

**Technology Needs Assessment
Report III**

**Technology Action Plan
for
Climate Change Mitigation Technologies**

**Government of Pakistan
Ministry of Climate Change
Islamabad, Pakistan**

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Technology Needs Assessments Report III

Technology Action Plan for Climate Change Mitigation Technologies

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National TNA Coordinator:

Muhammed Irfan Tariq, Director General, Environment and
Climate Change, Ministry of Climate Change, Government of
Pakistan, Islamabad

Contributors and Supporting Team:

Expert Working Group on Mitigation, Ministry of Climate Change

Lead Expert:

Jawed Ali Khan

DISCLAIMER

This document is an output of the Technology Needs Assessment project, funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment and the UNEP DTU Partnership (UDP) in collaboration with the Regional Centre Asian Institute of Technology, Thailand. The present report is the output of a fully country-led process and the views and information contained herein is a product of the National TNA team, led by the Federal Ministry of Climate Change, Government of Pakistan.

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Abbreviations and Acronyms

ADB	Asian Development Bank	FERTS	Fuel Efficiency and Road
ADPs	Annual Development Plans	project	Transport Project
AEDB	Alternate Energy Development Board	GB	Gilgit Baltistan
AIT	Asian Institute of Technology	GCF	Green Climate Fund
AKF	Aga Khan Foundation	GCISC	Global Change Impact Studies Centre
AJK	Azad Jammu and Kashmir	GDP	Gross Domestic Product
BRT	Bus Rapid Transport	GEF	Global Environment Facility
Btu	British Thermal unit	GHGs	Greenhouse gases
CBO	Community Board Organization	GIS	Geographical Information System
CC	Climate Change	GLOF	Glacier Lake Outburst Floods
CCRD	Center for Climate Research and Development	GPS	Geographical Positioning System
CDM	Clean Development Mechanism	GW	Giga watt
CERs	Certified Emission Reductions	HDPE	High Density Polythene
CH ₄	Methane	HEC	Higher Education Commission
CO ₂	Carbon dioxide	IEE	Initial Environmental Examination
COP	Conference of Parties	IESCO	Islamabad Electric Supply Company
Cos	Community Organizations	INDC	Intended Nationally Determined Contributions
CPEC	China Pakistan Economic Corridor	IIU	International Islamic University
CSR	Corporate Social Responsibility	IPP	Independent Power Producer
CTCN	Climate Technology Centre and Network	IRR	Internal Rate of Return
DC	Direct Current	JFMC	Joint Forest Management Committees
DFIs	Development Finance Institutions	kms	Kilo meters
DG	Director General	KP	Khyber Pakhtunkhwa
DTU	Technical University of Denmark	KtCO ₂ -eq	Kilo metric tons of carbon dioxide equivalent
EAD	Economic Affairs Division	LESCO	Lahore Electric Supply Company
EandCC	Environment and Climate Change	LOIs	Letter of Intent
EE	Energy Efficiency	KWH	Kilo watt hour
EGTT	Expert Group on Technology Transfer	LULUCF	Land use, land use change and forestry
EIA	Environmental Impact Assessment	MAF	Million acre feet
ENERCON	National Energy Conservation Centre	MCDA	Multi Criteria Dimension Analysis
EPA	Environmental Protection Agency	MHP	Micro hydropower plant
ESTs	Environmentally Sound Technologies	MIS	Management Information System
FAO	Food and Agriculture Organization	MRV	Measurement, review and verification
FATA	Federally Administered Tribal Areas	MoCC	Ministry of Climate Change
FD	Forest Department	MOU	Memorandum of Understanding
		MW	Mega watt

NAVTTTC	National Vocational and Technical Training Commission	PV	Photo-voltaic
NCPC	National Cleaner Production Center	REDD+	Reduction of Emissions from deforestation and degradation
NDCs	Nationally Determined Contributions	RELs	Reference emission levels
NEPRA	National Electric Power Regulatory Authority	SFDP	Siran Forest Development Project
NGOs	Non-government organization	SFM	Sustainable forest management
NEECA	National Energy Efficiency and Conservation Authority	SMEs	Small and Medium Enterprises
NUST	National University of Science and Technology	SUT	Sustainable Urban Transport
NTFP	Non-Timber Forest Products	TAP	Technology Action Plan
NTRC	National Transport Research Center	TEVTA	Technical Education and Vocational Training Authority
O&M	Operation and Maintenance	TNA	Technology Needs Assessment
PCRET	Pakistan Council of Renewable Energy technologies	TOP	Terms of Partnership
PCSIR	Pakistan Council of Scientific and Industrial Research	UET	University of Engineering and Technology
PEMRA	Pakistan Electronic Media Regulatory Authority	UN	United Nations
PES	Payment for Ecosystem services	UNDP	United Nations Development Program
PFI	Pakistan Forest Institute	UNFCCC	United Nations Framework Convention on Climate Change
PIF	Project Identification Form	UNR	United Nations Regulations
PNAC	Pakistan National Accreditation Council	UN-REDD	United Nations-Reducing Emissions from Deforestation and Forest Degradation Program
PSDP	Public Sector Development Program	WAPDA	Water and Power Development Authority
PSQCA	Pakistan Standards and Quality Control Authority	WO	Women Based Organizations
PVC	Polyvinyl chloride		

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.

Pakistan 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 economy of the country.

In this backdrop, the Ministry of Climate Change 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 dissemination of 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 collaboration and assistance of the implementing partners Pakistan will soon be able to implement these environmentally sound climate resilient technologies on the ground; so that country's capacity for sustainable socio-economic development is enhanced. The Ministry of Climate Change will take all necessary measures to help transfer and diffusion of technologies prioritized by experts in the energy, forestry and transport sectors.

I am confident that the international community will also contribute to our efforts in diffusion and dissemination of prioritized technologies and help Pakistan in contributing to the global efforts towards maintaining global temperature well below 2°C above pre-industrial levels as agreed under the Climate Change Paris Agreement.

Mushahid Ullah Khan
Federal Minister for Climate Change
Government of Pakistan

Acknowledgement

I wish to take this opportunity to extend my gratitude to the United Nations Environment, Climate Technology Centre and Network (CTCN), Technical University of Denmark (DTU-Partnership) and Asian Institute of Technology, for successfully accomplishing the most essential study under Technology Needs Assessment Project in collaboration with the Ministry of Climate Change, Government of Pakistan.

We believe it is an encouraging step forward in the country's progress towards climate change mitigation. The Ministry earnestly hopes that the TNA project will serve as a key step towards addressing our climate change concerns and help in mobilizing resources for diffusion and dissemination of proposed mitigation technologies. I am sure that this exercise will trigger a process for making Pakistan climate resilient and usher an era of low carbon development.

My special thanks are due to the members of the Expert Working Group on Mitigation, especially Dr. Arshad M. Khan and Dr. M. Mohsin Iqbal (GCISC), Dr. Qamar-uz-Zaman Chaudhry, Dr. Muhammad Parvaz (HDIP), Dr. Saleem Janjua and Mr. Asad Mehmood (NEECA), Dr. Zafar Mahmood Khalid (IIU), Mr. Muhammad Irshad Ramay (NCPC), Mr. Aqeel Jafri (AEDB), Mr. Bilal Anwar (University of Manchester) and all other experts who contributed to the TNA process. I am grateful to the officers of Ministry of Climate Change especially Mr. Muhammad Irfan Tariq, Director General (Env and CC) and Mr. Imran Khan, Assistant Director.

I would also like to thank the numerous other ministries, divisions of the government, non-government and private sector experts who took time out of their busy schedule to meet with our consultants and provide data and information; their names are too numerous to register here.

My special gratitude is extended to National Transport Research Center, Ministry of Communication, Hydrocarbon Development Institute of Pakistan, Alternate Energy Development Board, NEECA, UNDP, National Cleaner Production Center, Pakistan Atomic Energy Commission, Islamic International University and Center for Climate Research and Development (CCRD) of COMSATS University. Further I also acknowledge the hard-work put in by the lead-expert Mr. Jawed Ali Khan and members of his team Ms. Yasmin Jawed Khan, Mr. Tayyab Shahzad and Ms. Faiqa Aziz in carrying out the TAP exercise under TNA Project.

