Technology Action Plan (TAP) for Climate Change Mitigation Technologies

Government of Afghanistan

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TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AE	Alternate Energy
AIT	Asian Institute of Technology
ALGAS	Asian Least Cost GHG Abatement Strategy
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon dioxide
DG	Director General
DTU	Technical University of Denmark
E&CC	Environment and Climate Change
EE	Energy Efficiency
EGTT	Expert Group on Technology Transfer
ESTs	Environmentally Sound Technologies
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse Gas
GHGR	Greenhouse Gas Reduction
GoA	Government of Afghanistan
IGCC	Integrated Gasification Combined Cycle
IBUR	Initial Biennial Update Report
LPA R&D	Logical Framework Approach Research and Development
TNA	Technology Need Assessment
NEPA	National Environmental Protection Agency
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Program

GLOSSARY

Barrier: Obstruction or impediment that impedes technology transfer; a reason why a target is adversely affected, including any failed or missing countermeasures that could or should have prevented the undesired effect(s).

Biomass: The total mass of living organisms in a given area or a given species is usually expressed as dry weight. Organic matter consisting of, or recently derived from, living organisms (especially regarded as fuel) excluding peat. Biomass includes products, by-products, and waste derived from such material. Cellulosic biomass is biomass from cellulose, primary structural component of plants and trees.

Capital goods: Machinery and equipment used in producing other goods, e.g. consumer goods such as boilers, motors, steel, or pumps.

Caron dioxide (CO2): CO2 is a naturally occurring greenhouse gas and a by-product of burning fossil fuels or biomass, land-use changes, and industrial processes. It is the principal anthropogenic greenhouse gas that affects Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore it has a Global Warming Potential.

Climate Change: Climate change refers to a change in the climate state that can be identified (e.g., by using statistical tests) by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing or persistent anthropogenic changes in the composition of the atmosphere or land use.

Consumer goods: Good and products specifically intended for the mass market and purchased by (private) consumers.
Diffusion: The process by which technology is spread or disseminated through various channels over time in a society, where the technology is gradually adopted by more and more society members (people, institutions, companies, etc.).

Enabling Environment/Framework: The set of resources and conditions within which the technology and the target beneficiaries operate. The resources and conditions generated by structures and institutions beyond the immediate control of the beneficiaries should support and improve the quality and efficiency of the transfer and diffusion of technologies.

Energy: The amount of work or heat delivered. Energy is classified in a variety of types and becomes useful to human ends when it flows from one place to another or is converted from one type to another.

Land-use: The total of arrangements, activities and inputs undertaken in a certain land-cover type (a set of human actions). The social and economic purposes for which land is managed (e.g., grazing, timber extraction, and conservation). Land-use change occurs when, e.g., the forest is converted to agricultural land or to urban areas.

Market/value chain: The chain of economic actors that own and transact a particular product as it moves from primary producer to final consumer.

Market mapping: An analytical framework for understanding market systems and an approach to market development that is both systematic and participatory.

Measures: Measures are technologies, processes, and practices that reduce GHG emissions or effects below

anticipated future levels. Examples of measures are renewable energy technologies, waste minimization processes and public transport commuting practices etc. Measures can also be factors (financial or non-financial) that enable or motivate a particular course of action or behavioural change or is a reason for preferring one choice over the alternate. Often the word 'incentive' is used synonymously, sometimes with a slightly different interpretation.
Mitigation: Mitigation is short for 'climate change mitigation', meaning an action to decrease the concentration of greenhouse gasses, either by reducing their sources or by increasing their sinks.
Non-market goods: Goods not traded in a market.

Publicly provided goods: A category of technologies characterized by large investments, general public ownership, and production of good and services available for the public or a large group of persons.

Reforestation: Direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was previously forested but converted to non-forested land.

Renewable Energy: Renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, biomass, wind, rain, tides, waves and geothermal heat.

Stakeholder: A person, group, organization or system that affects or can be affected by an organization's actions.

Sustainability: The ability to meet the current needs while considering the carrying capacity of the Earth's supporting eco-systems without compromising the ability of future generations to meet their own needs.

Technology: Technology is a piece of equipment, technique, practical knowledge or skills for performing a particular activity. It is common to distinguish between three different elements of technology: the tangible aspect such as equipment and products (hardware); the know-how, experience and practices (software) associated with the production and use of the hardware; and the institutional framework, or organization, involved in the transfer and diffusion of a new piece of equipment or product (orgware).

Technology transfer: Technology transfer involves vertical technology transfer, which is understood as the movement of technologies from the Research and Development "R&D" stage to the commercialization, and horizontal transfer, which involves the spatial relocation or diffusion.

FOREWORD

Innovation is the key to knowledge, technology, and creative outputs. Achieving global reduction in GHG emissions requires innovation to transform current technologies into cleaner and climate-resilient technologies. Thus, innovative technologies serve as the cornerstone for sustainable socio-economic and climate-resilient development. Afghanistan is in dire need of innovative technologies for reducing GHG emissions and climate change impacts. During the past four decades, nine out of top ten natural disasters have triggered due to climate change which is inflicting colossal damage to life, property, natural eco-system and the economy of the country.

In this effort NEPA in collaboration with the United Nations Environment, Climate Technology Centre, and Network (CTCN) and Technical University of Denmark (DTU) and Asian Institute of Technology, launched the Technology Needs Assessment (TNA) project, which produced three reports. The first report identified and prioritized potential GHG emission reduction technologies helpful in climate change mitigation. The second TNA Report presented barrier analysis and enabling framework to streamline diffusion and disseminate potential identified mitigation technologies. The present TNA Report III presents the Technology Action Plan (TAP) and Project Idea Notes based on the outcome of TNA Report I and II. The TAP identifies concrete actions and activities needed for successful technology implementation and develops indicative investment proposals for each technology. The implementation of the proposed technologies will play an effective role in reducing GHG emissions as well as increasing resilience against climate change vulnerabilities through transfer and diffusion of prioritized technologies and removing barriers in their adoption.

I am sure that the proposed technologies will attract funding from potential national and international donor agencies. With the collaboration and assistance of the implementing partners, Afghanistan will soon be able to implement these environmentally sound -resilient technologies on the ground allow the country's capacity for sustainable socio-economic development is enhanced. NEPA will take all necessary measures to help transfer and diffusion of technologies prioritized by experts in the energy and waste sectors. I am confident that the international community will also contribute to our efforts in diffusion and dissemination of prioritized technologies and help Afghanistan contribute to the global efforts towards maintaining global temperature well below 2°C above pre-industrial levels as agreed under the Climate Change Paris Agreement.

Director General, NEPA

EXECUTIVE SUMMARY

The Technology Need Assessment Report III on "Technology Action Plan (TAP) for Climate Change Mitigation Technologies" is built on the findings of two earlier reports i.e. "Technology Needs Assessment (TNA Report-I)" and "Barrier Analysis and Enabling Framework for Mitigation (TNA Report II)". The prioritized sectors are Energy & Waste sectors. The priotitised technologies in the respective sectors include (i) Solar PV at household and institution levels (ii) Small hydropower plants (iii) 3Rs Technology and (iv) Biogas Technology. The TAP identifies concrete actions and activities needed for successful technology implementation and develops indicative investment proposals for selected technologies. These can be considered for funding by the potential public, private and international institutions in the prioritized sectors.
The selected technologies have vast potential to scale up into projects and programs that can be implemented to reduce greenhouse gas emissions and improve resilience to climate change as committed by the country in its Nationally Determined Contributions (NDCs).

It is envisaged that the implementation of Technology Action Plan (TAP) and the project idea notes will pave the way for reducing GHG emissions in the country. It is therefore, considered necessary that the Government of Afghanistan draws up a comprehensive National Climate Change Mitigation Technology Development Programme with short, medium- and long-term goals and targets. For effective utilization of climate change fund, there is a need to develop a multipronged strategy to support the development and diffusion of climate change mitigation technologies and promote socio-economic development in the country. It will also help Afghanistan to meet its Nationally Determined Contributions (NDC) committed by the Government of Afghanistan to the global community under the Paris Agreement.

The Technology Need Assessment (TNA) study on climate change mitigation has identified that Afghanistan has huge un-tapped indigenous mitigation potential, which if effectively exploited will lead Afghanistan towards low carbon economic growth by significantly reducing GHG emission. It will also help Afghanistan to meet its Nationally Determined Contributions committed by the Government of Afghanistan to the global community under the Climate Change Paris Agreement. Implementation of Technology Action Plan (TAP) and the project idea notes will pave the way for reducing GHG emissions in the country.

There is an urgent need that the Government of Afghanistan draws up a comprehensive National Climate Change Mitigation Technology Development Programme with short, medium- and long-term goals and targets. These must focus on capacity building, curriculum development, undertaking detailed study for the establishment of technology incubation centres and technology parks. To create a trained cadre of professionals in these technologies, the government may offer scholarships to youth and provide internship opportunities for the deployment of skilled and trained professionals.

The program must also be designed for mass awareness for wide diffusion and dissemination of technical knowledge, skills development in the climate change mitigation technologies and distant learning. The funding mechanisms for launching these programs must be explored through contributions from national budget and private sectors, bilateral and multilateral donors and financial windows such as Green Climate Fund (GCF) etc.

In accordance with TAP methodology the technologies selected in the Part I of this report are further analysed to develop market maps, conduct barrier analyses, develop enabling environment and derive the concrete Technology action plans for their deployment and dissemination. The interaction with stakeholders was also used to develop and suggest concrete pilot project ideas. Afghanistan is in early stage of formulating its policies towards climate change mitigation technologies, the most important barriers are generic rather than specific to each technology in different subsector. Therefore, it was chosen to conduct the market analyses and develop TAPs for

the highest priority technologies.

The barrier analysis has revealed that lack of information and awareness is the most important barrier for implementation of these technologies. This concerns awareness and information at policy, consumer manufacturer and general market levels. There is a need to develop and communicate the information to various stakeholders. Second important barrier is financial barrier for manufacturers and consumers' short term vision preventing from investment in longer term durable benefits. Thirdly, technological barrier namely need for proper adaptation of the technology to specific region conditions, and lack of R & D for testing certification and standardization.

Recommended policies and measures for overcoming the barriers to the selected technologies are:

- Government should support innovation and R & D institutions
- Standardization and certification
- Cheap and business friendly special financing sources
- Proper energy pricing and accounting for externalities
- Better donor coordination with local conditions is needed.
- Efficient construction has a much more complicated market map with several related markets and big number of market participants.

Insufficient information and knowledge of architects, designers and constructors as well as developers and consumers does not allow the technology to develop and lack of adequate factual information at policy level does not support creation of enabling and creation of supportive policy and regulatory environment which is the second most important barrier. The measures and policies to overcome this barrier include:

- Development of training and educational programs for specialists
- Outreach campaigns and better coordination of donor programs
- Sharing best world experience and practices

Local manufacturing and assembly needs to be promoted in order the overcome the main barrier which is relatively high cost of the equipment. The main factors of business enabling environment are: taxation regimes and import duties, energy prices and availability, cost of capital and interest rates on financial market, consumer awareness and preferences, government economic strategies and policies, Donor projects and programs, general business environment. High price of the equipment relative to population incomes and lack of reliable information about the potential benefits of technology for the consumer and for economy prevent its development. The recommended measures for overcoming these barriers are:

- Better coordinated and planned Donor programs with pronounced information component.
- Introduction of tax benefits and cheap financing schemes.
- Introduction of tax benefits and cheap financing schemes etc.

These measures require more government policy and institutional development. Therefore, an essential part of TAP is continued participation of Donor agencies since the Afghan government is not yet prepared for leading the development of climate change mitigation technologies. An emphasis should be placed on developing the relevant institutions functionality in this direction.

CHAPTER 1: ENERGY SECTOR TECHNOLOGY ACTION PLAN AND SECTOR OVERVIEW

Meeting the energy deficit is of fundamental importance to Afghanistan's economic growth and its efforts to raise levels of human development. This pressing issue needs to be addressed through an integrated energy plan comprising short-term, medium-term, and long-term actions. The broad vision behind the integrated energy plan should meet the demand for all sectors' energy needs sustainably at competitive prices with a greater reliance on indigenous resources. The sustainable development and growth in the energy sector can be ensured by developing a technological base of optimal energy options. Under the energy sector, the Technology Needs Assessment report identified nine technologies. Out of these two top-ranking technologies, namely Solar Energy (PV) and Small hydropower plants were prioritized for barrier analysis and preparation of Technology Action plan.

1.1. Preliminary Targets for Technology Transfer and Diffusion in Energy Sector

Despite Afghanistan being rich in energy resources, more than three decades of continuous conflict has destroyed or severely degraded much of its infrastructure base, including that of the energy. As a result, currently, Afghanistan relies heavily on electricity imports from neighbouring countries, which account for more than three-quarters of Afghanistan's total electricity usage. To reduce reliance on imported electricity, Afghanistan has made it a national priority to promote the generation of domestic electricity. Over the last decade, Afghanistan has made significant reconstruction efforts at all levels of the energy supply chain, particularly the electricity sector.

