



REQUEST FOR: CEO ENDORSEMENT
PROJECT TYPE: FULL-SIZED PROJECT
TYPE OF TRUST FUND: LDCF

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PART I: PROJECT INFORMATION

Project Title: Integrated water harvesting technologies to adapt to climate change induced water shortage			
Country(ies):	Yemen	GEF Project ID: ¹	5211
GEF Agency(ies):	UNDP	GEF Agency Project ID:	4989
Other Executing Partner(s):	National Water Resources Authority (MoWE)/ Ministry of Agriculture and Irrigation/Social Fund for Development	Submission Date:	Nov. 6, 2014
GEF Focal Area (s):	CCA	Project Duration (Months)	48
Name of Parent Program (if applicable):	N/A	Project Agency Fee (\$):	467,400
➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> ➤ For PPP <input type="checkbox"/>			

A. FOCAL AREA STRATEGY FRAMEWORK²

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
CCA-1	Outcome 1.2 Reduce vulnerability in development sectors	Output 1.2.1 Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability	LDCF	1,620,000	19,369,161
CCA-3	Outcome 3.1 Successful demonstration, deployment, and transfer of relevant adaptation technology in target areas	Output 3.1.1 relevant adaptation technology transferred to target groups	LDCF	3,300,000	9,431,435
Total project costs				4,920,000	28,800,596

B. PROJECT FRAMEWORK

Project Objective: to re-introduce traditional and innovative water harvesting techniques to improve water availability to rain-fed farmers and pastoralist who are highly vulnerable to climate change						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
Capacity and policies for traditional and innovative water harvesting developed.	TA	The technical capacity to integrate cost-effective water harvesting techniques at national and local institutions and in local Water Management Organisations (WMOs) to improve water security.	The Ministry of Agriculture and Irrigation (MoAI) and National Water Resource Authority (NWRA) assisted to produce rainfall-runoff models (RRM) based on GIS to simulate key parameters for selection of water harvesting, including artificial recharge techniques. Water harvesting regulations integrated into the Water Law of Yemen	LDCF	673,930	4,054,363

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.

			to include harvested water as part of the national water budget.			
			Long term, climate resilient water plans developed incorporating integrated water harvesting to facilitate groundwater recharge and supplement irrigation in the selected governorates.			
On-the-ground measures for the introduction of water harvesting and rehabilitation of traditional water harvesting structures.	TA	Water availability increased through introducing on-the-ground measures for water harvesting and rehabilitating traditional water harvesting structures.	Five traditional water harvesting techniques re-introduced into selected governorates. (1. Inter-row water harvesting; 2. Micro-catchment water harvesting; 3. Rooftop water harvesting; 4. Medium-sized catchment water harvesting; 5. Large catchment water harvesting).	LDCF	3,173,231	18,400,703
			Fog harvesting technology introduced in Raymah.			
			Local community members (farmers, pastoralists and rural households) from selected governorates trained in the construction and maintenance of water harvesting techniques.			
			Integrated groundwater recharge systems established.			
			Floodwater harvesting systems introduced to support irrigation.			
			Awareness raising programme designed and implemented for all six selected governorates to promote socio-economic benefits of water harvesting.			
Decentralised and community-led water management systems developed to cope with long term impacts of climate change on water availability.	TA	Decentralised and community-led water management systems developed to cope with long-term impacts of climate change on water availability.	Water user associations (WUAs) in the selected governorates provide customer-orientated water distribution and seasonal rationing services for communal harvested water, with full engagement of the community members and traditional <i>Al Moqadems</i> of the target communities.	LDCF	840,000	4,905,500
			Social Fund for Development (SFD) Engineering Unit and extension services have the skills and capabilities to support range of water harvesting technology			

			designs and maintenance requirements.			
			A set of incentives, such as concessional micro-loans, community grants and employment guarantees for construction and maintenance of water harvesting infrastructure introduced to stimulate community and private investment in water harvesting infrastructure, within target governorates.			
			Subtotal		4,687,162	27,360,566,
			Project management Cost (PMC) ³ including DPCs in the amount of \$ 26,839	LDCF	232,838	1,440,030
			Total project costs		4,920,000	28,800,596

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 Environment and Water/EPA	In-kind	2,000,000
National Government	National Water Resource Authority	Grant	12,000,000
National Government	Social Development Fund	Grant	14,200,000
GEF Agency	UNDP	Grant	600,596
Total Co-financing			28,800,596

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

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) ²	Total c=a+b
UNDP	LDCF	CCA	Yemen	4,920,000	467,400	5,387,400
Total Grant Resources				4,920,000	467,400	5,387,400

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	324,100	2,016,041	2,340,141
National/Local Consultants	461,080	3,168,065	3,629,145

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

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF⁴

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

1. No significant changes in alignment with the project design of the original PIF have been made. The wording of Outcomes and Outputs has been changed to improve their clarity and highlight specifics unavailable during development of the PIF. In addition, Outputs have been further contextualized to fit Yemen's needs, following the consultations held during the PPG. However, while the exact wording of Outcomes and Outputs may have changed, there has been no change in their focus.
2. The implementing partner has been changed from the Environmental Protection Agency (EPA) to the Ministry of Agriculture and Irrigation (MoAI) following consultations during the PPG, as the MoAI is better positioned to undertake the necessary responsibilities.
3. The municipality of Al Mukalla – capital of Hadramout Governorate – was originally selected as one of the project's target sites, but has been excluded because of security concerns. The governorate of Raymah has been included in its place. However, the LDCF-financed project will remain flexible and may re-include Al Mukalla as a target governorate should the situation become feasible.
4. The indicative co-financing in the PIF totalled US\$19,601,596. This estimate was made based on discussions with relevant co-financing initiatives – particularly the Social Development Fund (SFD), National Water Resource Authority (NWRA) and EPA – at the time the PIF was formulated. Further consultations with these stakeholders during the PPG phase lead to the total value of co-financing from the NWRA being increased from US\$2,801,000 to US\$12 million. Consequently, the total co-financing for the LDCF-financed project has been adjusted to US\$28,800,596.

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.

5. There have been no significant changes in alignment with relevant national strategies and plans since the original PIF. The LDCF-financed project remains aligned with:
 - GEF Result-Based Management (RBM) Framework for Adaptation to Climate Change;
 - United Nations Framework Convention on Climate Change (UNFCCC);
 - Hyogo Framework for Action (HFA);
 - Convention on Biological Diversity (CBD);
 - Least Developed Countries Expert Group (LEG);
 - Yemen's Millennium Development Goals (MDGs);
 - Yemen's National Adaptation Plan of Action (NAPA);
 - Yemen's Second National Communication (SNC);
 - Yemen's National Water Sector Strategy and Investment Programme (NWSSIP); and
 - Yemen's Fourth Five-Year Development Plan (4th DPPR).
6. For additional information on the LDCF-financed project's alignment with national strategies and plans please refer to Section 2 of the project document.

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

7. There have been no changes in the GEF focal areas or eligibility since the original PIF.
8. The LDCF-financed project is consistent with LDCF objectives CCA-1 "Reduce vulnerability to the adverse impacts of climate change" and CCA-3 "Promote transfer and adoption of adaptation technologies". Specific contributions to these objectives are described below.
 - Component 1 will support mainstreaming of climate change adaptation by integrating water harvesting regulations into Yemen's Water Law, and incorporating climate change into national and sub-national policies and strategies.
 - Component 2 will increase water availability through on-the-ground water harvesting interventions. This is aligned with LDCF Objective CCA-1, Outcome 1.2 ("Reduce vulnerability in development sectors") and

⁴ 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.

Output 1.2.1 (“Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability”).