(Syed Abu Ahmad Akif)
Secretary, Ministry of Climate Change
Government of Pakistan

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 include Energy, Forestry, and Transport. The technologies in the respective sectors include (i) Solar PV at household and institution levels (ii) Micro hydropower plants (iii) Sustainable Forest Management (SFM) plans (iv) Social Forestry (v) Bus Rapid Transport (BRT) System and (vi) Vehicle Tune up. 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 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).

TAP describes the following prioritized technologies in Energy, Forestry, and Transport sectors along with Project Idea Notes for up-scaling and attracting national and international investment.

Solar PV at Household and Institution level

Solar PV system off-grid at household and institution level ranked highest in prioritization of technologies in energy sector. It is projected that Solar PV technology at household and institutional level will be scaled up to 3,000 MW through various sizes of projects from 200 Watts to 1450 MW in the four provinces including Azad Jammu and Kashmir (AJK), Gilgit Baltistan (GB), Federally Administrated Tribal Areas (FATA) and Islamabad Capital Territory (ICT) by the year 2025.

Promotion of soft term credit line ranked top highest as it is especially important for a scaling up implementation of the technology and making affordable for a larger group of households. Awareness raising and training component ranked as second priority action. Due to the lack of awareness and knowledge about the technical specifications, market information as well as unavailability of accredited technicians the technology is not picking up. Hence, the TAP focuses on: identification of training institutes and its accreditation; mass awareness through electronic and print media; as well as training of technicians at grassroots level. Further, Net metering was identified as an added incentive for promotion of Solar PV. The main stakeholder for promotion of solar PV is Alternate Energy Development Board (AEDB) and the banks providing loaning facilities and electric supply companies.

Micro hydropower plants

The national target for micro hydropower plants is to generate 2,500 MW of energy by the year 2025. In this regard, the promotion of soft-term credit line ranked top priority action as it is considered effective in making micro hydropower plants affordable for the communities. Training and awareness raising component ranked second prioritized action since it plays

predominant role in the promotion of micro-hydel technology in the country. Development of quality standards and labeling for micro hydropower plants ranked third in priority, as there are no quality standards to monitor the quality of equipment. This will help in the development and enforcement of quality standards and labeling procedures for increasing consumer satisfaction though it will initially increase the cost of micro hydropower plants. The primary stakeholders include AEDB and the banks providing loaning facilities and electric supply companies.

It is worth mentioning that solar PV and micro hydropower plants, identified as top priorities in energy sector in the TNA-I and TNA-II reports have been picked up in 2017 by the Asian Development Bank's program titled as "Pakistan: Access to Clean Energy Investment Program", focusing on expanding access to decentralized solar facilities in Khyber Pakhtunkhwa (KP) and Punjab and micro hydropower (MHP) plants in rural off-grid areas of KP.

Sustainable Forest Management (SFM) Plans

The Pakistan Vision 2025 recognizes the importance of Sustainable Forest Management (SFM) Plans and the government's program to deliver SFM over 67,861 ha of forest habitats by 2020. The SFM can be achieved through provision of economic incentive mechanism for staff and communities for SFM have been identified as top priority action. The activities proposed for economic incentives include promoting REDD+ program; establish national and sub-national REDD+ funds as private companies limited by guarantee to serve as an intermediary between forest owners/users and potential REDD+ financiers.

The component of enhancing capacity and dissemination of knowledge and information is the second prioritized action as this will facilitate designing and implementation of effective SFM Plans. The main primary stakeholders include Forestry Wing, Ministry of Climate Change, provincial/ territorial forest departments and local communities.

Social Forestry

The Social Forestry technology aims to increase the forest cover from 5% to 6% by 2020 and to 10 % by 2030 through community participation. Incentives for social forestry ranked as top priority action as it serves as a powerful tool for farmers to switch from traditional agricultural practices to social forestry. The proposed incentives includes: designing of fiscal and financial incentives and expanding its network for increased rural outreach; designing policies to promote small land holder and community benefits in out-grower schemes and programs to connect forest owners and farmers in direct contact with the forester.

Further, training and awareness raising ranked as the second prioritized action as it is an effective tool for promotion of social forestry among the farmers community. The main primary stakeholders include Forestry Wing, Ministry of Climate Change, provincial/ territorial forest departments and local communities.

Bus Rapid Transport (BRT) System

The ambition is to expand the BRT network up to 300 km by 2030 in Pakistan, which will facilitate about 9.6 billion passenger per year. Reducing capital cost by giving tax incentives/

soft-term loan for BRT system ranks as a top action because the initial cost incurred in the establishment of the BRT is the major barrier in the implementation of the technology.

Involvement of private sector for promotion of BRT ranked second priority action. This will help in bridging the gap in meeting the increasing demand of BRT system in major cities. The main stakeholders include, Ministry of Communication, National Transport Research Centre, Provincial/ Territorial Transport Departments and Ministry of Finance and Board of Revenue.

Vehicle Tune-up

The technology focuses on developing a modern, competitive and viable automobile and auto-parts industry, capable of substantially reducing GHG emissions. Initial capital cost of computerized tune up facility would be made affordable through revolving loan fund ranked as top priority action which can be achieved through creation of loan facility through government, DFIs and identification of potential donors.

Training and Awareness raising for automated vehicle tune up is the second prioritized action. There is a lack of awareness and understanding concerning modern engine diagnostic practices and the equipment required for the diagnostics leading to the propagation of faulty and incorrect engine diagnosis and maintenance practices. The main stakeholders include National Energy Efficiency and Conservation Authority (NEECA), Technical Education and Vocational Training Authority (TEVTA), National Transport Research Center (NTRC) and the bank providing loaning facilities.

Project Idea Notes

The Technology Action Plan (TAP) also presents six project idea notes, two in each of the three prioritized mitigation sectors i.e. energy, forestry and transport. Under the energy sector two project ideas are developed namely (i) Promotion and Diffusion of Solar PV Technology at Household Level in Pakistan and (ii) Promotion of Micro hydropower plants in Pakistan. Under forestry sector (i) Preparation and Implementation of Sustainable Forest Management Plans and (ii) Social Forestry in Dry Areas of Punjab (Thal desert) and in transport sector (i) Feasibility study on Faizabad-Rawat Bus Rapid Transport System and (ii) Establishment of Vehicle Tune up Centers.

Way Forward

It is envisaged that the Implementation of Technology Action Plan (TAP) along with the project idea notes, will pave the way for reduction of GHG emissions in the country. It is therefore, considered necessary that the Government of Pakistan 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, created under the recently promulgated Climate Change Act - 2017, there is a need to develop the multipronged strategy to support development and diffusion of climate change mitigation technologies and promote socio-economic development in the country. It will also help Pakistan to meet its Nationally Determined Contributions (NDC) committed by the Government of Pakistan to the global community under the Paris Agreement.

Further, it is suggested to conduct studies on other identified potential mitigation technologies which could not be prioritized under the present study due to limitation of its scope, so that Pakistan can fully harness its available potential mitigation opportunities.

Chapter 1: Background and Introduction

1.1. Introduction

The Technology Needs Assessment (TNA) project aims at assisting developing countries to determine their technology priorities for mitigation of greenhouse gas emissions, removal of barriers in the diffusion and dissemination of identified technologies as well as to produce portfolios of prioritized projects for priority technologies for mitigation.

In Pakistan the project on Technology Needs Assessment (TNA) commenced in June 2015 in collaboration with UNEP-DTU Partnership, Asian Institute of Technology (AIT) and Climate Technology Centre and Network (CTCN).

The purpose of the project is to analyze its priority technology needs and development of projects to facilitate technology transfer and access to environmentally sound technology, in accordance with Article 4.5 of UNFCCC. The main objectives of the technology action plan are to:

1. Identify and prioritize through country driven participatory processes the technologies that can contribute to mitigation and adaptation goals of the participating countries while, meeting their national sustainable development goals and priorities.
2. Identify barriers hindering the acquisition, deployment and diffusion of prioritized technologies, and
3. Develop Technology Action Plan (TAP) specifying activities and enabling framework to overcome the barriers and facilitate the transfer, adoption and diffusion of selected technologies in the priority areas with national relevance.