The need for a master plan in the energy sector was identified at the time the ANDS was first developed. The master plan was prepared in 2004 with the support of the World Bank. However, the master plan quickly became outdated, as Ministry of Energy and Water lacked the capacity to update it. For instance, MEW's power sector strategy was based on the requirement assumed in the 2004 master plan. This requirement did not consider the population increase between 2004 and 2007 and, therefore, significantly underestimated Kabul's needs in 2007. Although power projects are prioritized by ANDS, the ANDS power sector investment program has not been appropriately implemented. Without an updated master plan, many activities under the ANDS have become ad hoc and lack strategic management. Many aid agencies have supported investment in the electricity sector without coordinating and consulting with one another. The North East Power System, a successful initiative of the ANDS, brought immediate power to major load centres in the northeast, but there were incompatibility issues because seven different aid agencies were involved. In many instances, the same type of equipment had different specifications, complicating future maintenance. Coordination would have brought some sort of standardization within the system.

It is worth mentioning that TNA-I and TNA-II reports identified solar PV and small hydro powerplants as the top two prioritized technologies in the energy sector. The present energy sector technology action plan is the outcome of need assessment, identification and prioritization of energy technologies and barrier analysis and enabling framework for promotion of these technologies in Afghanistan. The identified solar PV and small hydro power technologies have the most considerable potential among the renewable technologies to meet the energy demand in the most cost-effective manner. These technologies have a vast potential to be developed into projects and programs that can be ultimately implemented to reduce greenhouse gas emissions and improve resilience climate change as committed by Afghanistan in its Nationally Determined Contributions (NDCs).

1.2. Solar PV Technology Action Plan at Household and Institutional level

1.2.1. Introduction

In the TNA exercise, solar photovoltaic (PV) system in off-grid at household and institution level ranked highest in prioritization of technologies in energy sector. The off-grid solar system consists of solar PV panels, charge controller, battery which runs only on Direct Current (DC) power for lighting, fan and other electric appliances. The solar PV system has many benefits: (i) during electricity load-shedding the solar system overcomes the discomfort of life, loss of production and business; (ii) facilitates in creating new employment opportunities as

well as helps in establishing cottage industries and increasing the working hours; (iii) the solar PV provides clean energy, better health conditions and also replace use of fossil fuel for energy generation; and (iv) helps in reducing national level GHG emissions. Thus, can also be a source to claim Certified Emission Reductions through Clean Development Mechanism projects. In rural Afghanistan, solar panels have started initially with the support of NGOs and Asian Development Bank and mainly used for lighting.

Step 1: Ambition for promoting solar technologies

Years of war and neglect have left Afghanistan's energy sector in poor condition. Electrification ratios and energy consumption rates are among the lowest in the world. By some estimates, less than 10% of the population have intermittent access to publicly provided power, and per capita, electricity consumption is as low as 21 kilowatt-hours a year. Many load centres around the country get electricity only 2–3 hours a day. Such electricity shortage affects people in urban and most rural areas alike and constrains economic growth. The government has been developing the Afghanistan National Development Strategy (ANDS) since 2004, with the support of the international community, AERU2018

The ambitions for the TAP The overall intention of the TNA is to improve the socio-economic situation in Afghanistan, by moving towards a trajectory of sustainable development. In this regard, there key objectives for sustainable development were adopted: sustainable economic development; reduced poverty through increased employment and incomes and climate change mitigation and protection of the environment. Coupled with these key objectives, SDGs 7 and 13 were also identified as key sustainable development goals SDGs) that the technologies should set out to achieve.

Step 2: Actions and activities selected

Summary of Barriers and measures to overcome barriers:

Barriers related to technologies implementation in the Energy sector have been identified in seven categories: 1) Economic, Financial, 2) Market Failure and Imperfection, 3) Policy, Regulatory, 4) Institutional, 5) Information, Awareness, 6) Technology Issues and 7) Human Skills. Though, all the barriers identified in Energy Sector are profound, difficult to identify and difficult to understand, however respective measures were recommended to overcome those barriers for the creation of enabling framework. In order to understand the fundamental problems in technology transfer Problem trees, objective trees and market mapping, each of prioritized technologies of Energy sector was analysed with a view to overcome the barriers to transfer and diffusion identified during the Barrier Analysis and Enabling Framework phase of the project.

The nature of the barriers in the sector is mainly considered to be institutional and regulatory while economic and financial measures have reasonable operational costs, low investment costs for the import of technologies, new equipment, and techniques. Measures for overcoming of barriers have been identified for each technology and respective action plans have been drafted by the project team.

The significant barrier in the diffusion of solar PV identified in the TNA Barrier Analysis and Enabling Framework report is the economic and financial and non-financial barriers. One of the most important barriers for the installation of solar PV in both large and small scale is the high upfront capital cost. The initial capital cost of panels and batteries are hindering the expansion of the solar market due to lesser consumer affordability. The barrier can be overcome by the promotion of the established credit line and the development of a business model to encourage domestic manufacturing.

The major non-financial barriers for solar PV are low awareness, lack of quality standards and labelling, lack of strategies and legislations, less technological skills and coordination between government departments and NGOs are also among the barriers. The measures to overcome non-financial barriers are development and

implementation of behaviour change strategy, awareness raising, development of accredited training facilities to disseminate solar PV technology among the prospective consumers, and establishment of solar energy quality standards to guarantee the availability of reliable product quality in the market. For the promotion of solar PV systems, the establishment of a regulatory mechanism for coordination between NGOs and government departments and incentives such as tax rebates and duty-free imports of solar PV equipment and systems and expansion of Net-metering program. An overview of barriers and its mitigation measures identified in the TNA process are identified in the TNA process described in Table 1 bellow:

Table 1: Overview of Solar PV Barriers and Measures to overcome these

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	High up-front/ capital cost	Promotion of soft term credit line
	Difficulties in accessing finance/ credit	Develop business model to encourage domestic manufacturing
Non-financial	Less technical skill and low awareness	Production of accredited technicians and awareness-raising;
	No quality standards and labelling;	Establishment of quality standards and labelling;

a. Framework for ranking measures for inclusion as Actions selected for the TAP

The assessment and ranking of identified measures have been done based on effectiveness, efficiency, interaction with other measures, suitability within the country, and benefits and costs as per guidelines for preparation of TAP in Table 2 below:

Table 2: Framework for ranking measures for inclusion as Actions selected for the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
Promotion of soft term credit line	Interactions with other measures	The credit line program has an interaction with awareness raising and training measures as both complement and supplements each other.	Promotion of credit line will overcome this issue and will help in expansion of the solar market by making it affordable. The banks have indicated their willingness to credit line for solar systems if certified trainers and technicians are available at local level to reduce the risk of failure.
	Suitability within country/ sector	Provision of a credit line is suitable for the country as there is a huge energy crisis in non-grid and grid connected areas. Solar energy is the most feasible technology in the country but due to high initial cost is not affordable for a common man. The credit line will facilitate to overcome the high initial cost and make the technology affordable.	
	Benefits and costs	The credit line will be beneficial for the consumers as well as for the banks. Direct benefit of technology implementation is the immediate availability of electricity, whereas indirect benefits include more working hours and electricity available for SMEs and other income-generating opportunities.	
Production of accredited technicians and awareness raising	Effectiveness	Effectiveness of solar PV technologies is enhanced when potential developers, local technicians and people in general are aware. The banks will increase their credit line when supported by accredited technicians reducing the risk of failure of technology.	The solar PV market will pick up in the country at a fast scale with dissemination of knowledge and information and training a cadre of technicians even at grassroots level. Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and will expand the banks loan portfolio towards solar technology. The measure is not costly as compared to its benefits. Therefore, the measure is prioritized
	Efficiency	The measure will be effective through establishment of accredited institutions providing technical skills at the grass root level. Promote mass awareness programs through print, electronic and social media.	

			second to be taken as action.
	Interactions with other measures	Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and the banks' loan portfolio towards solar technology. The measure is also helpful for Net metering promotion, so it has a good interaction with other possible measures.	
	Suitability within country/ sector	The measure will ensure provision of accredited technicians at grassroots level and public awareness of the technology. Further, it will build confidence of financial institutions and the suppliers of the technology. This will result in promoting the technology on a large scale in the country.	
	Benefits and costs	The awareness raising and training programs do not require much cost as compared to the benefits. For promoting the technology, there is a need of accredited technicians at the local level and use of mass media for awareness raising. The measure will facilitate the supporting programs like credit line,	
Establishment of quality standards and labelling	Effectiveness	The effectiveness of quality standards and labelling is high because it enables a consumer to choose the type of solar PV systems. However, at the present the cost of the technology is high and is not affordable by a common man. The standards developed for the country may be adopted at par with the global accredited standards to improve its effectiveness.	At present there are no quality standards to monitor the quality of the panels. Local manufacturers are producing some parts of the technology but is not meeting the standards
	Efficiency	According to the standards, training to the producers of solar equipment will improve efficiency of solar systems and facilitate its adoption.	After the establishment of labelling the local manufacturers will require the training and technology transfer to enable them to meet the

	Interactions with other measures	At present local manufacturers are producing some parts of the technology but is not meeting the standards. After the establishment of labeling the local manufacturers will require the training and technology transfer to enable them to meet the standards.	standards.
	Suitability within country/ sector	The solar PV systems being sold in market are not labelled and are sold at a lower price. However, there is no guarantee that the system will remain fully functional. The standardization and labelling program will ensure and will retain the confidence of the users and financial institutions of the technology although it will initially increase its cost but in the long term will be helpful in expansion of the loan technology.	
	Benefits and costs	The measure increases the cost of product, but it also ensures the efficiency and performance of the product. Quality standards and labelling is required to be supported by legislation as well as enhancing capacity building of relevant institutions and manufacturers. The labeling program itself has a cost that may be borne by the government or the manufacturer.	

Selection of Actions for inclusion in the TAP

In consultation with the Expert Working Group on Mitigation and assessment of measures the following measures have been taken as actions for developing TAP for solar PV is indicated in Table 3.

Table 3: Final selection of Actions/Measures for promoting Solar PV for inclusion in the TAP

Categories	Identified measures to overcome barriers (ranking) for the solar panel technology	Measures selected as actions for inclusion in TAP
Economic and Financial	Promotion of soft term credit line (1)	Promotion of soft term credit line with low interest rate of less than 5%.
Non-financial	Production of accredited technicians and awareness raising (2)	Production of accredited Technicians and awareness raising;
	Establishment of quality standards and labelling (3)	Establishment of quality standards and labelling

Identifying activities for the selected Actions:

Action 1: Promotion of soft term credit line for the Solar PV system.

Afghanistan will need to establish a special window for promotion of renewable energy technologies including solar and hydropower. It is a soft term credit line with less than 5% interest rate. The banks/financial institutions will need to prepare proposals for securing funding. The banks will develop credit policy and procedures as well as disbursement and recovery of loans with regular documentation and monitoring.

Table 4: Identification and description of specific activities to support Action 1:

Activity 1.1. Identify donors, NGOs and other stakeholders
Activity 1.2. Prepare concept notes and project proposals for securing funding according to donor's or banks guidelines
Activity 1.3. Banks develops credit policy and procedures
Activity 1.4. Disbursement of loans under one window operation.
Activity 1.5. Recovery of loans according to banks policy.
Activity 1.6. Regular documentation and monitoring of loan program.

Action 2: Capacity building of Accredited Technicians and Awareness raising

At national and provincial levels, institutions for training will be identified. To enhance the capacity, these institutions will be interlinked with accrediting institutions e.g. Afghanistan National Standardization Entity Technical Education and Vocational Training. The Identified institutions will be responsible for preparing training modules, monitoring mechanism, selection criteria of participants, and conducting training. Promotion of awareness program will be through pamphlets, booklets, leaflets, banners and billboards. These will also be developed in local languages and provided to the relevant stakeholders and communities for wider dissemination of the technology.

Table 5: Identification and description of specific activities to support Action 2

Activity 2.1. Identification of training institutes and its accreditation at national and provincial level.
Activity 2.2. Identified institutions prepare training modules and monitoring mechanism according to the local needs and carry out periodic monitoring and revision of training module based on feedback.
Activity 2.3. Preparing selection criteria for training participants.
Activity 2.4. Accredited institutes conduct training at national and provincial level.
Activity 2.5. Monitoring of learnt skills and design refresher training programs.
Activity 2.6. Mass awareness through electronic, print media and social media.

Action 3: Establishment of quality standards and labelling

At present local manufacturers are producing some parts of the technology but is not meeting the standards. After the establishment of labelling the local manufacturers will require the training and technology transfer to enable them to meet the standards. The effectiveness of quality standards and labelling is high because it enables a consumer to make right choice of purchase of the type of solar PV systems. However, at present the initial cost of the technology is high and is not affordable by a common man. The standards developed for the country may be adopted at par with the global accredited standards to improve its effectiveness.

Table 6. Identification and description of specific activities to support Action 3

Activity 3.1. Drafting of quality standards and labelling procedures.
Activity 3.2. Development of legal framework to support standardization and labelling and its approval from competent forum.
Activity 3.3. Development of laboratory facilities.
Activity 3.4. Labelling and its accessories available in the market.
Activity 3.5. Training and awareness of the producers and consumers on standards and labelling.

Step 3: Identifying Stakeholders and determining timelines

The main primary parties include national and provincial banks providing loan facilities and electric supply companies. The timeline of the plan is 5 years commencing from 2022 till 2027. The primary and secondary responsible parties/ stakeholders along with timeline is identified in Table 7 below.

