibly result in economic displacement (e.g. loss of assets or access to resources due to land acquisition or access restrictions – even in the absence of physical relocation)?	No
5.3	Is there a risk that the Project would lead to forced evictions?[50]	Yes
5.4	Would the proposed Project possibly affect land tenure arrangements and/or community based property rights/customary rights to land, territories and/or resources?	No
Standard 6: Indigenous Peoples		
6.1	Are indigenous peoples present in the Project area (including Project area of influence)?	No
6.2	Is it likely that the Project or portions of the Project will be located on lands and territories claimed by indigenous peoples?	No
6.3	Would the proposed Project potentially affect the rights, lands and territories of indigenous peoples (regardless of whether Indigenous Peoples possess the legal titles to such areas)?	No
6.4	Has there been an absence of culturally appropriate consultations carried out with the objective of achieving FPIC on matters that may affect the rights and interests, lands, resources, territories and traditional livelihoods of the indigenous peoples concerned?	No
6.4	Does the proposed Project involve the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples?	No
6.5	Is there a potential for forced eviction or the whole or partial physical or economic displacement of indigenous peoples, including through access restrictions to lands, territories, and resources?	No
6.6	Would the Project adversely affect the development priorities of indigenous peoples as defined by them?	No
6.7	Would the Project potentially affect the traditional livelihoods, physical and cultural survival of indigenous peoples?	No
6.8	Would the Project potentially affect the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices?	No

[50] Forced evictions include acts and/or omissions involving the coerced or involuntary displacement of individuals, groups, or communities from homes and/or lands and common property resources that were occupied or depended upon, thus eliminating the ability of an individual, group, or community to reside or work in a particular dwelling, residence, or location without the provision of, and access to, appropriate forms of legal or other protections.

Standard 7: Pollution Prevention and Resource Efficiency		
7.1	Would the Project potentially result in the release of pollutants to the environment due to routine or non-routine circumstances with the potential for adverse local, regional, and/or transboundary impacts?	No
7.2	Would the proposed Project potentially result in the generation of waste (both hazardous and non-hazardous)?	No
7.3	Will the proposed Project potentially involve the manufacture, trade, release, and/or use of hazardous chemicals and/or materials? Does the Project propose use of chemicals or materials subject to international bans or phase-outs? *For example, DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Conventions on Persistent Organic Pollutants or the Montreal Protocol*	No
7.4	Will the proposed Project involve the application of pesticides that may have a negative effect on the environment or human health?	No
7.5	Does the Project include activities that require significant consumption of raw materials, energy, and/or water?	No

9.6 Letters of Co-financing

بسم الله الرحمن الرحيم

Republi of Sudan
Ministry of Environment, Forestry & Physical Development
Higher Council for Environment & Natural Resources
General Secretariat

جمهورية السودان
وزارة البيئة والغابات والتنمية العمرانية
المجلس الأعلى للبيئة والموارد الطبيعية
الأمانة العامة

10 March 2015

To: **Adriana Dinu**
Executive Coordinator
UNDP - Global Environment Facility
United Nations Development Programme
304 East 45th Street, FF 914
New York, NY 10017, USA

From: **Prof. Haider Elsafi Mohamed Ali Shapo**
Secretary General, Higher Council for Environment and Natural Resources
Khartoum, Sudan.

Subject: **Co-financing in support of the "Promoting the use of electric water pumps for irrigation in Sudan" project**

This letter is to confirm the support and commitment of the Higher Council for Environment and Natural Resources (HCENR) for the implementation of the project **"Promoting the use of electric water pumps for irrigation in Sudan"**, funded by the Global Environment Facility.The Higher Council for Environment and Natural Resources oversees the application of environmental laws and regulations to all development projects in Sudan, and has particular responsibilities in the climate change area such ascoordinating National Communications and assistance to the design and implementation of the Nationally Appropriate Mitigation Action (NAMA) elements of the project.

In this specific project, HCENR will participate in the implementation of the project and is willing to make parallelcashcontribution which is equivalent of USD 500,000 for the project.

Thank you for your support and looking forward to our continued partnership.

Yours sincerely

هاتف : ٧٨٤٢٧٩ ـ ١٨٣ ـ ٢٤٩+ فاكس : ٧٨٧٦١٧ ـ ١٨٣ ـ ٢٤٩+ ص . ب : ١٠٤٨٨ الخرطوم
Tel. : +249 - 183 - 784279 Fax : +249 - 183 - 787617 P.O. Box : 10488 - Khartoum
E-mail:hcenr2005@yahoo.com www.hcenr.net

بسم الله الرحمن الرحيم

جمهورية السودان

وزارة الموارد المائية والكهرباء

REPUBLIC OF SUDAN

MINISTRY OF WATER RESOURCES & ELECTRICITY

Under Secretary Office مكتب الوكيل

Date:26/2/2015

Adriana Dinu,
UNDP-GEF, Executive Coordinator and Director a.i.
304 East 45th Street,
New York,
NY 10017
USA.

Re: Co-financing in Support of the "Promoting the use of electric water pumps for irrigation in Sudan" project

This letter declares the interest of Ministry of Water Resources and Electricity (MWRE) in supporting the implementation of the Global Environment Facility funded project "Promoting the use of electric water pumps for irrigation in Sudan"
The Ministry of Water Resources and Electricity is the Government body responsible for electric power in Sudan, and the National Implementing Partner of this project. MWRE is responsible for implementing the project. Hence, MWRE is willing to contribute parallel cash contribution with an amount of USD 1,500,000
Sincerely,

Musa Omer Abu Elgasim
Undersecretary
Ministry of Water Resources and Electricity
Khartoum, Sudan

بسم الله الرحمن الرحيم

REPUBLIC OF SUDAN

ALNILE BANK FOR COMMERCE & DEVELOPMENT

بنك النيل
AlNile Bank

Date 03/03/2015

Adriana Dinu,

UNDP-GEF-Executive Coordinator and Director a.i.

304 East 45th Street,

New York,

NY 10017

USA.

Re: Co-financing in Support of the "Promoting the use of electric water Pumps for irrigation in sudan " project

This letter declares the interest of "AlNile Bank for Commerce& Development Dongola branch" in supporting the implementation of the Global Environment Facility funded project "promoting the use of electric water pumps for irrigation in sudan"

The project will help the bank in achieving the 12% quota for micro-finance loans which was mandated by the Central Bank of sudan . Hence , "AlNile Bank for Commerce& Development Dongola branch" is willing to support the project with a contribution loan of (2,000,000 $) according to the regulations of the bank.

