PROJECT IDENTIFICATION FORM (PIF) [1]

PROJECT TYPE: FSP
TYPE OF TRUST FUND: LDCF

PART I: PROJECT IDENTIFICATION

Project Title:	Integrated Water Harvesting Technologies to Adapt to Climate Change Induced Water Shortage		
Country(ies):	Yemen	GEF Project ID:[2]	5211
GEF Agency(ies):	UNDP	GEF Agency Project ID:	4989
Other Executing Partner(s):	Ministry of Environment and Water / Environmental Protection Agency	Submission Date: Resubmission Date:	October 3, 2012 January 22, 2013
GEF Focal Area (s):	Climate Change	Project Duration (Months)	48 months
Name of parent programme (if applicable): ➢ For SFM/REDD+ ☐	N/A	Agency Fee ($):	467,400

A. FOCAL AREA STRATEGY FRAMEWORK[3]:

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Indicative Grant Amount ($)	Indicative Co-financing ($)
CCA-1	Outcome 1.2: Reduced vulnerability to climate change in development sectors	Output 1.2.1: Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability	LDCF	1,520,000	10,383,845
CCA-3	Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas	Output 3.1.1: Relevant adaptation technology transferred to targeted groups	LDCF	3,200,000	8,217,751
		Sub-Total		4,720,000	18,601,596
		Project Management Cost[4]		**200,000**	1,000,000
		Total Project Cost		4,920,000	19,601,596

B. PROJECT FRAMEWORK

Project Objective: To re-introduce traditional and innovative water harvesting techniques to improve water availability to rainfed farmers and pastoralists who are highly vulnerable to climate chang						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Indicative Grant Amount ($)**	**Indicative Cofinancing ($)**
1. Capacity and policies for	TA	1. Technical capacity to identify	1.1.Environmental Protection and Water Resources	LDCF	680,000	2,012,376

[1] It is very important to consult the PIF preparation guidelines when completing this template.
[2] Project ID number will be assigned by GEFSEC.
[3] Refer to the reference attached on the Focal Area Results Framework when filling up the table in item A.
[4] GEF will finance management cost that is solely linked to GEF financing of the project. PMC should be charged proportionately to focal areas based on focal area project grant amount. The National Implementing Partner has requested UNDP to provide Direct Project Services (DPS) for this project. DPS for this project includes: procurement services for equipment, water harvesting infrastructure related items; and procurement services for all consultants, including sub-contractors .The estimated Direct Project Costs (DPC) in providing DPS is budgeted to be $48,000. This is calculated based on UNDP's Universal Price List, in line with UNDP's cost recovery policy. Any DPS provided will only be done so in accordance upon the request and written agreement of the National Implementing Partner.

traditional and innovative water harvesting developed		and implement cost effective integrated water harvesting techniques developed at national and local institutions and community groups to withstand risks of increasing water deficit as a result of climate chang	Authorities assisted to produce rainfall-runoff models based on GIS, using Digital Elevation Models (DEM) and satellite imageries, to simulate key parameters for selection of water harvesting (including, artificial recharge techniques) in various locations of the country. 1.2. Water harvesting regulations integrated into the Water Law of Yemen to include harvested water as part of the national water budget 1.3. Long term, climate resilient water plans that include, integrated water harvesting that facilitates ground water recharge and supplimentary irrigation from the harvested flood waters have been prepared for 6 target governorates of Ibb, Taiz, Sana'a, Dhamar, Al Mahweet and Al Mukalla			

2. On the ground measures for introduction of water harvesting and rehabilitation of traditional water harvesting structure	TA	2. Water harvesting technologies designed and tested to cover 5,000 ha of land	2.1. Five traditional water harvesting technologies re-introduced in 6 identified governorates (1. Inter-row water harvesting; 2. Micro-catchment water harvesting; 3. Roof-top water harvesting; 4. Medium-sized catchment water harvesting; 5. large catchment water harvesting); 2.2. Fog harvesting technology introduced in one coastal and / or mountainous governorate (Al Mukalla and Al Hadaydah); 2.3. At least 900 community members (local farmers, pastoralists and rural households) from Ibb, Taiz, Sana'a, Dhamar, Al Mahweet and Al Mukalla governorates have been trained in construction and maintenance of water harvesting technologies; 2.4. Integrated groundwater recharge systems established as part of the integrated water harvesting infratstructure; 2.5. Supplementary irrigation from the flood water harvesting technique introduced; 2.6. Awareness raising programme designed and implemented for all 6 identified governorates to promote socio-economic benefits of water harvesting	LDCF	3,200,000	8,217,751

3. Decentralised and community - lead water management systems developed to cope with long term impacts of climate change on water availability	TA	3. Community-based water harvesting management arrangements developed to improve local water access and distribution in the face of increasing water stres	3.1. at least 6 Water user associations of the target 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's of the target communities; 3.2. Social Fund for Development engineering unit and at least 6 Extension services have skills and capabilities to support range of water harvesting technology designs and maintenance requirements; 3.3. Suite of incentives, such as concessional micro-loans, community grants, employment guarantee (for construction and maintenance) introduced to stimulate community and private investment into water harvesting infrastructure, benefiting 20,000 people of the target governorates	LDCF	840,000	8,371,469
			Sub-Total		4,720,000	18,601,596
			Project Management Cost[5]		200,000	1,000,000
			Total Project Costs		4,920,000	19,601,596

[5] Same as footnote #4.

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

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount ($)
National Government	Ministry of Environment and Water / EPA	In-kind	2,000,000
National Government	National Water Resource Authority	Grant	2,801,000
National Government	Social Development Fund	Grant	14,200,000
GEF Agency	UNDP	Grant	600,596
Total Cofinancing			19,601,596

D. GEF/LDCF/SCCF/NPIF RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (a)	Agency Fee (b)[2]	Total c=a+b
UNDP	LDCF	Climate Change	Yemen	4,920,000	467,400	5,387,400
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
Total Grant Resources				4,920,000	467,400	5,387,400

[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

[2] Please indicate fees related to this project.

PART II: PROJECT JUSTIFICATION

A. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

A.1.1 the GEF focal area/LDCF/SCCF strategies:

1. This project is fully in line with LDCF/SCCF focal area objective 1 to "reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level" and objective 3 to "promote transfer and adoption of adaptation technology." The project is aligned with the focal area outcome 1.2 on reducing vulnerability in development sector, in particular focusing on rainfed agriculture where the key vulnerability arises from the current and anticipated water shortages in Yemen. It is also aligned with outcome 3.1 on successful demonstration, deployment and transfer of relevant adaptation technology in target areas, specifically reviving and introducing a range of cost-effective water harvesting technologies and techniques in varied sub-climatic, topographic and livelihood conditions of Yemen.

A.1.2. For projects funded from LDCF/SCCF: the LDCF/SCCF eligibility criteria and priorities:

2. Consistent with the Conference of Parties (COP-9), the proposed project will implement priority interventions addressed in Yemeni National Adaptation Programme of Actions, therefore satisfying criteria outlined in UNFCCC Decision 7/CP.7 and GEF/C.28/18. It will address urgent and immediate climate change adaptation needs and leverage co-financing resources from national government and multilateral sources that complies with the level of co-financing requirements for the LDCF projects. The LDCF is requested to finance the additional costs of achieving sustainable development imposed on the LDCF-eligible countries by the impacts of climate change. Following the NAPA formulation process, it is fully country-driven and addresses the NAPA priority 7 on "Rainwater harvesting through various techniques, including traditional methods" and 8 that proposes the "rehabilitation and maintenance of mountainous terraces" that also play an important role in water retention as well as facilitating infiltration necessary for groundwater recharge. NAPA priorities 1 and 5 on coastal adaptation are already being addressed by the first and the second LDCF projects with support of UNEP and WB. Moreover, the proposed project focuses on most vulnerable populations including women, and households below or around the national poverty line. The project follows a principle of additionality. It will contribute to the resilience of vulnerable rainfed communities to additional risks imposed by climate change with three tier approach: Firstly, through developing technical capacity at the key institutions to improve rainwater capture and utilization and its inclusion into the national water budget. The project will assist the local governorates to organize and develop a participatory water harvesting plans that will include a range of traditional and innovative techniques. These plans will be underpinned by a GIS based spatially distributed rainfall-runoff model outputs and will be developed with full consideration of key characteristics (soil, vegetation, topography, land use) within the catchment area, based on range of rainfall scenarios that will demand varied approaches to water harvesting, including artificial ground water recharge requirements. Secondly, the project will strengthen organizations such as water user associations, Social Development Fund's Engineering Unit and extension service providers to secure long term institutional ownership and support to water harvesting infrastructure management, maintenance and further replication. Apart from institutional set up for the promotion of climate resilient water harvesting technologies, the project will introduce suite of financial incentives for greater uptake and replication of water harvesting techniques. Micro loans, community grants and seasonal employment guarantee schemes will be designed to support revival and advancement in water harvesting practices in particularly water stressed regions of the country. Thus, the proposed project is aligned with the LDCF Results Framework Objective CCA-1 and CCA-3 as described in Table A above. This approach also underpins the recognition of the linkage between adaptation and poverty reduction (GEF/C.28/18, 1(b), 29) and is aligned with the scope of expected interventions as articulated in the LDCF programming paper and decision 5/CP.9.