The project on its implementation will build capacity of the Government of Pakistan to effectively meet the obligations under the UNFCCC for mitigating GHG emissions. This will lead to reduction of vulnerability of sectors and protection of livelihoods of the communities exposed to the adverse impacts of climate change.

The Technology Needs Assessment (TNA) Report I on mitigation, presented the assessment of prioritized sectors and technologies. Initially eight sectors and ninety seven mitigation technologies were identified (Annexure-I), out of which three sectors were prioritized and fifteen potential technologies were shortlisted. The shortlisted technologies were reviewed and six technologies were prioritized keeping in view their high mitigation potential and priority needs identified in Pakistan Vision 2025 and National Climate Change Policy.

For prioritization of technologies in energy, forestry and transport sectors, fifteen fact sheets were prepared. The members of the Expert Working Group on Mitigation in their meeting held in October 2015 prioritized through Multi-Criteria Decision Analysis (MCDA) the following technologies i.e. solar PV and micro hydropower plants in Energy Sector; sustainable forest management (SFM) and social forestry in Forestry Sector and Bus Rapid Transport (BRT) and Vehicle Tune up in Transport sector.

Based on prioritized sectors, the Technology Needs Assessment (TNA) Report II presented barrier analysis and enabling framework of prioritized technologies for potential climate change mitigation technologies in the context of Pakistan's National Scenario. The common

barriers identified under all prioritized technologies is high capital cost, difficulty to access finance, lack of incentives in government policy for promotion of the technologies, lack of training and certified technicians and scarce knowledge and awareness. With respect to enabling framework, the report focused on revision of policies and diffusion of technologies by providing incentives, access to finance and encouraging private sector participation. Further, trainings and awareness raising programs is needed for effective diffusion of technologies.

The third and final report of the TNA process presents “Technology Action Plan for Climate Change Mitigation Technologies” (TAP). It presents scale of ambition for diffusion and dissemination of selected technologies in the national context. The TAP identifies measures to overcome technology barriers along with concrete actions and activities for implementation of the prioritized technologies in three sectors i.e. Energy, Forestry and Transport. The TAP also develops indicative investment proposals for selected six technologies that can be considered for funding along with Project Idea Notes.

The schematic presentation of three outputs of the Technology Needs Assessment (TNA) project on mitigation is presented in Figure 1.

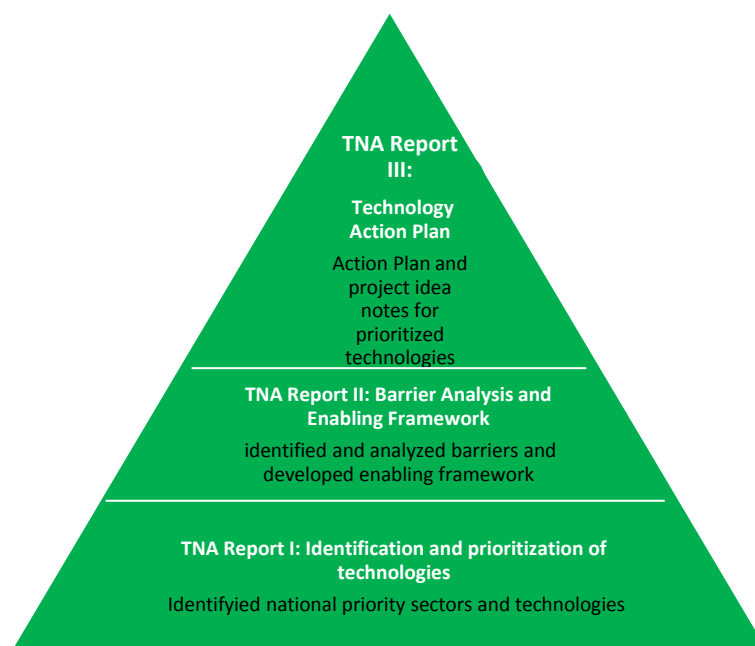


Figure 1: Overview of TNA Steps

1.2. Methodology

The methodology adopted for designing the TAP and Project Idea Note includes:

1. Review of TNA Reports I “Identification and Prioritization of Technologies for Mitigation” and TNA Report II “Barrier Analysis and Enabling Framework for Climate Change Mitigation”.
2. Meetings with Expert working group on Mitigation (Annexure-II) related to development of Technology Action Plan (TAP) and Project Idea Notes.

3. Consultation with stakeholders representing concerned government line ministries, departments and other agencies, academia, civil society organizations, manufacturers, suppliers, micro finance institutions, individual experts, national and international donors and development finance institutions in the relevant fields were also consulted (Annexure-III)
4. Conducted meetings with relevant agencies responsible for plans, programs and projects on selected technologies i.e. Solar PV, Micro hydropower plants, Sustainable Forest Management (SFM), Social Forestry, Bus Rapid Transport (BRT) and Vehicle Tune up. Schematic presentation of methodology adopted for TAP preparation is presented in Figure 2.



Figure 2: Schematic presentation of methodology adopted for TAP Preparation

5. Formulation of TAP for each technology followed five steps presented in Figure 3. The first step explains the ambition of the scale of diffusion and dissemination of the selected technologies in the national context. This is followed by a brief description of measures to overcome technology barriers and selection of actions and activities for implementation of the technology. The next step identifies stakeholders, timeline, capacity building requirements and estimated cost. The TAP also takes into consideration the management planning and developing project idea notes for mobilizing resources required for diffusion of selected technologies.

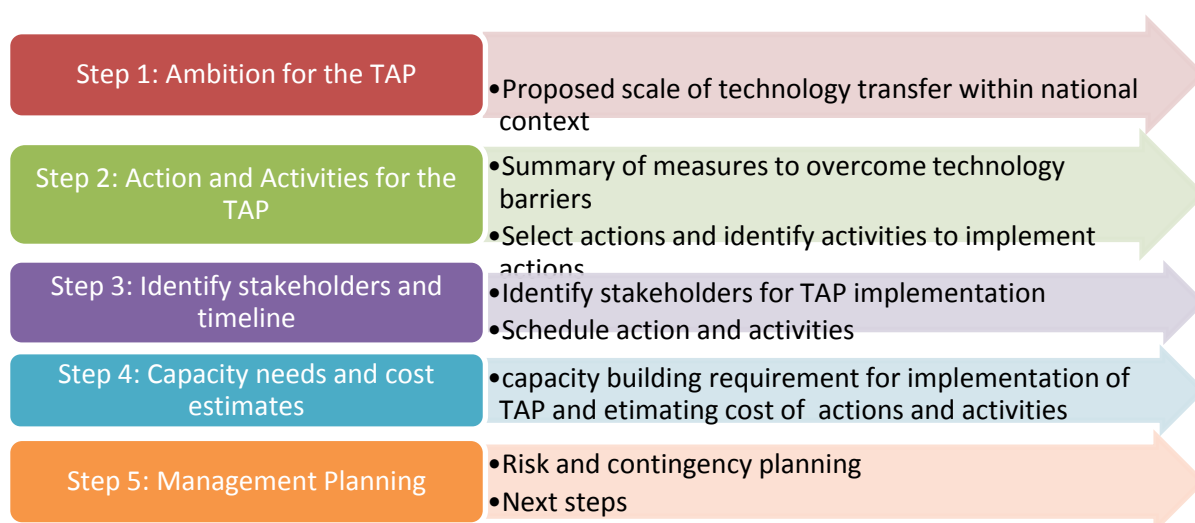


Figure 3: Overview of TAP formulation process for each technology

Chapter 2: Energy Sector Technology Action Plan

Sector Overview

Energy sector is the main driver of national economy. However, at present, Pakistan is not able to meet its energy demand as the current shortfall in supply of energy is more than 7,000 MW in the peak season¹. This shortfall has resulted in a massive negative impact both on societal and economic wellbeing which is estimated at 4-7% loss to GDP².

The Pakistan Vision 2025 has set the goal of ensuring uninterrupted access to affordable energy for all by the year 2025 to overcome the prevailing serious energy crisis situation as well as to achieve sustained economic growth of 8 per cent of the GDP. The shortfall will overcome through optimizing energy generation mix in consideration to its indigenous, economic feasibility and scalability as well as maximizing transmission and distribution efficiencies and cutting wasteful losses through investment in infrastructure and effective enforcement control.