Sincerely,

ALbadri A.Rahim Osman A.Rahman
Manager
North state Dongola Branch Manager
AlNile Bank for Commerce & Development
Tel: +249 241825007
Fax: +249 241822575
Mob: +249 912565095
H.Q P.O Box 62 Khartoum- Sudan
ab.a.osman@alnilebank.com
www.alnilebank.com

بنك النيل للتجارة والتنمية
فرع دنقلا

In the name of god

AL- SHAMAL ISLAMIC BANK DONGOLA BRANCH

10/03/2015

Sir/UNDP-GEF,Executive coordinator and director a.i

Promoting the use of electric water pumps for irrigation in sudan

This Letter Declares The Interest Of **(Al-Shamal Isalamic Bank- Dongola Branch)** In Supporting The Implementation Of The Global Environment Facility Funded Project "Promoting The Use Of Electric Water Pumps For Irrigation In Sudan".

The Project Will Help The Bank In Achieving The 12% Quota For Micro-Finance Loans Which Was Mandated By The Central Bank Of Sudan . Hence , **(Al-Shamal Isalamic Bank- Dongola Branch)** Is Willing To Support The Project With Contribution Of the equivalent loan of 2 million US Dollars According To The Regulation Of The Bank .

Sincerely

بنك الشمال الاسلامي

فرع دنقلا

البركة

Al Baraka bank sudan
Date 05/03/2015
Adriana dinu
304 east 45 th street
New york
N y 10017
USA

RE: CO-FINANCING IN SUPPORT OF THE "PROMOTHING THE USE OF ELECTRIC water pumps for
Irrigation in sudan project
This letter declares the interest of albaraka bank sudan in supporting the implementation of the global
Environment facility funded project "promothing the use of electric water pumps for irrigation in sudan

The project wiii help the bank in achieving the 12% quota for micro- finance loans which was mandated
By the central bank of sudan .hence albaraka bank of sudan is willing to support the project with
Acontribution of (2000000)$ according to the regulation of the bank

Sincerelly

Mohamed Mustafa ali ahamed
Manger of al Baraka bank sudan
Dongola branch

بنك البركة السوداني
البركة
5 MAR 2015
فرع دنقلا

المركز الرئيسي
Head Office

مصرف الإدخار والتنمية الإجتماعية
Savings & Social Development Bank
الأول في التمويل الأصغر

R : S.S.D.B/G.M.O/2015

Date : 15.03.2015

Adriana Dinu,

UNDP-GEF, Executive Coordinator and Director a.i.

304 East 45th Street,

New York,

NY 10017

USA.

Re: Co-financing in Support of the "Promoting the use of electric water pumps for irrigation in Sudan" project

This letter declares the interest of savings and social development bank in supporting the implementation of the Global Environment Facility funded project **"Promoting the use of electric water pumps for irrigation in Sudan"** The project will help the bank in achieving the 12% quota for micro-finance loans which was mandated by the Central Bank of Sudan. Hence, savings and social development bank is willing to support the project with a contribution loan of the equivalent of (2,000,000 $) i.e. in local currency according to the regulations of the bank.

Sincerely

Hado

Elzein Omer Elhado Omer

General Manager

الخرطوم - ميدان الأمم المتحدة ص . ب : ١١٧٧٥ - تلفون : ٧٧٥١٥٧ - ٧٧٤٣٥٨ - فاكس : ٧٨٦٩٣١
Khartoum - Umam Motahida Squar - P.O.Box: 11775 - Tel. : 775157 - 774358 - Fax : 786931
Www.ssdbank.com - E-mail:info@ssdbbank.com

Sudanese Islam Bank

Dongola Branch

Date: March 9.2015

Adrina Dinu

UNDP-GEF Executive Coordinator and Director a.i.

304 East 45 Street

New York

NY 10017

USA

Re: Co-financing in support of the "promoting the use of electric water pumps for irrigation in Sudan" project.

This letter declares the interest Bank of Sudanese Islamic Bank - Dongola Branch in supporting the implementation of the Global Environment facility funded project " promoting the use of electric water pumps for irrigation in Sudan"

The project will help the bank in achieving the 12% quota for micro – finance lonas which was mandated by the Central Bank of Sudan .Hence of Sudanese Islamic Bank Dongola Branch is willing to support the project with a contribution of the equivalent of 2 million US Dollars according to the regulation of the bank.

Sincerely

{signature}

Sulaiman Abdahameed Salim

مصرف المزارع التجاري
فرع دنقـــــلا

FARMER S COMMERIAL BANK 2015/3/4م

Adriana Dinu

UNDP –GEF.Executive coordinator and director a.i.

304East45thStreet.
NewYork.

NY10017
USA.

Re:Co-financing in support of th "promoting thuse of electric water pumps for irrigation in sudan"project

This letter declares the interest of Farmers Commerial Bank in supporting the implementation of the Global Environment Facility funded project"promoting the use of electric water pumps for irrigation in sudan"

The project will help the bank in achieving the 12%quota for micro-finance loans which was mandated by the Central bank of Sudan.Hence.Farmes Commerial bank Dongla Branch is willing to support the project with acontribution of Farmes Commerial bank loanof 2000000 Dollors u $ according to the regulations of the bank.

Sincerely.

Farmer's Commercial Bank
Dongola Branch

فاكس: 02418822416 تلفون: 2418822364

[insert entity letterhead]

March 4, 2015

Adriana Dinu,

UNDP-GEF, Executive Coordinator and Director a.i.

304 East 45th Street,

New York,

NY 10017

USA.

Re: Co-financing in Support of the **"Promoting the use of electric water pumps for irrigation in Sudan"** project

This letter declares the interest Bank of Family - Dongola Branch in supporting the implementation of the Global Environment Facility funded project **"Promoting the use of electric water pumps for irrigation in Sudan"**

The project will help the bank in achieving the 12% quota for micro-finance loans which was mandated by the Central Bank o Sudan. Hence Bank of Family - Dongola Branch is willing to support the project with a contribution of *the equivalent of 2 million U$ Dollars according to the regulations of the bank.*

Sincerely,

[signature]

FAMILY BANK

5.3.2015

بسم الله الرحمن الرحيم

Republic of The Sudan
Ministry of Petroleum
Sudanese Petroleum Corporation
General Directorate For Energy Affairs

جمهورية السودان
وزارة النفط
المؤسسة السودانية للنفط
الإدارة العامة لشئون الطاقة

مكتب المدير العام
Director General Office

Adriana Dinu,

Khartoum, 24 March 2015

UNDP-GEF, Executive Coordinator and Director a.i.

304 East 45th Street,

New York,

NY 10017

USA.