Table 7: Characterization of activities for implementation of actions for Solar PV

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary Focal point	Secondary Focal point
1. Promotion of Soft term credit line	1.1. Identify the donors/ other stakeholders and Prepare concept notes and proposals for securing funding according to bank's guidelines	Jan 2022	June2022	Jan 2023	June 2025	Afghanistan Independent Entity for Energy, DABS, World Bank	Ministry of Rural Rehabilitation, Asian Development Bank, World Bank, European Commission
	1.2. Banks Develops credit policy and procedures.	Mar 2022	June 2022	Jan 2023	June 2025	The central Bank & Word Bank	Other private banks in Afghanistan
	1.3. Disbursement of loans under one window operation, Recovery of loans according to banks policy and Regular documentation and monitoring of loan program.	Mar 2022	June 2022	Jan 2023	June 2025	The Central Bank, DABS and private sector	Private Sector/financial institutions
2.Production of accredited technicians and Awareness raising	2.1. Identification of training institutes and its accreditation at national and provincial level.	July 2022	Dec 2023	Jan 2023	June 2025	DABS	Kabul University

	2.2. Identified institutions will prepare training modules and monitoring mechanism according to the local Needs and Carry out periodic monitoring and revision of training module on the basis of feedback.	Jan 2022	July 2022	Aug. 2022	Dec 2024	Afghanistan Energy Entity	Provincial Govts, NGOs, private sector
	2.3. Preparing selection criteria for training participants	Feb 2022	June 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Afghanistan Energy Entity
	2.4. Accredited institutes to conduct training at national and provincial level.	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector
	2.5. Monitoring of learnt skills and design and conduct refresher training programs.	Jan 2022	Mar 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Line ministries/private sector
	2.6. Mass awareness through electronic, print and social media.	Jan 2022	Mar 2022	Jan 2023	June 2025	NEPA	NGOs, private sector
3. Development of Quality Standards and labelling for small hydro powerplants	3.1. Drafting of quality standards and labelling procedures.	July 2022	Dec 2023	Jan 2023	June 2025	MRRD MRRD	Kabul University Kabul University
	3.2. Development of legal framework to support standardization and labelling and its approval from competent forum.	Mar 2022	July 2022	Aug. 2022	Dec 2024	MRRD	NGOs & private sector
	3.3. Development of laboratory facilities.	Feb 2022	June 2022	Jan 2023	June 2025	Local NGOs	Afghanistan Energy entity and MRRD

	3.4. Labelling of small hydro powerplants and its accessories available in the market.	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector
	3.5. Training and awareness of the producers and consumers on standards and labelling	Jan 2022	Mar 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Line ministries/private sector

Step 4: Determining capacity needs and estimating costs and funding needs

For efficient implementation of the solar PV system in the country, the stakeholders need to enhance their technical capacities in areas of credit disbursement and recovery procedures. The relevant accredited training institutes like Afghanistan National standardization Entity will play a major role in imparting training and awareness creation. As part of capacity building process, the accredited training program is very effective as it will provide required skills at the grassroots level and the risk of failure of technology in the remote areas will be reduced Also, it will not only provide energy security in remote areas of the country but will also enhance employment opportunities. Further, the measure is also in conformity with government training programs. For training and awareness raising, conduct mass awareness through electronic, print media and social media. The table below is a summary of expenses for the capacity building and development.

Table 8: Summary of cost and resources for PV systems

Actions	Activities to be supported	Total costs (US$)
Develop and implement a financial incentive scheme	Expert to implement all activities including workshops	$20000.00
Support the promulgation of Electricity Supply Regulations	Workshop support	$20000.00
Create and implement a full training program for PV systems	Purchase for training equipment and materials	$18000.00
PV system installation on government buildings and for energy impoverished societies	Project feasibility studies and design Procurement and installation of systems	$18,00.00 $9M
Total		$9096000

Step 5: Management Planning

Risks and Contingency Planning

The field of solar PV is among the most emerging technology and rapid innovations are taking place in this field. The main risks and contingency plans of Solar PV technology have been described in Table 7.

Table 8: Overview of risk categories and possible contingencies for promoting solar PV

Risks	Description	Contingency action
The socio- economic situation of Afghanistan might deteriorate (e.g. change in exchange rate, rate of interest etc.)	Fragile economic conditions may result in change of interest rate and may impact negatively on programs and projects	Launch awareness and sensitization programs as well as capacity building of the stakeholders to enable them to sustain the market shocks.
Change in government policies.	With change of government usually the priorities also change.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	Afghanistan is subjected to vulnerabilities due climate change.	Undertake climate change resilient infrastructure and adaption measures.

Next Steps

The immediate requirements for solar PV technology implementation would be to appoint a task manager by the banks and with the support from interested donors for implementation of different components of the technology. Steps should be taken to enhance the efficiency of the solar PV and battery systems so that people are more attracted to the technology's benefits. Universities and relevant industries should be involved in technology transfer programs.

Table 9: Identification of immediate requirements and critical next steps

Immediate Requirements	Prepare concept notes and project proposals for mobilizing resources for solar energy and establish linkages with the potential stakeholders for implementation of different components of solar technology.
Critical steps	Enhance the efficiency of the solar PV and battery systems by involving universities and relevant industries. Further, in Net metering, encourage corporate sector to be a part of service delivery network to help the consumers for meeting the procedural requirements and availing the facility easily. The price of electricity purchased from the consumer should be at par with the price of electricity charged from the consumers.

Table 10: TAP overview summary for Solar PV

Name of Technology: PV systems							
Ambitions	The ambitions for the TAP The overall intention of the TNA is to improve the socio-economic situation in Afghanistan, by moving towards a trajectory of sustainable development. In this regard, there key objectives for sustainable development were adopted: sustainable economic development; reduced poverty through increased employment and incomes and climate change mitigation and protection of the environment. Coupled with these key objectives, SDGs 7 and 13 were also identified as key sustainable development goals SDGs) that the technologies should set out to achieve.						
Benefits	1. Carbon footprint of pilot building is reduced 2. Cost of operation of government buildings reduced 3. Livelihoods and quality of life of energy impoverished households and communities improved 4. Institutional and human skills capacity improved for dealing with PV systems 5. PV systems become more economically viable enabling their future diffusion						
Actions	**Sources of Funding**	**Responsible Body**	**Timelines**	**Risks**	**Success Criteria**	**Monitoring Indicators**	**Budget for action (US$)**
Develop and implement a financial incentive scheme	USAID, World Bank, Asian Development Bank	Ministry of Finance	Aug 2022 to Aug 2023	High costs for consultancy Options for tax reform cannot be implemented	PV systems are more economically viable	Report completed on schedule Options implemented	$20000.00
Create and implement a full training program for PV systems	GIZ, World Bank	DABS (De Afghanistan Brishna Sharkat)	Apr 2022 to Mar 2023	High cost for training materials High cost for train the trainer	Program designed and implemented	No of persons trained Institution equipped to conduct training	$30000.00
Design and implement PV installation project	World Bank	DABS	June 2022 to Aug 2023	High cost of consultancy	contribute to the reduction	Reduce carbon footprint by 10%	$9 M

Project Concept Note (1): Supply water and power to community centres through solar power-driven systems

Project outputs, activity results and indicative activities

Output 1: Enhance critical government institution service delivery and community resilience through access to alternative energy.

Activity Result 1: Provide access to renewable energy to support productive community infrastructure as a recovery support.

The project aims to supply water and power to community centres through solar power-driven systems. The solar-powered submersible water pumps will be installed in the vicinity of school locations to provide access to water and sanitation to the communities and to the students. Alternative water points will also be included in the pastoral zones. In the event of fluctuating supply during rainy season, backup generators can be an option.

Targets: Schools; community resource centre; or police stations (across 20 districts)

Indicative Activities:

a) Install solar supported submersible pumps in 20 schools across 20 districts.
b) Install solar-panels and associated infrastructure in 20 community centres or similar location across 20 counties.
c) Train maintenance staff (40 person) on routine maintenance and operation of solar panels. The benefit of this include decreasing dependency on other sources and sustainable maintenance.

Activity Result 2: Increased access to energy for improved essential health services

It is proposed that the project provides solar energy to primary and secondary health care facilities in selected locations to support critical health services such as reproductive health; maternity ward; incubation room and essential storage facilities. The support to health facilities includes 5 hospitals across five zone locations and/or the health facilities within selected districts. The project will benefit the hospitals in each zone, while supporting over mostly women and children in district health facility. Depending on the type of solar panel, a single panel can generate an average of 1kwh.

Target: Health facilities

Indicative Activity:

- Install solar power and associated infrastructure in five hospitals (maternity ward; premature infant incubation unit; medicine refrigerators; laboratory services; mortuary)
- Install solar power and associated infrastructure in 20 health centers across 20 districts (maternity ward; premature infant incubation unit; medicine refrigerators; laboratory services; mortuary etc.)
- Train (40) maintenance staff routine maintenance and operation of solar powered systems

Activity Result 3: Enhance sustainable livelihoods through solar-powered income generation activities

Income generation activities are essential to building resilience and restoring the community asset base. Under the project, two areas of support have been proposed. 20 hybrid (solar and firewood) powered community shower (Hamam) will be installed across 20 locations. Solar hot water systems make use of sunlight to heat water. In an average solar irradiance location (below 40 degrees) from 60 to 70 percent of the domestic hot water use with temperatures up to 60 °C can be provided by solar heating systems. The most popular types of solar water heaters are evacuated tube collectors (44 percent) and glazed flat plate collectors (34 percent) generally used for domestic hot water; and unglazed plastic collectors (21 percent) used mainly to heat swimming pools or hamams in this case.

Secondly, the construction of group-based solar powered freezers and/or cold storages near agricultural market locations on zone level will be set up for storage and selling fresh fruits and vegetables in consultation with the communities and local authorities. Sustainability of these interventions will be built into the design of the programme interventions so that user fees can be collected to conduct routine maintenance and operation of the facilities.

Target: Community livelihoods project

Indicative Activity:

a) Installing the Solar PV System on pilot based on 20 selected districts.
b) Construction of solar powered cold storage for fruits and vegetables across 20 locations
c)
d) Training 200 youth (farmers) on cleaning and preparing fruits / vegetables for cold storage (20 locations.
e) Training 100 (50 women) and youth on management including financial management.
f) Setting up a sustainability fund and user-fee for the utilization and maintenance of the facility.

Project budget (Tentative)

Details of project budget presented in table below:

No.	Item	Total cost
1	Provide access to renewable energy to support productive community infrastructure as a recovery support.	5 million
2	Increased access to energy for improved essential health services	6 million
4	Enhance sustainable livelihoods through solar-powered income generation activities	5 million
5	Project Management Cost (including M & E)	5 million
	Total cost in Mil. Afs	21 million
	Total cost in (US$)	400 thousand

Table 11: budget and resources for project idea (1)

1.3. Small hydro Power Plants Technology Action Plan and project ideas

1.3.1 Introduction

Small Hydropower (SHP) is the most economical option for addressing energy crisis for providing a reliable and cheap energy to the rural communities of Afghanistan due to its natural topography, availability of flowing water and climatic conditions. Small hydro powerplants can meet the electricity needs of remote small communities as well as micro business and cottage industries. Villages not connected to the grid and having a source of water flow with a head more than 5 feet can benefit from low cost rural electrification based on SHPs. It is estimated that Afghanistan has about 50,000 MW small hydro power generations potential, but at present only 14 percent potential has been tapped.

The technology has many benefits, the most important being the economic benefits as villages not connected to the grid can benefit from low cost rural electrification based on small hydro powerplants. Provision of electricity will help in gaining additional hours for income generation activities. The social benefits of SHP is that the schemes are owned and operated by skilled members of the communities and provides employment opportunities and also improve quality of life. There is learning opportunities for students in the evenings and family members have additional time for social and economic activities. Traditionally families in rural areas use paraffin candles and lamps as source of light.

These sources produce fumes which are harmful to human health, whereas the hydropower technologies do not emit any pollution and helps in achieving energy security through clean sources. Small hydro power has also environmental benefits, unlike traditional power stations that use fossil fuels; micro hydro generators have practically no effect on the environment. While large hydropower dams disturbs the flora, fauna and the local environment because of the large construction, but on the other hand the small hydro power do not cause negative impacts on environment rather benefits economically, socially and environmentally. Thus,

the technology results in significant reduction of greenhouse gas (GHG) emissions depending on the size of the system.

Technology status in Afghanistan

In small hydropower plant technology, moving water turns a turbine, the turbine spins a generator, and thus electricity is produced without using fossil fuel. The amount of power that can be produced by a small hydro powerplant is determined by the head (the height of power drop); the flow rate; and efficiency factor of the system. The higher the head, the smaller the flow rate needed to produce the same amount of electricity. Small hydro powerplants are best suited for isolated locations where there is no grid electricity. Off-grid power plants need local load controlling device to stabilize frequency and voltage supply. Small hydro powerplants can serve a small community and as well as cottage industrial units.

In the case of grid-connected sites, smaller hydro plants act to enhance the reliability of local supply in the more remote areas of the power grid. By providing input to the system locally, they may also act to reduce the costs of transmission and distribution (ADB, 2017).