- Component 3 will develop decentralised and community-led water management systems. This is aligned with LDCF Objective CCA-3, Outcome 3.1 (“Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas”).

A.3 The GEF Agency’s comparative advantage

9. No significant changes have been made since the PIF. Further details have been added to the relevant section of the project document outlining UNDP’s experience and success in assisting the GoY to access funding for climate change adaptation.
10. For additional information on the GEF Agencies comparative advantage, please refer to Section 2.4 of the project document.

A.4. The baseline projects and the problems they seek to address:

11. The problem that the project seeks to address has not changed from the PIF. The problem that the project seeks to address is that climate change is expected to exacerbate chronic water scarcity and aquifer depletion in Yemen. The solution to this problem is the revival of traditional water harvesting techniques and the introduction of innovative improvements. Rainwater harvesting will contribute to reducing water scarcity and stress on aquifers, however Yemeni water security cannot be achieved by these systems in isolation. Therefore, the project is part of the national response, which also includes irrigation efficiency and the promotion of drought resistant crops and varieties of drought resistant crops.
12. Rainwater harvesting will relieve pressure on Yemen’s groundwater resources. Considering the current groundwater situation in Yemen together with the projected effects of climate change, rainwater harvesting is part of a solution that will provide sustainable water resources in a cost effective manner. The volume of water made available through rainwater harvesting will often be less than a borehole and pump, however, costs per volume will be much less than for pumped groundwater. Additionally, rainfall is predicted to become increasingly erratic. Therefore, rainwater harvesting maximises its use, when it is available, and reduces the negative effects of intense rainfall events, *inter alia* erosion and floods.
13. The outcomes of the project will allow local communities to be more self-sufficient in their water requirements. Decentralised water harvesting systems will be more efficient, sustainable and cost-effective in capturing and making harvested water available than centralised water supply systems. Decentralised systems also have limited exposure to negative political forces at both a local and national level.
14. The two main baseline projects upon which the LDCF-financed project will build are focussed on addressing similar problems in water scarcity, but without a specific consideration of predicted climate change impacts. These baseline projects are the National Water Sector Strategy and Investment Programme (NWSSIP) and the SFD’s numerous water harvesting projects. These have not changed from the PIF. The LDCF-financed project will contribute towards climate-proofing these two baseline projects through: i) informing and guiding baseline interventions using climate data generated under Component 1; ii) implementing climate-resilient water harvesting infrastructure to manage extreme rainfall and sedimentation under predicted climate change scenarios; and iii) promoting the inclusion of rainwater harvesting into legislative and policy frameworks.
15. For further details on baseline projects please see Section 2.4 of the project document.

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:

16. The additional cost reasoning has been updated since the original PIF. The revised additional cost reasoning is described below.

Component 1. Capacity and policies for traditional and innovative water harvesting developed

17. The LDCF-financed project under this outcome will: i) improve the capacity of technical staff within the MoWE and other water management institutions to apply modern geo-spatial techniques and improved climate information for climate-resilient management of water resources; ii) improve the quality and geospatial coverage of biophysical, weather and climate information to support improved water resource management; iii) study the socio-economic benefits of rainwater harvesting and use the results of this research to inform proposed policy revisions; and iv) develop catchment-level plans for the governorates of Sana'a, Ibb, Taiz, Dhamar, Raymah and Al Mahweet. This outcome will strengthen the skills and decision-making capacity of institutions to promote water harvesting as a climate-resilient approach to increasing availability of water.
18. The ongoing political restructuring in Yemen creates an opportunity for water harvesting to be incorporated into the regulations of the new states or governorates. While the institutional restructuring is still in progress, the LDCF-financed project will remain flexible to work with new structures as they are established. Yemen's political restructuring also provides the opportunity to integrate the promotion of water harvesting into relevant national and sub-national legislation, build the capacity of water officials and managers in newly created positions, and institutionalise sustained support for WUAs after project termination.
19. The outputs and activities within Component 1 are:
- Output 1.1: The MoAI and NWRA assisted to produce rainfall-runoff models (RRM) based on GIS to simulate key parameters for selection of water harvesting, including artificial recharge techniques.
 - Activity 1.1.1: Build technical capacity within NWSSIP for remote sensing and GIS to produce simulation models.
 - Activity 1.1.2: Assemble biophysical and meteorological data from existing sources and identify gaps in target governorates.
 - Activity 1.1.3: Collect field data to address gaps identified in Activity 1.1.2.
 - Activity 1.1.4: Develop models that incorporate climate projections and land use changes to identify locations for water harvesting.
 - Activity 1.1.5: Train the MoAI in RRM, incorporating erosion and run-off related pollution and an assessment of potential for groundwater pollution in artificial recharge techniques.
 - Output 1.2: Water harvesting regulations integrated into the Water Law of Yemen to include harvested water as part of the national water budget.
 - Activity 1.2.1: Calculate the economic value of harvested rainwater, including future impacts of climate change and aquifer depletion, for domestic use and irrigation at a basin level. Disseminate the findings to relevant policymakers.
 - Activity 1.2.2: Propose changes to policies and strategies to include potential climate change effects.
 - Activity 1.2.3: Propose water harvesting regulations for inclusion into the Water Law.
 - Activity 1.2.4: Facilitate implementation of water harvesting under new federal government institutions.
 - Output 1.3: Long term, climate resilient water plans developed incorporating integrated water harvesting to facilitate groundwater recharge and supplement irrigation in the selected governorates.
 - Activity 1.3.1: Create a discussion forum in NWRA to facilitate dialogue on water harvesting between national, sub-national and community stakeholders.
 - Activity 1.3.2: Update IWRM basin-level plans to include harvested water under predicted climate change scenarios using models developed under Activity 1.1.4.
 - Activity 1.3.3: Assess existing water harvesting programmes, projects and CBO initiatives in the six selected governorates. Collate lessons learned to inform future water harvesting programmes, projects and initiatives.

Component 2. On the ground measures for the introduction of water harvesting and rehabilitation of traditional water harvesting structure

20. To address the anticipated effects of climate change and aquifer depletion, the LDCF-financed project will implement a range of water harvesting techniques in the governorates of Sana'a, Taiz, Ibb, Dhamar, Raymah and Al Mahweet. Local communities will be trained in the construction and maintenance of various water harvesting techniques. In addition, awareness of the socio-economic benefits of water harvesting will be raised

in the selected governorates. The introduction of alternative systems for distribution of water will reduce the extractive pressure on existing water resources and support improved water security under conditions of climate change. Traditional water management and harvesting techniques, such as terraces and spate irrigation, have shown their effectiveness over time and are well-established practices in Yemen. This infrastructure will be rehabilitated and improved to become resilient to climate change effects. New techniques, such as fog harvesting with a vertical mesh screen, will be introduced to provide additional water under uncertain climate change predictions.