Re: Co-financing in Support of the **"Promoting the use of electric water pumps for irrigation in Sudan"** project

This letter declares the interest of Ministry of Petroleum (MoP) in supporting the implementation of the Global Environment Facility funded project **"Promoting the use of electric water pumps for irrigation in Sudan"**

The Renewable Energy Directorate of MoP has a national mandate for renewable energy resource mapping and off-grid renewable applications. MoP has begun to experiment a number of PV irrigation pump units. MoP will assist in the project implementation by providing advisory support local capacity development and national policy formulation

Hence, MoP is willing to support the project with parallel cash contribute of *USD 200,000*

Sincerely,

Dr. Mohi Adin Naeem

Director General

Sudan & Kuwait Building Centre - Khartoum
Nile Street - Second tower - Fifth floor
Tel.: 83 763808 - 83 782199 - Fax.: 83 773872

المركز السوداني الكويتي - الخرطوم
شارع النيل - البرج الثاني - الطابق الخامس
تلفونات: ٨٣ ٧٦٣٨٠٨ - ٨٣ ٧٨٢١٩٩ فاكس: ٧٧٣٨٧٢

جمهورية السودان
Republic of The Sudan
وزارة المالية والاقتصاد الوطني
Ministry of Finance & National Economy

Undersecretary الوكيل

Date: 22/3/2015

Adriana Dinu,
UNDP-GEF, Executive Coordinator and Director a.i.
304 East 45th Street, New York,
NY 10017, USA.

Subject: Co-financing in support of the **"Promoting the Use of Electric Water Pumps for Irrigation in Sudan"** project.

This letter is to confirm the support of the Ministry of Finance and National Economy on **"Promoting the Use of Electric Water Pumps for Irrigation in Sudan"**, funded by the Global Environment Facility.

The Ministry of Finance and National Economy will provide its technical and financial expertise to the project, in particular for working with the Ministry of Water Resources and Electricity and Ministry of Agriculture to ensure the establishment of the National Fund for solar pumps, support of banks' micro-finance lending for solar pumps and inclusion of solar pumps in the fiscal concessions list of the Investment Law and the Agricultural Implements Regulation.

In addition, the Ministry of Finance and National Economy will support the project with a contribution of tax exemption from import duties on solar pumps and associated components. Thus the Ministry of Finance and National Economy is contributing a cash parallel co-finance equivalent to USD3, 000,000

We are looking forward for the implementation of this project.

Sincerely,

Mustafa Yousif Holi
Undersecretary,
Ministry of Finance and National Economy

بسم الله الرحمن الرحيم

Republic of Sudan

Northern State

Ministry of Agriculture Animal Resources & Irrigation

جمهورية السودان

الولاية الشمالية

وزارة الزراعة والثروة الحيوانية السمكية والري

مكتب المدير العام

Re: co-financing in support of the promoting the use of electric water pumps for irrigation in Sudan" project

This letter declares the interest of Ministry of Agriculture (MoA) in the Northern State supporting the implementation of the Global Environment Facility Funded project "promoting the use of electric water pumps for irrigation in Sudan"

Ministry of Agriculture is the Implementing Body for the Agricultural Strategic Plan (2007-2015) in the Northern State which has the central objective of increasing the amount of farming land in Sudan by 70% and doubling the Amount of Irrigated Land. (MoA) operates a number of support programmes for farmers on agricultural practices including irrigation and water pumping. (MoA) will assist in the project implementation by providing the following services:

: Establishing the National PV Fund in conjunction with the Ministry of Finance & National Economy

: liaising with water user groups

: Providing assistance in the Development of Nationally Appropriate Mitigation Actions (NAMAs) by ensuring the inclusion of PV pumps in the Agricultural Implements Regulation

Hence (MoA) is willing to support the project with a contribution of USD 150000 in kind.

sincerely

Emad Eldeen Mohammed Ali

General Director of Ministry of Agriculture Animal Resources & Irrigation - Northern State

United Nations Development
Sudan Country Office

Empowered lives.
Resilient nations.

Ref: UNDP/CD/15/212

Date: 25 February 2015

Dear GEF Secretariat,

Subject: Co-financing in Support of the "Promoting the use of Electric Water Pumps for Irrigation in Sudan" project

This letter is to confirm the support and commitment of the UNDP Sudan Country Office in the implementation of the **"Promoting the use of electric water pumps for irrigation in Sudan"** project funded by the GEF.

UNDP Sudan considers promoting renewable energy to be one of the key activities for improvement of the livelihood of local people and it is in line with the Strategic Plan (2013-2017) of UNDP and Country Programme Document (2013-2016). In this regard, I am pleased to confirm that UNDP Sudan will support the GEF project with a cash contribution of **USD 550,000.**

We look forward to the implementation of this project.

Sincerely,

Abdel Rahman Ghandour
Officer-in-Charge
UNDP Sudan

GEF Secretariat
1818 H Street, NW, Mail Stop P4-400
Washington DC 20433 - USA

Copy to:

- Dr. Babiker Abdlla Ibrahim, Undersecretary,
  Ministry of Environment, Forestry and Physical Development, GEF-OFP, Khartoum, Sudan
- Dr. Musa Omar Abu Elgasim, Undersecretary,
  Ministry of Water Resources and Electricity, Khartoum, Sudan

UNDP compound, House 7, Block S, Gama'a Avenue, P.O. Box: 913, Khartoum, Sudan.
Tel: +249 187120 000 / +249 187 122 222-Fax: +249 183 773 128 - Email: registry.sd@undp.org- www.sd.undp.org

بسم الله الرحمن الرحيم

Ministry of Science & Communications
National Energy Research Centre
General Director

وزارة العلـــوم والإتصـــالات
المـركز القـومـي لأبحـــاث الطاقـة
المدير العام

TO : Adriana Dinu,
UNDP-GEF, Executive Coordinator and Director a.i.
304 East 45th Street,
New York, NY 10017
USA.