Step 1: Ambition for promoting small hydro powerplants

In Afghanistan, small and mini-HP are the most effective water pressure mini hydroelectric diversion type HPP. Development of such HPP can reduce the cost of HPP: from USD 350 - 700 per kW to USD 100 - 250 per kW, at the cost of USD 0.05 - 0.4 cents per kWh of electricity and organize mass production of hydroelectric power station with pipelines in some foothill regions of Afghanistan with the realization of products to customers, installation, and service work.

Step 2: Actions and activities selected

Summary of Barriers and measures to overcome barriers

The TNA Barrier Analysis and Enabling Framework Report identifies economic and financial and non-financial barrier in the diffusion of small hydro powerplants. The economic and financial barriers are high up-front capital cost, difficulties in accessing finance/ credit and lesser consumer affordability. The measures to overcome financial barriers are through promotion of soft-term credit line of central Bank of Afghanistan to facilitate adoption and diffusion of the technology.

The major non-financial barriers for small hydro powerplants include (i) inadequate policy and programs, (ii) poor quality of standards and non-existence of labelling on machinery and equipment, (ii) lack of information and awareness, (iv) limited market for small hydro powerplants business because of lack of demand and non-availability of certified technicians for the technology, and (v) risk of disasters and water-flow variability because of fragility and climate change impacts. The measures to overcome barriers are to establish quality standards and labelling of small hydro powerplant machineries and equipment to ensure supply of good quality SHP. To increase public awareness, demonstration of efficient SHP plants at the potential sites will help in capacity building efforts besides awareness about the benefits of the technology. The professional and vocational training centres should include essential elementary training on market development and maintenance of SHP plants. The feasibility studies and Initial Environmental Examination (IEE) and Environment Impact Assessment (EIA) prior to installation of SHP plants will help to identify appropriate measures to mitigate the risks of potential disasters like land sliding, glacier hazards. The main barriers and its mitigation measures identified in the TNA process are described in the table below:

Table 12: Overview of Barriers and Measures to overcome these for small Hydro powerplants

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	High installation cost Difficulties in accessing finance Low consumer affordability.	Promotion of soft-term credit line
Non-financial	Poor quality of SHP plants due to absence of Quality Standards. Lack of information and awareness; Limited Market Development Services and Risk of disasters or variable water-flow.	Establishment of quality standards and labelling for small hydro powerplants. Training and Awareness Raising. Risk of disasters reduced by enforcing Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA)

Framework for ranking measures for inclusion as Actions selected for inclusion in the TAP:

The table (13) below provides an assessment and ranking of identified measures have been made on the basis of effectiveness, efficiency, interaction with other measures, suitability within the country and the sector and benefits and costs.

Table 13: Assessment and ranking of identified measures for Small Hydro Power plants

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
Promotion of soft term credit line	Effectiveness	Access to finance through credit line with low interest rate of for SHP systems is an effective measure for wider scale implementation and making it affordable.	The measure is effective and efficient as only less than 5% is being charged for Disbursement and recovery of loans by the bank. The technology is suitable within the country and the sector as huge unexploited sites are available in the mountainous areas of the country. The measure is cost effective with payback period of 8-10 years.
	Efficiency	Effectiveness of this measure is particularly enhanced when potential consumers, developers and local technicians are aware of the benefits of micro hydro plants. The credit program with reduced interest rate is offered for a limited period of time (i.e. for first 5 years). It is expected that by that the benefits of the technology will be widely disseminated, and proven, and common people may be ready to take loans even at market rate of interest.	
	Interactions with other measures	If the government allows the private sector to sell electricity to the consumers directly, to create competition in the market, there will be more energy generated.	
	Suitability within country/ sector	In rural Afghanistan SHP energy is one of the most feasible technology in the country but due to high initial cost is not affordable for a common man. The credit line will facilitate to overcome the high initial cost and make the technology affordable.	

	Benefits and costs	Direct benefit of technology implementation is immediate availability of electricity whereas indirect benefits include more working hours and electricity availability for SMEs and other income generating opportunities. In the local context SME is pretty much a household level intervention.	
	Efficiency	Efficiency of the measure will be effective with skilled local technicians.	
	Interactions with other measures	In Afghanistan with adopting the international standards and regional best practices the domestic manufacturers will take time to build their capacity to meet he requisite standards.	
	Suitability within country/ sector	By providing tax incentives in the long run local manufacturing of the system will be more feasible and will create sustainable supply chain for the promotion of SHP especially in local areas.	
	Benefits and costs	A good business model will reduce the cost of local production of SHP plants that will be helpful in promotion of the technology.	
Capacity of accredited technicians and Awareness raising	Effectiveness	Effectiveness of SHP technologies is enhanced when potential developers, local technicians and people in general are aware. The banks will increase their credit line when supported by accredited technicians reducing the risk of failure of technology.	Dissemination of knowledge and information and training a cadre of technicians even at grassroots level is instrumental. Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and will expand the banks loan portfolio towards SHP technology. The measure is not costly as compared to its benefits.
	Efficiency	The measure will be effective through establishment of accredited institutions providing technical skills at the grass root level. Promote mass awareness programs through print, electronic, and social media.	
	Interactions with other measures	Awareness raising mobilize the investment of common people and the banks' loan portfolio towards solar technology.	
	Suitability within country/ sector	The measure will ensure provision of accredited technicians at grassroots level and public awareness of the technology. Further, it will build confidence of financial institutions and the suppliers of the technology. This will result in promoting the technology on a large scale in the country.	

	Benefits and costs	For promoting the technology, there is a need of accredited technicians at the local level and use of mass media for awareness raising. The measure will facilitate the supporting programs like credit line, etc.	
Establishment of quality standards and labelling	Effectiveness	The effectiveness of quality standards is high because it enables a consumer to make right choice of purchase of the SHP systems. At the rural level the NSP produced pumps are more reliable among the communities.	At present there are no quality standards to monitor the quality of the panels. Local manufacturers are producing some parts of the technology but is not meeting the standards
		technology is high and without the NGO or donor support common people cannot afford it.	water flow and its head for a longer period. It will reduce wasteful use of material and labour which will ultimately reduce O&M cost. Due to better performance and life of the plants, it will result into wider dissemination of the technology in the country by complying standard requirements. However, it may increase the initial cost of the hydropower plants. At present, the quality standards and labeling is not supported by legislation as such the measure will take time to implement and has been ranked third.
	Efficiency	Trainings to the producers of SHP equipment	
	Interactions with other measures	labelling, and laboratory facilities to check the efficiency of the machinery on scientific parameters will enhance its effectiveness and will enable the consumer to make right choice for efficient SHP plants to be purchased to minimize the risk of collapse of the plant.The standards developed may conform with the global accredited standards to improve its effectiveness.	
	Suitability within country/ sector	The standardization and labelling program will ensure and will retain the confidence of the users and financial institutions of the technology although it will initially increase its cost but in the long term will be helpful in expansion of the loan technology.	

Final selection of Actions for inclusion in the TAP

In consultation with Expert Working Group on Mitigation and assessment of measures, actions taken for promoting small hydro powerplants are described in Table 11 below:

Table 11: Selection of Actions for promoting Small hydro power Plants

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	Promotion of soft term credit line (1)	Promotion of soft term credit line for small hydro powerplants
Non-financial	Development of Quality Standards and labelling for small hydro powerplants (3); Training and Awareness Creation (2) Risk of disasters reduced by enforcing Initial Environmental Examination and Environmental Impact Assessment (4)	Training Awareness raising Establishment of Quality Standards and labelling for small hydro powerplants

Identifying activities for the selected Actions

Action 1: Promotion of micro-hydel soft-term credit line

For promoting soft-term credit line, mapping small hydro powerplant sites will help the banks to identify the potential clients and prepare concept notes and project proposals for securing funding. The sales agents will be hired from the local communities to promote and provide facilitation in acquiring and recovering loans. The bank with the assistance of the technical expert in hydropower will assess the loan requirement with one window operation of loan disbursement and develop MIS and risk management system for monitoring small hydro powerplants.

Table 14: Identification and description of specific activities to support Action 1

Activity 1.1. Develop portfolio of opportunities by identifying and mapping small hydro powerplant sites
Activity 1.2. Prepare concept notes and project proposals to secure funding for small hydro powerplants
Activity 1.3. Develop credit programs and procedures including MIS and risk management system for small hydro powerplants in remote areas.
Activity 1.4. Recruitment of sales agents for promotion and facilitation in acquiring loans for the small hydro powerplants.
Activity 1.5. Loan disbursement under one window operation, its documentation and recovery.

Action 2: Training and Awareness raising for promoting small hydro powerplants

For training and awareness raising, conduct mass awareness through electronic, print media and social media. For efficient and effective hydropower plants, training from accredited institutes at national and provincial levels is essential. Universities and vocational training institutes can take initiatives in training programs. Monitoring and evaluation will be done on a regular basis and the lessons learnt will guide to develop the follow up refresher and training courses.

Table 15: Identification and description of specific activities to support Action 2

Activity 2.1. Awareness raising through electronic, print, and social media.
Activity 2.2. Identification of accredited training institutes to develop modules and conduct training as per local needs.
Activity 2.3. Follow up of trainings and lessons learnt.

Action 3: Development of Quality Standards and labelling for small hydro powerplants

The specific activities required for development of quality standards involves drafting of standards and legal framework in accordance with national requirements at par with international standards. Laboratory facilities for testing small hydro powerplants will be developed and tested as per the guidelines of approved quality standards and labelling procedures. The producers and consumers will be guided regarding standards and labelling of small hydro powerplants and its accessories.

Table 16. Identification and description of specific activities to support Action 3

Activity 3.1. Drafting of quality standards and labelling procedures.
Activity 3.2. Development of legal framework to support standardization and labelling and its approval from competent forum.
Activity 3.3. Development of laboratory facilities.
Activity 3.4. Labelling of small hydro powerplants and its accessories available in the market.
Activity 3.5. Training and awareness of the producers and consumers on standards and labelling.

Step 3: Identifying Stakeholders and determining timelines

The timeline of the plan is 5 years commencing from 2022. The stakeholders along with their responsibilities are described in Table 17 below:

Table 17: Characterization of activities for Implementation of Action for small hydro powerplants.

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary And Focal point	Secondary
1. Promotion of Soft term credit line	1.1. Identify the donors/ other stakeholders and Prepare concept notes and proposals for securing funding according to bank's guidelines	Jan 2022	June 2022	Jan 2023	June 2025	Afghanistan Independent Entity for Energy, MRRD	Ministry of Rural Rehabilitation
	1.2. Banks Develops credit policy and procedures.	Mar 2022	June 2022	Jan 2023	June 2025	The central Bank	Other private banks in Afghanistan
	1.3. Disbursement of loans under one window operation, Recovery of loans according to banks policy and Regular documentation and monitoring of loan program.	Mar 2022	June 2022	Jan 2023	June 2025	The Central Bank, MRRD and private sector	financial institutions
2.Production of accredited technicians and Awareness Raising	2.1. Identification of training institutes and its accreditation at national and provincial level.	July 2022	Dec 2023	Jan 2023	June 2025	MRRD	Kabul University
	2.2. Identified institutions will prepare training modules and monitoring mechanism according to the local Needs and Carry out periodic monitoring and revision of training module on the basis of feedback.	Jan 2022	July 2022	Aug. 2022	Dec 2024	MRRD	NGOs & private sector
	2.3. Preparing selection criteria for training participants	Feb 2022	June 2022	Jan 2023	June 2025	Local NGOs	MRRD

	2.4. Accredited institutes to conduct training at national and provincial level.	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector
	2.5. Monitoring of learnt skills and design and conduct refresher training programs.	Jan 2022	Mar 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Line ministries/private sector
	2.6. Mass awareness through electronic, print and social media.	Jan 2022	Mar 2022	Jan 2023	June 2025	MRRD	NGOs, private sector
3. Development of Quality Standards and labelling for small hydro powerplants	3.1. Drafting of quality standards and labelling procedures.	July 2022	Dec 2023	Jan 2023	June 2025	MRRD	Kabul University
	3.2. Development of legal framework to support standardization and labelling and its approval from competent forum.	Mar 2022	July 2022	Aug. 2022	Dec 2024	MRRD	NGOs & private sector
	3.3. Development of laboratory facilities.	Feb 2022	June 2022	Jan 2023	June 2025	Local NGOs	MRRD
	3.4. Labelling of small hydro powerplants and its accessories available in the market.	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector
	3.5. Training and awareness of the producers and consumers on standards and labelling	Jan 2022	Mar 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Line ministries/private sector

Step 4: Determining capacity needs and estimating costs and funding needs

MRRD will conduct training needs assessment for developing project proposals and implementation of small hydro powerplants. As per the results of training needs assessment, the capacity building programs will be designed and conducted. In training programs Engineering Universities, Technical Education and Vocational Training institutes. The stakeholders need to develop their capacities in relevant disciplines. The training institutes will be identified for accreditation by the relevant concerned institutions and the capacity needs of relevant institutes will be assessed and enhanced. Specific activities and budget estimates will be provided in the project concept notes.

Table 18: Summary of cost and resources for Small Hydropower

Actions	Activities to be supported	Total costs (US$)
Develop and implement a financial incentive scheme	Expert to implement all activities including workshops	$15000.00
Support the promulgation of Electricity Supply Regulations		$15000.00
Create and implement a full training program for SHP	Purchase for training equipment and materials	$15 000.00 $20000.00
SHP for energy impoverished societies	Project feasibility studies and design Procurement and installation of systems	$10000 $ 5 M
Total		$5075000

Step 5: Management Planning

Risks and Contingency Planning

The possible risks to small hydro powerplant technology and proposed contingency action are described in Table 19.