21. The design of the LDCF-financed project builds on lessons learned from other initiatives that have water harvesting experience in Yemen. These initiatives include WAM, WASH, RALDP, the GSCP, the Community Livelihoods Project (CLP), the SGP and Progressio. The proposed adaptation interventions of the LDCF-financed project have been designed as a package of complementary activities that: i) incorporate traditional and innovative water harvesting techniques; ii) require locally available or simple inputs; and iii) respond to the anticipated effects of climate change on women, youth and other vulnerable groups. The design of on-the-ground interventions will follow a participatory approach. Specifically, the LDCF-financed project will promote the involvement of local communities in selecting and prioritising interventions that are tailored to their specific conditions. This approach will promote local community 'buy-in' and ownership of the project's activities. Community buy-in has significantly contributed to the success of previous government and donor-funded water harvesting projects. The sustainability of the LDCF-financed project will be further enhanced by establishing collaborative relationships with relevant partners such as WUAs, MoAI extension officers and local CBOs.
22. The design of water harvesting techniques to be implemented will include considerations of simplicity and ease of maintenance⁵. Maintenance requirements form a significant factor in the sustainability of a system. Design aspects to be taken into account when minimising maintenance include: i) size of the system; ii) distance between the collection point and storage or use location; iii) distance of the system from the community or household; iv) potential energy and water speed; and v) required materials and tools. Wherever possible, techniques that are user-friendly and easy to maintain will be promoted in favour of complex and expensive systems such as pump-operated systems, which require some technical knowledge for maintenance and repairs.
23. The outputs and activities within Component 2 are:
 - Output 2.1: Five traditional water harvesting techniques re-introduced into the selected governorates. (1. Inter-row water harvesting; 2. Micro-catchment water harvesting; 3. Rooftop water harvesting; 4. Medium-sized catchment water harvesting; 5. Large catchment water harvesting.)
 - Activity 2.1.1: Install rooftop harvesting systems, according to predicted rainfall regime with planned overflow for exceptional events.
 - Activity 2.1.2: Demonstrate inter-row, micro, medium- and large-catchment water harvesting techniques in pilot sites.
 - Activity 2.1.3: Provide training, materials, tools and technical guidance in selected sites for inter-row, micro-catchment, medium- and large-catchment water harvesting.
 - Output 2.2: Fog harvesting technology introduced in Raymah.
 - Activity 2.2.1: Develop a fog harvesting manual based on quantitative and qualitative data from previous fog harvesting attempts in Yemen, including 'traditional' stone-piling and the 'modern' screen technique. This manual will be made available to relevant NGOs working in suitable areas in Yemen.
 - Activity 2.2.2: Host workshops to disseminate the fog harvesting manual to local communities that have suitable socio-economic and biophysical conditions.
 - Activity 2.2.3: Install 'screen' fog harvesting in selected sites using the fog harvesting manual.
 - Activity 2.2.4: Train local communities in maintenance of fog harvesters and record keeping of water yields.
 - Activity 2.2.5: Measure results of fog harvesting in providing water and effect on communities.
 - Output 2.3: Local community members (farmers, pastoralists and rural households) from the selected governorates trained in the construction and maintenance of water harvesting techniques.
 - Activity 2.3.1: Train local communities on the principles of water harvesting.

⁵ Spurlock, A., 2009. Case Studies for Terrace Rehabilitation in Yemen: Assessing local communities and household resilience to adapt to climate change in rain-fed areas of Yemen, Report for the SFD in collaboration with World Bank.

- Activity 2.3.2: Train CBOs to monitor and advise farmers, pastoralists and rural households on water harvesting technologies.
- Activity 2.3.3: Train CBOs and WUGs on forming WUAs according to lessons learned from Output 3.1.
- Activity 2.3.4: Train masons in selected local communities where material is available for their skill.
- Activity 2.3.5: Host local community discussion forums to share lessons learned on water harvesting experiences. Collate and analyse these lessons into a report.
- Output 2.4: Integrated groundwater recharge systems established.
 - Activity 2.4.1: Educate farmers and water managers on techniques for increasing soil infiltration in agricultural fields using Activity 2.1.2 as demonstration sites.
 - Activity 2.4.2: Conduct hydrogeological tests to determine specific locations for artificial recharge.
 - Activity 2.4.3: Install check and sand dams at sites determined under Activity 2.4.2.
 - Activity 2.4.4: Establish local community nurseries propagating agroforestry species to reforest upper catchments.
 - Activity 2.4.5: Train local communities in the protection of these upper catchments.
- Output 2.5: Floodwater harvesting systems introduced to support irrigation.
 - Activity 2.5.1: Use hydrological modelling developed under Activity 1.1.4 to model floods and potential damage.
 - Activity 2.5.2: Remove alien vegetation (e.g. *Prosopis juliflora*) from channels and educate farmers on alien vegetation management.
 - Activity 2.5.3: Vegetate canals with agroforestry species.
 - Activity 2.5.4: Rehabilitate and install sediment traps to limit canal sedimentation.
- Output 2.6: Awareness raising programme designed and implemented for all six identified governorates to promote socio-economic benefits of water harvesting.
 - Activity 2.6.1: Analyse data from pilot interventions and collate the results for dissemination to schools, media and public institutions.
 - Activity 2.6.2: Propose water harvesting and water resources education in the school syllabus and promote water management as a career option in secondary schools.
 - Activity 2.6.3: Review current awareness in local communities and the effect of current awareness raising initiatives. Use the results of this study as a basis for 2.6.4.
 - Activity 2.6.4: Use media, including radio and signboards to target specific audiences with appropriate water harvesting information.
 - Activity 2.6.5: Promote water harvesting and grey water recycling in public buildings and mosques, including public displays of these techniques and their results.

Component 3. Decentralised and community – lead water management systems developed to cope with long term impacts of climate change on water availability

24. Traditional Yemeni systems of water management were developed centuries ago and their endurance is evidence of their efficacy. However, modern events have placed additional challenges on the country's water management institutions. Predictions for climate change, particularly increased rainfall variability, and aquifer depletion in Yemen will make these challenges more acute. Therefore, Yemen's WMOs and government institutions require increased capacity to provide sound water management for predicted scenarios.
25. Increased variability under climate change projections will place additional stress on water resources. Additionally, Yemen's heterogeneous landscape creates strong variability between regions. A decentralised approach will allow local WMOs to make decisions based on their current local conditions. Access to short- and long-term weather data will assist management decisions. Future water shortages will require traditional dispute mediators to have increased authority and skills to manage the resource and arbitrate conflict resulting from this scarcity. Formal establishment of WUAs will add further authority to WUGs. This formalisation will provide additional access to support from government institutions, such as NWRA and the SFD.
26. The LDCF-financed project will promote mechanisms for increasing investment into the water harvesting sector. Activities will provide finance for local communities to implement their own water harvesting infrastructure.

Loans and grants will come in the form of materials and revolving funds. Public works projects will rehabilitate terraces using local labour. Additionally, private investment in water harvesting, as part of corporate social responsibility (CSR), will be promoted. CSR refers to a company's commitment to being a good corporate citizen, which includes being socially responsible. Social responsibility includes contributions to sustainable development and philanthropic donations – referred to as Corporate Social Investment – to projects and organisations that promote social and environmental wellbeing.

27. The outputs and activities within Component 3 are:

- Output 3.1: Water user associations (WUAs) in the selected governorates provide customer-oriented water distribution and seasonal rationing services for communal harvested water, with full engagement of the community members and traditional *Al Moqadem* of the target communities.
 - Activity 3.1.1: Assemble data on existing and former WUAs in Yemen and collate this into a manual for their future establishment and management.
 - Activity 3.1.2: Train representatives of the Ministry of Social Affairs and Labour to facilitate the WUA registration process.
 - Activity 3.1.3: Train WUA representatives in: i) water budgets; ii) demand-side management; iii) criteria establishment for assessment of household water demand; and iv) conflict management.
 - Activity 3.1.4: Train *Al Moqadem* in climate change effects and adaptation measures.
 - Activity 3.1.5: Establish discussion forums for WUAs in the selected governorates to facilitate information dissemination and discussion between WUAs and governorate water management institutions.
- Output 3.2: Social Fund for Development Engineering Unit and extension services have the skills and capabilities to support range of water harvesting technology designs and maintenance requirements
 - Activity 3.2.1: Establish criteria for the selection of certain areas, districts or water user groups for rainwater harvesting practices, for example target poor, remote or flood prone areas.
 - Activity 3.2.2: Establish and maintain a database for current sites and techniques of rainwater harvesting to use as a reference for establishing new sites.
 - Activity 3.2.3: Train SFD-EU and extension services on the principles of water harvesting, technique costing and local community-education methods.
- Output 3.3: A set of incentives, such as concessional micro-loans, community grants and employment guarantees for construction and maintenance of water harvesting infrastructure introduced to stimulate community and private investment into water harvesting infrastructure, within target governorates.
 - Activity 3.3.1: Establish criteria, including biophysical and socio-economic conditions, for directing loans and incentives to local communities who will yield maximum water harvesting benefits.
 - Activity 3.3.2: Offer grants in the form of materials (not cash) accompanied with implementation guidelines.
 - Activity 3.3.3: Rehabilitate terraces and other water harvesting infrastructure to provide non-agricultural income between cropping seasons.
 - Activity 3.3.4: Attract CSR investment and CSI spending from the private sector on rainwater harvesting projects.