Date : 9 March 2015

Re: Co-financing in Support of the "Promoting the use of electric water pumps for irrigation in Sudan" project

This letter declares the interest of National Energy Research Centre (NERC) in supporting the implementation of the Global Environment Facility funded project **"Promoting the use of electric water pumps for irrigation in Sudan"**

The National Energy Research Centre has been active in promoting and developing solar water pumping. NERC has a special department for solar energy equipped with instruments and a mechanical workshop. NERC will assist in the project implementation by providing the following services:

- Define the standards specifications of the PV solar pumps systems
- Testing , inspection and approval of solar system quality
- Training of engineers , technicians in solar water pumping
- Pre-qualification of the companies supplying PV solar pump systems

Hence, NERC is willing to support the project with parallel cash contribution of *[USD 250,000]*

Sincerely,

Prof. Eltayeb Idris Elsa
General Director
NERC

ص ب: ٤٠٣٢ - الخرطوم/ السودان - ت: ٢٤٩١٢٠٩٥٢٨٣٧+ / فاكس: ٢٤٩١٥٥٧٧٣١٢٣+
P. O Box: 4032 - Khartoum-Sudan/- Tel: +249120952837/ Fax: +249155773123
Email: nerc1@nerc.gov.sd - Website: nerc.gov.sd

9.7 Letter of Agreement

بسم الله الرحمن الرحيم
جمهورية السودان
وزارة الموارد المائية والكهرباء
REPUBLIC OF SUDAN
MINISTRY OF WATER RESOURCES & ELECTRICITY
Under Secretary Office مكتب الوكيل

LETTER OF AGREEMENT BETWEEN UNDP AND THE GOVERNMENT FOR THE PROVISION OF SUPPORT SERVICES

1. Reference is made to consultations between officials of the Government - **Ministry of Water Resources and Electricity** (hereinafter referred to as "the Government") and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.

2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.

3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:
(a) Identification and/or recruitment of project and programme personnel;
(b) Identification and facilitation of training activities;
(c) Procurement of goods and services;

4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.

5. The relevant provisions of the *UNDP standard basic assistance agreement with the Government* (the "SBAA") signed in 24 October 1978, including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.

6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.

الخرطوم – شارع النيل– ص.ب : ٨٧٨ تلفون :٧٧٧٥٣٣ ٢٤٩ ١٨٣ + – فاكس: ٧٧٨٣٣٠ ٢٤٩١٨٣ +
WebSite: www.wre.gov.sd E mail: mincom@wre.gov.sd

7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

Signed on behalf of Government
Musa Omar Abu Elgasim
Undersecretary –Ministry of Water Resources and Electricity
Date...28/9/2015.....

Signed on behalf of UNDP
Marta Ruedas
Resident Representative
Date: 29-IX-2015

MINISTRY OF WATER RESOURCES & ELECTRICITY
W.R.E.
Under Secretary Office

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between Ministry of Water Resources and Electricity, the institution designated by the Government of Sudan and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project **Promoting the use of electric water pumps for irrigation in Sudan.**

2. In accordance with the provisions of the project document, the UNDP country office shall provide support services for the Project as described below.

3. Support services to be provided:

	Description of services	Reimbursement amount based on the Universal Price List 2015 used by UNDP for cost recovery with other UN Agencies (in USD)	UNIT
1	Payment Process	29.85	Per voucher
2	Credit card payment	31.80	Per transaction
3	New vendor creation in ATLAS	15.44	Per vendor
4	Payroll validation	30.91	Per person, quarterly
5	Leave monitoring	4.42	Per person, quarterly
6	IC and SC recruitment, including	180.54	Per person
6a	Advertisement	36.11	
6b	Short listing	72.22	
6c	Contract Issuance	72.22	
7	Issue IDs	29.93	Per ID
8	F10 Settlement	24.82	Per item
9	Ticket request	24.40	Per ticket
10	Hotel reservation	10.97	Per booking
11	Visa request	20.00	Per person
12	Vehicle Registration	29.13	Per item
13	Procurement process involving local CAP or RACP/ACP	416.29	Per case
13a	Identification and selection	208.14	
13b	Contracting/Issue PO	104.07	
13c	Follow-up	104.07	
14	Procurement not involving review bodies	167.81	Per case
14a	Identification and selection	83.91	
14b	Contracting/Issue PO	41.95	
14c	Contract follow-up	41.95	
15	Disposal of equipment	211.73	Per lot

4. The total amount for provided support services will not exceed 29,016.70 USD.

9.8 Financial Analysis

A direct comparison between diesel pumping and solar powered pumping is made difficult by two factors. First, establishing equivalency is challenging – i.e. sizing a solar pump to provide irrigation equivalent to a diesel pump involves some challenges. The diesel pump may operate irregular hours or irregular days. It may be necessary to modify the irrigation schedule. Second, farmers have no record of their expenditures on diesel pumps. Thus, long-term operating costs, including things such as breakdowns and repairs are rough estimates at best.

As part of the PPG progress, interviews with farmers and some measurements were carried out to try to estimate the cost of diesel operation. For a 10 feddan (4.2 ha) farm, using a 4" pump, which is a typical configuration, and irrigating eight months per year, the approximate operating costs are as in the table below.

Table 10 Operating costs for a typical 4" diesel pump[51]

Item	No. of Units	Cost per unit (SDG)	Total Cost
Diesel consumption	4 gallons/day × 30 days/month × 8 months/year = 960 gallon/year	16 SDG/gallon	15,360 SDG/year
Lubricants	21 gallons/year	160 SDG/gallon	3,520 SDG/year
Spare parts	2 repairs/year	800 SDG/repair	1,600 SDG/year
Lubricants	2 repairs/year	160 SDG/repair	320 SDG/year
Labor	2 repairs/year	600 SDG/repair	1,200 SDG/year
Total annual operating cost			**22,320 SDG/year**

As can be seen from the table above, estimated operating cost for a typical diesel pump is 1,860 SDG/month. Such a pump can be replaced by a solar pump for approximately 175,000 SDG. The figure immediately below shows the monthly installments for a solar pump as a function of the cost of finance, for loan terms from five to fifteen years. The estimated average monthly cost for a diesel pump is plotted in a black dotted line. As can be seen, when the loan term is five to seven years (which is typical for lending from the Sudanese banks) there is no cost of finance for which the monthly installments on a solar pump are comparable to the cost of a diesel pump.

[51] El Amin, A., "Solar pump cost and benefit compared with diesel and electricity pumps in the Northern State of Sudan"

For a cost of finance of 9%, as recommended by the Central Bank of Sudan Guidelines 2011, the latest version to recommend a cost of finance, the solar pump must be repaid over a period of approximately 13.6 years in order for the monthly payments on a solar pump to be comparable to those on a diesel pump. For a cost of finance of 11%, which is what the Sudanese bank representatives interviewed as part of the PPG indicated as a minimum cost of finance, a repayment term of 18 years is required for the monthly installments to be equivalent to the cost of operating a diesel pump. Such a term was considered unacceptably long by the Sudanese banks.