Table 19: Overview of risk categories and possible contingencies for Small Hydro Power plants.

Risks	Description	Contingency action
Escalation of political tensions may hamper private sector investment	Political stability plays an important role in private sector investment in dissemination and diffusion of any technology.	Launch awareness raising and sensitization programs for politicians and other stakeholders.
Change in government policies.	With change of government usually the priorities also change.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	Afghanistan is subjected to vulnerabilities due climate change.	Undertake climate change resilient infrastructure and adaption measures.

Next Steps

MRRD will need to coordinate with relevant NGOs and donor agencies for preparing projects and mobilizing resources for installation of small hydro powerplants. Further, standardization and labeling program may be initiated for manufacturing quality small hydro powerplants and its associated components and accessories. In areas having maximum potential for small hydro powerplants, the network of metrological stations needs to be increased to overcome the unavailability of temporal hydrological data which is required for designing appropriate small hydro powerplants.

Table 20: Identification of immediate requirements and critical next steps

Immediate Requirements	For scaling up the technology, prepare proposals for mobilizing resources for small hydro powerplants.
Critical steps	For manufacturing of micro hydel power plants, establishment of quality standards and labelling be initiated. Further, the network of metrological stations needs to be increased so that hydrological flow data is made available to minimize the risks of damage of small hydro powerplants infrastructure.

Table 21 - Summary TAP table for Small Hydro Power

Energy supply and consumption							
Micro Hydro Power							
Ambitions	In Afghanistan, small and mini-HP are the most effective water pressure mini hydroelectric diversion type HPP. Development of such HPP can reduce the cost of HPP: from USD 350 - 700 per kW to USD 100 - 250 per kW, at the cost of USD 0.05 - 0.4 cents per kWh of electricity and organize mass production of hydroelectric power station with pipelines in some foothill regions of Afghanistan with the realization of products to customers, installation, and service work.						
Benefits	1. Carbon footprint of pilot building is reduced 2. Cost of operation of government buildings reduced 3. Livelihoods and quality of life of energy impoverished households and communities improved 4. Institutional and human skills capacity improved for the operation and maintenance of SHPs 5. SHPs become more economically viable enabling their future diffusion						
Actions	**Sources of Funding**	**Responsible Body**	**Timelines**	**Risks**	**Success Criteria**	**Monitoring Indicators**	**Budget for action**
Develop and implement a financial incentive scheme	USAID, World Bank, Asian Development Bank	Ministry of Finance	July 2022 to Aug 2023	High costs for consultancy Options for tax reform cannot be implemented	PV systems are more economically viable	Report completed on schedule Options implemented	$15000.00
Create and implement a full training program for SHP	GIZ, World Bank	MRRD and DABS	Apr 2022 to Mar 2023	High cost for training materials	Program designed and implemented	No of persons trained Institution equipped to conduct training No of persons working in the	$15000.00
Design and implement SHP installation project	World Bank	DABS	June 2022 to Aug 2023	High cost of consultancy	Fleet of EVs contribute to the reduction	EVs reduce carbon footprint by 10%	$8 M

Project Ideas for Energy sector expected here

Project Concept Note (2): Promotion of Micro hydropower plants in Afghanistan

Introduction and Background

To prevent dangerous anthropogenic interference with the climate change, the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) has agreed that actions must be taken to keep global temperature rise below 2 degrees Celsius (2°C) above the preindustrial level. Meeting the 2°C target requires significant efforts to reduce the greenhouse gas (GHG) emissions. Production of electricity through renewables including micro hydropower plants is the right step towards achieving the global goal under Paris agreement and INDC of the Government of Afghanistan's to reduce GHG emissions.

Objective of the project:

The objectives of the project are to create an enabling environment for the promotion of micro hydropower plants for reducing pressure on existing energy demand and supply gap and reduction of deforestation, soil erosion, siltation and GHG emission, conservation of forest and forest biodiversity; environmental pollution; increasing life of big dams; and reduction of country's fossil fuel import bills.

Project deliverables

Provide electricity to about 30,000 households in the mountainous and forested areas of the country.
In addition to this, about 120,00 individuals would be the indirect beneficiaries benefitted in the form of employment or business generation. The project will help to reduce deforestation, conserve biodiversity, reduce siltation and soil erosion up-stream areas. The project will also help reduce power shortages and pressure on existing energy demand and supply gap, reduction in GHG emissions and environmental pollution. Furthermore it will reduce country's fossil fuel import bills and extra workload on women.

Project scope and possible implementation

The project is proposed for the central highland of Afghanistan. The production of electricity from hydropower is among the cheapest sources of energy in Afghanistan. Micro hydropower plants are best suited for isolated off-grid locations as well as in grid connected areas. Off-grid power plants need local load controlling to stabilize frequency and voltage supply for household consumption and agro- cottage industries. For industrial use, the output from the turbine shaft can be used directly, as opposed to converting it into electricity via a generator or batteries. This is suitable for agro- processing activities such as milling, oil extraction and carpentry. The amount of power that can be produced by a micro hydropower plant is determined by the head (the height of power drop); the flow rate; and efficiency of the system. The project would help to provide support for construction of micro hydropower plants.

Project activities are:

- Awareness raising program.
- Capacity building:
- Training of manufacturers and suppliers of micro hydropower plants and
- Production of accredited technicians by developing curriculum and imparting vocational training through government and private accredited institutes

Training of financial institutions

- Promotion of special credit line for renewable energy established by the Afghan central bank and donors
- Develop monitoring and evaluation system for micro hydro power plants.
- Institutional collaboration mechanism between the government, private sector, NGOs and community groups.

Project budget (Tentative)

No.	Item	Total cost
1	Awareness raising campaigns through print and electronic media and involvement of Civil society	2 Million
2	Support for Policy and Institutional Framework	2 million
3	Training/ Capacity building of financing institutions, local technicians & suppliers	8 million
4	Promotion of special credit line	10 million
5	Project Management Cost (including M & E)	6 million
	Total cost in Mil. Afs	21 million
	Total cost in (Million US$)*	400 thousand

Table 22: budget and resources for project idea

CHAPTER 2: WASTE SECTOR TECHNOLOGY ACTION PLAN AND SECTOR OVERVIEW

The effects from decades of war in Afghanistan have left the country facing severe environmental challenges, from deforestation to water management. Among these issues is the inability of the country to treat and dispose of municipal solid waste and sewage. Across the country, the poor handling of waste and chemicals is made all the more problematic by a lack of information about the generation, processes and composition of waste and its management. This information void is represented in the only piece of legislation related to waste management in Afghanistan, the Waste Management Policy, which addresses all the chemical management needs.

2.1. Preliminary targets for technology transfer & diffusion

The Waste Management Policy was endorsed by the National Environmental Protection Agency, the overarching government authority for the protection of the environment, in 2010. The Waste Management Policy is now being revised by the National Environmental Protection Agency. The provision of a clean and healthy living environment through the improved management and control of waste to support a "healthy life for all Afghans" is the vision for the Waste Management Policy. The National Environmental Protection Agency seeks to increase the capacity of government institutions, which relate to biodiversity, agriculture, forestry, land, climate change, and so on. Because there is no strong legislation, except for the Environment Law, it is difficult to grasp the development of the chemicals and waste agenda, particularly when it relates to the production, management, and imports of chemicals.

Estimates by the National Implementation Plan of Afghanistan on Persistent Organic Pollutants show a very low amount of hazardous waste generation in the country, but the emission of toxin from unregulated dumpsites is unknown. In the meantime, economic development is leading to growing industries, construction and imports of chemicals from neighboring countries, and so Afghanistan's story can be perceived from another angle. The infant legislative system for the sound management of chemicals and waste in Afghanistan might not be ready for the pressure spurring from blooming industries. To minimize the growing emissions of harmful pollutants, the country will need access to green and clean technologies.

In the capital city of Kabul, increasing generation of solid waste and its improper management has imposed daunting impacts. The city of 5 million people generated 3050 tons of solid waste every day in 2018. Data analysis shows that if an estimated 25% waste reduction is achieved gradually by 2023, then the total cost of the system will be reduced to 1505.9 million Afs/year, much lesser than the estimated cost at 2210 million Afs/year. Developing an integrated solid-waste management (ISWM) plan for Kabul city based on an overview of the existing system and practices, including the gaps in the entire value chain. A paradigm shift from business-as-usual scenario to an ISWM approach is recommended. The proposed strategies, when implemented effectively, will increase the recycling rate, and reduce the requirement for landfilling in Kabul city. Policy reforms to encourage waste reduction and segregation, and the establishment of facilities for recycling, treatment, and landfilling are proposed. Moreover, the willingness to pay of citizens indicates the total cost of waste management system, estimated at 111.53 million Afs/month, can be recovered effectively.

2.2. Reduce, Reuse and Recycle (3Rs)

2.2.1. General description

The 3Rs Concept of technologies to be implemented can substantially contribute to the reduction of the amount of waste disposed on land. To carry out the implementation of the 3Rs concept of technologies requires a high degree of coordination and organization of the waste management chain. For the purpose of reduction of the waste problems in future, reduction in waste generation and reuse of old, products such as electronics can be one of the most important factors. The reduction, for example, possible at consumption level includes better buying habits and cutting down on the use and purchase of disposable products and packaging. In addition, recycling is viable and the best option for a range of waste products. In some economies, there are already well-organized recycling businesses processes in place for a range of products (e.g. furniture, clothing textile etc.) and materials (e.g. paper, iron, glass and steel).

With goal of reducing the disposal of wastes at uncontrolled sites and hence, to reduce GHG emissions, the 3Rs' technology is aimed at achieving the followings:

- Reduce pollution problems and improve the livelihood across the country
- Create job opportunities and improve the socio-economic status of the urban population
- Reduce GHG emissions across the country especially in the urban settlement.

2.2.2. Identification of barrier Analysis for 3Rs technology

A well-functioning waste management system allows residents to dispose of their waste in an appropriate manner. Components of a waste management system include the facilities and equipment used to temporarily store waste (collection bins) or transfer collected waste to its final disposal site. The majority of Technical Working Group observations point to problems with the waste management system. The major barriers in the wide diffusion of 3Rs technology are categorized under economic, financial, and non-financial barriers as below:

Step 1: Ambition for promoting 3Rs Technology

For the purpose of reduction of the waste problems in Afghanistan, reduction in waste generation and reuse of old, products such as electronics can be one of the most important factors. The reduction, for example, possible at consumption level includes better buying habits and cutting down on the use and purchase of disposable products and packaging. In addition, recycling is viable and the best option for a range of waste products. In some economies, there are already well-organized recycling businesses processes in place for a range of products (e.g. furniture, clothing textile etc.) and materials (e.g. paper, iron, glass, and steel).

Step 2: Actions and activities selected

Summary of Barriers and measures to overcome barriers

The key barriers and measures for all mitigation-prioritized technologies have been identified through literature review, bilateral meetings with the experts and meeting with Expert Working Group on Mitigation.

The most frequently cited barrier to effective waste management identified was a problem with non-fixed waste collection points. People can find an appropriate location to put their solid waste that there were an insufficient number of collection points, or, points are not sited appropriately, or, that collection points are not fixed. Also in Afghanistan, many residents refuse to have a bin in front of their home because they fear others will bring their garbage there too, thereby establishing a neighbourhood waste collection point, rather than a household one. Waste collection routes in major cities of Afghanistan including Kabul are not divided into proper zones, there is no system of collection routes for each truck; they struggle to complete their set tasks each day. The waste collectors are unable to adhere to their collection schedule. Waste collection services were a common issue of concern for most technical working group members. During working group discussions, the representative of Kabul municipality also recognized this problem. The second most cited issue was the frequency of waste collection. Nearly all municipalities in capital and provinces lack basic resources to sustain the services on regular basis.

Waste collection routes in major cities of Afghanistan including Kabul are not divided into proper zones, there is no system of collection routes for each truck; they struggle to complete their set tasks each day. The waste collectors are unable to adhere to their collection schedule. Waste collection services were a common issue of concern for most technical working group members. During working group discussions, the representative of Kabul municipality also recognized this problem. The second most commonly cited issue was the frequency of waste collection. Nearly all municipalities in capital and provinces lack basic resources to sustain the services on regular basis.

An overview of barriers and its mitigation measures as identified in the TNA process are described in Table 23.

Table 23: Overview of 3Rs Barriers and Measures to overcome them

Category	Barrier dimension	Main Barriers	Measures
Economic and Financial Barriers	Cost	• Lack of financial resources	Promotion of soft term credit line
Non- Financial Barriers	Institutional and legal instruments	• Ambiguity in terms of sector ownership, roles and responsibilities	Work with the key stakeholders to further define the roles and responsibilities of key constituencies.
	Technical	• Lack of proper recycling technology	Setup standards recycling technologies in Kabul and other capital cities.
	Institutional and organizational capacity	• Insufficient capacity of provincial and district level staffs • Lack of public and private partnership (PPP) mechanism	Production of accredited Technicians and awareness raising
	Information and awareness	• Inadequate public knowledge about the health impacts of uncontrolled solid waste.	Using social media, TV and other sources for reaching out winder communities and audience

Framework for ranking measures for inclusion as Actions selected for the TAP

The table below describes measures, assessment, and specific considerations for inclusion as action points.