The Government is encouraging the private sector in generating electricity through hydel and other renewable sources, but at the same time the full benefits of this initiative will only be harnessed once wheeling and evacuation problems are effectively addressed. When an Independent Power Producer (IPP) completes its project of electricity production through renewable sources, the government should not delay lying of infrastructure to feed in the national grid. Expansion in transmission network is required to transmit power from upcoming projects. It was noted that in the case of New Bong Escape Hydropower Project, the government took several years to extend the network of the grid to the location of the project and feed the generated electricity in the national grid.

Presently, Pakistan's installed electricity capacity is 19,000-20,000 MW, which is not enough to meet the country's current electricity demand of 227,760 GWh/year³ and affecting the economic growth of the country. The energy shortfall situation in the country has led domestic and industrial users to rely, more upon inefficient electricity generators running on furnace oil, and in turn, has increased average energy usage costs as well as GHG emissions.

It is worth mentioning that TNA-I and TNA-II reports identified solar PV and micro hydropower plants as the top two prioritized technologies in the energy sector. The Asian Development Bank which remained involved in TNA-I and TNA-II mitigation consultations and have launched a program in 2017 titled as "Pakistan: Access to Clean Energy Investment Program", focusing on expanding access to renewable energy, notably decentralized solar facilities for education and primary health care facilities in KP and Punjab and micro hydropower (MHP) plants in rural off-grid areas of KP.

The present energy sector technology action plan is the outcome from need assessment, identification and prioritization of energy technologies and barrier analysis and enabling framework for promotion of these technologies in Pakistan. The identified solar PV and micro

¹ The daily "Dawn", May 8, 2017, Power cuts return as shortfall touches 7,000MW, <https://www.dawn.com/news/1331738>

² The daily "NEWS", Feb. 9, 2017, Coal-based energy, <https://www.thenews.com.pk/print/184919-Coal-based-energy>

³ Equivalent to 26,000 MW

hydropower technologies have the largest 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 in order to reduce greenhouse gas emissions and to improve resilience climate change as committed by Pakistan in its Nationally Determined Contributions (NDCs).

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

2.1.1. 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.

The Federal Policy for Development of Renewable Energy for Power Generation, 2006 takes into account that the solar power project developers are allowed to enter into direct bilateral sales contracts with end-use customers and the utility company for general distribution. The policy and plans also include adding at least one million customers and approximately 3000 MW of solar power through Net metering by 2025⁴.

2.1.2. Step 1: Ambition for promoting solar technologies

It is projected that the solar PV technology will be scaled up to 3,000 MW through launch of various sizes of projects from 200 Watts to 1450 MW in the four provinces including AJK, GB, FATA and Islamabad by the year 2025.

The Pakistan's policies and plans on energy sector focuses on providing affordable and clean energy to all sections of the population. The Pakistan Vision 2025 and Integrated Energy Plan 2009-2022 also aims to eliminate current electricity supply-demand gap by 2018, and cater to growing future demand by addition of 25,000 MW by 2025. Further, establishment of renewable energy power projects to tap the immense potential of alternative and renewable energy in Pakistan and expected outcome of on-grid and off-grid solar energy is 1,500 MW and 2,000 MW, respectively. In remote areas, the plan is to encourage hybrid power generation system. Alternative renewable such as solar, wind or micro hydropower will be used for

⁴ January 2016, A Solar Developer's Guide to Pakistan, Alternate Energy Development Board and IFC World Bank Group, <http://www.ifc.org/wps/wcm/connect/b46619004b5e398cb8b5fd08bc54e20b/IFC+-+Solar+Developer's+Guide+-+Web.pdf?MOD=AJPERES>

electricity generation and it will be coupled with diesel generator only when the renewable source is not available.

The State Bank of Pakistan has introduced a Revised Financing Scheme for Renewable Energy (Annexure-IV) in June 2016 with a view to promote renewable energy projects (Solar, wind, hydro, biogas, bio-fuels, bagasse co-generation and geo-thermal) @ 6% interest to attract borrowers and financing banks/ DFIs in the country. The scheme is available to two categories (i) sponsors, desirous of setting up renewable energy power projects with a capacity ranging from 1 MW and upto 50 MW (ii) Consumers willing to install facility of electricity generation ranging from 4 KW to 1000 KW for own use or supply to distribution company as per rules. In addition, the USAID signed US\$88m funding agreement in 2016 with five banks in Pakistan (HBL, MCB Bank, Faysal Bank, Meezan and JS Bank) to help finance establishment of small-scale clean energy projects. The project will facilitate opening of special financing windows for providing credit lines to install solar PV in on-grid and off-grid systems to benefit both urban and rural population.

The provincial governments have developed their own plans for reducing GHG emissions based on their provincial development priorities. The Punjab province has planned to install Quaid-e-Azam Solar-Power Park in Bahawalpur district for 1,000 MW, the World's largest Solar Park. Out of this, 200 MW has already been installed in the Solar-Power Park and is connected to the national grid. The Punjab Government is also undertaking projects for solarizing the irrigation pumps, schools and public sector buildings. An agreement has been signed with Asian Development Bank to provide solar panels to 17,400 schools and public health facilities and University of Bahawalpur.

The Sindh Government has issued Letter of Intents (LOIs) to 24 private sector companies to set up solar PV power projects of cumulative 1450 MW capacity. The Balochistan Government is also processing LOI requests of two companies for solar PV power projects with a view to generate green energy. The Balochistan Government has signed an MOU with a Korean company to set up a 300 MW solar power plant. Further, Balochistan Government is also planning to convert existing electric and diesel operated irrigation water pumps to solar and electrifying remote areas of the province through solar PV home systems, particularly in areas where there is no conventional electricity option⁵. The government of Khyber Pakhtunkhwa (KP) plans to supply solar power to 5,800 off-grid households in 200 villages⁶. With Asian Development Bank assistance, the province will install solar PV facilities in 8,187 schools and public health facilities.

The government of AJK plans to install 3,000 solar home systems and 10,000 solar geysers⁷. FATA is planning to install solar PV facilities in educational, health and technical institutes

⁵ Solar power plant: Balochistan govt inks deal with Korean firm; <http://tribune.com.pk/story/529000/solar-power-plant-balochistan-govt-inks-deal-with-korean-firm/>

⁶ Solar power for off-grid homes in KP; <http://www.dawn.com/news/1164507>

⁷ Alternate Energy Projects: Solar Energy Projects. <http://www.pmajk.gov.pk/web/solarEnergy.html>

and drinking water supply schemes⁸ and is also planning solar energy for its 450 villages selected from 07 agencies and 06 frontier regions⁹.

2.1.3. Step 2: Actions and activities selected

a. 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 major barrier in diffusion of solar PV as identified in TNA Barrier Analysis and Enabling Framework report is the economic and financial and non-financial barriers. One of the most important barriers for 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 expansion of solar market due to lesser consumer affordability. The barrier can be overcome by promotion of the established credit line and development of business model to encourage domestic manufacturing.

The major non-financial barriers for solar PV are low awareness, lack of quality standards and labeling, 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 behavior 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 availability of reliable product quality in the market. For promotion of solar PV systems, 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 as identified in the TNA process are described in Table 1.

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

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	<ul style="list-style-type: none"> • High up-front/ capital cost • Difficulties in accessing finance/ credit 	<ul style="list-style-type: none"> • Promotion of soft term credit line • Develop business model to encourage domestic manufacturing
Non-financial	<ul style="list-style-type: none"> • Less technical skill and low awareness • No quality standards and labeling; • Lack of strategies and legislation 	<ul style="list-style-type: none"> • Production of accredited technicians and awareness raising; • Establishment of quality standards and labeling; • Expansion of Net metering Program

⁸ Federally Administered Tribal Areas (FATA),Tenders; <https://fata.gov.pk/tenders.php>

⁹ Digest of Mega Projects: Part V; FATA Development Authority; Project: Provision of solar energy system in FATA. Planning and Development Department; FATA Secretariat, Peshawar.
<http://www.waterinfo.net.pk/sites/default/files/knowledge/Digest%20of%20Mega%20Projects,%20Planning%20and%20Development%20Dept%20-%20FATA%20Secretariat.pdf>

b. 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 2.

