PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title:	Energy Efficiency and Renewable Energy for Sustainable Water Management in Turkmenistan		
Country(ies):	Turkmenistan	GEF Project ID:[1]	5536
GEF Agency(ies):	UNDP	GEF Agency Project ID:	4947
Other Executing Partner(s):	Ministry of Water Resources	Submission Date:	2013-07-01
GEF Focal Area (s):	Multi-focal Areas	Project Duration (Months)	72 months
Name of parent program (if applicable): • For SFM/REDD+ ☐ • For SGP ☐ • For PPP ☐	N/a	Project Agency Fee ($):	587,575

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK[2]:

Focal Area Objectives	Trust Fund	Indicative Grant Amount ($)	Indicative Co-financing ($)
CCM-1	GEFTF	1,071,290	1,300,000
CCM-2	GEFTF	3,700,000	25,500,000
LD-1	GEFTF	1,413,710	2,500,000
Total Project Cost		6,185,000	29,300,000

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: An integrated approach to making energy use in the water management sector sustainable: reducing GHG emissions while preventing land degradation and improve management of arable land and pastures

Project Component	Grant Type[3]	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount ($)	Indicative Cofinancing ($)
Component 1: Knowledge, Information and Technology for sustainable energy and water management	TA	Technological, informational and knowledge base for sustainable energy use and GHG emission reduction in water management sector	▪ Sectoral Technology Action Plans (TAP) for energy efficient (EE), renewable energy (RE) and other low-emissions technologies and practices in water management sector prepared and financing secured for their implementation ▪ Detailed technical specifications, testing and adaptation of prioritized technologies for specific climate conditions, agricultural practices and water/energy potential in 3 pilot regions ▪ Pump audits conducted ▪ Training delivered to water management system designers and operators on EE/RES technologies and practices in	GEFTF	1,200,000	1,250,000

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the reference attached on the Focal Area Results Framework and LDCF/SCCF Framework when completing Table A.
[3] TA includes capacity building, and research and development.

			water management ▪ Awareness raised among stakeholders involved in water management about economic, environment and social benefits of integrated EE-RES-based water management, as well as international best practices and low-carbon technologies applied to irrigation and other water supply systems			
Component 2: Investment in EE and RES technologies in large-scale irrigation systems	Inv	Complex modernization of large-scale pumping scheme implemented featuring a range of low-carbon technologies and practices GHG emissions avoided in irrigation sector	▪ Feasibility studies for pilot EE/RE projects in irrigation system prepared ▪ Prioritized EE/RE irrigation technologies and low-carbon agricultural practices demonstrated at selected large-scale pump scheme (cca 6,000 ha of irrigated lands)	GEFTF	2,300,000	23,200,000
	TA		▪ 'Know your irrigation system' program introduced at selected pump schemes, including EMS, personnel training, irrigation scheduling, and other low-cost energy and water saving measures ▪ Energy consumption and GHG emissions monitored (before and after), cost-effectiveness of selected low-carbon options assessed and demonstrated ▪ Revolving financial mechanism for EE investment in irrigation set-up		400,000	200,000
Component 3: Low-carbon solutions for sustainable land management	Inv	Reduced water-related causes of land degradation in 3 representative (pasture and agricultural land) eco-systems covering the area of about 2,500 ha via introduction of low-carbon technologies and other SLM practices Ecosystem, GHG and development benefits will include: - Decreased pressure on degraded pastures; - Increased land productivity: pastures and arable land; - Quality and improved access to water supply; - GHG emission reduction; - Improved resilience to climate change-induced water stress *[Targets established at PPG]*	▪ Up to 600 kW in installed capacity of RE-based technologies for off-grid water supply introduced in three representative eco-systems: ▪ Improved pasture irrigation leads to reduction in overstocking and overgrazing and recovery of rangelands ▪ Improved irrigation system decrease soil salinization and raises agricultural productivity ▪ Improved water quality and availability for forest plantation and other SLM measures ▪ Improved livestock and manure management practices leads to reduced GHG emissions and improved land productivity	GEFTF	1,000,000	2,000,000
	TA		▪ Sustainable Land Management (SLM) Plans prepared and implemented in 3 pilot locations resulting in uptake of improved land use	GEFTF	400,000	500,000

			and livestock management practices with a particular focus on appropriate low-carbon solutions for water supply and land management ▪ Training and information provided to local communities/farmers and their associations on low-carbon water supply solutions ▪ Sustainable Energy, Water and Land Management Plans incorporated in Regional/Village Development Plans in pilot communities ▪ LD/CCM benefits of proposed low-carbon SLM solutions monitored and documented			
Component 4: National policy and regulatory framework for sustainable energy and water management	TA	National policy, regulatory and financing framework for sustainable energy and water management adopted and capacities for its implementation improved	▪ National program for integrated energy/water management prepared and adopted ▪ Energy consumption norms, and regulations for water management sector introduced/revised and roadmap for their gradual strengthening adopted till 2030 ▪ Public servants involved in enforcement related to energy efficiency norms and standards in irrigation trained in best practices facilitating their observation and compliance ▪ Regulations mandating evaluation (energy audit and 'know your irrigation system') of pumping plants and other irrigation facilities introduced ▪ National financial support scheme for de-centralized RE-solutions for rural water supply established and capitalized ▪ Policies, regulations and financial incentives to promote replication of prioritized and tested non-CO2 CCM measures in agricultural sector adopted and enforced	GEFTF	595,000	700,000
Subtotal					5,895,000	27,850,000
Project Management Cost (PMC)[4]				GEFTF	290,000	1,450,000
Total Project Cost					6,185,000	29,300,000

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

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount ($)
National Government	Ministry of Water Resources	Investment	22,000,000
National Government	Ministry of Water Resources	In-kind	400,000

[4] To be calculated as percent of subtotal.

National Government	State budget	Cash	500,000
Academia	Solar Institute "Gun"	In-kind	350,000
GEF Agency	UNDP	Grant	350,000
Private Sector	Chevron	Investment	1,500,000
Private Sector	Grundfos	In-kind	200,000
Private Sector	Grundfos	Soft-Loan	3,000,000
Bilateral Donor	European Union	Grant	1,000,000
Total Cofinancing			29,300,000

D. INDICATIVE TRUST FUND 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	GEFTF	Climate Change	Turkmenistan	4,771,290	453,273	5,224,563
UNDP	GEFTF	Land Degradation	Turkmenistan	1,413,710	134,302	1,548,012
Total Grant Resources				6,185,000	587,575	6,772,575

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

[2] Indicate fees related to this project.

E. PROJECT PREPARATION GRANT (PPG)[5]

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

	Amount Requested ($)	Agency Fee for PPG ($)[6]
• (upto)$200k for projects up to & including $10 million	150,000	14,250

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

Trust Fund	GEF Agency	Focal Area	Country Name/ Global	(in $)		
				PPG (a)	**Agency Fee** (b)	**Total** c = a + b
GEF TF	UNDP	Climate Change	Turkmenistan	115,710	10,992	126,702
GEF TF	UNDP	Land Degradation	Turkmenistan	34,290	3,258	37,548
Total PPG Amount				**150,000**	**14,250**	**164,250**

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

[5] On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

[6] PPG fee percentage follows the percentage of the GEF Project Grant amount requested.

PART II: PROJECT JUSTIFICATION[7]

PROJECT OVERVIEW

A.1. Project Description.