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:

28. While the wording of the project risks have been altered and since the original PIF to make them more specific, they remain based on the same underlying principles. Additional risks and appropriate mitigation measures have been identified since the original PIF. These risks are summarised below in the table below.

Table 1. Risks, mitigation measures and assumptions of LDCF-financed project

	Risk	Impact and Probability	Mitigation measure	Assumption
1	Technical staff and community leaders are constrained from attending training sessions.	I: 4 P: 2	Transport costs will be paid for trainees to attend training sessions.	Technical staff and community leaders will be willing to attend training sessions.
2	Attendance of training	I: 4	Training will include climate	Trainees leave training with

	sessions does not result in the adoption of water harvesting.	P: 2	change effects to emphasize benefits of water harvesting. Pre- and post-training assessments of capacity will be conducted.	improved capacity.
3	Local communities are sceptical about the reliability of water harvesting to satisfy their water needs and are not willing to commit their workforce in the proposed adaptation measure.	I: 4 P: 2	Meetings held with local stakeholders to explain project activities and enlist support. Evidence from successful projects will be presented. E.g. WAM fog harvesting project. Local communities will be trained in selecting most beneficial techniques.	Local communities are aware of the benefits of water harvesting and, if not, will respond positively to evidence of success.
4	Reluctance of local institutions to change the status-quo of groundwater use and promote water harvesting.	I: 4 P: 2	Data of groundwater depletion and predicted outlooks will be presented to justify alternatives.	Local institutions are aware of the groundwater situation and realise that alternative water supplies are required.
5	Project focal points are unable to procure the necessary materials to implement community-level interventions for water harvesting.	I: 4 P: 3	Interventions will be designed to be as simple as possible. Interventions will use locally available materials.	Project focal points will be able to spend funds appropriately and timeously.
6	Political unrest resulting in delays to project implementation.	I: 4 P: 4	The project manager and UNDP CO will continuously monitor the security situation. Community buy-in will contribute towards the safety of the project team and facilitate implementation.	The political situation is improving and local communities will recognise the project's benefits and avoid actions that might jeopardise it.
7	Uncertain climate change projections cause scepticism for water harvesting in policy and decision-makers	I: 3 P: 2	Presentation of evidence that water harvesting will be beneficial for soil and water resources regardless of the eventual climate change effects.	Water harvesting is a favoured option to provide domestic and irrigation water under the current water crisis in Yemen.
9	Antipathy for government prevents cooperation from local communities.	I: 4 P: 2	Meetings held with local stakeholders to explain project activities and enlist support.	Local communities will welcome projects that address their livelihood needs.
10	Communal harvested water becomes a source of conflict and dispute.	I: 3 P: 3	Implementations will be decentralised as much as possible. For those requiring communal management, community organisations will be trained in managing conflict. Dispute resolution mechanisms will be created.	Local communities have the incentive to create cooperative arrangements and methods of resolving disputes are strong enough to have binding decisions.
11	Suggested regulations and plans are unenforceable.	I: 3 P: 3	Meetings with local stakeholders to explain the benefits of cooperation.	Officials have the means and capacity to enforce regulations and plans.

A.7. Coordination with other relevant GEF financed initiatives

29. No significant deviations were made from the PIF. The project has been designed in full alignment with the portfolio of GEF projects that are currently in implementation phase. The project align with the following GEF-financed initiatives:

- the Rural Adaptation in Yemen Project (LDCF);
- the GEF-funded Small Grants Programme (GEF); and
- the Rain-fed and Livestock Development Project (GEF).

Other relevant non-GEF initiatives

30. The LDCF-financed project is also aligned with the following non-GEF-financed initiatives:

- the Rural Water Supply and Sanitation Project;

- the Groundwater and Soil Conservation Project for Yemen;
- the Sana'a Basin Water Management Project; and
- the Fog and Rainwater Harvesting for Improved Coffee Production in Manakha.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

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

31. Stakeholders at all levels – national, district, sub-district and community – will be engaged during implementation of the LDCF-financed project. This process commenced during the PPG phase with the inception workshop (detailed in Annex 2). Because of security concerns in Yemen, the validation mission was cancelled in favour of disseminating the project document to stakeholders for comment. The stakeholder involvement plan was discussed and agreed upon during one-on-one meetings and *via* correspondence with relevant stakeholders.

Table 2. Relevant partners and stakeholders identified for engagement by project outcome/output.

Outcome	Output	Stakeholders	Key Responsibilities
Outcome 1. <i>The technical capacity to integrate cost-effective water harvesting techniques at national and local institutions and in local WMOs to improve water security.</i>	Output 1.1. The MoAI and NWRA assisted to produce RRM based on GIS to simulate key parameters for selection of water harvesting, including artificial recharge techniques.	MoWE, MoAI, NWRA, SFD, WEC, YRSC	Develop and coordinate GIS training (WEC, YRSC). Participate in training sessions on RRM and remote sensing (MoAI, MoWE, NWRA, SFD). Integrate improved GIS data into NWSSIP and NASS (MoAI, MoWE, MoAI, NWRA, SFD).
	Output 1.2. Water harvesting regulations integrated into Water Law of Yemen to include harvested water as part of the national water budget.	EPA, NWRA, SFD, MoWE, MoAI, IMCCC, MoPIC	Participate in workshops to offer input on proposed regulations. Incorporate water harvesting regulations into the Water Law and annual national budgets. Integrate climate change into national and sub-national policies and strategies. Facilitate implementation of water harvesting under new federal institutions.
	Output 1.3. Long-term, climate resilient water plans developed incorporating integrated water harvesting to facilitate groundwater recharge and supplement irrigation in the selected governorates.	EPA, NWRA, SFD, MoWE, MoAI, SGP, WMOs	Provide input on lessons learned from existing water harvesting programmes and projects. Facilitate a discussion forum on water harvesting between national, sub-national and community stakeholders (NWRA). Participate in water harvesting discussion forum. Update IWRM basin-level plans to include proposals for water harvesting under predicted climate change scenarios (EPA, NWRA, MoWE, MoAI, WMOs).
Outcome 2. <i>Water availability increased through introducing on-the-ground measures for the introduction of water harvesting and rehabilitation of</i>	Output 2.1. Five traditional water harvesting techniques re-introduced into selected governorates (1. Inter-row water harvesting; 2. Micro-catchment water harvesting; 3. Rooftop	EPA, NWRA, MoWE, MoAI, SFD	Pilot inter-row, micro-catchment, medium- and large-catchment water harvesting at selected sites. Provide training, material, tools and technical support to communities for inter-row, micro-catchment, medium- and large-catchment water harvesting.