A.2. national strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NIPs, PRSPs, NPFE, etc.:

3. The project is fully in line with the SNC and NAPA priorities that flags the water as the most vulnerable sector requiring urgent attention. The **SNC** report indicates that water resources are perhaps the most vulnerable sector to climate change in Yemen. The key finding of the SNC report is that groundwater across the piloted aquifers which include Surdud, Sana'a, Sadah, and Aden Basins are vulnerable to climate change. Among the

adaptation options identified by the **NAPA** lists "rainwater harvesting through various techniques including traditional methods" among the top ten priority adaptation projects. Moreover, the **National Water Sector Strategy and Investment Programme**, underlines strategic importance of "rain water harvesting in rural and urban areas". It is among the sectorial priorities for the Ministry of Agriculture and Irrigation. The recent climate change study of impacts on water and agriculture puts forward five critical adaptation measures for Yemen. "Strengthening traditional water harvesting techniques" is among the highest ranked priorities. It is also fully in line with the **Social Fund for Development's** (SFD) strategic priorities. SFD's Fourth investment phase has been synchronized with the Five-Year Plan for Economic and Social Development and Poverty Reduction (2010–15) and water sector strategy. This emphasizes not only the importance of the water sector in the context of development and poverty alleviation priorities but also role of SFD as the important financial mechanism to invest in realization of these priorities. The Mid-Term Vision encompasses many themes: empowering communities and promoting local development, expanding and enhancing economic activities, strengthening local and national institutions and partnerships; and improving access to water through water harvesting. Climate change under the Fourth Five-Year Developmental Plan ***(DPPR 2011-2015)*** was identified as one of the emerging issues which require adequate adaptation measures. The 4th DPPR has recognized the current situation of the water sector as unsustainable due to a number of challenges which includes climate change impact. The Plan acknowledges that present water scarcity could be aggravated by droughts and hotter weather and changes in rainfall patterns.

B. PROJECT OVERVIEW:

B.1. Describe the baseline project and the problem that it seeks to address:

Problem

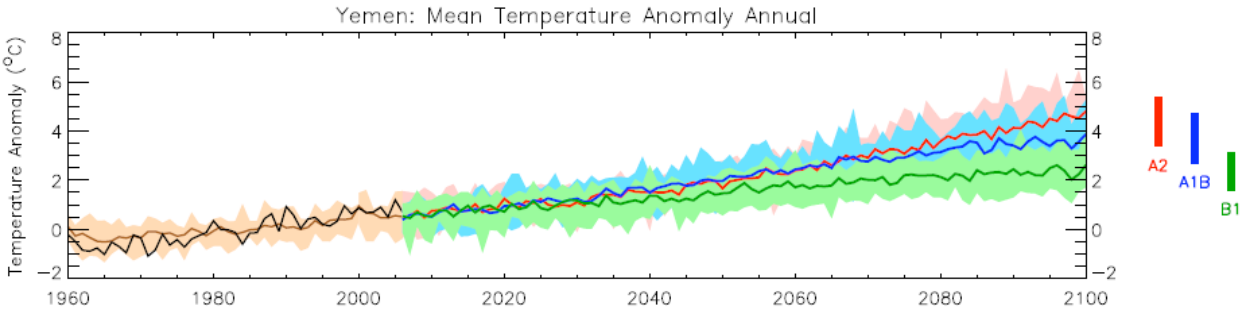
4. Yemen is one of the least developed countries in the world where profound poverty persist. The recent Poverty Assessment estimated about 40% of Yemenis to be below the poverty line in 2010/11 (based on the revised international poverty line that is defined as $1.25 a day, purchasing power parity (PPP)). As a Least Developed Country (LDC), Yemen is highly vulnerable to climate change-related impacts such as drought, extreme flooding, changes of rainfall patterns, increased storm frequency/severity and sea level rise. These are serious concerns as Yemen's economy largely depends on its natural resources. Moreover, more than 75% of the population is rural based, engaged in farming and pastoralism and hence highly reliant on favorable climatic conditions for their livelihoods. Historically, scarce water resources have become increasingly precious, as per capita availability is falling steadily with growing population and demand on food production. Yemen already faces extreme water scarcity. Per capita annual water resources of only 135m^3 will be further strained by more frequent occurrences of dry spells and droughts. The average individual consumption of water in rural areas is 40 liters a day, compared to 120 liters in the rural areas of other countries in the region. Currently only 48% of total population has secured access to water.

5. Yemen has a predominantly semi-arid to arid climate with rainy seasons during spring and summer. In low altitude zones high temperatures prevail throughout the year. Rainfed agriculture represents more than half of the total 1.2 milion hectares of cultivated area of Yemen. Agriculture, including livestock contributes 20% of Yemen's GDP, supports 53% of employment, and provides for almost all of domestic supply of staple food (wheat, sorghum, millet and animal production). In fact, according to the regional study, Yemen had the second highest percentage of population without access to safe water (after Comoros) – 33% - just over double the Arab average. Addressing poverty through improved agricultural production is among Yemen's development objectives, yet production is consistently low, due in part to the vulnerability of rain-fed agriculture to rainfall variability and prolonged drought. Water scarcity, rapid population growth and internal conflicts are some of the main factors causing an "alarming state of food insecurity" at national and local levels, a new report by the International Food Policy Research Institute (IFPRI) has warned. The study also revealed that at the household level, 32.1% (7.5 million) of the country's 23 million people do not have enough food to satisfy their needs. It puts Yemen among the 10 most food-insecure countries in the world that is largely linked with the limited availability of water to be further exacerbated by climate change.

6. In recent decades, rainfall patterns have shown increasing extremes in Yemen. Rainfall has decreased considerably leading to major agricultural losses, losses of animals and water shortages. On the other hand,

recurring flooding events were observed in 1996 and during the period 2005-2008. Under warmer climate, these features are likely to be further aggravated. Indeed, current vulnerability will exacerbate with increased aridity in future. Yemen's National Communication and NAPA processes established that temperature across the country is expected to rise by 2050 in the range of 1.7°C to 2.3°C in summer and in the range of 1.4°C to 2.5°C in winter and be accompanied by increasing rainfall variability and decrease in precipitation across the four seasons in the range of -9% to -25% throughout the year. As all scenarios of the First and Second National Communications suggest, Yemen will be getting warmer, most likely at a faster rate than the global average. Two IPCC scenarios on future precipitation trends indicate opposing projections: By 2100, changes from past mean values are predicted to range from -95.4% to +37.7%.

Figure 1: Changes in annual average temperature in Yemen to 2010



Source: UNDP Climate Change Country Profiles – Yemen.

7. Scientific assessments suggest there will be greater variability, with an increased frequency of intense rainfall events and therefore possibly an increased risk of floods. Thus, the common factors in the predictions are:

- Yemen will be getting warmer, most likely at a faster rate than the global average (by between 1and 4.5°C towards the end of century) and more arid;
- It is likely that there will be more variability of rainfall patterns within years;
- There will be an increased frequency of intense rainfall events and therefore an increased risk of floods.
- These changes in temperature and rainfall patterns are likely to worsen existing water scarcity conditions, loss of land productivity and desertification processes as well as frequency and intensity of drought and flood related disasters, which have been increasing over the past decade in all parts of the country. More violent and less predictable rainfall and a hotter and possibly drier climate would place Yemen's people and economy under further stress. Climate change could also badly affect 52% of Yemen's workforce working in the agricultural field. Considerable losses in grain production and husbandry have already been experienced in 2008/2009, when aggregate production was lower by 24% compared to 2007. This dramatic fall in food production was largely due to increasingly prolonged drought conditions, when most of the water sources in valleys producing grain dried up.

8. After these consecutive years of drought the Food Security Report of 2012 set out preliminary results from its comprehensive food security survey:

- 32% of the population is food insecure, i.e. suffering from acute hunger;
- 12% of the population suffers from severe food insecurity;
- One in 10 children under five is acutely malnourished;
- 25% of all women of child-bearing age are malnourished.

9. Yemen's water resources depend on rainfall, much of which is rapidly lost to evapotranspiration. About 6% of rainfall runs off as surface water and flows into stream beds, often as violent spate torrents. Occasionally, very large rainfall events occur outside of normal patterns and cause destructive floods (e.g. Hadramout and Al-Mahra floods of 2008, Sana'a, Ibb and Dhamar in 2010). Flash-flooding and droughts are frequent hazards. The floods of 2008, for example, claimed the lives of 180 people, displaced 10,000 and caused damage equivalent to 6% of Yemen's GDP. A serious drought occurred during 1962–70 and had lasting social and economic consequences. More recently a severe drought was reported to have caused displacement of thousands of residents in Al Mahwit Governorate, some 113 km northwest of the capital Sana'a, to abandon their mountainous villages and move to

cities.

10. Alluvial and rock aquifers have large reserves of groundwater, and are partly recharged annually. However, rapid increases in water abstraction and use have affected the water balance. The rate of groundwater overdraft is currently twice the recharge rate, and is increasing depleting water reserves. Yemen's aquifers are being mined at such a rate that groundwater levels have been falling by 2 to 8 meters annually. The country's capital Sana'a is expected to face serious water shortage problems in the coming decade. To-date, many wells have to be drilled to depths of 800 to 1200 meters. The exhaustion of most groundwater reserves, expected in another two to three decades, could lead to reductions in output of more that 40% by 2030. This will be a combined effect of population pressure and climate aridification. Climate change will clearly exert additional pressure on recharge rates through rainfall decline and lead to accelerated depletion. As such, modeling results predict groundwater reserves will be exhausted by about 2025-2030. Thereafter, groundwater extraction would be limited to recharge levels. The model studies also looked at what the likely outcome would be in 2050 if the climate became warmer and wetter in line with the range of predictions from global climate models. If that occurred, then groundwater availability would be about half the present extraction rates. If, on the other hand, the climate becomes hotter and drier then groundwater availability would be about a quarter of the current rates of extraction. Both scenarios indicate that irrigated agriculture would be significantly reduced as first priority for groundwater use would be for potable water supplies. Thus there is likely to be even greater reliance on rainfed agriculture.

Underlying causes

11. Clearly expected climate change represents a priority threat to Yemen's economy and food security, which are overwhelmingly dependant on rainfed agricultural production. Some of the critical underlying causes of current vulnerability relate to heavy reliance on agriculture, high population growth and poverty rates, with increasing inequalities. A combination of rural economic growth and demographic pressures is driving up demand for water, and especially those extracted from the groundwater reserves.