Global environmental problems and barriers to be addressed

1. Irrigated agriculture – mainstay of Turkmen economy, large energy end-user and growing source of GHG emissions: Agriculture forms the basis of Turkmen economy providing for almost 20% of GDP and is a source of livelihood for half of the population. Because of arid climate, irrigation is necessary for nearly all cultivated land. Apart from agricultural needs, irrigation is also a source of water for municipal and domestic needs in rural areas, such as drinking water supply and pasture irrigation. Energy plays a critical role in ensuring sustainable and uninterrupted water supply, especially in remote rural locations: extending to the area of over 1.7 mln hectares irrigation infrastructure consists of extensive canal systems (42,500 km), collector-drainage network (35,000 km) and artificial water storage reservoirs, all served by hundreds of pumping stations with a total installed power capacity in excess of 250 MW. In addition, in the areas where central electricity grid is not available, diesel oil is used to run off-grid water pumping stations and small-size farming irrigation systems. Due to its sheer size, but also huge inefficiencies in the way infrastructure was designed (inherited and not yet modernized since the Soviet times) and is being maintained, irrigation makes for the second largest power-consuming sector in Turkmenistan accounting for 31 % of total power consumption or 3,870 GWh/year[8]. Consequently, irrigation and water supply is responsible for large and growing share of national GHG emissions: cca 6.9 mln tCO2/year[9] or 27% of all CO2 emissions and 11% of all GHG emissions (in CO2 equivalent)[10] come from energy use in water management sector (water supply and irrigation). Finally, agriculture is also responsible for the large share of non-CO2 emissions in Turkmenistan, such as nitrogen oxide and methane from irrigated land and livestock.
2. Land use and degradation: Of the total 49.12 million ha of the country's surface, about 33.9 million ha are classified as agricultural land but it is mainly desert pasture. Desert ranges are considered both agricultural rangelands and bush forests (saxaul), which must be protected. Vast pasture areas have been severely degraded (1.7 million ha or 4.5 per cent) or moderately degraded (17.4.million ha or 45 per cent). Bush forest areas are grazed and cut for fuel, leading to a loss in quantity and quality of desert range production, a reduction in biodiversity, wind erosion of the denuded lands, and an increase in unfixed sands around roads, settlements and irrigated areas. Palatable species (Haloxylon, Salslola, Carex sp.) are replaced by nonedible ones (Peganum and Stipagrostis sp.) that are not typical to the station, leading to a decline in fodder quality. The privatization of livestock, which is now 90 % in private hands, has resulted in a huge increase in livestock numbers. Watering points are randomly and scarcely available in the desert rangelands. Tracts better provided with water are overgrazed, and rangelands surrounding desert wells have been degraded because of excessive cutting of shrubs for firewood. Rangelands located close to agricultural zones and settlements are overexploited, and remote rangelands in the central Karakum Desert with no water supply are not properly used, also leading to losses in terms of the quality and quantity of available forage.
3. Additionally, natural features such as the absence of natural drainage flow, low atmospheric precipitation, and high vaporability result in increasing salinization of soils, wind and water erosion. The growing rate of salinization is considered one of the main causes of irrigated land degradation. Due to extensive use of old and inefficient irrigation technology requiring increasing amounts of water, as well as due to the lack of proper drainage and infiltration facilities, more than 60 % of arable land is now salinized, resulting in a crop

[7] Part II should not be longer than 5 pages.
[8] IEA. Energy Balances for Non-OECD Countries 2012.
[9] Estimated based on IEA data on electricity consumption and CO2 emission factor (1.8tCO2/MWh). Sources: CO2 emissions from fossil fuel combustion. IEA 2012; IEA. Energy Balances for Non-OECD Countries 2012.
[10] 2nd National Communication to UNFCCC.

yield decline of 20-30%. In some areas, like in Dashoguz province, 90% of irrigated land is characterized as medium-to-heavy saline[11].

4. Specific environmental, energy and socio-economic challenges in pilot regions:

5. **Yerben region (Karakum desert)**: the region is located in the Central Karakum Desert and occupies an area of almost 842,000 ha with 8,000 inhabitants. The greater part of the region is represented by desert pastures, and for centuries, the sand desert with a prevailing continental climate and high variability of precipitation has been used by nomadic livestock breeders for extensive pasture. Intensive irrigation practices have contributed to land degradation. As people settled in villages, traditional practices of pasture management were forgotten. The lands started to be intensively exploited, especially around the villages and livestock water points. Saxaul bushes were dug out and used for heating and cooking purposes as other alternatives are not available, and have not recovered due to over grazing. Moving sand dunes, and more frequent heavy sandstorms not only threaten houses and other social infrastructure, they also degrade pasture land further and damage the limited number of existing wells. The degraded pasture lands do not produce sufficient fodder for the animals. The lack of watering points has led to the concentration of animals around existing wells. A structural change in the pastoral system (more goats and cattle instead of camels; more unguarded pastures around settlements instead of far pastures) has resulted in degradation of the vegetation, particularly around settlements and watering points. Better well management and introduction of new watering points are necessary. The region has abundant solar and wind energy potential, which can be harnessed to bring groundwater water for irrigation of remote pastures and watering livestock.

6. **Sakar-chaga region (Mary velayat oases)**: the region is located in the north-western part of Mary Velayat in the delta of Murgab River. It occupies a total area of 53,000 ha with 34 settlements and 17 farmer associations. Population of the region is 132,000, the largest part of which lives in oases where 80% of settlements are located. The region is considered to be a primary centre of arable farming in Turkmenistan for cotton, grain and vegetables. Soil salinization is the main problem of this site due to inadequate irrigation techniques and lack of drainage and this has resulted in very modest harvests and low yields. This has resulted in the abandonment of previously arable areas. The current irrigation management system leads to irrational use of water, land, and energy resources. Introduction of more energy efficient and renewable energy-based irrigation techniques (such solar surface irrigation) can achieve significant water and energy saving in the region.

7. **Balkan velayat:** third pilot location will be selected in the Balkan velayat, the western most region of the country bordering the Caspian Sea. This is one of the most densely populated region, where water shortages are most pronounced. Balkan's water supplies come from the Karakum Canal and numerous wells in the Yaskhan area. However, agricultural pesticides and chemicals have rendered groundwater undrinkable, and an outdated infrastructure has caused losses of over one-half of the water supply. Consequently, rationing is frequent and the occurrence of water-borne diseases is high because approximately 50% of the drinking water falls below hygienic standards. On the other side, the region is blessed with outstanding solar and wind resources potential and is situated along 1,200 km shoreline of the Caspian Sea. Such nature endowment positions Balkan well for utilizing RE-based desalination technology to supply water for regions' industrial, agricultural and residential needs.

8. Government response: The Government of Turkmenistan is aware that land and water availability will be crucial to maintaining economic growth and social cohesion within the agricultural sector. Driven by heightening concerns over food security, water scarcity and land productivity, it has announced the goal to bring additional 300,000 ha of arable land under irrigation by 2030 and is now investing heavily in new irrigation infrastructure. Hundreds km of new channels, drainage network and large water storage facilities are being built, all requiring additional amount of energy to operate and bring much needed water to its end-users. The government has also adopted a new integrated national strategy for water and agriculture in

[11] Turkmenistan: Environmental Performance Review. UNECE 2012

2011 which addresses the efficiency issues in cotton and wheat farming. Even so, recent analysis undertaken within the UN Institutional and Financing Framework (IFF) project, and findings within the Second National Communication indicate that such measures are unlikely to be sufficient to meet the overall projected water deficit over the next 20 years. It is particularly crucial to improve water availability for the significant proportion of the rural population that is engaged in small scale agriculture and livestock management and operate outside of the centralized water supply system.