traditional water harvesting structures.	water harvesting; 4. Medium-sized catchment water harvesting; 5. Large catchment water harvesting).		Provide training, material, tools and technical support to communities for rooftop harvesting (SFD, NRW).)
	Output 2.2. Fog harvesting technology introduced in Raymah.	WAM, NRW, EPA	<p>Develop a fog harvesting manual based on lessons learned from previous projects.</p> <p>Conduct workshops to disseminate fog harvesting manual to selected NGOs and communities.</p> <p>Install 'screen' fog harvesters in selected sites. (NRWA, EPA).</p> <p>Assess fog harvesting water yields and benefits to communities. (NRWA, EPA).</p> <p>Train communities in maintenance and recording water yields (NRWA, EPA).</p>
	Output 2.3. Local community members (farmers, pastoralists and rural households) from the selected governorates trained in the construction and maintenance of water harvesting techniques.	NRWA, EPA, SFD, MoAI, MoWE, MoSAL, CBOs, WUGs	<p>Provide training to CBOs and WUGs on water harvesting techniques, construction, and monitoring (NRWA, EPA, SFD, MoAI, MoWE).</p> <p>Provide training on establishing WUAs (MoSAL, NRW, SFD).</p> <p>Participate in training sessions on establishing WUAs and water harvesting techniques, construction and monitoring (CBOs, WUGs).</p> <p>Train masons in selected communities (NRWA, EPA, SFD, MoAI, MoWE).</p> <p>Facilitate community discussion forums to share lessons learned on water harvesting (NRWA, EPA, SFD, MoAI, MoWE).</p>
	Output 2.4. An integrated groundwater recharge system established.	NRWA, EPA, SFD, MoAI, MoWE	<p>Conduct hydrogeological tests to determine specific locations for artificial recharge.</p> <p>Install check and sand dams at selected sites.</p> <p>Establish community nurseries propagating agroforestry species to reforest upper catchments.</p> <p>Train communities in upper catchment protection.</p>
	Output 2.5. Floodwater harvesting systems introduced to support irrigation.	NRWA, EPA, SFD, MoAI, MoWE	<p>Model floods and their potential impacts to guide the rehabilitation of <i>wadi</i> division structures and canals (NRWA, EPA, SFD, MoWE).</p> <p>Coordinate the removal of alien vegetation from channels and educate communities on alien vegetation management.</p> <p>Rehabilitate and install sediment traps to limit canal sedimentation.</p>

	Output 2.6. Awareness raising programme designed and implemented for all six identified governorates to promote socio-economic benefits of water harvesting.	NRWA, EPA, SFD	<p>Assess current awareness of water harvesting and efficacy of awareness raising initiatives.</p> <p>Analyse and collate data from pilot interventions for dissemination to schools, media and public institutions.</p> <p>Design and implement a media campaign to disseminate appropriate water harvesting information.</p> <p>Pilot grey water recycling and water harvesting at public buildings and mosques.</p>
Outcome 3. <i>Decentralised and local community-led water management systems developed to cope with long-term impacts of climate change on water availability.</i>	Output 3.1. WUAs in the selected governorates provide customer-oriented water distribution and seasonal rationing services for communal harvested water, with full engagement of the community members and traditional <i>Al Moqadem's</i> of the target communities.	MoSAL, NRWA, EPA, SFD, WUAs	<p>Develop and disseminate a manual on establishing and managing WUAs.</p> <p>Develop training on facilitating the WUA registration process.</p> <p>Participate in training on facilitating the WUA registration process (MoSAL).</p> <p>Provide training on water budgets, demand-side management, conflict management and assessing household water demand (MoSAL, NRWA, EPA, SFD).</p> <p>Participate in training on water budgets, demand-side management, conflict management and assessing household water demand (WUAs).</p> <p>Facilitate discussion forums for WUAs to disseminate information between associations and governorate water management institutions (NRWA).</p> <p>Train <i>Al Moqadem</i> on climate change effects and adaptation interventions.</p>
	Output 3.2. SFD Engineering Unit and extension services have the skills and capabilities to support a range of water harvesting technology designs and maintenance requirements.	SFD, EPA, NRWA	<p>Develop site selection criteria.</p> <p>Establish and maintain a database of current rainwater harvesting sites and techniques to guide site selection.</p> <p>Provide training on principles of water harvesting, technique costing and community-education methods (EPA, NRWA).</p> <p>Participate in training on the principles of water harvesting, technique costing and community-education methods (SFD).</p>
	Output 3.3. A set of incentives, such as concessional micro-loans, community grants and employment guarantees for construction and maintenance of water harvesting infrastructure	SGP, SFD, NWRA, EPA	<p>Establish criteria for directing loans and incentives to communities who will yield maximum water harvesting benefits.</p> <p>Provide material grants for water harvesting interventions accompanied by implementation guidelines.</p> <p>Design and promote rainwater harvesting</p>

	introduced to stimulate community and private investment in water harvesting infrastructure, within target governorates.		projects for CSR (SFD). Implement terrace and other water harvesting infrastructure rehabilitation to provide non-agricultural income between cropping seasons.
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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):

National and household benefits

32. The LDCF-financed project will benefit Yemen by increasing local communities' water security under predicted climate change scenarios and reducing the rate of aquifer depletion. This will be achieved through: i) reviving traditional water harvesting techniques, e.g. spate irrigation and terracing; and ii) introducing innovative water harvesting techniques e.g. artificial recharge and fog harvesting.
33. Without the project, local communities and their livelihoods will be at increasing risk from the effects of climate change on water availability. Furthermore, progress towards poverty reduction and economic development is likely to be hampered. The project will improve local communities' water security and reduce their reliance on groundwater resources, thereby enhancing communities' climate-resilience and slowing the rate of aquifer depletion. Water is integral to Yemen's economy and improving water security will strengthen and safeguard livelihood assets and household incomes against the effects of climate change. At least 1,000 households from a minimum of two villages in each of the six target governorates will benefit directly from LDCF resources. These households represent more than 6,000 people. The total land benefitting from improved rainwater harvesting techniques will be at least 5,000 ha. The project will focus on communities that are the most vulnerable to water scarcity and will allow these communities to be more self-sufficient in their water requirements. Decentralised water harvesting systems are more efficient, sustainable and cost-effective in capturing and making available harvested water than centralised water supply systems. This decentralisation also limits the influence of negative political forces at both a local and national level.
34. The project will also increase awareness of the predicted effects of climate change on water security and the benefits of rainwater harvesting techniques amongst national and sub-national stakeholders. Although government institutions and international NGOs and CBOs are actively promoting such techniques, these programmes currently do not incorporate predicted climate change scenarios into their designs. The LDCF-financed project will climate-proof physical water harvesting interventions and water management strategies, policies and plans through the improving climate change assessment capacity in the MoAI, EPA, NWRA and SFD. Additionally, physical infrastructure – such as bridges, roads and water supply – as well as economic assets – such as agricultural land – will benefit from water harvesting through the reduction in flooding risk and erosion potential.