Development challenges: poverty, population growth, unemployment and inequality

12. Yemen experiences numerous development challenges which include high population growth rate and poverty, inadequate access to basic social services, limited infrastructure, high illiteracy rate, low per capita income, slow economic growth, and environmental degradation. There are also large gender disparities, with significant gaps in women's access to economic, social and political opportunities. The current population of Yemen is estimated about 23 million, while growing at an annual rate of about 3.02%. The high population growth rate remains one of the underlying cause for many of the challenges Yemen faces (Development Plan for Poverty Reduction - DPPR 2006-2010). In addition, poverty is among the largest challenges to Yemen's development. Poverty in Yemen is also more pronounced in rural areas. Although rural areas have 72.6% of the total population, it accounts for 84% of the poor. On the other hand, urban areas have 27% of the total population, but accounts for only 16% of the poor.

13. Yemen economically depends mostly on declining oil resources. In 2006, Yemen began an economic reform programme designed to boost non-oil sectors of the economy and foreign investment. The average growth rate for non-oil GDP reached 5.3%. Poor economic growth and continued imbalances characterized the structure of the GDP and reduced the potential for job creation. Hence, unemployment rose from 12% in 2000 to 16.8% in 2008 (among youth population group it reaches 53.9% in the same year). The oil sector's contribution to real GDP declined to 12.4% in 2008 compared to 17% in 2000 due to a 2.7% average decline in annual crude oil production (Yemen DPPR 2006-2010).

14. Yemen's economy consists mainly of different sectors namely: agriculture including livestock, industries including oil, and services. Over the last few decades the sectoral contribution to the GDP showed an unequal pattern. Most of the sectors showed low growth in GDP. However, one important feature in the structure of the Yemeni economy is the dominance of service industry, the contribution of which rose to 42.5% in 2004 from about 36.8% of the GDP in 1994. The livelihood opportunities offered by oil revenues has not been used to transform the structure of the economy such as manufacturing whose contribution to GDP remained unchanged since 1990, only

providing 5% of employment in the country thus losing the potential of creating substantial livelihood assets and institutions that could bring about significant socio-economic changes. Private industry has failed to take advantage of the opportunities offered by greater availability of foreign exchange due to an unfavorable investment climate, largely related to weak governance and absence of a culture of rule of law.

15. Although oil accounts for around 30% of GDP, and over 70% of Government revenue, it does not provide much employment. Agriculture, on the other hand, employs 54% of the population, and is the mainstay of 74% of the rural population, while only accounting for at best 15% of GDP. This largely explains the much higher incidence of rural poverty since oil investments have not significantly contributed to the improvement of rural livelihoods and economy (GoY 2010). Aagriculture productivity is constrained by numerous factors which include droughts, rain variability, declining underground water tables, and land degradation.

16. In rural areas, high levels of poverty often have led to environmental degradation. Households are living well below subsistence levels and use natural resources such as land, water, forests at rates that exceed sustainable limits for recovery or renewal. The poor have no other option than to adopt short-term survival strategies, which do not incorporate longer-term resource management considerations. As such, natural resources have been experiencing heavy pressures and rapid degradation. Yemen is highly vulnerable to impacts of climate change because of its fragile socio-economic development and inadequate adaptive capacity. The potential impact of climate change on the development in Yemen is expected to turn the current sustainability challenge further complicated. Poverty is expected to increase due to declining access to water and decreasing agriculture productivity, or even asset destruction.

Water scarcity, declining agriculture productivity and insecurity of rural livelihoods

17. Livelihood sustainability in terms of household food security is vulnerable to natural factors such as droughts, disease outbreak, and floods, which negatively influence the livelihoods of the poor households. Falling per capita incomes have aggravated further the food insecurity situation of the poor households. Inefficient and poorly integrated food markets coupled by geographical isolation are additional factors, which combine to further limit access to food for the poor. The majority of food insecure households are dependent on marginally productive lands, where agricultural production depends on highly variable rainfall. There are those without access to land resources (especially women) or with very smallholdings. Their food insecurity is significantly affected by the environmental context in which they live, which often does not allow for more lucrative production activities such as cash crops. Those who have access to irrigation (groundwater, spate[6], Wadi flood based[7]), or those living in high rainfall areas, are generally acknowledged as being better off. Land is a limited resource in Yemen and experience rapid deterioration due to drought and poor management. Also, land ownership and tenancy rights are problematic, as tenant farmers are often not permitted to make improvements to their farming plots, and have no incentives to make the best use of the land they have rented or been given rights to farm. In addition, illegal land takings have been reported in many parts of the country. Furthermore, accessibility to the already limited land resource for agriculture is expected to experience additional challenges due to increasing soil erosion, and rangeland degradation.

18. Food insecurity, long hours in search of water, fuel wood and fodder for livestock, inevitably result in

[6] Spate irrigation is an ancient form of water management unique to arid areas bordering highlands which involves the diversion of floods running off from mountainous catchments, using simple deflectors constructed from sand, stones and brushwood on the beds of normally dry Wadis.

[7] Wadi flood based irrigation refers to the plains where most of the mountain runoff flows into through seven major wadis, namely: Mawr, Surdud, Sihrun, Rima, Zabid Rasyan and Mawza, besides numerous minor wadis. Thus the greatest potential for agricultural development lies in the Tihama plane where most of the mountain runoff flows into.

women and girls being deprived of the opportunities for education, skills development and training, and taking advantage of development opportunities, including participation in income generating activities. Women are involved in nearly all livelihood activities, providing an estimated 60% of agricultural non-paid labour, but cultural traditions keep them at a lower status and prevent them from gaining control over important household livelihood resources. Women's productivity is further constrained by lack of education, high fertility, and poor health condition (WFP 2011).

19. The SNC's (2011) agricultural Vulnerability and Adaptation (V&A) study pointed out that the indicated decline in cereal production including wheat during the referenced years is plausibly attributed to unfavorable climate change-induced weather and rainfall fluctuations in which food security will be placed under significant threats, particularly on those whose livelihoods mainly occur across the rural rain-fed areas. Grain and fodder production accounts for 58% of agricultural land in Yemen, and is integral to the livelihoods of small scale farmers. The most important grain is sorghum, with the grain being used for human consumption, and the vegetative part of the plant used as either green or dry forage. Sorghum can be produced in rain fed areas, but has much higher productivity when irrigated. It is also the perfect plant for subsistence farmers, by providing food for household consumption and producing much larger amounts of fodder to support their livestock than other grains. Millet has a similar dual usage, with grain production for household consumption, and forage production. Wheat and barley are grown in upland areas, and are primarily for human consumption. They are generally rain-fed, and can produce two harvests a year depending on the micro-climate.

20. The vast majority of small rural rain-fed farmers and the rural poor have some husbandry, and many rely on livestock as a savings account, as animals are sold when money is needed. Households also consume livestock products, such as eggs and milk, which accounts for an important food source. Small scale pastoralism and livestock production also has an impact on the crops grown on a small holder's limited land, and fodder may be a significant part of what is produced, and competes with other crops that could be consumed directly or sold. Improvements in livestock production for small farmers, and pastoralists could play a significant role in the food security of rural households, through increased consumption of livestock products and increased income through sale of animals and dairy products. There are good opportunities to provide additional rural income if markets are developed for underutilized resources, such as skins and wool, and expanded production of by-products, such as cheese, all can contribute to improving incomes of farmers and rural dwellers. Nevertheless, such pastoralism and livestock-generated rural livelihood values are projected to decline under changing climate due to vulnerability to prolonged drought, and weather fluctuation resulting increased fodder base deterioration and ultimately pastoralism and livestock production decrease.

21. Although agriculture remains the most important productive sector, productivity remains poor, and water shortages are emerging. As a result, rural incomes are stagnating, and poverty and inequity are on the rise. Agriculture accounts for most of water consumption, about 90%, with the remainder being divided between the industrial and residential. Of Yemen's nearly 1.6 million hectares of cultivated land approximately 45% relies on rainfall while 55% is irrigated by groundwater (67%) or season water floods i.e. "spate irrigation" (23%). Up to now the sector and the rural economy remain surprisingly poor, when compared to other countries in the region. Much of this can be attributed to the mining of groundwater. The exhaustion of most groundwater reserves, expected in another two to three decades, could lead to reductions in output of more than 40% by 2030. Rainfall varies widely across the country, from less than 50 mm along the coast, rising with the topography to between 500 and 800 mm in the Western Highlands, and dropping again to below 50 mm in the desert interior. Most of rainfall water upon which Yemen's water resources depend is rapidly lost to evapotranspiration and about 6% as runs off. In light of limited water resources, the development of the agriculture sector depends mainly on developing rain-fed agriculture methods and improving irrigation efficiencies. Most land holdings depend on traditional and outdated agricultural methods, which lead to continuous low production and productivity. This situation reflects negatively on small farmers, low-income households and the poor, be they producers or consumers. High rates of population growth and relative poverty cause increased demand for food production and add pressure on water and land resources. Other challenges include inefficiencies in irrigation and water harvesting, poor maintenance and

rehabilitation of agricultural terraces and poor soil fertility. (MoPIC 2006).

22. Following the aforementioned understanding, and based on the fact that most of the rainfall water is rapidly lost to ET and runs off, it can be concluded that the loss of invaluable runoff due to non-harvested rainwater not only represents loss of natural capital but also carries enormous opportunity costs to a country like Yemen with severe water crises. In addition, this indicates not only loss of opportunities but also substantial scope of potential adaptations. Therefore, such insightful implications suggest that promoting rainwater harvesting can significantly contribute towards the efforts Government of Yemen towards bridging the gap of the annual water deficit and particularly offers effective adaptation under changing climate. Also, proper integrated adaptation measures with emphasis on rainwater harvesting will optimize the effectiveness of the IWRM interventions of NWSSIPP II particularly across the rural rain-fed areas to ensure sustainable livelihoods for the most vulnerable communities under changing climate in Yemen.