Table 2: Framework for ranking measures of promoting solar PV for inclusion as Actions selected for inclusion in the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
Promotion of soft term credit line	Effectiveness	<ul style="list-style-type: none"> ➤ Better access to finance through credit line with low interest rate of 6%¹⁰ for solar PV systems is an effective measure for wider scale implementation and making it affordable. The average prevalent rate of interest on other products is 20% or even more¹¹. ➤ The State Bank of Pakistan has allowed provision of credit line at 6% rate of interest for grid based solar systems and some of the commercial banks have already opened a dedicated credit line for grid solar Independent Power Producers (IPPs). 	1 There is a great demand of Solar PV but due to initial high cost is not affordable by common man. 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 of
	Efficiency	<ul style="list-style-type: none"> ➤ 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. ➤ The credit line will be offered for initial 10¹² years for household and institutions so that the benefits of the technology are widely disseminated and proven, and therefore, people would be ready to take loans even at market rate interest. 	

¹⁰ State Bank of Pakistan's circular # 3 dated 20 June 2016, revised Financing Scheme for Renewable Energy

¹¹ <https://pakistan.deposits.org/>

¹² Revised SBP Financing Scheme for Renewable Energy, State Bank of Pakistan, June 20, 2016

		<ul style="list-style-type: none"> ➤ The post-tax equity IRR and simple pre-tax pre-financing project IRR are 16% and 18%, respectively.¹³ 	<p>technology. The government has granted partial waiver of taxes and duties on import of solar system equipment and machinery. Therefore, the measure has been ranked as top priority.</p>
	Interactions with other measures	<ul style="list-style-type: none"> ➤ The credit line program has an interaction with awareness raising and training measures as both complement and supplements each other. 	
	Suitability within country/sector	<ul style="list-style-type: none"> ➤ Provision of credit line is suitable for the country as there is a huge energy crisis, not only in non-grid but also in 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	<ul style="list-style-type: none"> ➤ The credit line will be beneficial for the consumers as well as for the banks. ➤ 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. ➤ The payback period of the technology, based on its average values as per current market rates @ 6 per cent per year (Credit line interest rate for Renewables), is 16 years but if mitigation benefits are monetized and included this period is further reduced. 	
<i>Develop Business model to encourage domestic manufacturing</i>	Effectiveness	<ul style="list-style-type: none"> ➤ Locally 100% manufacturing is not effective due to the lack of technology and high cost of production. 	<p>5</p> <p>Due to scale of demand and high capital cost 100% local manufacturing of solar PV is not feasible. The measure at</p>
	Efficiency	<ul style="list-style-type: none"> ➤ Due to duty free import of Solar PV 100% local manufacturing is not able to compete in price and quality with the imported PV systems. However, efficiency of the measure will be effective with skilled technicians. 	

¹³ We assume the minimal acceptable rate (also the cost of capital) to be 6 percent which is the available interest rate as per State Bank of Pakistan's policy for "Revised SBP Financing Scheme for Renewable Energy" Circular NO. 03 dated June 20, 2016, so the IRR of 16% and 18% are the acceptable value.

		<ul style="list-style-type: none"> ➤ The post-tax equity IRR and simple pre-tax pre-financing project IRR are 16% and 18%, respectively¹⁴. 	<p>present cannot be implemented unless tax incentives are given to local manufacturers, Hence, the measure is ranked 5.</p>
	Interactions with other measures	<ul style="list-style-type: none"> ➤ There are no negative interactions with other measures however, after establishment of quality standards and labeling, the domestic manufacturers will take time to build their capacity to meet the requisite standards. 	
	Suitability within country/sector	<ul style="list-style-type: none"> ➤ At present the local market cannot compete with the price of imported solar PV system. However, it is feasible and economical to import solar cells and assemble the system locally. ➤ 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	<ul style="list-style-type: none"> ➤ A good business model will reduce the cost of local production of solar panels that will be helpful in promotion of the technology. However, it will take time to compete with the price and efficiency of the imported solar panels. ➤ The payback period of the technology with interest rate of 6 per cent per year is 16 years but if we include the mitigation benefits this period is further reduced. 	
<i>Production of accredited technicians and Awareness raising</i>	Effectiveness	<ul style="list-style-type: none"> ➤ 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. 	<p>2</p> <p>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</p>
	Efficiency	<ul style="list-style-type: none"> ➤ 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. 	

¹⁴ This is acceptable value of IRR

		<ul style="list-style-type: none"> ➤ The post-tax equity IRR and simple pre-tax pre-financing project IRR are 16% and 18%, respectively¹⁵. 	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 second to be taken as action.
	Interactions with other measures	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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, Net metering etc. ➤ It is estimated that per unit (kWh) cost of commonly available solar system is Rs.16 while that of generator is Rs.29¹⁶. ➤ The payback period of the technology with interest rate of 6 per cent per year is 16 years but if we include the mitigation benefits this period is further reduced¹⁷. 	
<i>Establishment of quality standards and labeling</i>	Effectiveness	<ul style="list-style-type: none"> ➤ 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 	4 At present there are no quality standards to monitor the

¹⁵ This is acceptable value of IRR¹⁶ Daily "The NEWS", 3rd June 2017, Redefining energy, Brand of Pakistan.¹⁷ This is acceptable value of IRR

		<p>technology is high and is not affordable by a common man.</p> <p>➤ The standards developed for the country may be adopted at par with the global accredited standards to improve its effectiveness.</p>	<p>quality of the panels. 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. However, the implementation of the measure will initially increase its' per unit cost. Therefore, the measure is not prioritized as action.</p>
	Efficiency	<p>➤ The quality standards and labeling increases the efficiency of any system on scientific parameters. The payback period of the solar PV technology with interest rate of 6 per cent per year is 16 years but if we include the mitigation benefits this period is further reduced. The post-tax equity IRR and simple pre-tax pre-financing project IRR are 16% and 18%, respectively. After enforcement of quality standards and labeling the IRR will improve and payback period will reduce gradually.¹⁸</p> <p>➤ Trainings to the producers of solar equipment according to the standards will improve efficiency of solar systems and facilitate its adoption.</p>	
	Interactions with other measures	<p>➤ 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.</p>	
	Suitability within country/ sector	<p>➤ The solar PV systems being sold in market are not labeled and are sold at a lower price. However, there is no guarantee that the system will remain fully functional for 25 years as claimed by the suppliers. The standardization and labeling 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.</p>	

¹⁸ We assume the minimal acceptable rate (also the cost of capital) to be 6 percent due to other debts so the IRR of 16% and 18% are the acceptable value.

	Benefits and costs	<ul style="list-style-type: none"> ➤ 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. The labeling program itself has a cost that may be borne by the government or the manufacturer. 	
Expansion of Net metering program	Effectiveness	<ul style="list-style-type: none"> ➤ Expansion of Net metering program is an effective measure only in the grid connected systems because it enables the consumer to install the system without the batteries and reduce its electricity bills or even makes profits. ➤ Streamlining procedures for Net metering by utility companies to encourage consumers to benefit from the program will improve the effectiveness of the system. 	<p>3</p> <p>Net metering is applicable only in grid connected system. If this program is fully installed and functional, it can bring revolution in solar PV market. In Pakistan it has potential but due to lack of expertise it has been practiced on a limited scale.</p> <p>At present, Net metering is only practiced in Islamabad and Lahore and is picking up in other cities.</p> <p>Further, the measure requires a strong partnership between public and private sector to become sustainable. The</p>
	Efficiency	<ul style="list-style-type: none"> ➤ Similarly payment of solar system in installments by the retailers is effective and efficient for promotion of solar PV systems at smaller scale. The payback period of the equity IRR and simple pre-tax pre-financing project IRR are 16% and 18%, respectively. ➤ Allowing private sector to sell and purchase electricity directly from the consumers will create competition and improve efficiency through market mechanism. ➤ The resolution of issues of limited scale of coverage of Net metering system and its cost recovery through utility companies will make the measure attractive and most of the people who can afford will benefit from this measure. Further the measure also requires strong partnership between the public and private sector. 	
	Interactions with other measures	<ul style="list-style-type: none"> ➤ The Net metering reduces the payback period of the technology. The consumer will earn through Net metering that will 	

		be helpful in paying back the loan from the bank. Thus, this measure can be very effective in promoting the technology. This measure has brought revolution in the technology in many developed countries.	Government has approved legislation for net-metering for sale of extra electricity produced from renewables like solar energy to the utility companies, hence has been prioritized as an action.
	Suitability within country/ sector	➤ At present, the measure is being practiced in Islamabad and through Islamabad Electric Supply Company (IESCO) and Lahore Electric Supply Company (LESCO) respectively. Faisalabad and Multan divisions are in the process of installation of the system. However, it will take time for the installation of the system all over the country.	
	Benefits and costs	➤ The benefits of the measure are among the highest as it excludes the cost of the batteries from the system, being the major cost. ➤ The Net metering system needs cost to be invested in two way system i.e. developing soft-wares and hard-wares for electricity consumption by the consumers and its sale by the consumers. With the promotion of technology at a larger scale and supportive regulatory environment, the cost of production of energy from solar PV will reduced.	