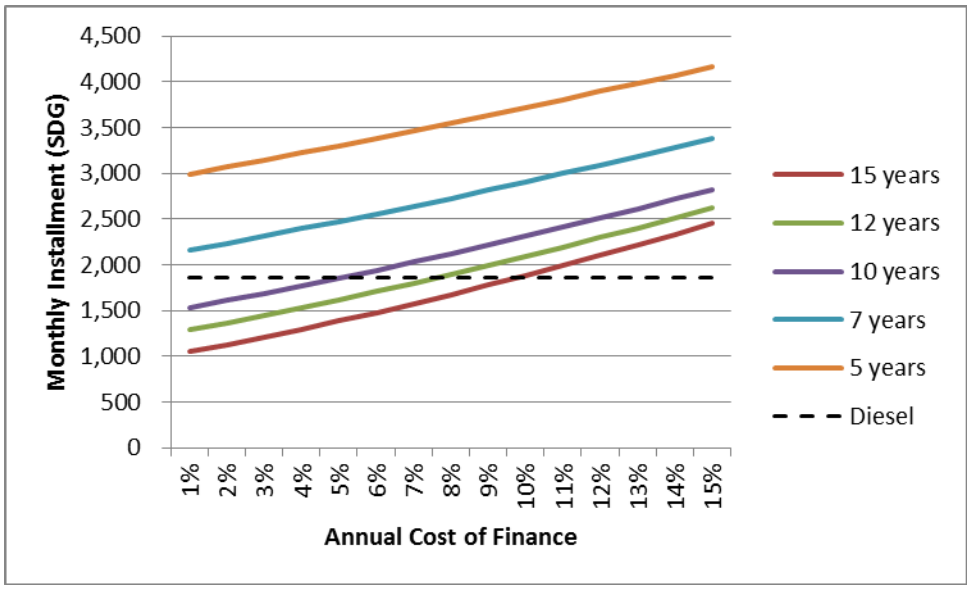


Figure 18 Fixed monthly installments for a 175,000 SDG solar pump as a function of cost of finance.

Table 11 Fixed monthly installments for a 175,000 SDG solar pump as a function of cost of finance

	Repayment Term				
Interest Rate	15	12	10	7	5
1%	1,047	1,290	1,533	2,158	2,991
2%	1,126	1,368	1,610	2,234	3,067
3%	1,209	1,449	1,690	2,312	3,145
4%	1,294	1,532	1,772	2,392	3,223
5%	1,384	1,619	1,856	2,473	3,302
6%	1,477	1,708	1,943	2,556	3,383
7%	1,573	1,800	2,032	2,641	3,465
8%	1,672	1,894	2,123	2,728	3,548
9%	1,775	1,992	2,217	2,816	3,633
10%	1,881	2,091	2,313	2,905	3,718
11%	1,989	2,194	2,411	2,996	3,805
12%	2,100	2,298	2,511	3,089	3,893
13%	2,214	2,406	2,613	3,184	3,982
14%	2,331	2,515	2,717	3,280	4,072

15%	2,449	2,627	2,823	3,377	4,163

In order to promote the use of solar pumps, the project seeks to make their cost competitive with that of diesel pumps. At least for the initial several years, it is therefore envisioned that a subsidy may be needed to bring the monthly installment cost on a solar pump in-line with the monthly cost of operating a diesel pump. The figure and table below show the monthly installment on a 175,000 SDG solar pump for various repayment terms and cost of finance, as a function of the percentage subsidy on the initial investment. As can be seen, for a reasonable repayment period of 10 years, and cost of finance of 11%, a subsidy of 23% is needed to bring the monthly installments on a solar pump to 1,856 SDG, comparable to the estimated 1,860 SDG monthly operating cost of a diesel pump.

If we assume a 10 year repayment is possible with 10% cost of finance, the subsidy needed becomes 19.5%. For a 9% cost of finance, and 10 year repayment, the subsidy needed is 16%, to make the cost of a solar pump equivalent to the estimated operating cost of a diesel pump.

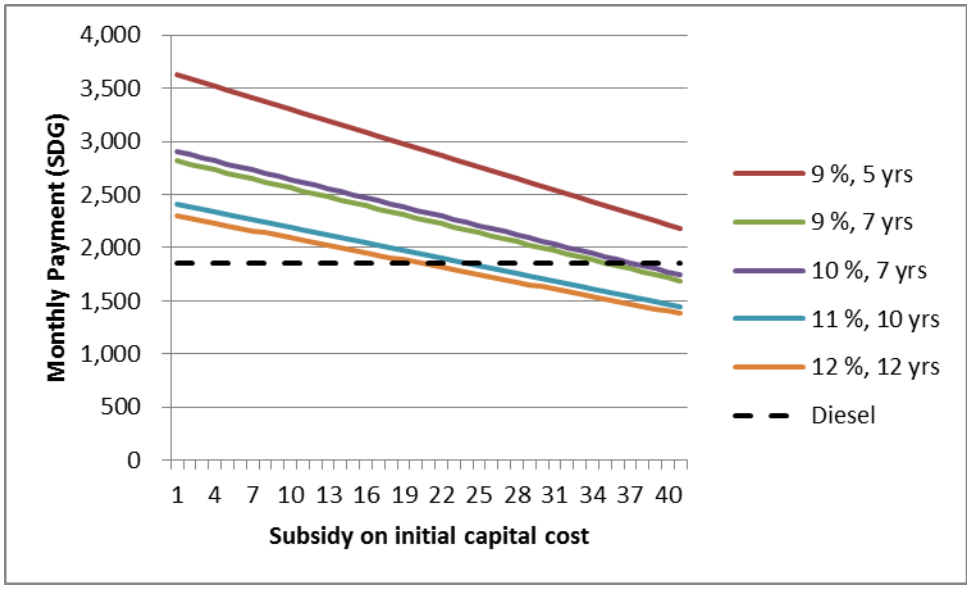


Figure 19 Monthly installments on a 175,000 SDG solar pump as a function of subsidy on initial cost for various finance scenarios. Note that finance scenarios where cost of finance is equal to repayment term (10% and 10 years, 11% and 11 years, 12% and 12 years) all fall on almost the same line, hence only one such case (12%, 12 years) is shown.

Table 12 Monthly installments on a 175,000 SDG solar pump as a function of subsidy on initial cost for various finance scenarios. Note that finance scenarios where cost of finance is equal to repayment term (10% and 10 years, 11% and 11 years, 12% and 12 years) result in almost the same monthly installments, hence only one such case (12%, 12 years) is shown.