Long-term solution and barriers to achieving it

23. Rainfed farmers, pastoralist and poor households will have to find the most effective ways to adapt to growing water scarcity. In this regard, a revival and introduction of some of the traditional and innovative water harvesting techniques seem the most feasible adaptation strategy that has also been underlined by the National Adaptation Programme of Action (NAPA) of Yemen. Given the dwindling prospects for full groundwater irrigation, focus should be placed on sustainable systems. Water harvesting for dry land agriculture is a traditional water management technology to ease future water scarcity in many arid and semi-arid regions of the world. This old technology is gaining new popularity these days. It will also help ease the pressures over the fast depleting groundwater reserves and climate change induced pressures on water availability. It is well known that hydro-climatic deficiency sets the boundary conditions of potential yields. Adding extra water is one way to compensate for soil water deficiency and to reduce the risk for plant damage during dry spells. The source of such water may be water harvesting, defined as the collection of water for productive use. It is used as an umbrella term for a range of methods of collecting and conserving rainwater and runoff water. Therefore, given the ancient tradition of these methods in Yemen, rainfed agriculture with water harvesting (both rainfall and flood water harvesting) for spate and supplemental irrigation and artificial groundwater recharge seem to offer sustainable adaptation solutions in the face of climate change. Potential is there, as surface water is considered to be an important source in Yemen, estimated to be about 1,500 m^3/year, the considerable source that is currently underutilized as the capture and retention techniques haven't been promoted. The main identified barriers to establish this sustainable adaptation solution to climate change induced water shortages are the following:

- Given the uncertainties related rainfall scenarios for Yemen, there is a perception that investment in water harvesting infrastructure is not justifiable. This exact uncertainty about the rainfall amounts and distribution patterns demands more innovative and well calculated approaches to rainwater harvesting to secure water supply to predominantly rainfed agriculture. However, technical skills and methods are missing at the key responsible institutions to support the development of the sector and introduce appropriate techniques and technologies to maximize the potential of the resource.
- Traditional water harvesting systems currently cannot compete with pump irrigation and have declined. Traditionally, Yemenis had many ingenious water harvesting techniques to husband their scant water, and these all had equally well-developed institutional systems to ensure their working. Water harvesting systems are declining as they face competition from pump irrigation. Main perceived advantage is the stability of access. More erratic rainfall may seem to undermine stable access to water through rain or flood water harvesting.
- There is limited knowledge of innovative low cost improvements of water harvesting options that can be introduced to improve water capture and availability that would boost development of sustainable water harvesting practices
- There are no policy or financial incentives in place to make water harvesting methods attractive and profitable and counterbalance current preference for groundwater abstraction. National institutions are weak and cannot enforce their water reform policies that are to restrict overexploitation of groundwater reserves and ensure social equity in water access; Local associations and community groups are equally underdeveloped and do not play strong role in water rights and distribution decisions;

24. The proposed project seeks to reintroduce traditional water harvesting techniques for rainfed farmers, pastoralists and vulnerable households and promote artificial groundwater recharge through subsurface dams and other artificial recharge structures. The project will strengthen local capacities to revive and augment this important traditional technology and set community employment and management schemes to stimulate the development of the WH sector. Water User Associations and extension services will be strengthened in terms of their technical skills and capacities to support effective water capture and retention designs as well as in terms of promoting more decentralized water use and distribution decisions, including traditional modes of water right regulations and greater stewardship over this scarce resource. Local NGOs/CBOs, water users groups would be involved in popularizing the rainwater harvesting and artificial recharge methods. Awareness programme will be taken up as a precursor to revive the rainwater harvesting methods and to engage local farmers and pastoralists (main water users) in construction and maintenance activities. Incentives through micro-finance (concessional community micro-loans) and Social Development Fund (community grants and employment programme) will be designed to promote this traditional adaptation technology much needed to revive given the mounting pressures of climate change over the dwindling water resources. This will be done by feeding in the rainfall and runoff formation data and modeling outputs into the very site specific decisions about the type, location and scale of the potential water harvesting infrastructure. Required design and engineering skills will be developed; policy support and funding mechanisms will be secured through the Social Development Fund of Yemen and other means to bring the harvested water into the mainstay of the water sector of the country and secure improved access to water under the threats of climate change impacts and associated uncertainties.

Baseline Project(s) that the project will build on

25. There are several Government, UNDP and other development partner supported projects that form the baseline for the proposed LDCF project. These initiatives include ongoing measures to improve water management systems with particular focus on irrigation infrastructure and water use. The underlying policy for these investments is the National Water Sector Strategy and Investment Programme (NWSSIP) that has been updated to cover the period of 2008-2015. An overall goal of the strategy is "to improve the Yemeni population's sustainable and economically efficient use of the nation's secure water resources". Various donors (governments of Germany, Netherlands and WB) are contributing to the implementation of various components of the NWSSIP. The Total pledges available under WSSP is about $ 340 million which has been jointly co-financed by the World Bank ($ 90 million), Netherland ($ 64 million), and the government of Germany ($ 154 million), and the government of Yemen ($ 32 million). However, the financing gap is estimated to be 49% of the total programme cost. The Water Sector Support Programme (WSSP) under the NWSSIP is to improve access to reliable water supply and sanitation in rural and urban areas as well as develop institutional capacity in water resources management. The government of Yemen invests over $4 million to address the needs of Integrated Water Resource Management under this programme. UNDP also supports this framework with additional US$ 3,400,000 to develop and initiate the implementation of two water basin management plans covering three water basins of Hadhramout, Tuban-Abyan and Taiz. These are intended as comprehensive sub-basin level management plans for all sectorial and community water users. As part of the planning process, the project has initiated a large scale National Water Awareness Programme. Dedicated school water clubs were established to drive the campaign through community workshops in water conservation and management. In fact, these clubs are established following the guidance of the water sector strategy. These clubs mostly exist in most of the schools across the governorates that experience acute water scarcity and at the same time host a NWRA branch. UNDP's Integrated Water Resource Management project has already established 11 such clubs in Sana'a governorate and others. These clubs will be essential to continue with training and awareness raising programmes about the climate change risk management options and the role of water harvesting to effectively ease the current and future water shortages. In addition, UNDP also supports piloting the community-based water use in order to enhance water resource stewardship in rural areas. The US$ 2,000,000 project already supported about 5,000 people in 17 small settlements in Ressib, Hadhramout who as a result gained access to piped water and appropriate sanitation. This support continues through 2015 as to follow the NWSSIP framework.

25. The National Irrigation Programme (NIP) has also been established to support the implementation of

agricultural water consumption and management under NWSSIP. The programme is cost shared jointly by the government of Yemen, the governments of Netherlands, Germany, and International Development Association. The total amount committed is US$ 68,000 million over the period from 2010-2015. The programme is currently financed with amount of about $ 10.6 million on an annual basis. Over 3,000 ha will be covered to rehabilitate irrigation network, install conveyance pipes and water meters. The NIP is also a supporting the General Authority of Rural Water Supply to improve capacities for sustainable water management in rural areas in Yemen.

26. Social Development Fund has earmarked over $30 million for water management projects, including water harvesting. It is a fund of a long track record of a well functioning institution in Yemen. Through the efforts of LDCF project directed towards institutional capacity development, including engineering skill building, SDF will be able to support an upscale of water harvesting infrastructure in the country to the extent demanded in response to climate change related water stress. LDCF project will provide an additional support to SDF programmes and engage directly with the water sector grant programmes and concessional micro loan schemes in order to improve methods and techniques for water harvesting sector development. These stable funding mechanisms as directed to invest in water harvesting will help depart from the current practice of ad-hoc, sporadic and small scale pilots towards integrated water harvesting sector development that is linked with irrigation systems in a way that it can provide supplementary irrigation resource, facilitate ground water recharge and maximise water mobilisation options for the targeted rural population threatened by climate change induced water shortages.

27. Although, these programmes (NWSSIP, NIP SDF programmes) create critical baseline conditions for the good water governance in general and more concretely, are geared towards the improvement of rural water supply and irrigation infrastructure, they do not adequately consider climate change impacts that will inevitably demand additional water mobilisation both for rural supply and irrigation (e.g. supplementary irrigation). The aims of these baseline programmes will be undermined without due consideration of climate change risks and long term projections for Yemen that indicate, as noted above, accelerated water shortages (by reduced groundwater recharge rates and decline in irrigation options). This scenario clearly demands opening up additional water mobilisations options both for supplementary irrigation and groundwater recharge. The proposed LDCF project will build on this baseline to secure additional water resources (rainfall and seasonal floods from wadis) complement by integrated water harvesting infrastructure for supplementary irrigation and groundwater recharge in the remote and the most affected areas.

28. These government and donor supported initiatives constitute important baseline for the LDCF project to build on and integrate harvested water into irrigation, ground water management and rural and urban water supply plans and technological options.

B. 2. incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

29. Consistent with priority adaptation strategies identified by the Yemen NAPA, the project requests LDCF 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 (Component 1) and direct investment in such water harvesting technologies that facilitate ground water recharge and secure supplement irrigation through harvested water, including flood water (Component 2), within the context of rendering local planning and investment processes promoting integrated water harvesting and thus ensuring long term climate resilience of rainfed agricultural production systems that will inevitably dominate as a result of climate change (Component 3).