c. Final selection of Actions for inclusion in the TAP

In consultation with the Expert Working Group on Mitigation and assessment of measures in Table 2, three 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)	Measures selected as actions for inclusion in TAP
Economic and Financial	<ul style="list-style-type: none"> Promotion of soft term credit line (1) Develop business model to encourage domestic manufacturing (5) 	<ul style="list-style-type: none"> Promotion of soft term credit line with low interest rate of 6%.
Non-financial	<ul style="list-style-type: none"> Production of accredited technicians and awareness raising (2) 	<ul style="list-style-type: none"> Production of accredited technicians and awareness raising;

	<ul style="list-style-type: none"> • Establishment of quality standards and labeling (4) • Expansion of Net metering program (3) 	<ul style="list-style-type: none"> • Expansion of Net metering program
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d. Identifying activities for the selected Actions

Action 1: Promotion of soft term credit line

The State Bank of Pakistan has established a special window for promotion of renewable energy technologies including solar and hydropower. It is a soft term credit line with 6% interest rate. The banks with the support of AEDB will prepare proposals for securing funding. The banks will develop credit policy and procedures and establish MIS system, 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/ DFIs and other stakeholders
Activity 1.2. Prepare concept notes and project proposals for securing funding according to bank's guidelines
Activity 1.3. Banks develops credit policy and procedures
Activity 1.4. Establish efficient computer based MIS and risk management system.
Activity 1.5. Disbursement of loans under one window operation.
Activity 1.6. Recovery of loans according to banks policy.
Activity 1.7. 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. Pakistan National Accreditation Council (PNAC), Higher Education Commission (HEC), Technical Education and Vocational Training Authority (TEVTA), or National Vocational and Technical Training Commission (NAVTTTC). 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. At community level drama, skids, plays, workshops, seminars and contests will be arranged.

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 on the basis of feed back.
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: Expansion of Net metering program for solar PV

Promote Net metering by installation of necessary systems and providing technical or financial support and streamlining the procedures, entering into contracts with consumers and utility companies, Sale of electricity by consumers, and allowing private sector to sell and purchase electricity directly from the consumers. The price of electricity purchased from the consumer should be at par with the price of electricity charged from the consumers.

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

Activity 3.1. Installation of necessary systems and streamlining the procedures for Net metering by utility companies to encourage consumers to benefit from the program.
Activity 3.2. Agreement of consumers with Utility companies for Net metering.
Activity 3.3. Sale of electricity by consumers and getting concessions in electricity bills at par with the price of electricity charged from the consumers.
Activity 3.4. Allowing private sector to sell and purchase electricity directly from the consumers and improve efficiency through market mechanism.

2.1.4. Step 3: Identifying Stakeholders and determining timelines

The main primary parties include AEDB and banks providing loan facilities and electric supply companies. The timeline of the plan is 5 years commencing from July 2018 till June 2023. The primary and secondary responsible parties/ stakeholders along with time line is identified in Table 7.

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 and Focal point	Secondary

1.Promotion of soft term credit line	1.1.Identify the donors/ DFIs, other stakeholders.	July 2018	Dec 2022			AEDB, Banks	Ministry of Water and Power, EAD, UN Agencies, Provincial Govts, private sector
	1.2.Prepare concept notes and proposals for securing funding according to bank's guidelines	Aug 2018	Aug 2020				
	1.3.Banks develops credit policy and procedures.	Aug 2018	Feb. 2019	July 2019	Dec 2019	The Banks	AEDB
	1.4.Establish and implement efficient computer based MIS and risk management system.	Aug 2018	Aug 2019	Sept. 2019	June 2023		
	1.5.Disbursement of loans under one window operation.			March 2019	Jan. 2023	The Bank	AEDB, private sector
	1.6.Recovery of loans according to banks policy.			Sept. 2019	June 2023		
	1.7.Regular documentation and monitoring of loan program.			March 2019	June 2023		
2.Production of accredited technicians and Awareness raising	2.1. Identification of training institutes and its accreditation	July 2018	Dec. 2018			AEDB, NUST, TEVTA	PCRET, Taxila University of Sci. and Tech;

	at national and provincial level.						Provincial Govts, NGOs, private sector, University of Engg. and Technology Lahore and Peshawar, Mehran University Quetta
	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 feed back.	Jan 2019	July 2019	Aug. 2019	Dec 2022	AEDB, NUST	PCRET, Taxila University of Sci. and Tech; Provincial Govts, NGOs, private sector
	2.3. Preparing selection criteria for training participants	Feb. 2019	June 2019			Provincial Govts, Local NGOs	AEDB, PCRET
	2.4. Accredited institutes to conduct training at national and provincial level.			Aug. 2019	Dec. 2022	NUST, Taxila University of Sci. and Tech.	AEDB, PCRET, Provincial Govts, NGOs, private sector

	2.5. Monitoring of learnt skills and design and conduct refresher training programs.			Jan. 2020	Dec. 2022	Provincial Govts, Local NGOs	AEDB, PCRET
	2.6. Mass awareness through electronic, print and social media.	Sept. 2018	Sept. 2019	Oct 2019	June 2023	AEDB	PCRET, Provincial Govts, NGOs, private sector, PEMRA
3. Expansion of Net metering program in solar PV	3.1. Installation of necessary systems and streamlining the procedures for Net metering by utility companies to encourage consumers to benefit from the program.	July 2018	Dec. 2019	Jan. 2020	June 2023	Electric supply companies	AEDB, Provincial Govts
	3.2. Agreement of consumers with Utility companies for Net metering.			Jan. 2020	June 2023	Electric supply companies	Consumer
	3.3. Sale of electricity by consumers and getting concessions in electricity bills at par with the price of			Jan. 2021	June 2023	Electric supply companies	Consumer

	electricity charged from the consumers.						
	3.4. Allowing private sector to sell and purchase electricity directly from the consumers and improve efficiency through market mechanism.			Jan. 2021	June 2023	Utility companies	Consumer, Private sector

2.1.5. 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 capacities in areas of credit disbursement and recovery procedures. For ensuring sustainability in the program documentation including MIS is a vital tool.

The relevant accredited training institutes like Pakistan National Accreditation Council (PNAC), Higher Education Commission (HEC), Technical Education and Vocational Training Authority (TEVTA), or National Vocational and Technical Training Commission (NAVTTTC) will play a major role in imparting training and awareness creation.

The capacity of Utility companies for installation of necessary systems and procedures for Net metering will be assessed and enhanced by the suppliers in order to transfer the technology over a period of time. The activities and estimated costs/ budget are indicated in Annexure-V.

2.1.6. Step 5: Management Planning

a. 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 8.

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

Risks	Description	Contingency action
The socio-economic situation of Pakistan might deteriorate (e.g. change in	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.

exchange rate, rate of interest etc.)		
Change in government policies.	With change of government usually the priorities also changes.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	Pakistan is subjected to vulnerabilities due climate change.	Under take climate change resilient infrastructure and adaption measures.

b. Next Steps

The immediate requirements for solar PV technology implementation would be to appoint a task manager by the banks and with the support of AEDB prepare concept notes and project proposals for mobilizing resources from interested donors/DFIs 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 avail the benefits of the technology. Universities and relevant industries should be involved in technology transfer programs.