Gender considerations

35. Women's' exposure to climate risks is increased by existing inequalities and practices associated with traditional understandings of "appropriate" behaviour for men and women⁶. Despite their capability to innovate and lead, historically women have been marginalised from local and national decision-making processes, particularly in developing countries⁷. It is therefore important to identify gender-sensitive strategies to ensure that women are the focus of interventions designed to improve their resilience and capacity to adapt to climate change. The LDCF-financed project is aligned with the decision adopted at COP-18 to promote gender balance⁸. Promoting gender equality and women's empowerment is the third Millennium Development Goal.
36. During the implementation of the project activities, gender equity will be promoted by the following:
- Outcome 1: Enhancing capacity and influence of female technical staff. At least 50 percent of MoAI and NWRA staff trained in rainfall run-off models and remote sensing will be women. Through this training,

⁶ Masika, R. (2002). Editorial- Gender & Development. *Gender & Development*, 10(2), 2–9. doi:10.1080/13552070215910

⁷ Denton, F. (2002). Climate change vulnerability, impacts, and adaptation: Why does gender matter? *Gender & Development*, 10(2), 10–20. doi:10.1080/13552070215903

⁸ Decision 23/CP.18 in 4. Framework Convention on Climate Change, United Nations (2013) *Report of the Conference of the Parties on its eighteenth session*, Doha.

women will be empowered to participate in institutionalised climate change adaptation and water resource decision-making processes

- Outcome 2: Reducing women's workload. In Yemen, women are often tasked with collecting water. By harvesting it and making it available closer to the home, the LDCF-financed project will benefit women by: i) alleviating the need to fetch water from distant sources; ii) increasing domestic hygiene through providing cleaner drinking water and water for sanitation; and iii) increasing the role of women in community decision-making through training and participation in WMOs.
- Outcome 3: Enhancing decision-making capacity and influence. The project will focus on training women's groups and women-orientated WMOs in particular. Through this training, women will be empowered to participate in water resource and climate change adaptation decisions in their communities.

37. The EPA will be responsible for monitoring and evaluation of the actions above. Gender disaggregated indicators will be developed and used for monitoring and evaluation of the LDCF-financed project. In addition to gender, the project will also ensure that other disadvantaged and more vulnerable groups as elderly, children and less-abled, will receive adequate attention.

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

38. To address water scarcity in Yemen, rainwater harvesting is more cost-effective than alternative interventions such as desalination and large dams. Desalination and large dams require significant capital investment in infrastructure and maintain costs. For example, the estimated cost of building a desalination plant is US\$6 billion and a pipeline from Red Sea to Sana'a is US\$3 billion. With Yemen's oil resources being depleted, fuel price is increasing, and consequently water transportation and pumping costs increase. The increase in these costs also decreases the cost-effectiveness of centralised interventions that require distribution systems, either via canals, pipes or tanker trucks. For example, price of desalinated water increases by US\$3.72 per cubic metre to account for 109-km of transportation by tanker from Mocha to Taiz City. A 104-km pipeline running from Mocha to Taiz is planned with an estimated cost of US\$220 million.

39. In comparison, rain water harvesting requires less investment for a return on a given volume of water. For example, a study of groundwater recharge sites in Sana'a governorate estimated the most productive sites would recharge the aquifer the equivalent value of desalinated water (US\$1.1 m⁻³) within two years. The average for this study was 13.6 years. Rooftop rainwater harvesting systems are another example demonstrating the significantly smaller requirement on capital investment. These systems can be implemented for an estimated US\$1,684 per household. This estimate includes installation and maintenance costs for the operating period. It is estimated that rooftop harvesting will reduce annual water expenses for the residents of Sana'a by US\$82 million, representing potential water saving of 43.4% for households annually.

40. Besides being cost-effective to build and maintain, water harvesting interventions are decentralised, thereby reducing transport and costs of distribution infrastructure. The use of locally available materials where possible will contribute to the cost-effectiveness of the project's interventions. Because many of the techniques employed in this project are based on traditional knowledge, local materials are already inherent in their design.

41. The feasibility of investment on water harvesting structures in micro-catchments was evaluated using standard discount cash-flow techniques. In addition, the economic effect of groundwater recharge was analysed through the: i) reduction in the cost of groundwater irrigation; ii) amount of newly irrigated land; and iii) increase in net returns. The cost-benefit analysis of water harvesting structures indicates that investments are cost-effective and financially-viable. For every US\$1 spent, the investment yielded on average US\$1.21 over the economic life span of the watershed's assets.

42. The internal rate of return (IRR) was 12%. Considering the lending rate of five per cent on long-term loans, a modest IRR of 12% is economically worthwhile. The IRR is a reasonable indication of the higher average earning power of investment on water harvesting structures. Only direct benefits were considered in the analysis of investment in the watershed. If indirect benefits were also included, the IRR would increase further.

Medium and Macro-catchment water harvesting

43. Construction of medium and macro-catchment water harvesting structures, such as: i) *al qaid* (low earthen bunds); ii) *ogma* (high earthen bunds); iii) check dams; iv) terraces; and v) barriers to exclude livestock, will use alien vegetation removed under Activity 2.5.2. In doing so, the LDCF-financed project will have the dual benefit

of preventing the negative effects of the alien vegetation, such as groundwater depletion, while promoting positive effects, such as erosion prevention and groundwater infiltration.

C. DESCRIBE THE BUDGETED M &E PLAN:

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> Project Manager UNDP CO, UNDP CCA 	Indicative cost: 4,000	Within first two months of project start up
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> UNDP CCA RTA/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 the project (during the evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> Oversight by 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	<ul style="list-style-type: none"> Project manager and team UNDP CO UNDP RTA UNDP EEG 	None	Annually
Periodic status/ progress reports	<ul style="list-style-type: none"> Project manager and team 	None	Quarterly
Baseline Evaluation	<ul style="list-style-type: none"> Project manager and team UNDP CO UNDP RCU External Consultants (i.e. evaluation team) 	Indicative cost: 40,000	With the first two months of project start up
Mid-term Evaluation	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Project manager and team UNDP CO Local consultant 	0	At least three months before the end of the project
Audit	<ul style="list-style-type: none"> UNDP CO Project manager and team 	Indicative cost per year: 3,500	Yearly
Visits to field sites	<ul style="list-style-type: none"> UNDP CO UNDP RCU (as appropriate) Government representatives 	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST		US\$142,000	
Excluding project team staff time and UNDP staff and travel expenses		(+/- 5% 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)
Mahmoud M. Shidiwah	EPA Chairman	MINISTRY OF WATER AND ENVIRONMENT	09/16/2012

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 the project.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Adriana Dinu Executive Coordinator, UNDP/GEF		Nov. 6, 2014	Tom Twining-Ward Regional Technical Advisor	+90 5396532807	tom.twining-ward@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD:					
Local Balanced Development					
Country Programme Outcome Indicators:					
Number of Communities engaged in climate change adaptation					
Primary Applicable Key Environment and Sustainable Development Key Result Area:					
Promote climate change adaptation					
Applicable SOF (e.g. GEF) Strategic Objective and Program:					
Climate Change Adaptation Objective CCA-1					
Reducing vulnerability: Reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level					
Climate Change Adaptation Objective CCA-3					
Disseminating technology: Promote transfer and adoption of adaptation technology					
Applicable SOF (e.g. GEF) Expected Outcomes:					
Outcome 1.2: Reduced vulnerability to climate change in development sector					
Outcome 3.1: Successful demonstration, deployment and transfer of adaptation technology in targeted areas					
Applicable SOF (e.g. GEF) Output Indicators:					
Output 1.2.1: Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability					
Output 3.1.1: Relevant adaptation technology transferred to targeted groups					
	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective To re-introduce traditional and innovative water harvesting techniques to improve water availability to rain-fed farmers and pastoralist who are highly vulnerable to climate change	<p>1. Number of people benefitting from increased availability of domestic water given existing and projected climate change [AMAT 1.2.3]</p> <p>2. Percentage of targeted groups adopting adaptation technologies by technology type (disaggregated by gender) [AMAT 3.1.1]</p>	<p>Number of people without access to improved drinking water⁹ to be confirmed once pilot sites have been selected during implementation. Governorate level estimates of the number of people without access to improved water resources are as follows:</p> <ul style="list-style-type: none"> • Ibb: 1,219,950. 	<p>At least 2,000 people across all selected governorates benefiting from rooftop water harvesting and minimum 300 people benefitting from fog-harvesting</p> <p>60% of training session attendees adopting water harvesting technologies</p>	<p>Baseline, mid-term and terminal verification survey at household level</p> <p>Expenditure reports, mid-term and terminal evaluation reports</p> <p>Surveys and questionnaires for attendees of training sessions</p>	<p>Assumptions:</p> <ul style="list-style-type: none"> • Increased awareness and capacity of local communities will support the sustained maintenance beyond project implementation • Training sessions will increase capacity of institutional staff • Increased capacity will be applied in the field • Recommendations will be included in policies, strategies and plans • Policies, strategies and plans will be adhered to • Increased capacity of government technical staff to provide extension services and training

⁹ Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection).