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

30. ***Baseline:*** Irrigation network does not cover entire cultivated land in Yemen. Over 50% of the arable land remains rain-fed. A large portion of the cultivated area relies on spate irrigation and a base flow, which is highly unreliable with increasing climate variability. Moreover, the complex topography makes it challenging to fully rely

on spate irrigation. The country's topographic structure affects and modifies the climate on a sub-regional basis, especially rainfall distribution and influences the availability of water for agriculture. The country is characterized by rugged terrain of igneous and metaporphic rock. Some areas receive rainfall in excess of 500 mm/year. The hydrographic system of Yemen consists of rain-fed watercourses (Wadis) occasionally flooding but usually dry, draining from the main watershed along the three major escarpments. In the rugged slopes of the Western escarpment seven major wadis run towards the Red Sea, which they sometimes reach during periods of heavy rain. In the southern slopes, the Wadis of Tuban and Bana run, through a similar but less precipitous course, to the Gulf of Aden. As a result, most irrigation systems rely on underground waters. 32% of cultivated land is under well irrigation. The inefficiencies in well irrigation are also contributing to the resource depletion. A conventional gravity-fed small scale irrigation system is typically 35-45% efficient. Depending on the layout of the fields and the types of crops, about 15% of water is lost whilst being conveyed to the fields and another 20% is lost in application in the field. Removing these losses through piped conveyance and drip, bubble and sprinkle irrigation can bring an irrigation system up to 70-80% efficiency. The government has taken some steps to reverse water depletion, reduce the losses and stimulate efficient water use. For example, diesel prices have been raised to impact the affordability of well pump operations and reduce groundwater over extraction; investments in irrigation technological improvements have also been made as well as decentralized approaches to water resource management promoted. In 2004, the Ministry of Water and Environment (MoWE) prepared the National Water Sector Strategy and Investment Programme (NWSSIP I) for 2005-2009, as a strategy and action plan that includes the priority investment programme for the water sector. After the progress review this plan was updated to cover 2008-2015 investment period and is now under the implementation. It provides a sound basis for promoting water harvesting, but largely focuses on irrigation related technological investments, improvements in groundwater management and access to safe drinking water to the Yemeni population, 53% of which cannot access safe drinking water in rural areas and 43% - in urban areas. $ 340 million has been made available for investing in urban water, rural water, IWRM, and irrigation under the NWSSIP priorities. Moreover, as noted under the baseline section above, there are number of programmes underway to aim to improve irrigation systems, minimize the losses and improve water efficiency. The most important ones that the project will directly collaborate are the Water Sector Support Programme (WSSP) that is designed to improve. It is run under the NWSSIP II phase investment programme and has significant leveraging potential. It also includes the National Irrigation Programme (NIP) that is established to support the implementation of agricultural water consumption and management within the overall NWSSIP II framework. The programme is currently financed with amount of about $ 10.6 million on a yearly basis. The NIP is also a supporting the General Authority of Rural Water Supply Projects to better manage activities with regards to securing affordable, and sustainable water supplies for rural areas in Yemen. There are two main programmes under NIP which includes surface water, and ground water. Under ground water there are two sub-components which include modernization of irrigation techniques, and irrigation advisory services.

31. However, given the anticipated climate change impacts the country should take additional efforts for the mobilization of water resources through the effective water harvesting methods to be integrated into an overall surface water mobilization and rural supply system. As already noted, rainwater or flood water harvesting in Yemen is a traditional practice, and in many areas cisterns are used to conserve rain water (cisterns of Tawaila). As climate change leads to more extreme variations, water harvesting solutions must cope with both extreme rainfall and extreme droughts. Extreme rainfall requires good flood protection and diversion structures, while extreme drought requires large storage capacity, with an emphasis on groundwater replenishment. In some cases, droughts last so long that alternative water sources are required, which means that water rationalization schemes must be developed in advance for making water harvesting much more a stable practice. Currently sporadic efforts, mainly driven by NGOs and CBOs to recover this invaluable tradition, generate limited impacts. The reasons are being the localized, scattered efforts without national level policy vision or comprehensive planning for WH development that need to be based on long term water availability projections, cost-benefit calculations and inclusion of harvested water into the national water balance.

32. ***Additionality:*** Rainwater harvesting is essential because groundwater is inadequate to meet the demand of growing population under the conditions of climate aridification. Therefore, more combined options of water access, mainly surface water that would rely on groundwater only as a supplement source should be adopted. The projections to signal long term surface water availability, based on rainfall-runoff models are necessary to underpin

national policies and plans for water harvesting. Environmental Protection Agency and National Water Resources Authority will be assisted to improve climate risk information with regards to water availability. The project will therefore undertake the field-based, comprehensive studies to establish the cost-benefit ratios for each individual water harvesting technologies both in an immediate and long term with the view of climate change impacts on rainfall patterns and run-off formation. This will enable the government to develop WH as an important sector and bring it in the mainstay of the national water budget. Through the field-based studies the introduced water harvesting techniques will be designed to enhance the groundwater recharge and do not deteriorate the upper catchment areas and provide for long term sustainable solution. 6 governorates Ibb, Taiz, Sana'a, Dhamar, Al Mahweet and Al Mukalla will be targeted. These choices are mainly determined by balanced representation of all climatic zones in Yemen – hyper-arid, arid, semi-arid and sub-humid as well as various socio-economic circumstances. In terms of water stress it is comparably acute everywhere in the country. As the appropriate choice of water harvesting technique depends on the amount of rainfall and its distribution, land topography, soil type, soil depth as well as local socio-economic factors, these systems tend to be very site specific. The knowledge of rainfall characteristics (*intensity and distribution*) for a given area is one of the pre-requisites for designing a water harvesting system and precisely build-up of such knowledge by introducing tools and methods, such as rainfall-runoff models expressed through GIS mapping will improve water distribution and management planning as well as a selection of a right combination of WH technologies across all climatic zone. This is in contrast to current sporadic and ad-hoc initiatives of water harvesting that may not hold viable and effective in the face of changing climatic conditions and hence likely to discredit this important technology as one of the means to addressing current and anticipated water shortages. The availability of rainfall data series in space and time and rainfall distribution is important for rainfall-runoff process and also for determination of available soil moisture. A threshold rainfall events (*e.g. of 5 mm/event*) is used in many rainfall-runoff models as a start value for runoff to occur. The intensity of rainfall is a good indicator of which rainfall is likely to produce runoff. Useful rainfall factors for the design of a rain- or floodwater harvesting system include: (1) Number of days in which the rain exceeds the threshold rainfall of the catchment, on a weekly or monthly basis. (2) Probability and occurrence (in years) for the mean monthly rainfall. (3) Probability and reoccurrence for the minimum and maximum monthly rainfall. (4) Frequency distribution of storms of different specific intensities. The water harvesting methods applied strongly depend on local conditions. Therefore, the approach will have great demonstration effect with further scale-up potential for the most cost-effective water harvesting technologies under the specific agro-climatic and socio-economic conditions. The model outputs will inform all water use and management decisions, including irrigation, groundwater management and recharge decisions and water harvesting infrastructure development. Based on the model outputs and methods of assessments outlined above comprehensive, long term water harvesting development plans will be formulated for all 6 targeted governorates that will facilitate full appropriation of water harvesting to local needs and specific circumstances. These plans will become part of the national water sector strategy and national water law that will provide enforcement mechanisms (institutional roles and responsibilities and regulatory framework). Embedding these plans into the national policy and related regulatory framework will grant a full integration of the water harvesting into the national water budget.

Component 2: On the ground measures for the introduction of water harvesting and rehabilitation of traditional water harvesting structures

33. ***Baseline:*** Currently, number of studies and guidelines for water harvesting has been developed. The current government water policy focuses on securing groundwater resources for irrigation. Although, the government recognizes that depending on groundwater has almost resulted in steady depletion of this very scared resource and efforts should be made to diversify the additional water sources. In this context water harvesting comes as an important priority. Several important initiatives are underway to promote rainwater harvesting that used to be a major source of water in the past. However, the scale of these initiatives is inadequate and often overlooks necessary skill development needs to deal with diverse techniques and technological options of the sector. Moreover, not only that these initiatives are characterized by being small-scale and scattered, offered technological designs do not fully account for a full potential of this resource or a range of various climate change scenarios of rainwater amounts or distribution patterns and associated uncertainties. In addition, the pilot interventions were mainly implemented at the community levels and resulted practices usual lack proper documentation for knowledge sharing for future up scaling efforts. Despite the current gaps and flaws in support of water harvesting technologies

and a full integration of this critical additional source into the national water budget, there are number of pilot programmes that the proposed LDCF project will build on. For example, Coca Cola company under the UNDP RBAS- Water Governance Project funds a rainwater harvesting and grey water reuse from the mosques across two governorates, including Taiz and Syieun. The total cost of this project is about $ 46,000 and aims to showcase rainwater harvesting and gry-water reuse across three pilot areas in Yemen. It has implemented three small-scale pilot projects and works closely with National Water Authority and local communities. Additionally, CIDA funds a pilot rainwater harvesting project in Taiz and intends to support education and research in this area at faculty of Science at the Taiz University. The total cost of the project is about $ 9,000. In addition, The Social Fund for Development (SFD) committed about $8 million in the current programme cycle to support water sector ($7million), and rainwater harvesting in the country ($1million). The SFD provides communities with water for domestic use, and works in the following subsectors which includes: Rooftop rainwater harvesting; Public rainwater harvesting – closed cisterns; Public rainwater harvesting – open; cisterns; Surface water (springs, and reservoirs); and Ground water (Shallow and deep wells). SFD provides cement, steel reinforcement, pipes and inspection covers while the community provides all the remaining materials as well as labor. Such small scale interventions are numerous and scattered across the country but fail to constitute a critical mass necessary for a full fledge development of this sector. The current support as noted does not account for technique / technological requirements (including methods, combined approaches, engineering parameters etc) that are dictated by long term impacts of climate change on rainfall amounts and distribution patterns as well as associated uncertainties.

34. ***Additionality:*** Project is set up to closely coordinate with the water progrmmes and investments under the NWSSIP, NIP and SDF portfolio and introduces the most effective water harvesting technologies and methods that will provide supplementary water, including supplementary irrigation and facilitate groundwater recharge. There are several traditional methods for rainwater harvesting which exist in Yemen that the project will consider to revive and help to scale up their use.

- Al- kervan: natural or manmade depuration in clay loam soil for rainwater harvesting;
- Cartesian: underground tanks for rain water harvesting;
- Albearak Alasadiah: a water pond built from stone masonry and clay for rainwater harvesting
- Karif: cistern in mountainous areas;
- Aljeroof: a digging tanks between two boulders and built from two sides only;
- Rock pound (Al moujil): open rainwater harvesting tanks dig in rock areas;
- Alseegayat: a stone masonry water harvesting systems mainly built closer to the houses and receiving the roof water;
- Village Tank. A water harvesting system used to be within or outside the village and serving the whole community for drinking, livestock and household uses. These systems are very well known in the mountainous areas;
- Farm Ponds; small storage structures used for collecting and storing runoff water.