9. Energy efficiency (EE) and renewable energy (RE) for sustainable land and water management: Existing irrigational infrastructure is characterized by high inefficiency and losses. Most of irrigation facilities (pumping stations, water distributing canals, collectors, etc.) were built 50-60 years ago and by now are physically worn out; over 75% of pumping units exceed their operational lifetime by a factor of 2-3. An updated irrigation network with lining, troughs and pipes exists only in few newly developed areas, accounting for only 0.6-1.2 per cent of the total irrigation system. Inefficient, obsolete and outdated irrigational facilities do not only result in direct high water and energy losses, but also indirectly contribute to growing water shortages: the more power is wasted due to inefficient irrigation, the more water is needed for its generation (power sector is the second largest water-user in Turkmenistan after agriculture), which leads to intensifying competition for scarce water resources among key economic sectors. Significant water and energy saving opportunities can be realized in Turkmenistan's water management sector: power consumption can be reduced on overage by 15-20% across the irrigation network and up to 50% or more in certain locations by introducing more energy efficient irrigation technologies and techniques, better hardware maintenance and other technical and managerial improvements in the system. Such improvements can range from lower cost measures like soft starters for motors, trimming impellers (when pumps are over-sized) and re-winding motors, to higher cost measures like replacing inefficient pumps with efficient ones and installing variable speed drives. Likewise, system automation and regular energy monitoring are the examples of low-cost measures which can bring down operational costs and yield sizable energy and water savings.

10. Harnessing vast renewable energy potential, solar and wind, with such technologies, as solar and wind-based water pumps and solar-powered desalination can help address water supply issues and improve livelihoods and food security of the many Turkmen rural households, living in poverty, off the grid (without access to centralized water and energy supply). Such RE-based technologies together with application of sustainable agriculture and land management practices bear high potential to control and reverse degradation of irrigated lands and pastures. For example, solar-powered pasture irrigation was identified as the number one priority measure for prevention land degradation in the National Action Plan under UNCCD.

11. Barriers to sustainable energy use in water sector: The deployment of EE and RE technologies and practices in water sector is extremely limited due to the following barriers:

    - *Technologies and know-how:* Local scientific, research and design institutes have very limited capacities to undertake own R&D activities while at the same time lack access to and knowledge about best available technologies (BATs) and practices on sustainable energy use in irrigation. As a result, old-Soviet guidelines and techniques are being used for design of new and upgrade of existing irrigation systems. For example, there is no experience with such advanced techniques as irrigation system modeling and optimization (to maximize both water and energy saving); instead old pumps are being replaced with new ones, (same capacity, but more efficient), whereas additional and sometimes larger system-wide gains are being overlooked. In the past, Turkmen Academia of Science has implemented a few pilot projects featuring drip irrigation and solar-powered water pumping systems, but there is no effective mechanism and capacities to improve their design, promote commercialization and market availability. Similarly, national organizations, in charge of irrigation system design continue relying on guidance and technological solutions which existed 30-40 years ago. Technological exchange and exposure to international best practices in irrigation almost does not exist. Even though Government emphasizes importance of development and introduction of innovative EE/RE technologies (including on-farm micro-techniques such as solar-powered pumps), effective mechanism to support their wide-scale

adoption across Turkmenistan is not in place yet.

- *Low capacities for effective energy management*. The Ministry of Water Resources, which is in charge of construction, upgrade and maintenance of irrigation infrastructure, lacks human and institutional capacities to adopt modern practices and approaches to energy management in its irrigation network. Even when new more efficient equipment is installed, local technicians and engineers lack skills to ensure its optimal operation and maintenance and are neither encouraged, nor required to do so. There are no provision for mandatory energy audit of irrigation facilities and no methodological, technical and institutional base for systematic energy use monitoring. Consequently, there is no data and understanding among key end-users about potential for energy saving. In remote areas in particular local technical and engineering capacities to ensure adequate equipment design, installation, maintenance and repair are very limited.
- *Regulatory barriers*: outdated energy norms and their weak enforcement. Energy consumption norms and standards for irrigation and drainage pumping equipment were introduced already under Soviet time, but did not change since then to account for technological progress and modern irrigation management techniques, such as irrigation scheduling, electric load management, energy efficiency and energy performance requirements. To certain extent, existing construction norms and rules for irrigation even prohibit the application of BATs when new systems are designed and/or upgraded due to prescriptive nature of the standards, i.e. they mandate application of certain technologies/equipment which could have been on a par with BAT level back in the 80s, but since then became morally and technically obsolete. Standards are being strictly enforced at design and commissioning stage: State Commission on Architecture and Construction reviews and check compliance of all design documents with relevant standards. However, there is no effective system to ensure their enforcement during exploitation of the irrigation infrastructure. State entity, GosEnergoNadzor (State Energy Inspectorate), is in charge of monitoring compliance of operating stations with the standards and energy use limits. At this stage, the compliance and enforcement is much weaker: first due to poor maintenance and management practices of irrigation systems and, second, due to insufficient human and technical capacities of GosEnergoNadzor to fulfill its functions regularly and with sufficient quality. Energy information management system to collect and monitor data on actual energy consumption in irrigation does not exist, which makes compliance check procedures very cumbersome and unreliable.
- Awareness about water-energy-climate nexus: Knowledge about integrated nature of energy-water-climate problems is lacking at all levels of decision-making in energy and irrigation sector. The fact that excessive energy use contributes to global climate change, which in turn results in severe water resources shortages in Central Asia, and in particular Turkmenistan as a downstream country, is poorly understood and needs to be clearly communicated to a wide range of stakeholders responsible for water, energy and climate change policies at the national, regional and local level.

12. Barriers to sustainable land and pasture management: The National Programming Framework (NPF) prepared under CACILM defined a broad range of barriers that affect the effective combat of land degradation in Turkmenistan, such as low national capacity, ineffective policy environment, low levels of public investment in SLM, and the need to develop decision-making frameworks based on lessons learned from field-level projects.

    - *Regulatory barriers*: in general, the legislative framework for SLM is in place (Land Code) while the regulatory aspects require attention, including such issues as lack of local understanding of the laws and regulations, inconsistencies in land use categories or criteria, and lack of adequate controls or financing to support enforcement. Many of these instruments provide for sustained use of land but without adequate definition of means of determining sustainability
    - *Weak capacity* in at central and local level together with an unclear definition of tasks, structures, commitments and duties, procedures, and human resource deployment. It is recognized clearly in the NPFs that the human resources capacity uncoordinated and is in need of upgrading to adequately address land degradation problems. The institutional structures created do not yet

provide efficiencies nor is there a consolidated "approach" to SLM that could drive a change of management style, incentives, attitudes and increased responsibility and accountability.

- *Limitations in integrated water-energy-land use planning*: local governments have no previous practical experience or approach in collaborating in this regard. Many of the current professionals developed their careers under a central planning paradigm and have never had the opportunity to participate in a collaborative planning process (both inter-agency and intra-agency).