Table 24: Framework for assessment and ranking measures of promoting 3Rs. for inclusion as Actions selected for inclusion in the TAP.

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
Promotion of soft term credit line	Effectiveness	Local access to finance through credit line with low interest rate of for privatization of biogas sites. This included construction, operation, and maintenance	High financial costs associated with setting up composting it is recommended to establishing clear procedures for providing incentives or subsidies for encouraging private participation in composting ventures to facilitate the availability of necessary finance. This could potentially be done by using domestic and international funding sources to provide incentives for promoting public private partnerships in setting up composting plants. These funding sources could be used to provide incentives such as ensuring appropriate financial mechanism to support development waste management prioritized technologies to offset the high capital and operation and maintenance cost. Ensuring that sufficient financial resources are available to R&D institutions for strengthening and undertaking research, training and technology awareness raising activities among stakeholders. Strengthening operation and maintenance institutional capacities at national and sub- national levels.
	Efficiency	The efficiency of the measure will be effective through services of accredited technicians at grassroots level to reduce the risks of failure of the technology and build confidence of the financial institutions to expand the credit line to more clients.	
	Interactions with other measures	Awareness raising and training measures as both complement and supplement each other.	Special training to train local technicians in operation and maintenance of the prioritized technology.
	Suitability within country/ sector	Provision of credit line is suitable for the country as the solid waste management is one of the key concerns both for the central and provincial governments and PPP approach is the most appropriate approach.	
	Benefits and costs	The credit line will be beneficial for the consumers	

Develop Business model to encourage domestic manufacturing	Effectiveness	Lack of technology and high cost of parts production	Due to scale of demand and high capital cost for setting up sanitary landfill site it cannot be implemented unless tax incentives are given to local partners.
	Efficiency	Efficiency of the measure will be effective with skilled technicians.	
	Interactions with other measures	There are no negative interactions with other measures however, after establishment of replicable and adoptable approaches the local partners will take time to build their capacity to meet the requisite standards.	
	Suitability within country/ sector	By providing tax incentives in the long run local partnership of the system will be more feasible and will create sustainable supply chain.	
	Benefits and costs	The payback period of the technology will depend on the PPP mechanism and the amount of funding made available by third funding sources i.e. ADB, NGOs, etc.	
Production of accredited technicians and Awareness raising	Effectiveness	Effectiveness of 3Rs technologies is enhanced when potential developers, local technicians and people in general are aware. The banks will increase their credit line when supported by accredited technicians reducing the risk of failure of technology.	The dissemination of knowledge and information and training a cadre of technicians even at grassroots level. Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and will expand the banks loan portfolio towards this technology.
	Efficiency	The measure will be effective through establishment of accredited institutions providing technical skills at the grass root level. Promote mass awareness programs through print, electronic and social media.	
	Interactions with other measures	Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and the banks' loans.	
	Suitability within country/ sector	The measure will ensure provision of accredited technicians at grassroots level and public awareness of the technology. Further, it will build confidence of financial institutions and the suppliers of the technology. This will result in promoting the technology on a large scale in the country.	

Final selection of Actions for inclusion in the TAP

In consultation with the Expert Working Group on Mitigation and assessment of measures in Table 18, three measures have been taken as actions for developing TAP for 3Rs is indicated in Table 18.

Table 18: Final selection of Actions/Measures for promoting 3Rs for inclusion in the TAP

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	Promotion of soft term credit line and develop business model to encourage domestic manufacturing (1)	Promotion of soft term credit line with low interest rate
Non-financial	Production of accredited technicians and awareness raising (2)	Production of accredited Technicians and awareness raising;
	Establishment of quality standards (3)	Standardization of design and applications

Identifying activities for the selected Actions

Action 1: Promotion of soft term credit line

Afghanistan will need to establish a special window for promotion of 3Rs technologies It is a soft term credit line with less than 5% interest rate. The banks/financial institutions will need to prepare proposals for securing funding. The banks will develop credit policy and procedures as well as disbursement and recovery of loans with regular documentation and monitoring.

Table 25: Identification and description of specific activities to support Action 1:

Activity 1.1. Identification of key institutions and stakeholders
Activity 1.2. Determine the scope for the concept notes for securing funding
Activity 1.3. Develop workable and practical approaches for implementation

Action 2: Production of Accredited Technicians and Awareness raising

At national and provincial levels institutions for training will be identified. To enhance the capacity, these institutions will be interlinked with accrediting institutions e.g. Afghanistan National Standardization Entity Technical Education and Vocational Training. The Identified institutions will be responsible to prepare training modules, monitoring mechanism, selection criteria of participants and will conduct trainings. Promotion of awareness program will be through pamphlets, booklets, leaflets, banners and billboards. These will also be developed in local languages and provided to the relevant stakeholders and communities for wider dissemination of the technology.

Table 26. Identification and description of specific activities to support Action 2

Activity 2.1. Awareness raising through electronic, print, and social media.
Activity 2.2. Identification of accredited training institutes to develop modules and conduct training as per local needs.
Activity 2.3. Follow up of trainings and lessons learnt.

Action 3: Establishment of quality standards and labelling (3)

At present local manufacturers are producing some parts of the technology but is not meeting the standards. Afterthe establishment of labelling the local manufacturers will require the training and technology transfer to enable them tomeet the standards. The effectiveness of quality standards and labeling is high because it enables a consumer to make right choice of purchase of the type of solar PV systems. However, at present the initial cost of the technology is high and is not affordable by a common man.The standards developed for the country may be adopted at par with the global accredited standards to improve its effectiveness.

Table 27. Identification and description of specific activities to support Action 3

Activity 3.1. Drafting of quality standards and labelling procedures.
Activity 3.2. Development of legal framework to support standardization and labelling and its approval from competent forum.
Activity 3.3. Development of laboratory facilities.
Activity 3.4. Labelling and its accessories available in the market.
Activity 3.5. Training and awareness of the producers and consumers on standards and labelling.

The timeline of the plan is 3 years commencing from 2023-2025. The primary and secondary responsible parties/ stakeholders along with timeline is identified in Table 28 below:

Table 28: Characterization of activities for implementation of actions

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary Focal point	Secondary Focal point
1. Promotion of Soft term credit line	1.1. Identify the donors/ other stakeholders and Prepare concept notes and proposals for securing funding according to bank's guidelines	Mar 2022	June 2022	Mar 2023	Aug 2025	Municipalities on central and provincial levels.	Ministry of Urban Development
	1.2. Banks Develops credit policy and procedures.	Mar 2022	Aug 2022	Jan 2023	June 2025	The central Bank	Other private banks in Afghanistan
	1.3. Disbursement of loans under one window operation, Recovery of loans according to banks policy and Regular documentation and monitoring of loan program.	Mar 2022	June 2022	Jan 2023	June 2025	The Central Bank, municipalities and private sector	financial institutions
2.Production of accredited technicians and Awareness raising	2.1. Identification of training institutes and its accreditation at national and provincial level.	July 2022	Dec 2023	Jan 2023	June 2025	Ministry of urban development	Kabul University

	2.2. Identified institutions will prepare training modules and monitoring mechanism according to the local Needs and Carry out periodic monitoring and revision of training module on the basis of feedback.	Jan 2022	July 2022	Aug. 2022	Dec 2024	Ministry of urban development	NGOs & private sector
	2.3. Preparing selection criteria for training participants	Feb 2022	June 2022	Jan 2023	June 2025	Local NGOs	Ministry of urban development
	2.4. Accredited institutes to conduct training at national and provincial level.	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector
	2.5. Monitoring of learnt skills and design and conduct refresher training programs.	Jan 2022	Mar 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Line ministries/private sector
	2.6. Mass awareness through electronic, print and social media.	Jan 2022	Mar 2 022	Jan 2023	June 2025	Ministry of urban development	NGOs, private sector
Establishment of quality standards and labeling	3.1. Identification and approval of standards from competent forum.	Feb 2022	June 2022	Jan 2023	June 2025	Local NGOs	Ministry of urban development
	3.2. Development of legal	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector

	Framework to support standardization and labeling And its approval from competent forum.						Ministry of justice
	3.3. Training and awareness of producers and consumers on standards and labeling			Jan. 2022	Dec. 2024	Central government	NGOs

4: Determining capacity needs and estimating costs and funding needs

The activities and estimated costs/ budget are indicated in Annexure-V.

Table 29: Summary of cost and resources for Micro Hydropower

Actions	Activities to be supported	Total costs (US$)
Develop and implement a financial incentive scheme	Expert to implement all activities including workshops Workshop support	$20000.00
Create and implement a full training program for PV systems	Purchase for training equipment and materials Provide scholarships	$18000.00 $10,000.00
PV system installation on government buildings and for energy impoverished societies	Project feasibility studies and design Procurement and installation of systems	$18,00.00 $5M
Total		$5066000

Step 5: Management Planning

Risks and Contingency Planning

The main risks and contingency plans of 3Rs technology have been described in table 21 below:

Table 30: Overview of risk categories and possible contingencies for promoting 3Rs technology

Risks	Description	Contingency action
The socio- economic situation of Afghanistan might deteriorate (e.g. change in exchange rate, rate of interest etc.)	Fragile economic conditions may result in change of interest rate and may impact negatively on programs and projects	Launch awareness and sensitization programs as well as capacity building of the stakeholders to enable them to sustain the market shocks.
Change in government policies.	With change of government usually the priorities also change. Now that the Taliban regium has taken over we are not sure how they will handle this onward and with what changes in the policy.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	Afghanistan is subjected to vulnerabilities due climate change.	Undertake climate change resilient infrastructure and adaption measures.

Next Steps

The immediate requirements for 3Rs technology implementation would be to appoint a task manager by the banks and with the support of Kabul and provincial municipalities prepare concept notes and project proposals for mobilizing resources from interested donors for implementation of different components of the technology.

Table 31: Identification of immediate requirements and critical next steps

Immediate Requirements	Prepare concept notes and project proposals for mobilizing resources for 3Rs technology and establish linkages with the potential stakeholders for implementation of different components of this technology.
Critical steps	Encourage corporate/private sector to be a part of service delivery network to help the consumers for meeting the procedural requirements and availing the facility easily.

Table 32: Summary TAP table for 3R

Technology Name: 3R Technology							
Ambitions	In the capital city of Kabul, increasing generation of solid waste and its improper management has imposed daunting impacts. The city of 5 million people generated 3050 tons of solid waste every day in 2018. Data analysis shows that if an estimated 25% waste reduction is achieved gradually by 2023, then the total cost of the system will be reduced to 1505.9 million Afs/year, much lesser than the estimated cost at 2210 million Afs/year. Developing an integrated solid-waste management (ISWM) plan for Kabul city based on an overview of the existing system and practices, including the gaps in the entire value chain. A paradigm shift from business-as-usual scenario to an ISWM approach is recommended. The proposed strategies, when implemented effectively, will increase the recycling rate, and reduce the requirement for landfilling in Kabul city. Policy reforms to encourage waste reduction and segregation, and the establishment of facilities for recycling, treatment, and landfilling are proposed. Moreover, the willingness to pay of citizens indicates the total cost of waste management system, estimated at 111.53 million Afs/month, can be recovered effectively						
Benefits	1. Carbon footprint of pilot building is reduced 2. Cost of operation of government buildings reduced 3. Livelihoods and quality of life of energy impoverished households and communities improved 4. Institutional and human skills capacity improved for the operation and maintenance of 3Rs technology						
Actions	**Sources of Funding**	**Responsible Body**	**Timelines**	**Risks**	**Success Criteria**	**Monitoring Indicators**	**Budget for action**
Develop and implement a financial incentive scheme	World Bank, Asian Development Bank and NGOs	Ministry of Finance, central and provincial municipalities	July 2022 to Aug 2023	High costs for consultancy	Economically viable	Report completed on schedule Options implemented	$15000.00
Create and implement a full training program for 3R technology	World Bank	MRRD and DABS	Apr 2022 to Mar 2023	High cost for training materials	Program designed and implemented	No of persons trained Institution equipped to conduct training	$15000.00
Design and implement 3R technology installation project	World Bank	DABS	June 2022 to Aug 2023	High cost of consultancy	contribute to the reduction of GHG	Reduce carbon footprint	$5 M

Project Concept Note (3): Promotion and Diffusion of 3Rs Technology in Afghanistan

Introduction and Background

The 3Rs Concept of technologies to be implemented can substantially contribute to the reduction of the amount of waste disposed on land. To carry out the implementation of the 3Rs concept of technologies requires a high degree of coordination and organization of the waste management chain. For the purpose of reduction of the waste problems in future, reduction in waste generation and reuse of old, products such as electronics can be one of the most important factors. The reduction, for example, possible at consumption level includes better buying habits and cutting down on the use and purchase of disposable products and packaging. In addition, recycling is viable and the best option for a range of waste products. In some economies, there are already well-organized recycling businesses processes in place for a range of products (e.g. furniture, clothing textile etc.) and materials (e.g. paper, iron, glass, and steel).

Objective of the project:

With goal of reducing the disposal of wastes at uncontrolled sites and hence, to reduce GHG emissions, the 3Rs' technology is aimed at achieving the followings:

- Reduce pollution problems and improve the livelihood across the country
- Create job opportunities and improve the socio-economic status of the urban population
- Reduce GHG emissions across the country especially in the urban settlement

Following are the project outputs:

Enhanced enabling policy environment within which a commercial bank develops sustainable waste management financing mechanism and continues to operate beyond the lifetime of the project.
Established systems for monitoring and evaluation, quality standards certification and training programmes for sustainable financing mechanism.