35. Based on assessments and costing under the component 1, resources under this component will be used to construct and promote roof catchments, ground catchments, rock catchments, earth bunds, sub-surface bunds, and check and sand dams, terraces and contour ridges. Some are mainly used for irrigation, whereas the others can be used for domestic supply and small scale irrigation as well. As project favours traditional water harvesting techniques it will closely consider local circumstances, such as local agricultural practices, terrain and local climatic conditions, trends and long term climate change impacts. The project will engage local population both in design and implementation of the structures and use locally manufactured materials. For example, Khadad, locally produced material is used to cement the cisterns which proved to be of high quality and can withstand all environmental changes such as heavy rains and high temperatures and can last longer periods. More innovative water harvesting techniques such as fog harvesting will also be tested and scaled up. This technique that is typical in Latin America is not entirely alien to Yemen. One form of fog harvesting has been successfully piloted for domestic supply in Hajjah governorate. This technique can prove very successful in the coastal areas of the country where the fog formation is the greatest. Some of the highland, mountainous regions can offer another opportunity for fog harvesting. Initial studies for Sadda have already been conducted. The traditional Yemeni terrace system that allows the retention of enough water in the soil profile to grow a rainfed crop in low rainfall areas will be promoted. This practice also reduces erosion due to unchecked runoff on steeper slopes and improves recharge. Under climate

change, these functions could take on increasing importance. The innovative approach of the project also lies in its integrated approach that essentially means that water harvesting, selected appropriate measures and technologies, will contribute to groundwater recharge and provide for supplementary irrigation and household water resource. The most appropriate techniques and technologies will be selected not only from the range of rainwater harvesting options traditional to Yemen only, but the wider array will be carefully studies and explored from the broader Arab region and continent of Africa. Effectiveness, cost, labour intensity, suitability and cultural acceptance will be used as main elements of selection criteria (see Annex 1 for the list of technological options in Africa). The local communities of farmers and pastoralists will be trained to acquire essential skills in construction and maintenance of selected, most cost-effective water harvesting techniques. This is necessary to ensure availability of skilled cadre for the long term development of these technologies as part of the water management sector. Through the Social Development Fund, set up by the presidential decree to lead on poverty reduction policies in Yemen, the project will organize the targeted training for water specialists that will help design and guide local communities in deploying water harvesting technologies. SFD has a special engineering unit that will be fully engaged in design and implementation as well as quality control and monitoring of this infrastructure. SFD engineers will deliver necessary skill development training for the local population in the target 6 governorates as construction and maintenance works require. School water clubs established under the NWSSIP will be fully utilized for awareness raising campaign that will precede all construction works and will continue throughout the project implementation. Extension services will also be supported and enabled to provide necessary guidance to the local farmers and population at large about the operations, use and maintenance of the rainwater harvesting structures and techniques. At least 6 extension offices will be supported to ensure that necessary services are available to the target population in the 6 governorates.

Component 3: Decentralised and community - lead water management systems developed to manage uncertainties of climate change impacts on water availability

36. ***Baseline:*** Although some initiatives to reintroduce water harvesting techniques are ongoing, these efforts have been largely sporadic and have failed to develop water harvesting sector at more sustainable scale, as they overlook the necessities for financial incentives or other stimulus to make water harvesting more attractive and competitive. As a result, water harvesting systems are declining as they face competition from pump irrigation and reduced profitability. Indeed, targeted incentives and stimulus measures to support the development of water harvesting haven't been designed and introduced to attract the main water users to this viable adaptation technology. Up until now water harvesting has been supported through the humanitarian aid and grant programmes without strengthening requisite services or introduction of financial and employment incentives. Social Fund for Development of Yemen (SDF) offers a unique potential to make a breakthrough in current approaches to water harvesting and help scale up isolated efforts and make the harvested water integral part of the water sector. The SDF has been functional since 1997 and has run its investment programmes in four phases so far. Currently, SDF is in its fourth phase of operation that covers 2011-2015 programme cycle. In each phase the SDF disburses around $90-170million and up until now it has supported 3,888 projects and invested $343.5million in various priority development initiatives. In the current 5 year programme cycle, education represents the largest share of the SDF's total investment commitment (54%), followed by water projects (11%), health projects (7.6%) and investment in road infrastructure (7.5%). The SDF has directly benefited an estimated 7.1million people, around half of which are women. Structurally, SDF has three main governing and decision-making levels: the Board of Directors, the Head Office and the Branch Offices. The Board of Directors is chaired by the Prime Minister, who approves the main policy directions of the SFD, Annual Work Plan and reviews the progress made by SFD on a regular basis. The Head Office is in charge of overall operations. It carries out its duties through Procedural Policy Committee (PPC), Projects Approval Committee (PAC), supporting and technical units and Labour Intensive Works Programme (LIWP). The technical units include Education, Water and Environment, Health and Social Protection, the Training and Organisational Support, the Small and Micro Enterprise Development, the Agriculture and Rural Development and Cultural Heritage. Amongst the different support units, there are the Programming, Monitoring and Evaluation, Finance and Administrative, Research and Development and other. At the regional level SDF is represented by its nine Branch Offices, each covering one or more governorates and responsible for the preparation, implementation and monitoring of SFD activities in that governorate(s). The SFD is also equipped with a pool of engineers and experts. The SDF's Engineering Unit carries technical and engineering review and studies, submits technical

designs and ensures quality control; including conducting the monitoring visits to the project sites to follow up on the quality of implementation. The SFD also has a Financial Unit to manage the fund's financial assets and transactions. The SFD employs participatory approach to planning and implementation of community-based development projects and works with the private sector (SMEs) which fit very well under the project's methodology of developing the local capacities for water harvesting sector, associated engineering skills, policy and financial incentives for building up community resilience to the climate change induced water stress. SFD has proven experience in targeting the poor and the most vulnerable. As such, according to the poverty assessment report (2010) about 70% of the SFD resources have gone to the poorest three deciles. The institutional and funding profile of SFD is well suited for the upscale efforts of water harvesting and securing the investment finance for the full-fledged development of this sector so critical for improving the national water budget in Yemen in the face of climate change.

37. ***Additionality:*** The project will work closely with the Social Fund for Development of Yemen (SDF). More specifically, it will work with SDF's micro loan and grant programmes to establish sustainable financial mechanisms to support and upscale well-tested water harvesting infrastructure. Its major function is to proactively contribute in implementing the government's economic and social plans by means of increasing access for individuals, households, micro-enterprises, communities, the poor and low-income groups to employment, production and social services. The SFD aims at providing with development opportunities to the poor in delivering basic economic and social services. One of the key priorities of the SFD is to support water harvesting as part of its effort in poverty reduction. The Social Development Fund will be assisted to design a set of incentives to attract communities and private investment into the sector. A combination of grants or job guarantee cash transfers will be offered for revival of cost effective water harvesting technologies. More specifically, the above WH measures will be implemented by using local work force and help to turn the water harvesting sector into the local employment opportunity. The existing Labour Intensive Works Programme under the Social Development Fund will be used to create additional job opportunities in water harvesting sector. The seasonal employment on public works for cash transfers or direct benefits of partaking in management and accessing harvested waters can provide important stimulus for many disadvantaged farmers to participate in water harvesting schemes. A job guarantee / "cash for work" scheme for certain number of days of public works with the minimum fixed wage through Social Development Fund and / or other mechanisms will engage at least 20,000 community members, including women. Such public works will mobilize communities to implement priority adaptation measures, such as building and maintenance of water harvesting infrastructure. This approach will help improve the water harvesting services and attract communities back to this traditional sector that offers greater climate change resilience compared to overreliance on dwindling groundwater reserves. Microfinance schemes for farmers will include concessional payback conditions for the farmers and pastoralist that are using rainfall or flood harvested waters for their agricultural productions. A microloan product will be developed through SDF and associated micro-finance institutions to encourage community-based water harvesting enterprises.

38. In order to improve water delivery services, the project will establish seasonal water rationing regimes that will be enforced through the Water User Associations in order to grant uninterrupted and more stable supply system that will improve the conditions to compete with pumped groundwater-based irrigation. This will be done by carefully following traditional practices of water rights distribution. AL-Moqadems in communities where they function will be engaged. This is a traditional function of water rights distribution in Yemen. A person acting as Al-Moqadem is a locally recognized expert who knows the area and the land owners and is entrusted to negotiate seasonal as well as upstream and downstream water distribution rights amongst the community members. LDCF resources will also be used to strengthen local institutions, such as water user associations and relevant NGOs/CBOs to improve quality of water service delivery through water harvesting techniques. Extension services will help communities construct and effectively maintain these structures. The project will also raise the awareness of local communities on multiple benefits of the water harvesting sector in the face of increasing aridity, resultant from climate change.

B.3. 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) or adaptation benefits (LDCF/SCCF). As a background information, read Mainstreaming Gender at the GEF.":

39. Around 20,000 people will benefit from the improved water harvesting schemes, including the associated cash for work and other incentive measures. Fetching water is still a frequent obligation for most households in Yemen. 88% of persons collecting water are women and 13% are children 15 years old or less. Therefore, additional social benefit relates to the fact that improving household water supply might release girls and women from the burden of daily water fetching duty and enhance their social and livelihood conditions.