Baseline projects

13. A number of government-led and donor-financed projects are being undertaken to reverse unsustainable water, land and energy use issues. Those most relevant which will constitute the baseline for the purpose of proposed GEF project are summarized below.

14. Public support for R&D and investment in irrigation:

- Recently the Government of Turkmenistan has resurrected its support to promotion of renewable energy sources. It has ordered the re-establishment of the *National Solar Institute "Gun"* ("Sun"), which was closed since 1998, and tasked it with identifying suitable RE technologies and their most cost-effective applications in the country. RE-based water supply and desalination plants for rural areas have been prioritized and several pilot projects implemented featuring solar PV and wind energy installations (80-220 kW) for water pumping and desalination facilities. The Institute is now preparing recommendations and business plan for promotion and commercialization of RE technologies in agriculture and water management. These recommendations will form part of the business strategy of the Techno Park, new science and technology center, which is being established by the Government and Academy of Science in the vicinity of Turkmen Capital, Ashgabat.

- *Ministry of Water Resources*, the key Governmental agency in charge of irrigation infrastructure, has its investment program with annual budget of about 100 mln US$. The program is being formed on annual basis and there is clear upward trend in funds allocation from the state budget for irrigation. The government of Turkmenistan has come to realise that water is one of the key driving forces for its economic development, and under conditions of increasing scarcity water infrastructure needs to be upgraded to minimise losses to the system. Public programs and spending focus primarily on construction of new irrigation systems and upgrade/replacement of existing stations. The baseline investment by the Ministry of Water Resources in new and upgraded irrigation system will result in certain energy efficiency gains. According to Ministry's estimates, the expected improvements are usually within the range of 20-25% comparing to old equipment currently in use. On the other side, according to industry experts, BATs in irrigation can yield much higher energy efficiency gains, i.e. up to 50-60% or higher if RE-based solutions are applied. There is also some limited funding available to pilot such BATs, as drip and micro-spray irrigation. It is worth mentioning that Turkmenistan has started building a system that collects drainage water from irrigation and directs it to a large reservoir, Lake Altyn Asyr at the natural Karashor depression, which will hold over 130 billion m3 of water, from where it can be purified and recycled for irrigation. All in all, significant investment are available for upgrade, modernization and extension of irrigation system, but due to technological and capacity barriers outlined above, large efficiency gains remains to be realized.

15. Donor-funded initiatives on renewable energy/energy efficiency, land degradation and water management:

- *Adaptation Fund/UNDP "Addressing Climate Change Risks to Farming System in Turkmenistan" (2.9 mln US$, 2012-2016[12])* project focuses on strengthening water management practices at community level and developing integrating water management policies at the national levels. It is executed in three different climatic areas: a desert zone of Karakum (Bahardok); in the mountain

[12] This project constitutes part of baseline for the purpose of proposed UNDP-GEF project, but AF funding is excluded from sources of co-financing.

villages of Nohur and an irrigated area of Sakarchaga region where it supports community based adaptation initiatives with a particular focus on improving communal management systems for water delivery. Investment in the following measures are envisaged: piloting water harvesting and saving techniques, community-based well and watering point management measures, improved local irrigation services, and institutional strengthening at community level (e.g. assigning clear mandates and institutional functions for local water supply system operations and management). The project does not specifically target energy management/technologies for local water supply and irrigation, but because of close inter-linkage between water and energy use in the region, introduction of water saving technologies and practices will inevitably result in energy saving and GHG emission reductions.

- *EU-funded regional project "Sustainable Energy Programme for Central Asia: Renewable Energy Sources & Energy Efficiency" (5 mln EURO, including cca 1 mln EURO for Turkmenistan, 2013-2017)* aims at supporting the necessary policy, regulatory and institutional mechanisms for promotion of renewable energy sources and increasing the energy efficiency, as well as implementation of sustainable pilot projects in the fields of EE & RES. The project is currently in its inception phase when the exact scope of EU-supported activities to promote and pilot EE/RE projects in Turkmenistan will be defined (Inception report is due by end of 2013).

16. Private sector-led initiatives on renewable energy and energy efficiency:

    - *Chevron*, one of the perspective oil&gas operators in Turkmenistan, is considering a pilot investment (1.5 mln US$) in solar PV project as part of its corporate social responsibility program in the country. It has not yet identified a specific location and beneficiaries and is interested in joining forces with the proposed UNDP-GEF project, especially to demonstrate the potential of solar PV for water supply and desalination in rural areas.
    - *Grundfos*, world's leading manufacturer of efficient pumps and other water technologies, is interested in expanding its operations in the region. In other Central Asian countries, Kazakhstam, Uzbekistan and Kyrgyzstan, it has already implemented in partnership with UNDP, other donors and public agencies several water/energy saving projects in water supply sector and is also supporting awareness raising and educational activities about water/energy linkages, tools and measures to identify and realize water/energy saving potential. The company is offering a range of complementary services to its partners, such as training on pump audits, educational materials, assistance with project design, as well as interest-free credit lines for procurement of Grundfos equipment and suppliers (3 mln US$ and above).

17. BAU Summary: All in all, under the baseline, there are a number of initiatives planned or implemented by the Government of Turkmenistan, donor agencies, as well as private sector, aiming at promoting energy efficiency, renewable energy, sustainable water and land management. However, none of them has yet adopted an integrated approach to energy-water use, which recognizes that these two critical resources are inextricably and reciprocally interlinked and that addressing the challenges of their sustainable supply and consumption requires policies and actions which look at both sides simultaneously.

Proposed alternative scenario

18. Project objective: The objective of the proposed project is two-fold: a) to reduce GHG emissions from energy use in Turkmenistan water sector and b) to prevent degradation of arable land and pastures by adopting, demonstrating and promoting a range of low-carbon and SLM technologies and practices in the entire agricultural and water supply sector, introducing relevant standards and supporting their enforcement, as well as developing capacity of local professionals, governmental staff, and water users' associations and farmers for integrated energy, water and land management.

19. Project strategy: The project will include five components: Component 1 will build local capacity and knowledge to identify, adopt and promote appropriate low-energy solutions in water sector. Component 2 will support implementation of large-scale modernization project in the selected irrigation network featuring application of advanced EE and RE solutions and energy management practices. Component 3

will focus on deployment of decentralized RE-based solutions for improved rural water supply, irrigation and sustainable land management, as well as on promoting other SLM technologies and practices and their integration in the local resource management plans. Component 4 will aim at the development of national policy, regulatory and financing framework for sustainable energy use in water sector, including adoption of energy performance standards, requirements for energy audits, and financial support scheme for decentralized RE-based water supply solutions. Apart from GHG emission reductions, the project will yield additional environmental and socio-economic benefits for the countries and pilot communities by raising productivity of agricultural and pastoral systems, improving quality and reliability of water supply and strengthening resilience to climate change-induced water stress.

Incremental cost reasoning and expected contributions from the baseline and co-financing

20. Following incremental activities are proposed to complement and strengthen the baseline projects and initiatives implemented by the Government, donors and private sector.