Relationship to the country's sustainable development priorities

Afghanistan National Sustainable Development Strategy focuses on "sustainable management of solid waste in urban and rural settlements". Moreover, the project will help Afghanistan in fulfilling its commitments made in the Intended Nationally Determined Contributions (INDC), Therefore, the proposed project is in conformity with the sustainable development priorities of the country.

Project scope and possible implementation:

The project scope covers rural and urban households of the country.

Project activities:

The project will be implemented by Kabul municipality primarily in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries.

The activities of the proposed project include:

Mass awareness through using print and electronic media and employing marketing agents and credit portfolio. Implementation of policy and institutional framework of the banks for supporting sustainable waste management in Kabul.

Capacity building:

Training of local level technicians by developing curriculum and training manuals and production of accredited technicians by imparting vocational training through government and private accredited institutes for the assessment of borrowers and maintenance.

Project budget (Tentative)

Details of project budget presented in table below:

No.	Item	Total cost (Afs))
1	Awareness raising campaigns through print and electronic media and involvement of Civil society	1 Million
2	Support for Policy and Institutional Framework	1 million
3	Training/ Capacity building of financing institutions, local technicians & suppliers	5 million
4	Promotion of special credit line	2 million
5	Project Management Cost (including M & E)	5 million
	Total cost in Mil. Afs	14 million
	Total cost in (Million US$)*	250 thousand

Table 33: budget and resources for project idea (3)

3.3. Biogas Technology

3.3.1. General Description

In Afghanistan biogas capture from landfills have a greater potential contribution to socio-economic development of the regions across the country by the expansion of employment opportunities. Moreover, it improves the security of energy supply. Biogas capture from landfills improves the livelihood of people in the rural settlement of the country and as well as it provides the sustainable supply of energy and enhances population health by removing the hazards they face from the landfills both in the short and long runs. Biogas capture technology involves excavating the ground and constructing bio- digestion tank using the usual construction materials such as stones and cement. The tank is sealed to ensure anaerobic decomposition of biodegradable materials.

Domestic biogas plants vary in size, depending on the household's needs and quantity of feedstock – mainly animal manure; however, other organic material such as kitchen waste, crop residues, and night soil (human excreta) could supplement it. Water availability is also important because the collected manure must be mixed with water in the bio digester (typically at a ratio of 1:1). In general, the smallest size biogas plant (1 m3 capacity) requires about 25 kg of manure per day (supplied by about two-three cows) and 25 liters of water respectively, which can meet the cooking and lighting needs of a three- to four-member family. The largest family-size plant ($6m^3$ capacity) can cover the needs of a relatively large joint family of 18-24 members. There are many designs of biogas digesters for household use, including the floating drum and the heat-sealed plastic or rubber bag (balloon) type. However, the fixed-dome design is perhaps the most applied given its relatively low construction and maintenance cost, reliability, simplicity, durability, and long lifetime. In addition, the plant is constructed underground, protecting it from physical damage and saving space.

At a household level, the use of solid biogas resources - firewood, charcoal, animal dung, and crop residues is very high, about 90% of total firewood provides 65% of the domestic fuel. Anecdotal evidence and historical sources show that rural population is almost totally dependent on biomass fuels for cooking and heating, while lighting is provided by kerosene. In urban areas, there is a push to use liquefied petroleum gas (LPG) to offset fuel wood consumption and its resulting air pollution.

Step 1: Ambition for promoting biogas technologies

Biogas technology was introduced in Afghanistan about 20 years ago, on a very small scale, and through NGOs mostly in rural parts and mainly in central highlands of Afghanistan. However, financial and technical barriers such as high cost of construction, inadequate financial support, low design, construction and management skills, social and cultural beliefs and inadequate information have hampered diffusion in the country. The German GTZ in collaboration with the Ministry of Energy has been promoting the technology in the country for some time now. The waste residues are comparable to mineral fertilizers in plant nutrients and can therefore be used in farms for crop growth resulting in great savings for the farmers who use them instead of expensive commercial fertilizers. Bio-digesters are constructed at the households or institutions where the gas is used for cooking and lighting. The market demand is mostly from farmers in rural areas and is driven by factors such as availability of farm wastes and the need for affordable clean energy. Some NGOs within the country are conducting training of households on the operation of bio-digesters through demonstrations among other methods. In 10 years from now its envisioned that 50-60% farmers in some of the most remotest districts of Afghanistan use the biogas technology both for heating and lightning.

Step 2: Actions and activities selected

Summary of Barriers and measures to overcome barriers

Insufficient legal and regulatory framework followed by complex procedures and inadequate regulations for climate change technologies. In Afghanistan, the other major policy barrier is the lack of efficient enforcement and inability to enforce laws and regulations Also, in Afghanistan lack of professional institutions to properly promote and disseminate the technology. There are some institutions but with limited capacity. There is also limited capacity for research and development in this sector. Inadequate training facilities, consultant's, and lack of expenses to train stakeholders. Lack

of skilled personnel for the installation and operation of the technology and lack of service and maintenance specialist. Limited dissemination of information to technology users, lack of market information & lack of access to technology resource assessment data.

An overview of barriers and its mitigation measures as identified in the TNA process are described in

Table 23 below.

Table 23: Overview of biogas Barriers and Measures to overcome these

Category	Barrier dimension	Main Barrier	Measures
Economic and Financial Barriers	Cost	High cost, especially to hire experts and skilled labour Insufficient subsidy or support especially in some of the most remote areas of Afghanistan	Access to government loans and grants
Non- Financial Barriers	Policy, legal and regulatory	No specific policy provisions to provided subsidy and concession Inadequate renewable energy policy, strategy, and action plan	Review relevant policies and strategies and make necessary adjustments and practical solutions.
	Technical	Limited capacity and technology of productive use biogas energy Lack of proper maintenances system	Enhance technical capacity of the manufacturers for further production and efficiency of the proposed technology
	Institutional and organizational capacity	Insufficient capacity of provincial and district level staffs	Capacity building and training on local and domestic levels.
	Information and awareness	Inadequate public knowledge about proper use and advantages of biogas technology	Mass media awareness on grass root level

Framework for ranking measures for inclusion as Actions selected for the TAP

The assessment and ranking of identified measures have been done on the basis of effectiveness, efficiency, interaction with other measures, suitability within the country, and benefits and costs as per guidelines for preparation of TAP in Table 24 below.

Table 24: Framework for ranking measures of promoting biogas for inclusion as Actions selected for inclusion in the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
Promotion of soft term credit line	Effectiveness	Better access to finance through credit line with low interest rate of for biogas systems is an effective measure for wider scale implementation and making it affordable.	The government will give tax waiver to components that will be manufactured locally or imported for the purpose of maintenance of bio-digesters and reduce the cost of cooking stoves and gas lamps. The government should give tax waiver on the cooking stoves and gas lamps that use methane gas specifically
	Efficiency	The efficiency of the measure will be effective through services of accredited technicians at grassroots level to reduce the risks of failure of the technology and build confidence of the financial institutions to expand the credit line to more clients.	
	Interactions with other measures	The credit line program has an interaction with awareness raising and training measures are instrumental for this.	
	Suitability within country/ sector	Provision of credit line is suitable for the country as bigas technology basically serve the purpose of both waste management and energy production.	
	Benefits and costs	Direct benefit of technology implementation is immediate management of waste as well as the generation and production of renewable energy.	
	Efficiency	In Afghanistan 100% local manufacturing is not able to compete in price and quality. However, efficiency of the measure will be effective with skilled technicians.	
	Interactions with other measures	There are no negative interactions with other measures however, after establishment of quality, the domestic manufacturers will take time to build their capacity to meet he requisite standards.	
	Suitability within country/ sector	By providing tax incentives in the long run local manufacturing of the system will be more feasible and will create sustainable supply chain.	
	Benefits and costs	The financial institutions will form partnership with the government to provide low interest loans for development of bio-digesters in order to promote clean energy in rural households towards environmental conservation.	

Production of accredited technicians and Awareness raising	Effectiveness	The banks will increase their credit line when supported by accredited technicians reducing the risk of failure of technology.	
	Efficiency	The measure will be effective through establishment of accredited institutions providing technical skills at the grass root level. Promote mass awareness programs through print, electronic and social media.	
	Interactions with other measures	Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and the banks' loan portfolio towards solar technology.	Awareness raising and accredited technicians will build confidence and mobilize the investment of common people and will expand the banks loan portfolios.
	Suitability within country/ sector	The measure will ensure provision of accredited technicians at grassroots level and public awareness of the technology. Further, it will build confidence of financial institutions and the suppliers of the technology. This will result in promoting the technology on a large scale in the country.	
	Benefits and costs	The awareness raising and training programs do not require much cost as compared to the benefits.	
Establishment of quality standards and labelling	Effectiveness	The effectiveness of quality standards and labeling is high because it enables a consumer to make right choice of purchase biogas technology	At present there are no quality standards to monitor the quality of the panels. Local manufacturers are producing some parts of the technology but is not meeting the standards
		technology is high and is not affordable by a common man. The standards developed for the country may be adopted at par with the global accredited standards to improve its effectiveness.	After the establishment of labeling the local manufacturers will require the training and technology transfer to enable them to meet the standards.
	Efficiency	The quality standards and labeling increases the efficiency of any system on scientific parameters.	
	Interactions with other measures	After the establishment of labeling the local manufacturers will require the training and technology transfer to enable them to meet the standards.	
	Suitability within country/ sector	The standardization and labelling program will ensure and will retain the confidence of the users and financial institutions of the technology although it will initially increase its cost but in the long term will be helpful in expansion of the loan technology.	

	Benefits and costs	The measure increases the cost of product but it also ensures the efficiency and performance of the product. Quality standards and labeling is required to be supported by legislation as well as enhancing capacity building of relevant institutions and manufacturers.	

Final selection of Actions for inclusion in the TAP

Table 25: Final selection of Actions/Measures for promoting biogas technology for inclusion in the TAP

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	Promotion of soft term credit line and Develop business model to encourage domestic manufacturing (1)	Promotion of soft term credit line with low interest rate of less than 5%.
Non-financial	Production of accredited technicians and awareness raising (2)	Production of accredited Technicians and awareness raising;
	Establishment of quality standards and labelling (3)	Establishment of quality standards and labelling

Identifying activities for the selected Actions

Action 1: Promotion of soft term credit line

The banks/financial institutions will need to prepare proposals for securing funding. The banks will develop credit policy and procedures as well as disbursement and recovery of loans with regular documentation and monitoring.

Table 26: Identification and description of specific activities to support Action 1:

Activity 1.1. Identify donors and local practitioners
Activity 1.2. Banks develops credit policy and procedures
Activity 1.3. Recovery of loans according to banks policy.
Activity 1.4. Regular documentation and monitoring of loan program.

Action 2: Production of Accredited Technicians and Awareness raising

At national and provincial levels institutions for training will be identified. To enhance the capacity, these institutions will be interlinked with accrediting institutions e.g. Afghanistan National Standardization Entity Technical, Education and Vocational Training. The Identified institutions will be responsible to prepare training modules, monitoring mechanism, selection criteria of participants and will conduct trainings. Promotion of awareness program will be through pamphlets, booklets, leaflets, banners, and billboards. These will also be developed in local languages and provided to the relevant stakeholders and communities for wider dissemination of the technology.

Table 27: Identification and description of specific activities to support Action 2

Activity 2.1. Identification of training provider epically on local levels
Activity 2.2. Preparing selection criteria for the participants of the training
Activity 2.3. Mass awareness through electronic, print media and social media.

Action 3: Development of Quality Standards and labelling for small hydro powerplants

The specific activities required for development of quality standards involves drafting of standards and legal framework in accordance with national requirements at par with international standards. Laboratory facilities for testing small hydro powerplants will be developed and tested as per the guidelines of approved quality standards and labelling procedures. The producers and consumers will be guided regarding standards and labelling of small hydro powerplants and its accessories.

Table 13. Identification and description of specific activities to support Action 3

Activity 3.1. Drafting of quality standards and labelling procedures.
Activity 3.2. Development of legal framework to support standardization and labelling and its approval from competent forum.
Activity 3.3. Development of laboratory facilities.
Activity 3.4. Labelling of small hydro powerplants and its accessories available in the market.
Activity 3.5. Training and awareness of the producers and consumers on standards and labelling.

Step 3: Identifying Stakeholders and determining timelines

The main primary parties include central and provincial municipalities and banks providing loan facilities The timeline of the plan is 5 years commencing from 2022-2027. The primary and secondary responsible parties/ stakeholders along with timeline is identified in Table 25.