	9%	9%	10%	11%	12%
Subsidy level	5	7	7	10	12
0%	3,633	2,816	2,905	2,411	2,298
1%	3,596	2,787	2,876	2,387	2,275

2%	3,560	2,759	2,847	2,362	2,253
3%	3,524	2,731	2,818	2,338	2,230
4%	3,487	2,703	2,789	2,314	2,207
5%	3,451	2,675	2,760	2,290	2,184
6%	3,415	2,647	2,731	2,266	2,161
7%	3,378	2,618	2,702	2,242	2,138
8%	3,342	2,590	2,673	2,218	2,115
9%	3,306	2,562	2,644	2,194	2,092
10%	3,269	2,534	2,615	2,170	2,069
11%	3,233	2,506	2,586	2,145	2,046
12%	3,197	2,478	2,557	2,121	2,023
13%	3,160	2,450	2,528	2,097	2,000
14%	3,124	2,421	2,498	2,073	1,977
15%	3,088	2,393	2,469	2,049	1,954
16%	3,051	2,365	2,440	2,025	1,931
17%	3,015	2,337	2,411	2,001	1,908
18%	2,979	2,309	2,382	1,977	1,885
19%	2,942	2,281	2,353	1,953	1,862
20%	2,906	2,252	2,324	1,929	1,839
21%	2,870	2,224	2,295	1,904	1,816
22%	2,834	2,196	2,266	1,880	1,793
23%	2,797	2,168	2,237	1,856	1,770
24%	2,761	2,140	2,208	1,832	1,747
25%	2,725	2,112	2,179	1,808	1,724
26%	2,688	2,084	2,150	1,784	1,701
27%	2,652	2,055	2,121	1,760	1,678
28%	2,616	2,027	2,092	1,736	1,655
29%	2,579	1,999	2,063	1,712	1,632
30%	2,543	1,971	2,034	1,687	1,609
31%	2,507	1,943	2,005	1,663	1,586
32%	2,470	1,915	1,976	1,639	1,563
33%	2,434	1,886	1,946	1,615	1,540
34%	2,398	1,858	1,917	1,591	1,517
35%	2,361	1,830	1,888	1,567	1,494
36%	2,325	1,802	1,859	1,543	1,471
37%	2,289	1,774	1,830	1,519	1,448
38%	2,252	1,746	1,801	1,495	1,425
39%	2,216	1,718	1,772	1,470	1,402
40%	2,180	1,689	1,743	1,446	1,379

If we consider that a 10% increase in the monthly operating cost is acceptable in view of the reduced maintenance headache of a solar pump compared with a diesel pump, then the subsidy levels required drop dramatically. As an example, for a 10% cost of finance and 10 year repayment period, the subsidy required becomes approximately 11.5% instead of 19.6%. The table below compares the subsidy level required to make the monthly

installments on a solar pump equivalent to the estimated cost of ownership of a diesel pump, or 10% higher.

Loan condition (cost of finance, repayment period)	Subsidy level needed to make monthly installments equivalent to estimated diesel operating cost (1,860 SDG/month)	Subsidy level needed to make monthly installments for a solar pump 10% higher than estimated diesel operating cost (2,046 SDG/month)
10%, 7	36%	29.5%
9 %, 10	16%	7.7%
10%, 10	19.6%	11.5%
11%, 10	22.8%	15.1%
12%, 12	19.1%	11%

The desired end result is that farmers adopt solar pumping in place of diesel. The question is what subsidy level, if any, is required to cause this shift to happen. As can be seen from the tables and figures, the problem of determining a subsidy level, if any, to make the monthly installment cost of a solar pump comparable to the average monthly operating cost of a diesel pump is sensitive to many variables, most importantly, the loan conditions and the monthly operating cost of a diesel pump (and any increase that may be tolerated). It may be necessary to make the monthly operating cost of a solar pump initially less than that of a diesel pump to encourage adoption of the new technology. Based on interviews with farmers during the PPG process, this will likely not be necessary. Farmers are eager for a technology to rid them of the hassle associated with diesel.

The question of determining a subsidy level is complicated by the fact that farmer's decisions are unlikely to be quantitatively driven. Of the farmers interviewed during the PPG process, none knew immediately their total cost of operation. The records and estimates of costs were usually based on memory, highly variable, and likely to include considerable error.

GRANT AGREEMENT

(Micro-Capital Grant Agreement)

For Non-Credit Related Activities

DESCRIPTION

Standard Grant Agreement

(Micro-Capital Grant Agreement)

This Memorandum of Understanding is provided as a tool that can be adapted to the specific needs of a particular programme. Micro-Capital Grant Agreements should be approved by an independent mechanism such as a steering committee or Steering Committee. This grant agreement serves to register the commitments and results that the recipient institution has agreed to produce. It is recommended that funds be released in tranches, based on results. These results should be clearly specified, such that it is clear to all parties when a recipient institution qualifies for release of tranches of funds.

TERMINOLOGY

1. This Agreement utilizes the harmonized terminology in line with the revised financial regulations and rules (FRR) which have introduced new/redefined terms as follows:
   a. 'Execution' is the overall ownership and responsibility for UNDP programme results at the country level which is exercised by the government, through the Government Coordinating Agency by approving and signing the Country Programme Action Plan (CPAP) with UNDP. Therefore, all activities falling within the CPAP are nationally executed.
   b. 'Implementation' is the management and delivery of programme activities to achieve specified results, specifically the mobilization of UNDP programme inputs and their use in producing outputs that will contribute to development outcomes, as set forth in the Annual Work Plans (AWPs).

These two terms are elaborated under the Legal Framework section of the Programme and Project Management Section of the POPP.

2. It is important to note that at the level of project management, the terms “execution” under the non-harmonized operational modalities, including global and regional projects and “implementation” under the harmonized operational modalities have the same meaning, i.e. management and delivery of project activities to produce specified outputs and efficient use of resources. Therefore, this Agreement uses the term “implementation” in line with the “harmonized operational modalities” to cover also at the project level the term “execution” under the non-harmonized operational modalities. More specifically, all references to “Executing Agency” have been replaced with “Implementing Partner”.

3. When using this Letter of Agreement in non-harmonized or non-CPAP countries, change the following terms as follows:
   a. Execution instead of Implementation
   b. Designated Institution instead of Implementing Partner

A. MICRO-CAPITAL GRANT AGREEMENT

MICRO-CAPITAL GRANT AGREEMENT BETWEEN THE IMPLEMENTING PARTNER AND THE RECIPIENT INSTITUTION
FOR THE PROVISION OF GRANT FUNDS

Micro-Capital Agreement (hereinafter referred to as the "Agreement') made between the Implementing Partner [**INSERT NAME OF Implementing Partner]** and the Recipient Institution **[INSERT NAME OF Recipient Institution**].