21. **Component 1: Knowledge, Information and Technology on Sustainable Energy and Water Management**. This component is designed to improve local technological and knowledge base about modern EE and RE technologies and their application in water management sector in partnerships and building on several baseline initiatives implemented by the Turkmen Academy of Science and its Solar Institute, Ministry of Water Resources, as well as international partners (Grundfos, EU Sustainable Energy Program). GEF-financed activities will include:

- Based on the findings of UNEP-GEF supported TNAs (see section A.4 for details) and in close collaboration with Academy of Science and its Technopark prepare and implement specific technology action plans (TAPs) for climate change mitigation (CCM) technologies and practices (focusing on measures to reduce both CO2 emission via energy efficiency and renewable energy, as well as other GHG emissions, N2O and CH4) in water management sector
- Justify and secure allocation of public financing for prioritized TAPs implementation within the framework of state support for Technopark, as well as facilitating joint ventures and other forms of cooperation with international technology providers
- Prepare detailed technical specifications for prioritized technologies adapted to specific climate conditions, agricultural and livelihood practices, and available water/energy potential in 3 pilot regions:
    - pumping stations (EE pumps and variable speed drivers, power controlling and cut off protecting equipment, automatic restart systems, metering, etc.)
    - inter-farm irrigation and drainage (I&D) systems (EE drainage pumps and motors, adjusted impellers, fittings),
    - decentralized small-scale low-energy and RE-based technologies (e.g. solar/wind, surface or groundwater irrigation, desalination, etc)
- Design and provide comprehensive training and capacity building program to familiarize local specialists from specialized water management engineering and research centers with best available technologies (including via South-South exchange).
- Work with Academy of Science and its Technopark to prepare and implement a roadmap for commercialization and localization of the most suitable EE/RES technologies for the water sector, including
- In partnership with Grundfos and other interested technology providers provide training and conduct pump audits of selected irrigation network and facilities
- Conduct awareness raised campaign among various stakeholders about economic, environment and social benefits of integrated EE-RES-based water management, as well as international best practices and low-carbon technologies applied to irrigation and other water supply systems.

22. **Component 2: Investment in EE and RE modernization in large-scale irrigation system.** The component will support implementation of pilot project on complex modernization of a selected pump irrigation scheme featuring EE&RE technologies and management approaches in the entire irrigation

network (overall basin pumping stations, inter-farm irrigation and drainage (I&D) pumping, and on-farm micro-irrigation techniques). Complex modernization (as opposed to mere pump replacement or rehabilitation) is the process of technical and managerial upgrading of a given irrigation system with the objective to improve resource utilization (energy, water, land). Modernization will include a system modeling (or re-modeling for existing ones) and selection of most appropriate BATs to optimize its resource efficiency and service delivery functions. Also, other environmental considerations and risks (such as water availability as a result of climate change) has to be taken into account. Apart from new configuration and application of new technological solutions, modernization also envisages introduction of modern operation, maintenance and management approaches to a given irrigation system. This component will be implemented jointly with and co-financed by the Ministry of Water Resources and will be located in the Mary velayat, the center of irrigated agriculture in Turkmenistan, which is also one of the pilot locations for Component 3. The project will also support the design of revolving financial scheme for EE investment within the Ministry of Water to sustain and replicate the results of pilot projects. At PPG stage pilot project will be identified and financing secured for its implementation in the Ministry's investment plan and budget for 2015 (tentatively estimated at 22 mln US$). GEF-financed activities will include:

- Support identification of pilot irrigation scheme (at PPG), conduct energy/pump audit
- Conduct inventory of GHG emissions from agriculture/water management in the pilot sites, identify all major emission sources and select appropriate set of mitigation options
- Prepare technical feasibility studies and business plans featuring identified technological options in pilot locations. Investment in complex modernization of irrigation system will be complemented, to the extent possible, with implementation of prioritized CCM measures aiming at reducing N2O emissions from irrigated lands (such as better nutrient management)
- Co-finance those technologies and measures which will ensure additional energy saving/GHG emission reduction (i.e. those not envisaged/prescribed under existing norms and standard design practices). At PPG stage the baseline will be established by conducting pump audit of a recently renovated/constructed irrigation system and the exact target for GEF-supported pilots will be set-up, aiming at doubling the scale of energy saving compared to BAU scenario (i.e. 50% with GEF financing vis-à-vis 20-25% without GEF).
- Develop and implement operation, maintenance and management plan (O&M&M) to ensure irrigation system efficiency (O&M of electric motors, matching irrigation system components, minimizing pressure losses)
- Establish 'Know your irrigation system' program, including energy management system (EMS), personnel training, irrigation scheduling, and other low-cost energy and water saving measures
- Monitor and document results of pilot projects, including key sources of GHG emissions (before and after), energy and water consumption, as well as other indicators as mandated by GEF Focal Area tracking tools
- Create a revolving financing scheme, whereby energy savings generated from pilot projects can be monetized and accumulated on annual basis on a separate account within the Ministry's budget. These funds will then be used to finance other EE investment in irrigation systems operated by the Ministry. GEF will support development of provisions governing the revolving scheme and capacity building for Ministry's staff to operate it.

23. **Component 3: Low-carbon solutions for sustainable land management** . This component aims to prevent land degradation and improve productivity of agricultural and pastoral systems in 3 representative eco-systems selected across Turkmenistan covering the area of about 2,500 ha, while at the same time reducing GHG emissions associated with current agricultural practices. This will be achieved through two key outcomes, namely: i): technologies, and ii) capacities. Under the first outcome (technologies), the project will support demonstration of suitable low-carbon technologies to address water-related root causes of pasture and land degradation in pilot sites, including RE-based desalination facilities in Balkan region, solar/wind-powered pasture irrigation in Karakum desert, and energy efficient and renewable energy-based irrigation in Mary Oasis. Additionally, suitable technologies and practices to reduce non-CO2 emissions will be supported, such as biogas digestors using livestock manure to produce gas thus reducing CH4 emission, as well as improving nitrogen fertilization and livestock management practices to reduce N20 emissions. For each pilot location, sustainable land management plan will be prepared and implemented,

including specific provisions on how water-related causes of land degradation can be addressed via low-carbon technologies (e.g. introduction of new solar-powered wells for pastures or provision of de-salinized water for forest plantation, improved farmland productivity due to application of natural fertilizers, by-product of biogas production, etc).

24. Under the second outcome (capacities), technical assistance will be provided to local communities to help prepare, integrate and implement sustainable water/energy/land use plans in the scope of village/regional development plans. Also technical capacities of local specialists will be developed to ensure adequate maintenance and operation of proposed technologies.