		<ul style="list-style-type: none"> • Taiz: 1,374,300. • Sana'a 1,554,750. • Dhamar: 763,650. • Raymah: 226,350. • Al Mahweet: 284,400 <p>Limited knowledge or resources for planning, implementation and maintenance of water-harvesting technologies in EPA NWRA, SFD and MoSAL</p>			Risks: <ul style="list-style-type: none"> • Rooftop and fog harvesting systems will fall into disrepair because of limited funds • Water harvesting interventions in agricultural lands will not be maintained because of limited funds or labour • Training sessions will not increase capacity • Increased capacity will not be applied in the field • Staff turnover will cause capacity to be lost • Recommendations will not be included into policies, strategies and plans • Policies, strategies and plans will not be adhered to
Outcome 1 The technical capacity to integrate cost-effective water harvesting techniques at national and local institutions and in local Water Management Organisations (WMOs) to improve water security.	<p>1. Number of staff trained on the use of modern technologies related to analysis of climate information and availability of water resources, disaggregated by gender</p> <p>2. Number of national- and local-level policies, strategies and plans for water harvesting developed</p>	<p>MoAI and NWRA staff have general GIS skills, but are not trained in the analysis of climate information, such as rainfall run-off models and remote sensing</p> <p>Currently no sector policies, strategies and plans that explicitly include water harvesting into the national water budget</p>	<p>20 staff (50 percent split between gender) trained on the use of modern technologies related to analysis of climate information and availability of water resources</p> <p>Recommendations for at least 5 sector policies, strategies and plans that explicitly include water harvesting into the national water budget</p>	<p>Surveys and questionnaires for attendees of training sessions</p> <p>Review of recommendations for policies, strategies and plans</p>	Assumptions: <ul style="list-style-type: none"> • Data will be available or obtainable to develop models • Technical staff will be willing to attend training sessions • Recommendations for policies, strategies and plans will be accepted and mainstreamed • IWRM plans will be accepted by decisions-makers and local communities • Baseline and target updated by baseline study Risks: <ul style="list-style-type: none"> • Data cannot be collected or is not comprehensive enough to produce a sufficiently accurate model • Technical staff are constrained from attending training seminars • Policies, strategies and plans are not accepted by decision-makers or local communities and cannot be enforced • IWRM plans are not accepted by local communities and cannot be enforced

Outcome 2 Water availability increased through introducing on-the-ground measures for water harvesting and rehabilitating traditional water harvesting structures.	<p>1. Number and type of water-harvesting techniques introduced to increase supply of irrigation water</p> <p>2. Number of vulnerable communities trained on the use of water harvesting techniques for climate change adaptation</p>	<p>The number of communities benefiting from water harvesting systems will be determined once pilot sites have been determined</p> <p>Community representatives to participate in training will be identified once pilot sites have been established</p>	<p>At least 4 water-harvesting techniques demonstrated at pilot sites in target governorates, including: i) rooftop water harvesting; ii) inter-row, micro-, medium, large catchment harvesting; and iii) artificial recharge to increase irrigation water</p> <p>Representatives of at least 40 communities trained on using additional water harvesting practices</p>	<p>Baseline, mid-term and terminal verification survey at household level</p> <p>Expenditure reports, mid-term and terminal evaluation reports</p>	<p>Assumptions:</p> <ul style="list-style-type: none"> • Roofs are suitable for water harvesting. • Communities perceive harvested water for domestic use is potable • Water harvesting is able to improve crop yields • Water harvesting techniques are adoptable • Agroforestry plots have in excess of 60% survival rate • Sediment measurements between flood events are consistent enough to show difference before and after traps are rehabilitated or implemented <p>Risks:</p> <ul style="list-style-type: none"> • Rooftop systems cannot provide potable water • Water harvesting systems are not adopted and/or maintained by beneficiaries • Agroforestry plots are not maintained and revert to a degraded state
Outcome 3 Decentralised and community-led water management systems developed to cope with long-term impacts of climate change on water availability	<p>1. Number of WUAs in the target governorates trained on water management under changing climate scenarios</p> <p>2. Area of terraces rehabilitated (m²)</p>	<p>WUAs have limited training and become non-functioning over the long-term</p> <p>The sites for terraces rehabilitation will be determined once pilot sites have been identified at implementation</p>	<p>25 WUA representatives trained in water management under changing climate scenarios</p> <p>40,000 m² of terrace rehabilitated</p>	<p>Baseline, mid-term and terminal verification survey at household level</p> <p>Expenditure reports, mid-term and terminal evaluation reports</p> <p>Records of areas designated before and after rehabilitation, including photographs</p>	<p>Assumptions:</p> <ul style="list-style-type: none"> • WUA representatives and staff will be willing to attend training and follow-up sessions • Financing options are viable in terms of loans being repayable through increased crop yields from water harvesting • Material grants create water harvesting benefits • Allocated funds are sufficient to rehabilitate targeted area of terraces <p>Risks:</p> <ul style="list-style-type: none"> • WUA representatives and staff are constrained from attending training and follow-up sessions • Financing schemes fail to be sustainable • Material grants are insufficient to create sustainable water harvesting yields • Allocated funds are insufficient to rehabilitate targeted area of terraces

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

GEF SEC Comments		
Question	Comment	Response
11. Is (are) the baseline project(s), including problem (s) that the baseline project(s) seek/s to address, sufficiently described and based on sound data and assumptions?	<p>No. The sources of cofinancing list the Social Development Fund (SDF), but it is not clear what the SDF would fund. Other relevant initiatives are listed, but it is unclear how LDCF funding will be used to realize direct additional benefits vis-a-vis the National Water Sector Strategy and Investment Program, or the National Irrigation Program, both of which are referenced as baseline projects.</p> <p>Recommended action: Please provide clarification on the relationship between the project and all baseline interventions of direct relevance to this project.</p>	Additional information on the baseline projects and the relationship with the project has been provided and expanded on since PIF approval. Three main programs and funding frameworks will serve as the baseline interventions, including the National Irrigation Program, projects under the Social Development Fund and an overarching National Water Sector Strategy and Investment Program.
13. Are the activities that will be financed using GEF/LDCF/SCCF funding based on incremental/additional reasoning?	<p>Not entirely. The project requests LDCF funding to cover an additional costs of increasing the resilience of rainfed agricultural communities from climate variability and risks through developing technical, regulatory and institutional capacities for the revival and upscale of integrated water harvesting technologies, and direct investment in such water harvesting technologies with a view of ensuring long term climate resilience of rainfed agricultural production systems. However, please clarify the relationship of this initiative to the baseline development intervention(s).</p>	Additional clarifications on the relationship between the LDCF-financed project and baseline initiatives have been supplied. The justification for LDCF funding in order to ensure the resilience of the baseline projects is clearly stated, and has been further developed and expanded since the approval of the PIF.
20. Is the project implementation/ execution arrangement adequate?	<p>Not clear.</p> <p>Recommended action: Please outline the project implementation or execution arrangements.</p>	Additional information on the project implementation and arrangements has been supplied and expanded on since the approval of the PIF. The project will be nationally executed by the National Water Resources Authority – under the Ministry of Water and Environment – which will assume responsibility for project implementation. The Ministry of Agriculture and Irrigation will be responsible for the delivery of components 2 and 3 specifically.
Germany Comments		
Question	Comment	Response
N/A	The project should address the lack of coordination and collaboration between the different institutional entities at national level (horizontal and vertical) that are in charge of the national strategies regarding the different sectors. Cooperation, knowledge sharing and networking should be	<p>The lack of coordination and collaboration between the different institutional entities at national level (horizontal and vertical) has been addressed through the following Activities:</p> <ul style="list-style-type: none"> Activity 1.3.1: create a discussion forum in NWRA to facilitate dialogue on water harvesting between national