40. The project will yield significant economic, social and environmental benefits in as much as it promotes the best use of available water resources in the country. Rainwater and Floodwater Harvesting have the potential to increase the productivity of arable and grazing land by increasing the yields and by reducing the risk of crop failure. Rainwater and floodwater harvesting can contribute to the fight against desertification. Water harvesting also increases groundwater recharge. It restores the productivity of land, which suffers from inadequate rainfall by increasing yields from rain fed farming and runoff water collection and minimizes the food insecurity risks in drought prone areas. Water harvesting is considered an alternative source for irrigation, which reduces the dependency on groundwater. The project encourages the application of traditional techniques with possibilities for further improvements, as would be required by current and future conditions consequential from climate change impacts on water availability. Enhanced community participation in development and management of the WH sector will be supported. Equal opportunities for women and other disadvantaged farmers will be fully considered in forming and strengthening local maintenance and management groups for water harvesting technologies and water use and distribution systems, including water rationing decisions. The project targets the priority areas identified by the NAPA, specifically in relation to water harvesting. These are Ibb, Taiz, Sana'a, Dhamar, Al Mahweet and Al Mukalla regions. Over 4 million people residing in the 8 target governorates will benefit from the project results.

B.4 Indicate risks, including climate change risks that might prevent the project objectives from being achieved, and if possible, propose measures that address these risks to be further developed during the project design:

Risk	Level	Mitigation
Local communities are skeptical about reliability of the water harvesting to satisfy their water needs and are not willing to commit their workforce in the proposed adaptation measure	Law	Engagement and participation of local communities is the main strategic element of the project. Meetings with local stakeholders to explain project activities and enlist support. Employment scheme will grant for stronger incentives and commitments for the communities to participate. Focused awareness activities will be developed and implemented.
Reluctance of local institutions to change the status-quo and promote WH sector that should help lift the pressures on the groundwater use	Medium	Continuous stakeholder consultation and engagement will be employed by the project. Project will strengthen local community groups and associations and empower them to arrange for water rationing and distribution rules from the community managed WH infrastructure
Political unrest resulting in considerable delays and postponement of project implementation.	Medium	The current political situation in Yemen is stable, especially after the coalition government came in power. The project team with support of the Country Office will implement a continuous monitoring of the security situation in the country and update the project board on regular basis so that there is sufficient lead time for adequate response actions and adjustment in project strategy.

B.5. Identify key stakeholders involved in the project including the private sector, civil society organizations, local and indigenous communities, and their respective roles, as applicable:

41. The project has emerged as a result of consultations with the key institutions, such as the Ministry of Agriculture and Irrigation (MoAI), Ministry of Water and Environment (MoWE), Environment Protection Authority (EPA), National Water Resource Authority (NWRA), Social Fund for Development (SFD).

42. The Ministry of Water and Environment will assume responsibility for the project implementation, and the timely and verifiable attainment of project objectives and outcomes. Ministry of Agriculture and Irrigation will be responsible for the successful delivery of the components of 2 and 3 specifically. MWE will provide support to the project management unit, and inputs for, the implementation of all project activities. The MWE will nominate a high level official who will serve as the National Project Director (NPD) for the project implementation. The NPD will chair the Project Board / Project Steering Committee (PSC), and be responsible for providing government oversight and guidance to the project implementation The NPD will not be paid from the project funds, but will represent a Government in kind contribution to the Project. The project will be nationally executed by the Ministry of Water and Environment and specifically it's Environment Protection Authority in cooperation with the Ministry of Agriculture and Irrigation and its National Water Resource Authority (mainly under the components 2 and 3). National Execution enables the project to exercise greater national ownership. UNDP will provide technical backstopping, quality assurance and compliance with fiduciary standards in its capacity of MIE. For the site specific measures that take almost 80% of the project's total budget, the project will employ local coordinators / project focal points that will be responsible for the community mobilization and project delivery on-site as well s day to day oversight of the project implementation on the ground.

43. Further consultations will be conducted with the line agencies as well as local councils, communities and related institutions and more detailed stakeholder; and analysis will be conducted during the project preparation phase. In addition, coordination with donors and relevant interventions will be carried our during the project development to makes sure the complementarities and potential synergies are captured at full. The following outlines key stakeholder that have been consulted during the PIF formulation.

STAKEHOLDER	RELEVANT ROLES
Ministry of Water and Environment (MoWE)	The MoWE has been established to assume the responsibility of consolidating all water and environment related functions and institutions under one ministry. The MoWE is a key stakeholders and will assume responsibility for the project implementation, and the timely and verifiable attainment of project objectives and outcomes when it comes to the water and environmental matters through its specialized institutions which includes NWRA, and EPA
Environmental Protection Authority (EPA)	The EPA is an administrative body of the MoWE, which is responsible for protection of the environment according to the environmental law. Management and conservation in Yemen. In addition, EPA is UNFCCC focal point in Yemen, and the lead for the management of adaptation to climate change. The EPA will be one of the key agencies for the proposed LDCF project. They were the implementing agency of NAPA and have a mandate to coordinate matters related to climate change. The PPCR project is housed within the EPA and therefore they will provide key inputs to the proposed project. They will also be playing a critical role in providing technical inputs to ensure compliance of the project with the environmental policy safeguards

National Water Resources Authority (NWRA)	The NWRA is an administrative body of the MoWE to manage the water resources of the country on sustainable basis. NWRA is the responsible agency for the proposed project because of its core mandate of coordinating, and manage the overall implementation of national water sector strategy and investment programme (NWSSIP). NWRA has also experience in establishing water basin management plans, and it would therefore provide technical inputs, lessons learnt to the design, and management of the proposed project. In addition, it will also work closely with water user associations, and communities to ensure that the proposed project enhance the ongoing endeavors to ensure sustainable and use of water resources in the country under the framework of LDCF project.
Ministry of Agriculture and Irrigation (MoAI)	MoAI is mandated to implement the National Agriculture Sector Strategy which intended to work with existing strategies in the areas of water, food security and climate change. As agriculture is the major water user in the country, and agriculture productivity and food security will be severely impacted under climate change, MoAI will therefore be a key partner in playing a role in providing substantial technical support in enhancing productivity of irrigated agriculture through promotion of improved irrigation technologies, integrated water-saving approaches to spate and on-farm water management, promoting the production of rain-fed and drought tolerant crops, and provide support to research to develop new varieties of drought resistant crops or alternative crops, and knowledge transfer on agricultural water use efficiency and conservation under the proposed project.
Social Fund for Development (SFD)	The SFD is mandated to contribute towards implementing the country development plans, alleviation of poverty, assisting the vulnerable groups to access services. Furthermore, the SFD works on several strategic and thematic priorities which include: Water, agriculture; Poverty alleviation; Social protection, capacity building. The aforementioned thematic areas are evidently very-well positioned within the context of the proposed project. For instance, climate change impacts include posing further burdens on water accessibility for domestic and economic uses. Agriculture productivity is affected by climate change impact either through greater water stress or longer warm seasons. Therefore, the SFD will provide key lessons to the proposed project. They will also be playing a critical role in providing technical inputs for the design of water rainwater establishments
Ministry of Planning and International Coordination (MoPIC)	MoPIC is mandated to devise national policies, and strategies, and coordinate sector, and multilateral, and bilateral interventions to ensure coherent implementation of sectoral policies, strategies, programme, and project. Therefore, MoPIC is a key strategic partner in provide facilitation, and assistance, and coordination with different sectors, programmes as well as partners and donors under the proposed project
Ministry of Information (MoI)	MoI will provide support in contributing to public and community awareness raising on climate change adaptation under the proposed project which further boost the implementation of the water sector communication strategy under the overall IWRM framework.
Bilateral development partners	This project will work closely with, Netherland, Progressio, and GIZ among others. Their ongoing work on supporting the integrated water resources management in the country is expected to constitute key baseline development for the proposed project. The detail of the arrangement will be explored further during the formulation stage.
Multilateral development partners	In the context of the proposed project, World Bank is particularly important partners because of its technical assistance in the area of water resources management in the country. The GSCP is World Bank-supported project which designed to address the critical groundwater problem in Yemen In addition, more recently IFAD are targeting the water sector to improve irrigation systems to enhance rural livelihoods and therefore the alignment with this project will be ensured during the project formulation stage.

B.6. Outline the coordination with other related initiatives:

44. **The Groundwater and Soil Conservation Project (GSCP)** is designed to address the critical groundwater problem in Yemen. The objective of the GSCP are to conserve water in farming areas, especially groundwater, improve recharge and protect watersheds by: (i) improving water use efficiency and increasing farmer returns to water, so creating the conditions that would allow farmers to reduce pumping of groundwater from aquifers towards sustainable levels; (ii) increasing surface and groundwater availability through watershed management and groundwater recharge by supporting the rehabilitation of small to medium spate irrigation schemes, bank protection works, water harvesting structures, and the rehabilitation of terraces and other soil and water conservation investments; and (iii) supporting a groundwater management framework and institutions that will have the incentive and capacity to manage local water resources in a sustainable manner. The envisaged additional financing of US$15 million from World Bank is to scale up the ongoing project;

45. **The Pilot Programme on Climate Resilience (PPCR)** is designed to support countries to pilot and demonstrate ways in which climate risk and resilience may be integrated into core development planning and implementation and promote transformational change as needed. The pragmatic approach taken by the PPCR was to build on existing programmes and projects and the NAPA recommendations to mainstream climate resilience and promote synergies on the various risks facing Yemen: PPCR helps countries build on their National Adaptation Programs of Action and helps fund public and private sector investments identified in climate resilient development plans. PPCR is at work in nine pilot countries including Yemen.

46. Yemen is one of the 9 piloted countries under the PPCR targeted programmes. The PPCR provides Yemen with a unique opportunity to understand climate change, and prepare a road map for climate resilience to be mainstreamed into development planning, while showcasing transformation changes at the institutional and sector levels through the implementation of key pilots. Phase I of the PPCR is the preparatory phase for the overall programme and will lay the foundation for climate resilience to be mainstreamed into development planning, and inform the identification of specific interventions and investments that would be supported under Phase II. Yemen's Phase I PPCR program consists of four pillars, namely:

- Climate Change Information System and Awareness Raising;
- Mainstreaming Climate Change Resilience into National Development Planning;
- Formulation of Yemen's Strategic Programme for Climate Resilience *(*SPCR) & Identification of Phase II Interventions; and
- Program Coordination of the PPCR.