WHEREAS [Insert name of the Implementing Partner] (hereinafter referred to as "the Implementing Partner") has been requested by the United Nations Development Programme ("UNDP") to manage the project defined in project document [Insert project number and title] (hereinafter referred to as "the Project"), implemented at the request of the Government of [Insert name of country]

WHEREAS the Implementing Partner **[NAME]** and UNDP desire to provide funding to the **RECIPIENT INSTITUTION** in the context of a Project and on the terms and conditions hereinafter set forth, and

WHEREAS the **RECIPIENT INSTITUTION** is ready and willing to accept such funds from the Implementing Partner **[NAME]** and UNDP through the administration of UNDP for the above mentioned activities on the said terms and conditions.

NOW, therefore, the parties hereto agree as follows:

I. Responsibilities of the RECIPIENT INSTITUTION

1.1 The RECIPIENT INSTITUTION agrees to: 1) Undertake the activities described in its **Workplan** and **Budget** (attached), and updates related to the subsequent release of funds in **tranches**; 2) Provide quarterly reports to the Steering Committee; and 3) Provide Annual Audited Statements [Income Statement and Balance Sheets]. In projects where a technical contractor is providing assistance to the RECIPIENT INSTITUTION, the contractor shall be responsible for verifying the accuracy of these reports/statements. Funds provided pursuant to this Agreement shall be used for purposes related to producing results specified in its annual performance targets [Section C].

1.2 The RECIPIENT INSTITUTION agrees to reach the performance targets contained in Section C. If the RECIPIENT INSTITUTION fails to meet its responsibilities outlined in article 1.1, or [Optional] to attain at least 70% of any one performance target for any given year, then this will be considered grounds for the Steering Committee to suspend any further micro-capital grant support. The suspension shall remain in effect until the RECIPIENT INSTITUTION has achieved the target. In projects with a technical assistance contractor, the contractor may, at its discretion, continue to provide technical assistance to the RECIPIENT INSTITUTION during this suspension period.

1.3 The RECIPIENT INSTITUTION agrees to inform the Steering Committee about any problems it may face in attaining the objectives agreed upon.

II. Duration

2.1 This Agreement will come into effect on **[INSERT DATE/MONTH/YEAR]** and shall expire on **[INSERT DATE/ MONTH/YEAR],** covering the anticipated term of the project. It can be extended, if necessary by exchange of letters, noting the new expiration date.

III. Payments

3.1 The Implementing Partner [In cases of UNDP Support to NIM/Direct Payments: UNDP] shall provide funds to the **RECIPIENT INSTITUTION** in an amount up to **[INSERT CURRENCY & AMOUNT IN FIGURES AND WORDS]** according to the schedule of the project budget set out below. Payments are subject to the **RECIPIENT INSTITUTION** meeting the outputs as specified in the Performance Targets [Section C].

[INSERT CURRENCY AND AMOUNT], upon signature of this Agreement.

3.2 All payments shall be deposited into the **RECIPIENT INSTITUTION's** bank account of which the details are as follows:

[NAME OF THE BANK]
[BANK ROUTING NUMBER]
[BENEFICIARY ACCOUNT NAME]
[BENEFICIARY ACCOUNT NUMBER]
[ADDRESS OF THE BANK]

3.3 The amount of payment of such funds is not subject to any adjustment or revision because of price or currency fluctuations or the actual costs incurred by the **RECIPIENT INSTITUTION** in the performance of the activities under this Agreement.

IV. Records, Information and Reports

4.1 The **RECIPIENT INSTITUTION** shall maintain clear, accurate and complete records in respect of the funds received under this Agreement.

4.2 The **RECIPIENT INSTITUTION** shall furnish, compile and make available at all times to the Implementing Partner, UNDP any records or information, oral or written, which UNDP may reasonably request in respect of the funds received by the **RECIPIENT INSTITUTION**.

4.3 Within sixty days after completion of project activities, the **RECIPIENT INSTITUTION** shall provide the Implementing Partner and UNDP with a final report with respect to all expenditures made from such funds (including salaries, travel and supplies) and indicating the progress made toward the goals of the activities undertaken, utilizing the reporting format contained in Annex I.

4.4 [Optional: For projects with Technical Assistance] The **RECIPIENT INSTITUTION** agrees to submit required Performance Reports to the CONTRACTOR within 21 days of the close of each quarter using the attached reporting format (Annex 1) reporting on project progress. At the beginning of the project, the **RECIPIENT INSTITUTION** can request CONTRACTOR assistance for the preparation of the forms. The **RECIPIENT INSTITUTION**, however, should develop its own capacity to generate these reports, as they are critical to manage its activities.

4.5 All further correspondence regarding the implementation of this Agreement should be addressed to:

For the **Implementing Partner**

[INSERT NAME OF AUTHORIZED OFFICIAL AND ADDRESS]

For UNDP:

[INSERT NAME OF UNDP RESIDENT REPRESENTATIVE AND ADDRESS]

For CONTRACTOR: [Optional]

[INSERT NAME OF AUTHORIZED OFFICIAL AND ADDRESS]

For the **RECIPIENT INSTITUTION:**

[INSERT NAME OF AUTHORIZED OFFICIAL AND ADDRESS]

V. General Provisions

5.1 This Agreement and the Annexes attached hereto shall form the entire Agreement between **[INSERT ACRONYM OF ENTITY]** and the Implementing Partner, superseding the contents of any other negotiations and/or agreements, whether oral or in writing, pertaining to the subject of this Agreement.

5.2 The **RECIPIENT INSTITUTION** shall carry out all activities described in its Workplan with due diligence and efficiency. Subject to the express terms of this Agreement, it is understood that the **RECIPIENT INSTITUTION** shall have exclusive control over the administration and implementation of the activities referred to above in paragraph 1.1 and that the Implementing Partner and UNDP shall not interfere in the exercise of such control. However, both the qualities of work and the progress being made toward successfully achieving the goals of such activities shall be subject to review by the Steering Committee. If at any time the Steering Committee is not satisfied with the quality of work or the progress being made toward achieving such goals, the Steering Committee may advise the Implementing Partner to: (i) withhold payment of funds until in its opinion the situation has been corrected; or (ii) declare this Agreement terminated by written notice to the **RECIPIENT INSTITUTION** as described in paragraph 5.7 below; and/or seek any other remedy as may be necessary. The Steering Committee's determination as to the quality of work being performed and the progress being made toward such goals shall be final and shall be binding and conclusive upon the **RECIPIENT INSTITUTION** insofar as further payments are concerned.