25. Two pilot projects will be implemented in the same locations/communities where on-going UNDP/Adaptation Fund project already supports community based adaptation initiatives and improvements in communal management systems for water delivery: a desert pasture zone of Karakum (Bahardok) and an irrigated area of Sakarchaga region. Third pilot location will be selected in the Balkan region, along the Caspian Sea coast. These regions represent typical conditions of three major agro-ecological zones in Turkmenistan—that is, coastal, desert, and oasis systems. Selected locations have also already benefited from donor engagement under the previous UNDP/GEF/GTZ Sustainable Land Management Project (CACILM). Experience of working in these regions indicates that there is a high level of motivation to participate and a number of community level organisations exist that will facilitate roll out of the proposed technologies and provide an established platform to community level engagement. Further locations may be included in later stages of the project, based on more detailed technology needs assessment (Component 1) and the availability of funds. The following GEF financed activities are envisaged:

- Select project sites, with a suitable energy/water/land use profile, identify root causes to land degradation; conduct stakeholder consultation (at PPG);
- Conduct inventory of GHG emissions from agriculture/water management in the pilot sites, identify all major emission sources and select appropriate set of mitigation options
- Conduct hydrological studies of the pilot sites to assess hydrographic parameters of the landscape, available water sources, their quantity and quality, as well as potential impact of the proposed technologies on water resource
- Prepare Sustainable Land Management (SLM) plans for pilot locations, including a range of suitable low-carbon solutions to address land degradation. SLM plans will constitute an integral part of village development plans to be prepared under UNDP/Adaptation Fund project
- Implement SLM plans, including demonstration of selected low-carbon technologies and agricultural/livestock management practices. Investment sub-component will be co-financed by other donor-funded projects (EU and Adaptation Fund), private sector (Chevron[13]), and local communities. Also, at PPG stage, opportunities will be explored and discussed with the Government about establishing a prototype support scheme for the pilot projects, whereby a certain amount of confirmed co-financing for establishing financial support scheme for RE (under Component 4) will be channeled to support the pilots as grants for farmers or RE producers.
- Provide on the job training to local specialists in system O&M;
- Monitor SLM plan implementation (key sources of GHG emissions in the pilot sites, energy and water consumption, improvement of land productivity and associated socio-economic benefits for communities).

26. **Component 4: National policy, regulatory and financing framework for sustainable energy, water and land management.** This component builds upon the experiences from components 1,2 and 3 and is aimed at ensuring broader replication of EE-RE technologies and practices in water management sectors. It will do so by supporting the development and facilitating adoption of the National Sustainable Energy and Water Management Program (provisional title –the exact one to be determined at PPG) which will list specific policies, regulations, assign institutional responsibilities and financial support schemes and

[13] The details of Chevron's communication strategy about pilot project will be agreed upon under MoU to be signed between UNDP and the company on cooperation for implementation of pilot project. This MoU will also govern communication activities about the joint project by the parties. Draft MoU will be presented at the CEO Endorsement Stage so that any relevant provisions, as deemed necessary by the GEF, can be duly incorporated.

mechanisms to further promote implementation of prioritized low-carbon technologies in water sector, such as:

- Mandatory energy performance standards for irrigation systems, roadmap and long-term targets for their adoption (e.g.2030);
- Establishment of a system to monitor energy use in irrigation and compliance with established standards;
- Mandatory provisions for regular energy audits/inspection and establishment of modern management practices in irrigation ("Know your irrigation system"),
- Establishment of state financial support scheme for de-centralized RE-based water supply technologies, including the associated R&D needs and studies (such as hydrological assessment).
- Policies and regulations to mandate application of modern agricultural and livestock management practices for reduction of CH4 and N2O emissions.

27. The GEF support will include the development of the program, as well as support to appointed governmental agencies with its practical implementation, including:

- Revision of existing energy use standards applied to irrigation and other water supply systems and incorporate provisions for minimum energy performance requirements and mandatory energy audit in the scope of sector regulation;
- Building capacity for subsequent code revisions (post project) to ensure implementation of roadmap and achievement of established targets;
- Building capacity of Energy Inspectorate (Energonadzor) of TurkmenEnergo in development, introduction, enforcing, and monitoring compliance with energy use norms and standards in water sector;
- Supporting introduction of modern management practices in irrigation and tools to support them, such as on-line energy information management system to collect, present and analyze/benchmark data on actual energy consumption in water sector;
- Designing and securing financing for the state support scheme for de-centralized RE-solutions for rural water supply/irrigation. Based on the results of demo-projects under Component 3, proposal for the state support scheme for decentralized RE technologies will be prepared and included in the National Sustainable Energy and Water Management Program. Two options, either separately or in combination, will be explored and proposed for Governmental approval. First, launch of a new state-funded program which would provide grants, soft loans and other benefits to domestic RE manufactures to make their products affordable at local market (producers subsidies). Or, alternatively, incorporate RE-support scheme, as a separate funding window, in the scope of existing agricultural/rural development support programs (consumers subsidies);
- Specific policies and regulations necessary for ensuring replication of prioritized and tested non-CO2 CCM measures in agricultural sector, including provisions for their mandatory applications and appropriate sources of financing and public support scheme. For example, this might include revision of norms for fertilizers application (maximum allowances), as well as preparation, jointly with the State association for production, trade and sales of fertilizers, of a financing mechanism to reward farmers applying low-carbon agricultural practices (and using less fertilizers than currently allowed by the norms). One option for capitalization of such scheme would be to monetize the amount of "de facto" saved subsidies which the State Association receives from the state budget to cover up to 50% of the cost of fertilizers sold to the farmers.

Global environmental benefits

28. As illustrated in Table 1 the project expects to directly reduce about 2,500 tCO2 a year or around 50,000tCO2 over investment life-time from complex modernization of large-scale irrigation system. This will come from application of additional EE and RE technologies and modern management practices, which would not happen under BAU. The target is to achieve at least 20% reduction on top of energy saving expected under BAU (i.e. 20% saving to be achieved with baseline investment and additional 20%

due to GEF support).

Table 1: Direct global environmental benefits from Component 3

Type of demonstration	Energy use					Energy Savings		GHG emission reduction**	
	Current	BAU Upgrade		GEF-Alternative		Annual	Lifetime*	Annual	Lifetime
	MWh	MWh	%	MWh	%	MWh	MWh	tCO2	tCO2
Modernization of large irrigational scheme	**14,000**	**11,200**	**20**	**8,400**	**40**	**2,800**	**56,000**	**2,520**	**50,400**

* Lifetime of EE investment is assumed to be 20 years in line with GEF/STAP Guidance

** Estimated based on CO2 emission factor for electricity generation by using natural gas in Turkmenistan (0.9tCO2/MWh). Sources: CO2 emissions from fossil fuel combustion. IEA 2012, p. 121

29. Further, off-grid RES-based applications with the total installed capacity of up to 600 kW will provide clean energy to run local water supply systems and thus replace the need for off-grid diesel-based power generation with estimated GHG emission reductions of about 1,000 tCO2/year or 20,000 tCO2 over investment life-time (cca 800 MWh/year).

30. Indirect emission reduction impact from the project is conservatively and tentatively estimated at 50,000tCO2/yr or 1 mln tCO2 over investment life-time from application of mandatory EE norms and standards in the pumping stations to be rehabilitated/built during project implementation and influence period 2015-2030. Further indirect savings are expected from market development of energy efficient irrigation and drainage equipment and spill-over effect (to be quantified under PPG) to other pumping stations and amelioration pumping equipment in irrigation sector planed for rehabilitation and upgrading.

31. In addition, the project will deliver a number of ecosystem and local development benefits in pilot sites. RE-based irrigation of pastures (currently not in use due to water shortages/scarcity) will reduce overgrazing leading to recovery of rangelands. Improved rangeland condition and productivity lead to increased livestock productivity and sales; this will augment household incomes directly and improve over-all socio-economic conditions of local communities. This will in turn provide an incentive for sustaining the improved livestock management practices. Modernization of farm-level irrigation systems (improved drainage, more efficient irrigation techniques) will help prevent soil salinization, boost agricultural productivity and thus also improve local livelihoods. Livelihood opportunities and living conditions of 30,000 farmers and pastoralists will be improved as a direct result of the project. Global Environmental Benefits from implementation of pilot projects under Component 3 will be specified and quantified at PPG stage after selection of pilot sites and based on preliminary design of demo-projects.