Table 28 Characterization of activities for implementation of actions for biogas technology

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary Focal point	Secondary Focal point
1. Promotion of Soft term credit line	1.1. Identification of donors and Prepare concept notes and proposals for securing funding according to bank's guidelines	June 2022	Aug 2022	Mar 2023	Aug 2025	Local municipalities and non-profit organizations	MRRD
	1.2. Banks Develops credit policy and procedures.	July 2022	Aug 2022	Jan 2023	June 2025	The central Bank	Other private banks in Afghanistan
	1.3. Disbursement of loans under one window operation, Recovery of loans according to banks policy and Regular documentation and monitoring of loan program.	Mar 2022	June 2022	Jan 2023	June 2025	The Central Bank, local municipalities, and private sector	financial institutions

2.Production of accredited technicians and Awareness Raising	2.1. Identification of training institutes and its accreditation at national and provincial level.	July 2022	Dec 2023	Jan 2023	June 2025	Ministry of urban development	Kabul University
	2.2. Identified institutions will prepare training modules and monitoring mechanism according to the local Needs and Carry out periodic monitoring and revision of training module on the basis of feedback.	Feb 2022	July 2022	Aug. 2022	Dec 2024	Ministry of urban development	NGOs & private sector
	2.3. Preparing selection criteria for training participants	Feb 2022	June 2022	Jan 2023	June 2025	Local NGOs	Ministry of urban development
	2.4. Accredited institutes to conduct training at national and provincial level.	Mar 2022	June 2022	Jan 2023	June 2025	Kabul university	Provincial Govts, NGOs, private sector
	2.5. Monitoring of learnt skills and design and conduct refresher training programs.	Jan 2022	Mar 2022	Jan 2023	June 2025	Provincial Govts, Local NGOs	Line ministries/private sector
	2.6. Mass awareness through electronic, print and social media.	Jan 2022	Mar 2 022	Jan 2023	June 2025	Ministry of urban development	NGOs, private sector

Step 4: Determining capacity needs and estimating costs and funding needs

For efficient implementation of the biogas system in the country, the stakeholders need to enhance their capacities in areas of credit disbursement and recovery procedures. The relevant accredited training institutes like Afghanistan National standardization Entity, Technical Education and Vocational Training Authority will play a major role in imparting training and awareness creation. Resources needed for the capacity building, actions and activities needed are estimated in Annex 4.

Table 15: Summary of cost and resources

Actions	Activities to be supported	Total costs (US$)
Develop and implement a financial incentive scheme	Expert to implement all activities including workshops	$20000.00
Support the promulgation of Electricity Supply Regulations		$20000.00
Create and implement a full training program for biogas Technology	Purchase for training equipment and materials	$18000.00

Biogas system installation in remote villages of Afghanistan	Project feasibility studies and design Procurement and installation of systems	$18,00.00 $5M
Total		$5096000

Step 5: Management Planning

Risks and Contingency Planning
The main risks and contingency plans of biogas technology have been described in Table 29 below:

Table 29: Overview of risk categories and possible contingencies for promoting biogas technology

Risks	Description	Contingency action
The socio- economic situation of Afghanistan might deteriorate (e.g. change in exchange rate, rate of interest etc.)	Fragile economic conditions may result in change of interest rate and may impact negatively on programs and projects	Launch awareness and sensitization programs as well as capacity building of the stakeholders to enable them to sustain the market shocks.
Change in government policies.	With change of government usually the priorities also change.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	Afghanistan is subjected to vulnerabilities due climate change.	Undertake climate change resilient infrastructure and adaption measures.

Next Steps

Universities and relevant industries should be involved in technology transfer programs and efforts must be made to open training centres in rural parts of Afghanistan.

Table 30: Identification of immediate requirements and critical next steps

Immediate Requirements	Prepare concept notes and project proposals for mobilizing resources for biogas and establish linkages with the potential stakeholders for implementation of different components of biogas technology.
Critical steps	Enhance Market links to be developed within the households and between the households and the technology suppliers towards increasing the demand for the bio-digesters.

Table 31 - Summary TAP table for biogas technology:

Technology Name: Biogas							
Ambitions	The German GTZ in collaboration with the Ministry of Energy has been promoting the technology in the country for some time now. The waste residues are comparable to mineral fertilizers in plant nutrients and can therefore be used in farms for crop growth resulting in great savings for the farmers who use them instead of expensive commercial fertilizers. Bio-digesters are constructed at the households or institutions where the gas is used for cooking and lighting. The market demand is mostly from farmers in rural areas and is driven by factors such as availability of farm wastes and the need for affordable clean energy. Some NGOs within the country are conducting training of households on the operation of bio-digesters through demonstrations among other methods. In 10 years from now its envisioned that 50-60% farmers in some of the remotest districts of Afghanistan use the biogas technology both for heating and lightning.						
Benefits	1. Carbon footprint of pilot building is reduced 2. Cost of operation of government buildings reduced 3. Institutional and human skills capacity improved 4. Biogas become more economically viable enabling their future diffusion						
Actions	**Sources of Funding**	**Responsible Body**	**Timelines**	**Risks**	**Success Criteria**	**Monitoring Indicators**	**Budget for action**
Develop and implement a financial incentive scheme	USAID, World Bank, Asian Development Bank and some international and local NGOs	Ministry of Finance and provincial CDCs	June 2022 to Sep 2023	High costs for consultancy Options for tax reform cannot be implemented	Economicall y viable	Report completed on schedule Options implemented	$20000.00
Create and implement a full training program systems	GIZ, World Bank	MRRD	Mar 2022 to Mar 2023	High cost for training materials	Program designed and implemente d	No of persons trained Institution equipped to conduct training	$20000.00
Design and installation project	World Bank	MRRD	June 2022 to Aug 2023	High cost of consultancy	contribute to the reduction of GHG	Reduce carbon footprint by	$3 M

Project Ideas for Waste sector expected here

Project Concept Note (2): Increase alternative access to energy through Biogas digesters in prison Systems

Biogas sanitation systems are a promising technology for institutional settings of developing countries as they combine effective treatment of human excreta and kitchen waste, while at the same time generating a renewable fuel source for cooking and a nutrient-rich fertilizer. In Afghanistan, the potential of introducing biogas digesters as an alternative source of clean energy and avoiding the use of charcoal, exists in prison facilities. It is estimated that a prison with 200 detainees needs a 20m3 digester. The approximate average biogas consumption rate per (household-sized) stove is 400 L/h while a prisoner produces 61.9 L/person/day, therefore waste from 6 prisoners can supply the stove.

The gas is made of 70% methane, 25% carbon dioxide with remaining 5% composing other gases.[1] The aim is to reduce firewood use for cooking in the prisons by up to 40%. Currently, the prisons use only the firewood as its prime fuel for heating and cooking for prisoners. Biogas is considered as a better solution to reduce the rate of deforestation and reduce the amount of released human waste. The remaining waste from the biogas digester will be used as fertilizers and sold to farmers or used in the prison-farming projects. Research will be conducted to understand community buy-in of the project as social settings can vary.

Target: Prisons

Indicative Activity:

a) Construct 5 biogas digester made from local building materials based on feed from 300 detainees (30m3 digester);
b) Training prison wardens and detainees on constructing biogas digesters.
c) Combining human waste, kitchen waste and animal dung as input into the digesters.
d) Package the remaining fertilizers for sale to farmers; and
e) Construction of storage for packed fertilizers

Expected Impact

Output 1: Enhance critical government institution service delivery and community livelihood and resilience through access to alternative energy.

a) Improved government institutions service delivery.
b) Expanded health care services.
c) The capacity of communities to take up additional alternative livelihoods or add value to existing ones towards improvement in their livelihoods is strengthened.
d) Increased yield of sellable yield by up to 50% through drastic reduction in rotting and spoilage
e) Increased income for farming / agri-business communities thanks to improved value of farming yield and opportunity to export

Output 2: Supporting alternative sources of energy to mitigate climate change

1. Reduced quantity of firewood by 40% in prison
2. Provide an alternative source of waste management
3. Supply fertilizers to improve agriculture yield

Project budget (Tentative)

Details of project budget presented in table below:

[1] ICRC

No.	Item	Total cost
1	Awareness raising campaigns through print and electronic media and involvement of Civil society	1 Million
2	Training/ Capacity building of financing institutions, local technicians & suppliers	4 million
4	Promotion of special credit line	10 million
5	Project Management Cost (including M & E)	10 million
	Total cost in Mil. Afs	25 Million
	Total cost in (Million US$)*	350 thousand

Table 32: budget and resources for project idea

CHAPTER 3: CROSS CUTTING ISSUES

In Afghanistan there are several cross-cutting issues that constitute common barriers for all technologies considered and prioritized under TNA process. These issues result in insufficient development of climate change mitigation technologies and in many cases have also common remedies to overcome them. Therefore, the cross-cutting issue may seem indexical but they specific to every technology.

Consistent strategy and vision. Lack of a consistent and comprehensive vision in the field of climate change mitigation technologies, including energy efficiency and Renewable Energy use is a basic cause for existence of many other barriers. Lack of such a strategy and vision has resulted in absence of relevant state agency. Up to now there is no government agency working on development of general and comprehensive energy strategy incorporating all energy sources and the potential for energy saving into a common picture. On the other hand, there is a good example of promoting the hydropower development through a dedicated program of government. This example could be extended further, and similar programs might be developed for other high priority climate technologies identified under this TNA process. With the current TNA project an effort is being made to partially fill in the gaps in technology technical and economic information but much more needs to be done.

Need for fiscal Support Mechanisms The above barriers have resulted in a lack of state policies and action plans for climate technology development. As a consequence, there are no effective fiscal mechanisms of tax breaks, state subsidies organs involved to support the deployment and dissemination of climate change mitigation technologies.

Strengthening of R & D institutions Existence of efficient R&D centres with targeted programs and effective coordination with ongoing programs is of paramount importance for successful deployment and dissemination of efficient solar heating, and other high priority climate technologies.

There is also general lack of practical information about the selected technologies including their principles of operation, costs and benefits, operation and maintenance guidelines and selection criteria. Strengthening of R & D institutions could partly address this problem, though the dedicated data repositories and websites, as well as more knowledgeable experts. International cooperation needs to be strengthened for obtaining adequate information and learning material, Special purpose scholarships for Afghan students as well as fellowships for more mature experts might trigger bringing more CC technology information. Creation of data and information depositories would support adaptation and deployment, as well as the development of indigenous climate change mitigation technologies. Adequate fuel pricing and accounting for externalities

Discussions and own analysis during the project implementation have highlighted the need for further development of comprehensive national innovation system (NIS) to assure better interaction of educational and research institutions with businesses and to promote innovation for the benefit of the local industry and to the extent possible based on Afghan resources. Creation of Technology Parks, Centres of Excellence or Technology Transfer Centres for information storing and sharing, knowledge and know how transfer, and for the support of cooperation between higher education schools, R & D institutions and business is an important part of such a system. Addressing legal and financial aspects of innovation and developing the National Strategy for innovation are essential steps in this direction although beyond the scope of this TNA project.

ANNEXURES

ANNEX 1: TAP TECHNICAL GROUPS FOR ENERGY AND WASTE SECTORS

No	Name	Designation	Organization	Cell phone	Email
1	Gh- Sarwar Fayyaz	Se Rasis Engineer	Ministry of Rehabilitation and Rural Development	0799058455	sarwarfayyaz@mrrd.gov.af
2	Esmat Sharif	RE Manager	Da Afghanistan Burshna Shirkat	0799025573	Esmat.sharif@dabs.af
3	Eng.Gul Rasool Hamdard	Technical Manager	DABS	0729002732	Gulrasool.hamdard@dabs.af
4	Geeti Amanzada	Policy and Plan Director	Ministry of Transport	0700222190	geetiamanzada@yahoo.com
5	Sayed Kazem Hashemi	Lecturer	Kabul University	0790230122	Sayedkazem15@gmail.com
6	Payenda Mohammad	Technical SR Expert	Agha Khan Agency for Habitat	0775067699	paindamohammadkhuroshan@akdn.org
7	Noorgul Shirzoy	Industrial Affairs Sustainable Development	NEPA	0780222343	usernoor@yahoo.com
8	Mohammad Monib Noori	BUR Coordinator	UNEP	0790697310	Monib.noori@un.org
9	Nassiba Aryan	Climate Change Project Expert	NEPA	0781307691	nasibaaryan@gmail.com
10	Mohammad Nazir Safi	Employee	NEPA	0744811956	Mohammadnazirsafi2019@gmail.com
11	Basir Ahmad Nesar	H.Water supply and Canalization	Ministry of Urban Development and Land	0784104562	basirahmadnesar@yahoo.com
12	Habibullah Tahiry	Loss and Damage Expert	NEPA	0776511350	habibullaht@hotmail.com
13	Aria Neiaeesh	Head of Climate Change Mitigation	NEPA	0778825790	Aria.gardizi@gmail.com
14	Jawid Ahmad	Hydro Engineer	Ministry of Energy and Water	0799990899	Jawed_seraj@yahoo.com
15	Zaher Maher	Climate Finance Expert	NEPA	0773066320	Zaher.maher2014@gmail.com

16	Shamila	GRB Officer	NEPA	0788259155	Shamila.afzali2017@gmail.com
17	Nadera. Rashidi	Head of Gender Department	NEPA	0749880027	Nadera.rashidi@yahoo.com
18	Hamidullah Arefi	Media	The Kabul Times	0700163568	Hamidi1992@gmail.com
19	Sohila Usofzai	Manager	Ministry of Economy	0772030707	Sohila.besmil@gmail.com
20	Sediqullah.Omarzai	Director MIS	Kabul Municipality	0795999599	Sediqullah_omarzia@km.gov.af
21	Reshad Azimi	DB Manager	Kabul Municipality	0785453648	razimi@km.gov.af

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