47. The PPCR provided about $1.5 million grant through the PPCR Phase I which finalized in early 2011. In addition, total grant funds of about US$ 50-60 Million from PPCR fund will be provided for Yemen under the PPCR Phase II to support the implementation of the strategy through specific projects

48. Rural Adaptation in Yemen is IFAD's new LDCF initiative and aims to "enhance the resilience and adaptation in Yemen". This is at very early PIF submission stage. The IFAD supported LDCF project covers such components as community resilience; water resources, infrastructure and energy. Under the water component that is estimated $6million (out of total $10million of LDCF request) it aims to address the issues of water efficiency in the context of irrigation, watershed management, rehabilitation of degraded terraces and water harvesting. These are intended to do through a large scale infrastructure and land rehabilitation works. By contrast the proposed project focuses on the direct action at the community level, goes beyond demonstration of range of traditional and innovative water harvesting technologies and techniques and introduces policy and regulatory framework that will bring harvested water into the mainstream of the national water budget and promote its evolution as economically and socially viable sector. The UNDP project focuses on essential institutional capacity building, including engineering skill development and introduction of employment schemes and financial incentives for the sustainability of the sector as opposed to a currently practiced ad hoc water harvesting as social endeavors. Since the project preparation phases of the two initiatives will largely coincide in time, close coordination of the feasibility expert teams will be ensured during the PPG. Initial consultations have already taken place between the agencies.

C. DESCRIBE THE GEF AGENCY'S COMPARATIVE ADVANTAGE TO IMPLEMENT THIS PROJECT:

49. Since the water access issues dominate the country's development agenda UNDP has been an active partner of the government in this sector. UNDP has supported the government of Yemen in the formulation of NAPA and has provided continuous support in the process of implementation of the key priorities. UNDP has proven in-house expertise in promoting integrated water resource management in Yemen and broader region of Arab States. Since 2003 UNDP has been supporting the government in improving the conditions of water access and promoting water harvesting as one of the critical solutions to acute water shortages. The IWRM and Masila community-based water and sanitation projects are among the key UNDP-supported interventions in Yemen. With UNDP support the National Water Resource Authority (NWRA) developed and initiated the implementation of three water basin management plans covering the basins of Hadjarmout, Tuban- Abyan and Taiz. In the context of the proposed project UNDP has helped develop the Guidelines for Roof Top Rainwater Harvesting Systems that is being tested in partnership with National Water Resource Authority in the governorate of Taiz. Additionally, UNDP provided support for mainstreaming climate change risks into key national policy documents such as National Agriculture Sector Strategy (NASS) and made substantive contributions through targeted policy notes for National Water Sector Strategy and Investment Programme (NWSSIP), and National Fishery Sector Development Strategy (NFSS). UNDP has been an active partner supporting the Social Development Fund (SDF). In the context of discussions on establishing the National Climate Fund UNDP conducted an institutional and functional capacity assessment of the Social Development Fund.

C.1 Indicate the co-financing amount the GEF agency is bringing to the project:

50. UNDP's co-financing will be provided primarily through its 2nd phase of Integrated Water Resource Management (IWRM) project in amount of $600,596 (as a parallel grant). During the project preparation phase, the scope and specific areas of UNDP's support that are relevant to the proposed LDCF project will be further investigated and the co-financing figure modified accordingly.

C.2 How does the project fit into the GEF agency's programme (reflected in documents such as UNDAF, CAS, etc.) and staff capacity in the country to follow up project implementation:

51. This proposed project is fully aligned with UNDAF for Yemen for 2012-2015. It corresponds, inter alia, with UNDAF objective 2 - Inclusive and Diversified Economic Growth. And specifically in line with outcome 2 that aims that *local authorities and communities effectively engaged in sustainable management of natural resources, biodiversity conservation, adaptation to climate change, and disaster risk reduction by 2015*. This is in direct response to the findings that have emerged from Common Country Assessment that highlights "an aggravation of the crisis of water resources and environment";

52. The UNDAF promotes the outcome of ensuring that vulnerable groups benefit from improved livelihoods, increased employment opportunities and sustainable natural resources management, including adaptation and resiliency to climate change and disaster risk reduction. At the community level, support will be provided for advocacy and community awareness programmes and promotes active engagement of communities in sustainable environment management, including traditional natural resource management practices. In addition, support will be provided to government with regards to fulfilling and reporting on international conventions and treaties on climate change. Under this broad outcome the improvements in management of natural resources and an increase in resilience to natural, including climate related disasters will be ensured. UNDP's CPAP for the same timeframe promotes a strengthening of the capacity of Based on UNDAF and CPAP guidance the proposed LDCF project also adopts the comprehensive approach with full recognition that climate change adaptation and development are inextricably linked, and additional adaptation benefits must be nested into the broader development gains.

53. In terms of agency capacity to support the project, the Country Office in Yemen currently manages a programme portfolio of total value of over $70 million. It offers the following dedicated staff capacity for project implementation oversight support: (i) Environment Analyst who oversees the implementation on a daily basis, including quality assurance and monitoring and evaluation; (ii) Climate Change policy advisor who leads on

UNDP's programming and policy advice on climate change mitigation and adaptation; promote Policy Dialogue on climate change with government and development partners, engage in climate change policy dialogue at national level with key partners, and provide substantive inputs on national low-carbon, climate-resilient development strategies and plans and review of sector policies (iii) Environment Associate – assists with budget revisions, quarterly reporting, auditing and recruitment procedures; (iv) finance Analyst - reviews the budgets and monitors project delivery status; (iv) Head of Operations Unit - assures compliance with overall fiduciary standards of UNDP; (v) UNDP CO Country Director and Resident Representative who liaise with the government and negotiate key policy and legislative changes proposed by the project. A regional technical adviser on climate change adaptation will provide ongoing implementation oversight and support throughout the project.

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

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

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Mahmoud Shidiwah	EPA Chairman, GEF OFP	Chairman Ministry of Water and Environment, Environmental Protection Agency	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 project identification and preparation.					
Agency Coordinator, Agency name	**Signature**	**DATE** *(MM/dd/yyyy)*	**Project Contact Person**	**Telephone**	**Email Address**
Yannick Glemarc Executive Coordinator UNDP/GEF		January 22, 2013	Keti Chachibaia	+421 259337422	keti.chachibaia@undp.org

Annex 1: Traditional Water Harvesting Techniques in Africa

Technology	Extent of use	O & M	Level of involvement	Costs	Effectiveness	Suitability	Cultural Acceptability	Comments and Recommen-dations	Environmental Impact
Planting Pits ZAY/ZAI	Moderate	Low	Community	Low	High	Semi-arid degraded land	Highly acceptable	Requires more promotion	
Demi-Lunes or semi-circular hoop	Widely in Kenya and Niger	Low	Community & Extension workers	Low	High	200 - 800 mm rainfall	In highest population densities but low in pastoralists	Further research in yield Labour inputs on rainfall	Increases vegetation cover on degraded lands
Katumani pitting	Kenya	Low	Community	Moderate	Very high	Grazing lands-500-800 mm of rainfall	No cultural problems	Needs wider promotion	Rehabilitation effect on river course and water quality
Permeable rock dams	Burkina Faso	No Data	Community, NGOs, Government	High	Very high	Less than 700 mm of rain Local supply of stones Valley bottoms slope <2%	Acceptable	Requires technical advice	Positive effect on river course and water quality
Contour stone bunding	Burkina Faso, Mali	Low	Community	Low if stones are readily available	High	Semi arid 700-800 mm of rainfall Stone available Wetter areas to prevent overgrazing	Highly acceptable	Extension support required. Research in eventual silting required	Rehabilitation of degraded land and reduction of soil erosion
Tied contour ridge	Moderate	Low	Government, NGO, Community	Low	High	Variety of climatic and soil conditions Water shortage and severely degraded areas	Acceptable	Required effective promotion	Land rehabilitation and reduces soil erosion
"Fanya-juu" terracing	Morocco, Kenya	Moderate	Community	Moderate	Very high	>700 mm if rainfall Deep soils slopes < 5%-50%	Highly acceptable	Promotion in other areas required	Effective control of erosion
Flood harvesting using bunds	Somalia	Low	Community	No data Low	High	150-300 mm of rainfall Clay soils	Highly acceptable	Introduces contour surveying and research in optimum spacing of bunds and positioning of spill ways	Poor management of flows can lead to erosion
Earth bunds "Teras"	Sudan	Low	Community	No data Low	High	150-400 mm of rainfall	Acceptable	Develop spillways to improve efficiency and reduce operations & maintenance	Reduces degradation
External catchments using contour ridging	Niger, Kenya, Egypt	High	Community, NGO, Government	Moderate	Very high	350-650 mm of rainfall Reclamation of degraded land	Not fully assessed	Need demonstration and promotion involving the community	Reduction of soil erosion
Sand abstraction	Zimbabwe, Botswana, Libya, Algeria	High	Private sector, Government, Communities	High	High	Sandy river beds, usually seasonally dry	Highly acceptable	Research relating various productivity parameters required	Over abstraction may reduce downstream flows

Lagoon front hand-dug well irritation	Ghana	Low	Community	Low	Locally appropriate and effective	Good shallow groundwater	Acceptable	Studies needed on saline intrusion	None expected
Sub-surface dams, small dams, sand dams	Kenya, Zimbabwe, Egypt, Libya, Tunisia, Algeria	Low	Local agencies	High	High	Sandy seasonal rivers prone to siltation	Acceptable	Need to promote the technology more	Reduction of erosion, silt deposition and increased moisture infiltration
Cloud seeding	Zimbabwe	Very High	Government Community	Very high		Limited rainfall Agriculture a major commercial activity	No cultural problems	Better indicators of impact of cloud seeding	No expected environmental effects
Tidal irrigation	Gambia	Low	Government Community	Very high	Very successful	Where river is in relatively flat basin with high tide intrusion	Acceptable	No further development foreseen	

Source: Institute of Water and Sanitation Development - IWSD (2011) Sourcebook of Alternative Technologies for Freshwater Augumentation in Africa – UNEP publication.