	<p>fostered, e.g. through the establishment of respective forums or mechanisms. Besides the already mentioned ministries and agencies, the Ministry of Water and Environment (MoWE) as well as the National Water Resources Authority (NWRA) should also be involved in the project planning and implementation. They are crucial stakeholders and are already active in many fields of intervention targeted in the proposal (see e.g. national water sector strategy NWSSIP).</p>	<p>and sub-national stakeholders.</p> <ul style="list-style-type: none"> • Activity 2.3.5: host local community discussion forums to share lessons learned on water harvesting experiences and collate these lessons into a report. • Activity 3.1.5: establish discussion forums for WUAs in the selected governorates to facilitate information dissemination and discussion between WUAs and governorate water management institutions. <p>The MoWE and NWRA are implementing partners and have been consulted in the development of the project. Both institutions will be involved in implementation of the project activities. Furthermore, the LDCF-financed project has aligned itself and will coordinate with the NWSSIP.</p>
N/A	<p>There is a lack of capacity and limited understanding of climate change and resilience by Yemeni decision-makers and other stakeholders. The trainings and awareness raising should build on and make use of already existing structures (e.g. WUAs) to make sure that the right people are targeted and involved and to ensure the understanding and the acceptance of the importance of the issue.</p>	<p>The limit capacity and understanding of climate change and resilience among decision-makers and stakeholders has been addressed through the following:</p> <ul style="list-style-type: none"> • Activity 1.1.1: build technical capacity within NWSSIP for remote sensing and GIS to produce simulation models. • Activity 1.1.5: train the MoAI in RRM, incorporating erosion and run-off related pollution and an assessment of potential for groundwater pollution in artificial recharge sites. • Activity 1.3.1: create a discussion forum in NWRA to facilitate dialogue on water harvesting between national and sub-national stakeholders. • Activity 2.3.2: train CBOs to monitor and advise farmers, pastoralists and rural households on water harvesting technologies. • Activity 2.3.3: train CBOs and WUGs on forming WUAs according to lessons learned from Output 3.1. • Activity 2.6.1: analyse data from pilot interventions and collate the results for dissemination to schools, media and public institutions. • Activity 2.6.2: propose water harvesting and water resources education in the school syllabus and promote water management as a career option in secondary schools. • Activity 2.6.3: review current awareness in local communities and the effect of current awareness raising initiatives and use the results of this study as a basis for 2.6.4. • Activity 2.6.4: use media including radio and signboards to target specific audiences with appropriate water harvesting information. • Activity 2.6.5: promote water harvesting and grey water recycling in public buildings and mosques,

		<p>including public displays of these techniques and their results.</p> <ul style="list-style-type: none"> • Activity 3.2.3: train SFD-EU and extension services on the principles of water harvesting, technique costing and local community-education methods. <p>As recommended, training and awareness-raising activities make use of existing structures, such as WUAs and WUGs in particular. Furthermore, the structures will be enhanced and strengthened through the following Activities:</p> <ul style="list-style-type: none"> • Activity 3.1.1: assemble data on existing and former WUAs in Yemen and collate this into a manual for their future establishment and management. • Activity 3.1.2: train representatives of the Ministry of Social Affairs and Labour to facilitate the WUA registration process. • Activity 3.1.3: train WUA representatives in: i) water budgets; ii) demand-side management; iii) criteria establishment for assessment of household water demand; and iv) conflict management. • Activity 3.1.4: train <i>Al Moqadem</i> in climate change effects and adaptation measures. • Activity 3.1.5: establish discussion forums for WUAs in the selected governorates to facilitate information dissemination and discussion between WUAs and governorate water management institutions.
N/A	<p>Especially after the political uprising due to the Arab spring, with focus on youth, women and general civil society movements, strong involvement and active participation in development planning and implementation is more needed than ever. It is recommended to consider explicitly the involvement of local communities in the project planning and implementation. Crucial decision-makers on regional and local level should be involved in the project since they often proved to be a major asset or constraint in the implementation of planned activities.</p>	<p>Local communities have been consulted during the development of the project and will be involved throughout implementation of project interventions. Project interventions will be tailored to suit local contexts through close collaboration with local communities.</p> <p>Communication and coordination between local communities and crucial decision-makers has been facilitated through:</p> <ul style="list-style-type: none"> • Activity 1.3.1: create a discussion forum in NWRA to facilitate dialogue on water harvesting between national, sub-national and community stakeholders. • Activity 2.3.5: host local community discussion forums to share lessons learned on water harvesting experiences. Collate and analyse these lessons into a report. • Activity 3.1.5: establish discussion forums for WUAs in the selected governorates to facilitate information dissemination and discussion between WUAs and governorate water management institutions.

N/A	<p>We further suggest taking into account Yemeni traditional knowledge. The people of Yemen have, especially in the rural areas, rich and broad traditional knowledge in how to deal with crisis and hazard situations. This might also increase an active participation of communities and ownership.</p>	<p>Traditional rainwater harvesting knowledge and skills have informed the development of project interventions. Traditional water management and harvesting techniques, such as terraces and spate irrigation, have shown their effectiveness over time and are well-established practices in Yemen. This infrastructure will be rehabilitated and improved to become resilient to climate change effects. New techniques, such as fog harvesting with a vertical mesh screen, will be introduced to provide additional water under uncertain climate change predictions.</p> <p>Women in particular will be targeted for training – through coordination with women's organisations – as they are more likely to stay in rural villages than men – who often migrate to urban centres in search of employment opportunities. Targeting women will ensure that knowledge and skills remain in the rural areas and will increase the opportunities for sharing knowledge and skills with other community members – especially the youth.</p>
N/A	<p>Germany recommends exchanging and coordinating with German development cooperation in Yemen during the planning and implementation phase. We recommend using the existing initiatives to avoid overlapping and the creation of double structures. Water Basin Committees and Water User Associations should be involved in the planning and implementation of the project and could be replicated by the GEF project in other areas.</p>	<p>The LDCF-financed project has coordinated and aligned itself with relevant GIZ initiatives in Yemen – namely: the WSP and PSDP – during the project's design and will continue to do so throughout implementation (see Section 2.4).</p> <p>The project will build on WSP and PSDP structures – where relevant – and benefit from lessons learned by the two aligned initiatives.</p>

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

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

PPG Grant Approved at PIF: \$100,000 (LDCF) \$			
<i>Project Preparation Activities Implemented</i>	<i>LDCF Amount (US\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Activity 1: Technical Definition	51,777	20,462	35,403
Activity 2: Institutional Arrangement	30,728	2,925	1,950
Activity 3: Stakeholder Consultations	13,495	8,439	26,120
Activity 4. Financial planning and co-financing	4,000	4,026	371
Activity 5. PPG Management	0	0	0
Total	100,000	35,852	63,844