32. Innovativeness, sustainability and potential for scaling up: The project adopts innovative approach to addressing water-energy challenges in Turkmenistan which will demonstrate that a combined strategy that seeks to make water consumption more efficient can lead to energy savings, while at the same time energy saving and substitution of fossil fuels with renewable energy in water sector leads to GHG emission reductions, help mitigate climate change and its negative impact on water availability. The project will show that in water management sector in particular, climate change mitigation and adaptation strategies are inextricably interlinked and will thus help build a stronger case for climate change mitigation in Turkmenistan and other developing countries facing similar water-energy challenges. The project will support a number of innovative policies and technological solutions for integrated water/energy/land management, such as energy performance standards for irrigation systems - an innovative policy tool which builds on GEF's extensive experience with energy performance standards for buildings – or RE-based solutions for water supply and irrigation, especially solar-based desalination – one of the first GEF project globally targeting such technology. Also, the focus of the project on climate change mitigation measures in agricultural sector is quite novel for majority of past GEF-supported intervention were aimed at improving carbon sequestration/storage and mitigation measures in agricultural sectors have not yet received sufficient attention.

33. Sustainability and scaling-up: Component 4 of the project is designed to ensure sustainability and scaling-

up of pilot interventions by putting in place enabling policy, regulatory and financial framework which will provide for effective replication of proposed and tested low-carbon technologies and practices in water sector. Specifically, National Program for Sustainable Water/Energy Management will enlist specific targets, policies and regulations to be adopted by the Government to promote EE/RE in water sector, such as a) mandatory energy performance standards for irrigation systems, roadmap and targets for their adoption; b) system to control and monitor energy use in irrigation and compliance with established standards; c) Mandatory provisions for regular energy audits/inspection and establishment of management practices in irrigation (**"**Know your irrigation system**"**), and d) Sources of financing for de-centralized RE-based water supply technologies. The program will also assign institutional responsibilities among national and regional authorities for development, adoption and enforcement of the respective policies and regulations. The project will provide technical support to concerned agencies to develop and implement the key provisions of the Program. Further, to ensure financial sustainability and replication of investment in EE irrigation, under Component3, the project will work with the Ministry of Water Resources to create a revolving financing scheme, whereby energy savings generated from pilot projects will be monetized and accumulated on annual basis on a separate account within the Ministry**'**s budget. These funds will then be used to finance other EE investment in irrigation systems operated by the Ministry.

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

Stakeholder	Involvement in project preparation
Ministry of Water Resources and its entities (river basin irrigation system administrations, irrigation system administrations, and main canal administrations operating at the central and inter-farm levels)	National Executing Partner: lead project development on behalf of the Government Identification of pilot sites Review of relevant national policies and regulations
Ministry of Agriculture and State Commission on Land Issues	Contribute to identification of pilot sites and design of SLM plans
EnergoNadzor (State Agency for Energy Use Monitoring)	Capacity assessment for enforcement of EE norms and regulation in water management sector
Turkmen Academy of Science: Solar Institute "Gun", Institute of Desert, Flora and Fauna and Research Institutes for Water Management	Scoping for technology needs assessment Advice on pilot site/technology selection
Local communities: water user association, local government and community leaders	Identification of pilot sites/projects, stakeholder consultation
Ministry of Environment and Nature Protection	Coordination with Adaptation Fund/UNDP project
State association for production, trade and sales of fertilizers	Design of financial support scheme for low-carbon agricultural practices
Grundfos*	Sharing international best practices and technologies for water management sector Advice on scoping of pilot projects under Components 2 and 3

EU Sustainable Energy Program	Technical inputs for technology needs assessment Collaboration on identification of pilot off-grid projects

* Grundfos involvement in the project will only be limited to providing in-kind support and technical expertise for conducting pump audit and training of technical specialist. Grundfos will not be involved in preparing technical specifications for investment projects and technology providers will be selected via open and transparent tender procedures following UNDP and the Government procurement laws, rules and regulations.

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

Risk	Assessment	Mitigation
Water scarcity and its impact on implementation of new technologies and vice-versa: potential negative impact of new technologies on water availability, including groundwater	H	Water scarcity poses significant risk to sustainability of Turkmenistan's agricultural sector and thus is also a concern for the proposed project. To some extent, the proposed project will help address this risk by directly supporting water saving technologies, as well as identifying alternative water sources (such as from desalination). Assessment of water availability will be an important task under Component 1: to make sure that proposed solutions have adequate and available resources base to operate. Under Component 3, the design of demonstration projects featuring new RE-based water supply technologies will be based on careful hydrological studies in the chosen locations which would take into account the hydrographic parameters of the landscape, available water sources, their quantity and quality. Based on the results of these studies, such design characteristics of projects will be proposed (e.g. for new wells - location, size, depth, capacity, turnover and placement from each other) that they have negligible impact on the groundwater stores in the long-term perspective. These engineering and hydrological studies will be carried out by experienced local experts, drawing on international expertise as necessary. Further, to ensure that any further replication of RE technologies in water sector do not have negative impact on water resources, necessary provisions will be incorporated in the State support scheme for RE (to be developed under Component 4), which will mandate and finance undertaking of hydrological studies and risk assessment for RE projects in water sector, qualified for state support under the scheme. Finally, the project will work in close collaboration with Adaptation Fund project which is dealing specifically with water scarcity issue and will leverage its knowledge and expert base to better assess and address this risk in the scope of proposed GEF-suported activities.
Low motivation among basin irrigation system administrations and irrigation system administration to deal with energy efficiency	M	The project will demonstrate economic benefits of integrated energy management of the entire irrigation system applied to all levels of irrigation (central basin pumping stations, inter-farm I&D pumping, and on-farm micro-irrigation techniques). This should provide for sufficient motivation and incentives for all relevant governmental authorities since currently over 50% of annual operational budget of the Ministry of Water Resources is being spent on power bills.
Unintended impact of proposed EE/RE solutions on land degradation, i.e. intensification of presuares	M	This risk will be managed via preparation of local SLM plans. Each plan will be based on assessment of baseline situation, energy-water-land linkages, propose specific low-carbon and SLM technologies and practices to address them comprehensively (i.e. with no detrimental impact on one or another component of the triangle).
Low level of knowledge and skills among local professionals	M	Provision of technical assistance to build capacities of various local stakeholders involved in irrigation and drainage activities will constitute the major part of the project. This technical assistance will be provided through a "learning-by-doing" approach whereby local specialist will work together with international consultants to design and operate pilot EE irrigation

		projects.
Irrigated agriculture sector is vulnerable to climate change impacts	M	The Government of Turkmenistan recognizes that as a result of climate change water run-off provided by its major river, Amu-Daria, may further decrease (i.e. 65-75% of the total average amount) and therefore water saving programmes in agricultural sector are among the top of national priorities. The proposed project will help alleviate the risk of water shortage by introducing and promoting improvements in water and energy efficiency and an integrated water-energy management approach in irrigation thus leveraging win-win opportunities for climate change mitigation and adaptation.

A.4. Coordination. Outline the coordination with other relevant GEF financed and other initiatives:

34. The project will work in close cooperation with baseline projects described in the section A.1. Adaptation Fund project will invest in a range of measures aimed at improving communal water supply and management systems, such as water harvesting and saving techniques, community-based well and watering points, improved local irrigation systems. These investments will constitute the important and essential baseline. GEF additional investment will cover introduction of RE/EE-based solutions for communal water infrastructure. For example, AF will cover construction/improvement of wells, whereas GEF will only finance solar-PV applications.