Table 9: Identification of immediate requirements and critical next steps

Immediate Requirements	A Task Manager may be designated in the banks and with the support of AEDB 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.

2.2. Micro Hydropower Plants Technology Action Plan

2.2.1. Introduction

Micro Hydro-Power (MHP) is the most economical option for addressing energy crisis for providing a reliable and cheap energy to the rural communities in northern areas of Pakistan due to its natural topography, availability of flowing water and climatic conditions. Micro hydropower plants 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 MHPs. It is estimated that Pakistan has about 50,000 MW micro hydropower generation 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 micro hydropower plants. Provision of electricity will help in gaining additional hours for income generation activities. The social benefits of MHP 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.

Micro hydropower 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 micro hydropower 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.

2.2.2. Step 1: Ambition for promoting micro hydropower plants

The country aims to optimize energy generation mix between hydro, solar, wind, biomass etc. with reference to its indigenouness, economic feasibility, scalability, risk assessment and environmental impact¹⁹. At present only 128 MW of micro hydropower is operational and further 877 MW is under implementation. The Pakistan Vision 2025 and Integrated Energy Plan 2009-2022 focus on the development of micro hydropower plants. At present survey is complete²⁰ for more than 1000 MW micro hydropower potential while around 1,500 MW is being surveyed²¹ in all the provinces and territories of the country²² to be developed for micro hydropower.

¹⁹ Pakistan Vision 2025

²⁰ Alternate Energy Development Board, in collaboration with GTZ; 2005; Power Sector Situation

²¹ Alternate Energy Development Board, in collaboration with GTZ; 2005; Power Sector Situation in Pakistan. Pakistan Energy Business Day, Berlin, Page 8; <https://www.solarwirtschaft.de/fileadmin/media/pdf/eu-pakistan/Pakistan-GTZ-power-sector-overview.pdf>

²² Potential and Progress in Small Hydropower, <http://aedb.org/index.php/ae-technologies/small-hydro>

The Khyber Pakhtunkhwa Power Development Programme envisages construction of 356 micro hydropower plants and 24 medium-size projects from 2010-11 to 2024-25 to provide affordable electricity²³. Furthermore, a loan agreement has been signed with Asian Development Bank for installation of approximately 1,000 micro hydropower plants in off-grid areas of Khyber Pakhtunkhwa during 2017-2021. The Alternate Energy Development Board (AEDB)/United Nations Development Program (UNDP) and Aga Khan Foundation (AKF) are implementing 103 micro hydro projects. The Punjab government has issued LoIs to private investors for establishment of ten small hydropower projects with a cumulative capacity of 142 MW. Similarly, Sindh Government has issued six LoIs for small hydropower projects. The AJK and GB governments are developing different projects to get funding from national and international donors for micro hydropower production. The installed capacity is estimated to be about 2,100 MW up to 2025.

2.2.3. Step 2: Actions and activities selected

a. *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 micro hydropower plants. 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 State Bank of Pakistan to facilitate adoption and diffusion of the technology.

The major non-financial barriers for micro hydropower plants include (i) inadequate policy and programs, (ii) poor quality of standards and non-existence of labeling on machinery and equipment, (ii) lack of information and awareness, (iv) limited market for micro hydropower plants 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 labeling of micro hydropower plant machineries and equipment to ensure supply of good quality MHP. To increase public awareness, demonstration of efficient MHP plants at the potential sites will help in capacity building efforts besides awareness about the benefits of the technology. The professional and vocational training centers should include essential elementary training on market development and maintenance of MHP plants. The feasibility studies and Initial Environmental Examination (IEE) and Environment Impact Assessment (EIA) prior to installation of MHP 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 Table 10.

Table 10: Overview of Barriers and Measures to overcome these for micro hydropower plants

Categories	Identified barriers	Measures to overcome barriers
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²³ Khyber Pakhtunkhwa Action Plan, <http://www.pedo.pk/Docs/Action%20Plan.pdf>

Economic and Financial	<ul style="list-style-type: none"> • High initial capital cost • Difficulties in accessing finance • Low consumer affordability 	<ul style="list-style-type: none"> • Promotion of soft-term credit line
Non-financial	<ul style="list-style-type: none"> • Poor quality of MHP plants due to absence of Quality Standards and labeling; • Lack of information and awareness; • Limited Market Development Services and • Risk of disasters or variable water-flow 	<ul style="list-style-type: none"> • Establishment of quality standards and labeling for micro hydropower plants; • Training and Awareness Raising; • Risk of disasters reduced by enforcing Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA)

b. Framework for ranking measures for inclusion as Actions selected for inclusion in the TAP

The 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. These are described in Table 11:

Table 11: Assessment and ranking of identified measures for micro hydropower plants

Measures	Consideration	Assessment	Ranking
<i>Promotion of soft-term credit line for micro-hydel</i>	Effectiveness	➤ The credit line of 6% interest rate ²⁴ will encourage investors to afford the initial high cost of the technology which will be helpful for wider dissemination of the technology in the off-grid. The average prevalent rate of interest on other products in the market is 20% or even more ²⁵ .	1 The measure is effective and efficient as only 6% 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 7 years. It has

²⁴ As per State Bank's circular # 3 dated 20 June 2016.

²⁵ <https://pakistan.deposits.org/>

		<ul style="list-style-type: none"> ➤ 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 10 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. 	<p>good interaction with other proposed measures. However, it will be more effective when accredited technicians are available at local level for better informed risk assessments to leverage expanded funding by the banks. It is a clean technology and suitable for remote areas to meet the energy crisis as well as reducing GHG emissions. As such this measure has been ranked first.</p>
	Efficiency	<ul style="list-style-type: none"> ➤ The technology is very cost effective as IRR is 20.62 per cent²⁶ and its payback period is 7 years, when the electricity is being provided to the poor households on concessional rates (@Rs.5.30/KWH) which is a usual 	

²⁶ The IRR was calculated by taking costing of canal, land, building, construction, electrical and mechanical instruments, licensing, taxing, transmission and distribution. The water flow variability factor was calculated to be 60%, and risk of recovery default @20%, the cost of electricity usage charged on an average is different for household, mosques and commercial usage is Rs.5.30 per KWH. The IRR at 6% interest rate is 20.62%. The benefit cost ratio shows that during 7th year, breakeven point is achieved, actual costs incurred are recovered and then the business is in profit afterwards.

		<p>practice in northern areas of the country.</p> <p>➤ For hydropower plants up to 50 MW, it is noted that the NEPRA takes long time to take the grid to the sites of the plants which are mostly in remote areas and has lack of connectivity to the grid for transmission of power. If the government allows the private sector to sell electricity to the consumers directly, to create competition in the market, it will increase the efficiency of the technology.</p>	
	Interactions with other measures	<p>➤ The scale of the measure will be enhanced with awareness raising and training program. The Renewable Energy Policy also emphasizes on the production of electricity from micro hydropower plants.</p> <p>➤ The micro-hydro power generation was exempted from GST and other taxes as per</p>	

		<p>“Policy for Development of Renewable Energy for Power Generation” but in 2013, this exemption was withdrawn and 19% sales tax is imposed which has resulted in increasing burden on the project proponents.</p>	
	Suitability within country/ sector (Local acceptance)	<p>➤ This is a clean technology and suitable for remote areas/off grid to meet the energy crisis in the country. It does not require frequent maintenance. The measure is suitable in meeting energy crisis and reducing GHG emissions.</p>	
	Benefits and costs	<p>➤ Benefits to technology implementation are direct in terms of immediate availability of electricity at affordable prices.</p> <p>➤ The IRR exercise shows that the technology with provision of 6% interest rate will get breakeven point in 7 years.</p> <p>➤ The indirect benefits include</p>	

		<p>more time and electricity availability for SMEs and other income generating opportunities. The banking sector will enhance credit facilities when accredited technicians are available at the local level for better informed risk assessments.</p> <ul style="list-style-type: none"> ➤ The benefits of the technology are further enhanced when electricity is available at subsidized rates to the local communities which is helpful in reducing their dependence in forest for heating and cooking. ➤ The operation and maintenance of the technology can be managed even at local levels if certified technicians are available. 	
<i>Establishment of quality standards and labeling for micro hydropower plants</i>	Effectiveness	<ul style="list-style-type: none"> ➤ With the increasing demand of the technology, there are many suppliers producing the MHP plants locally. With the establishment of quality standards 	<p>3</p> <p>The establishment of quality standards and labeling will assure good quality micro hydropower plants that provide maximum electricity from a specific velocity of</p>