5.3 The Implementing Partner and UNDP undertakes no responsibilities in respect of life, health, accident, travel or any other insurance coverage for any person which may be necessary or desirable for the purpose of this Agreement or for any personnel undertaking activities under this Agreement. Such responsibilities shall be borne by the **RECIPIENT INSTITUTION**.

5.4 The rights and obligations of the **RECIPIENT INSTITUTION** are limited to the terms and conditions of this Agreement. Accordingly, the **RECIPIENT INSTITUTION** and personnel performing services on its behalf shall not be entitled to any benefit, payment, compensation or entitlement except as expressly provided in this Agreement.

5.5 The **RECIPIENT INSTITUTION** shall be solely liable for claims by third parties arising from the **RECIPIENT INSTITUTION**'s acts or omissions in the course of performing this Agreement and

under no circumstances shall The Implementing Partner and UNDP be held liable for such claims by third parties.

5.6 Assets (Equipment) supplied by UNDP funds to the **RECIPIENT INSTITUTION** shall be the property of UNDP until the end of the project, at which time UNDP shall determine the best use of these assets. In cases where the **RECIPIENT INSTITUTION** has met its responsibilities under this agreement, and handover of the asset would contribute to the sustainability of activities, UNDP would normally handover these assets to the **RECIPIENT INSTITUTION**. The assets shall be used for the purpose indicated in the Workplan throughout the period of this Agreement.

5.7 This Agreement may be terminated by either party before completion of the Agreement by giving thirty (30) days written notice to the other party, and the **RECIPIENT INSTITUTION** shall promptly return any unutilized funds to UNDP as per paragraph 5.6 above.

5.8 The **RECIPIENT INSTITUTION** acknowledges that the Implementing Partner and UNDP and its representatives have made no actual or implied promise of funding except for the amounts specified by this particular tranches Agreement. Although project related documents may indicate a total amount of funds that could be available for this **RECIPIENT INSTITUTION,** actual disbursements will be based upon the **RECIPIENT INSTITUTION** meeting performance targets. If any of the funds are returned to the Implementing Partner and UNDP or if this Agreement is rescinded, the **RECIPIENT INSTITUTION** acknowledges that the Implementing Partner and UNDP will have no further obligation to the **RECIPIENT INSTITUTION** as a result of such return or rescission.

5.9 No modification of or change to this Agreement, waiver of any of its provisions or additional contractual provisions shall be valid or enforceable unless previously approved in writing by the parties to this Agreement or their duly authorized representatives in the form of an amendment to this Agreement duly signed by the parties hereto.

5.10 Any controversy or claim arising out of, or in accordance with this Agreement or any breach thereof, shall unless it is settled by direct negotiation, be settled in accordance with the UNCITRAL Arbitration Rules as at present in force. Where, in the course of such direct negotiation referred to above, the parties wish to seek an amicable settlement of such dispute, controversy or claim by conciliation, the conciliation shall take place in accordance with the UNCITRAL Conciliation Rules as at present in force.

The parties shall be bound by any arbitration award rendered as a result of such arbitration as the final adjudication of any such controversy or claim.

5.11 Nothing in or relating to this Agreement shall be deemed a waiver of any privileges and immunities of the United Nations, or UNDP.

IN WITNESS WHEREOF, the undersigned, duly appointed representatives of the Implementing Partner, and the **RECIPIENT INSTITUTION**, respectively, have on behalf of the Implementing Partner and the **RECIPIENT INSTITUTION** signed the present Memorandum of Agreement on the dates indicated below their respective signatures.

On behalf of Implementing Partner: **On behalf of the RECIPIENT INSTITUTION:**

Name:_____ Name: _____

Title: _____ Title: _____

Date: _____ Date: _____

B. BUDGET

to be prepared by the Recipient Institution. This budget will be submitted to the Steering Committee For approval

PROJECT BUDGET OF RECIPIENT INSTITUTION

Project Number:

Date: _____

Project Title: _____

Name of the RECIPIENT INSTITUTION: _____

Total Amount of Funds under the Agreement: _____

Date of the Agreement: _____

PROJECT BUDGET (in Local Currency)

PERIOD COVERING FROM_____ TO_____

General Category of Expenditures	Tranche 1	Tranche 2	Tranche 3	**Total**
Personnel				
Transportation				
Premises				
Training/Seminar/ Workshops, etc.				
Contracts (Audit)				
Equipment/Furniture (Specify)				
Other [Specify]				
Miscellaneous				
Total				

***** *Please note that all budget Lines are for costs related only to project activities.*

****** *These budget categories and number of tranches are suggested guidelines. The Recipient may choose alternates which more accurately reflect their expense items and needs.*

C. RECIPIENT INSTITUTION Performance Targets

NAME OF RECIPIENT INSTITUTION: _____

PERFORMANCE TARGETS	BASELINE	YEAR 1		YEAR 2		YEAR 3	
		Proposed	Actual	Proposed	Actual	Proposed	Actual

ANNEX 1

Annual Reporting Format **Year**_____

Recipient Institution: _____

OVERALL TARGETS FOR ENTIRE GRANT	BASELINE	PROPOSED ANNUAL TARGETS	ANNUAL BUDGET	ACTUAL ANNUAL RESULTS	ACTUAL ANNUAL EXPENDITURES	PROGRESS TOWARDS TARGETS -

9.10 Signature Page

Country: Sudan

UNDAF Outcome: Government and stakeholders have evidence-based policies, strategic plans and mechanisms to ensure an enabling environment for improved basic services; and people in Sudan, with special emphasis on populations in need, have access to equitable and sustainable quality basic services.

CPAP Outcome: Populations vulnerable to environmental risks and climate change become more resilient and relevant institutions are more effective in the management of natural resources.

CPAP Output: Investment in green energy and access by needy communities to sustainable energy improved.

Executing Entity/Implementing Partner:

Programme Period:	60 months
Atlas Award ID:	00087168
Project ID:	00094271
PIMS #	5324
Start date:	January 2016
End Date	January 2021
Management Arrangements	NIM
PAC Meeting Date	_____

Total resources required	US$ 24,515,753
• Total allocated resources:	
o GEF	US$ 4,365,753
o Banks	US$ 14,000,000
o MWRE	US$ 1,500,000
o MoFNE	US$ 3,000,000
o HCENR	US$ 500,000
o MoP	US$ 200,000
o NERC	US$ 250,000
o MOAARI	US$ 150,000
o UNDP	US$ 550,000

Agreed by (Government):

NAME SIGNATURE Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

NAME SIGNATURE Date/Month/Year

Agreed by (UNDP):

NAME SIGNATURE Date/Month/Year