35. The project will coordinate closely with the following on-going and planned GEF-financed initiatives. 3rd National Communication to UNFCCC: the project will provide critical inputs for the preparation of 3rd NC based on its findings regarding potential for EE/RE and GHG emission reduction in water management sector. Close coordination will be ensured with UNEP/GEF Global Technology Needs Assessment project (where Turkmenistan is one of the target countries). The following arrangements are proposed: Technology Needs Assessment and Technology Action Plan for Turkmenistan (to be supported by UNEP-GEF project) will include detailed market and barrier analysis for prioritized climate change mitigation technologies in water sector, whereas UNDP-GEF project will build upon TNA findings by supporting the implementation of Technology Action Plan, including preparation of technical specifications for selected range of technologies, their testing and adaptation to local needs and circumstances, as well as developing institutional and financial framework for their replication and scaling-up. Coordination will be ensured by UNDP CO in Turkmenistan and UNDP-GEF Regional Coordination Unit for Europe and CIS, on one side, and UNEP DTIE and the UNEP Risoe Centre on Energy, Climate and Sustainable Development, on the other side.

36. UNDP/GEF/GTZ Sustainable Land Management Project (completed, under CACILM): the project will build on the results of CACILM-supported work in the region and specifically in Turkmenistan. Pilot locations were selected with a view of maximizing synergetic impact of these interventions and using the institutional structures and local capacities for sustainable land management established under CACILM. At national level, it will liaise closely with the National Coordination Council established under CACILM to facilitate adoption of proposed regulatory changes and financial support scheme (Component 4). At the communities level, the project will work with land users organizations, established/supported under CACILM, to familiarize them and help adopt suitable low-carbon solutions for water supply/irrigation.

37. The project will also seek to establish partnership with Islamic Development Bank (IsDB). ISDB provides interest-free loans to Turkmenistan to finance a range of infrastructure and agricultural projects, including a recently announced rural water supply project which offers good perspective for collaboration and leveraging resources for EE/RE in water supply sector.

DESCIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

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

Reports, etc.:

38. Adopted in 2012, National Climate Change Strategy has, for the first time in the history of Turkmenistan, identified energy efficiency and renewable energy as national policy priorities. The proposed project is designed to support the implementation of the Strategy by promoting sustainable energy use in one of the key energy end-use sectors: water supply and irrigation. The government is increasingly aware of climate change related pressures on water availability and agricultural productivity. The Second National Communication identifies water management and agriculture as the most vulnerable to the impact of climate change. Unless the efficiency of irrigation systems climbs from 57% at present to 75% by 2050, there will be a water deficit of 14km3 in irrigated agriculture. Further, the National Action Plan under UNCCD specifically refers to RE-based irrigation as the number one priority measure to improve pasture productivity and prevent land degradation. As such, the proposed project is well aligned with the national priorities and strategies both for mitigation, land degradation, and adaptation.

39. The project is consistent with recommendations of technology needs assessment (TNA), as presented in the Initial National Communication to UNFCCC (chapter 4, pp. 60- 65), which, prioritizes development of alternative energy sources, solar and wind, as well as calls for urgent modernization of main power consuming sectors, where highest level of inefficient energy use is observed.

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

40. The project is in line with the Climate Change Mitigation focal area strategy and will contribute to Strategic Objective 2 “Promote market transformation for energy efficiency in industry” with focus on water management sector. By doing so, it will also help identify, adopt and deploy a range of new, little known, let alone properly tested RE-based water pumping and de-salination technologies in the Turkmen context. Component 1 of this project will help and thus will support Strategic Objective 1 “Promote the Demonstration, Deployment and Transfer of innovative Low-Carbon Technologies”. The proposed project will directly respond to the strategic goals of the GEF-5 strategy in the Climate Change Mitigation focal area, namely improving energy efficiency in the water supply industry, and supporting new low-GHG emitting energy technologies. The project is consistent with the GEF-5 CCM-1 objective in that it would use south-south and north-south cooperation as well as institutional and technical capacity building and information dissemination to create an enabling environment for technology transfer, specifically for renewable energy (off-grid solar and wind) and energy efficiency (energy efficient irrigation pumps) technologies for better water management.

41. The project also responds to the GEF’s Objective 1 in the Land Degradation focal area to “maintain or improve flows of agro-ecosystem services to sustain livelihoods of local communities.” Rural communities in Turkmenistan will be supported to implement and operate modern RE-based water management technologies for agriculture and pasture management aimed at restoring and improving irrigated land while increasing economic opportunities for the rural population and improving environmental conditions.

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

42. UNDP is one of the lead agencies of the GEF to implement enabling activities and capacity development activities related to climate change mitigation and land degradation. In Turkmenistan, UNDP has supported the country in developing its First National Climate Change Communication to the UNFCCC and the National Climate Change Strategy adopted in 2012.

43. The proposed UNDP / GEF Project is fully aligned with the Outcome 3 of the Country Program Document (2010-2015) for Turkmenistan “Promoting sustainable development and inclusive

growth". UNDP Country Office in Turkmenistan has a strong climate change portfolio consisting of the following initiatives: UNDP-GEF "Promoting Energy Efficiency in Residential Building Sector" project, UNDP-Adaptation Fund "Addressing Climate Change Risks to Farming Systems in Turkmenistan at National and Community Level", and UNDP Climate Risk Management Project, and a dedicated climate change team, which supports portfolio implementation.

44. This project fully complies with the comparative advantages matrix approved by the GEF Council, where UNDP is assigned a leading role for technical assistance and capacity building on climate change. UNDP has a strong comparative advantage in the implementation of projects both in the area of climate change mitigation and sustainable land management. It will bring significant experience to this project with the implementation of its sizable portfolio of projects promoting industrial energy efficiency and decentralized RE solutions.

45. UNDP is also the lead agency within the United Nations (UN) system helping countries to develop capacity for Ecosystems and Biodiversity Management. With 40 years of transformational work in Ecosystems and Biodiversity management, and building on an established global network of country offices and regional centres, UNDP has been supporting countries to shape and drive natural resources management for sustainable development—driven by national commitments, needs and priorities. More specifically, UNDP works directly with countries to integrate ecosystems management and biodiversity into poverty reduction, development planning and economic sectors through: (a) developing capacity at the individual, institutional and systemic levels to remove barriers to, and identify new options for, effective governance and finance for biodiversity and ecosystem management and (b) assisting countries to identify, access, combine and sequence environmental finance to address the biodiversity and ecosystem financing gap, mobilize pro-poor markets for ecosystem goods and services, and generate sustainable livelihoods.

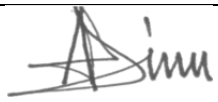
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

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)*
Jumamurad Saparmuradov	Deputy Minister of Nature Protection GEF Operational Focal Point	MINISTRY OF NATURE PROTECTION	**04/18/2013**

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	DATE *(MM/dd/yyyy)*	Project Contact Person	Telephone	Email Address
Adriana Dinu, Office-in-Charge, and Deputy Executive Coordinator, UNDP/GEF		Aug. 13, 2013	Marina Olshanskaya Regional Technical Advisor	+421 907 840 152	marina.olshanskaya@undp.org