		<p>labeling, 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 MHP plants to be purchased to minimize the risk of collapse of the plant.</p> <p>➤ The standards developed may conform with the global accredited standards to improve its effectiveness.</p>	<p>water flow and its head for a longer period of time. 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.</p>
	Efficiency	<p>➤ The technology is cost effective as the IRR of the technology is 20.62 per cent²⁷ and its payback period is 7 years when the electricity is being provided to the poor households on concessional rates (@Rs.5.30/KWH) which is a usual practice in northern areas of</p>	

²⁷ The IRR was calculated by taking costing of canal, land, building, construction, electrical and mechanical instruments, licensing, taxing, transmission and distribution. The water flow variability factor was calculated to be 60%, and risk of recovery default @20%, the cost of electricity usage charged on an average is different for household, mosques and commercial usage is Rs.5.30 per KWH. The benefit cost ratio shows that during 7th year, breakeven point is achieved, actual costs incurred are recovered and then the business is in profit afterwards.

		<p>the country and is helpful in reducing deforestation and GHG emissions.</p> <p>➤ Training the producers on hydropower equipment to produce the equipment according to the accredited standards which will improve efficiency of hydropower plant and will facilitate its adoption.</p>	
	Interactions with other measures	<p>➤ The measure is in accordance with the National Policy for Development of Renewable Energy for Power Generation (2006) and National Energy Conservation Policy of the country.</p>	
	Suitability within country/ sector	<p>➤ At present, the quality standards and labeling is not supported by legislation as such new legislation in this respect is required.</p> <p>➤ To measure the standards, laboratory facilities are also required which can be established</p>	

		at Pakistan Standards and Quality Control Authority (PSQCA) or Pakistan Council of Scientific and Industrial Research (PCSIR).	
	Benefits and costs	➤ The standardization and labeling program will enable installation of good quality machinery and equipment which is more efficient so its initial cost may be a bit high but its operation and maintenance (O&M) costs will be less and the electricity production will become affordable and sustainable over a long period of time.	
<i>Training and awareness raising for micro hydropower plants</i>	Effectiveness	➤ The accredited training program is very effective as it will provide required skills at the grassroots level and the risk of failure of the micro hydropower systems in the remote areas will be reduced. ➤ Awareness about the technology and	2 ➤ The accredited technicians and awareness raising of general public will pave the way for diffusion and dissemination of the micro hydropower plants. It will make the banks confident to expand their loan portfolio for the technology. This

		its suppliers is also very effective and efficient means to increase diffusion and dissemination of the technology.	will not only provide energy security in remote areas of the country but will also enhance employment opportunities.
	Efficiency	<ul style="list-style-type: none"> ➤ The measure is cost effective as the IRR of the technology is 20.62 per cent²⁸ and its payback period is 7 years when the electricity is being provided to the poor households on concessional rates (@Rs.5.30/KWH) and helpful in reducing energy crisis, deforestation and GHG emissions. ➤ The operation and maintenance (O&M) of the technology becomes easy when accredited technicians are available at the local level. ➤ The capacity building of the technicians and awareness of local communities regarding the technology will lead to increased 	Further, the measure is also in conformity with government training programs of TEVTA and Pakistan Technical and Vocational Education and Training Reforms program. Based on assessment the measure has been ranked second highest in priority.

²⁸ The IRR was calculated by taking costing of land, building, construction, electrical and mechanical instruments, licensing, taxing, transmission and distribution. The water flow variability factor was calculated to be 60%, and risk of recovery default @20%. The benefit cost ratio shows that during 7th year, breakeven point is achieved, actual costs incurred are recovered and then the business is in profit afterwards.

		<p>level of confidence of banks and the loan portfolio. This will result in generation of new employment opportunities and other socio-economic benefits. Hence it will also help in alleviating poverty, protecting forest, value addition in the natural resource base and products as well as meeting the energy crisis.</p>	
	Interactions with other measures	<p>➤ The measure is in conformity with government policies especially with Technical Education and Vocational Training Authority (TEVTA) and Pakistan Technical and Vocational Education and Training Reforms program.</p> <p>➤ The certified technicians and awareness will support the loan and standardization programs.</p>	

	Suitability within country/ sector	➤ Training and awareness raising will serve as the core component for building capacity of technicians and the users at the grassroots level. This will help in diffusion of this technology more easily.	
	Benefits and costs	➤ The training cost can be reduced by focusing on training of trainers (TOT). This has widespread benefits, multiple times more than the cost. ➤ The technology can bring a remarkable change by opening up potentials for enterprise development leading to new employment opportunities in the remote and mountainous areas.	
<i>Risk of disasters reduced by enforcing Initial Environmental Examination (IEE)/ Env. Impact Assessment (EIA)</i>	Effectiveness	➤ The micro hydropower plants are installed after initial on-site survey as the temporal data on flow of water is not available. For this reason, when there is high flow,	4 The data of hydrological flow of smaller streams is mostly not available as such hydropower plants are installed on assumptions taken from local community as

		sometimes infrastructure is damaged. The IEE and EIA are effective tools to take appropriate measures to minimize the risk in absence of temporal data.	such the data is not reliable. Due to absence of reliable data risk of disasters e.g. infrastructure collapse, silting etc. may occur. The IEE/ EIA are effective ways to ensure long-term sustainability of the system.
	Efficiency	➤ The data of hydrological flow of smaller streams is mostly not available and the survey is done on assumptions taken from the local community hence the data is not reliable. Through IEE and EIA the risk can be minimized.	
	Interactions with other measures	➤ The IEE/ EIA has direct interaction with other measures like installation of the hydropower systems through credit, standardization of the system and training requirements.	
	Suitability within country/ sector	➤ The measure is suitable as data of smaller streams is not available. Hence, the EIA will devise alternate viable mechanism for	

		installation of MHP.	
	Benefits and costs	➤ The IEE and EIA are beneficial as it ensures the long-term sustainability of the system. With the promotion of technology on a larger scale through supportive regulatory mechanism, the cost of installation will decrease.	

c. 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 micro hydropower plants are described in Table 12:

Table 12: Selection of Actions for promoting Micro Hydropower Plants

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	<ul style="list-style-type: none"> • Promotion of soft term credit line (1) 	<ul style="list-style-type: none"> • Promotion of soft term credit line for micro hydropower plants
Non-financial	<ul style="list-style-type: none"> • Development of Quality Standards and labeling for micro hydropower plants (3); • Training and Awareness Creation (2) • Risk of disasters reduced by enforcing Initial Environmental Examination and Environmental Impact Assessment (4) 	<ul style="list-style-type: none"> • Training Awareness raising • Establishment of Quality Standards and labeling for micro hydropower plants

d. Identifying activities for the selected Actions

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

For promoting soft-term credit line, mapping micro hydropower plant 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 micro hydropower plants.

Table 13: Identification and description of specific activities to support Action 1

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

Action 2: Training and Awareness raising for promoting micro hydropower plants

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 14: 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 labeling for micro hydropower plants

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 micro hydropower plants will be developed and tested as per the guidelines of approved quality standards and labeling procedures. The producers and consumers will be guided regarding standards and labeling of micro hydropower plants and its accessories.

Table 15. 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 micro hydropower plants and its accessories available in the market.
Activity 3.5. Training and awareness of the producers and consumers on standards and labelling.

2.2.4. Step 3: Identifying Stakeholders and determining timelines

The timeline of the plan is 5 years commencing from July 2018 till June 2023. The stakeholders along with their responsibilities are described in Table 16.

Table 16: Characterization of activities for Implementation of Action for micro hydropower plants.

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 for micro hydropower plants	1.1. Develop portfolio of opportunities by identifying and mapping micro hydropower plant sites	July 2018	Jan. 2019			AEDB & Banks	Ministry of Water and Power, Provincial Govts.
	1.2. Prepare concept notes and project proposals to secure funding for micro hydropower plants	Aug. 2018	Aug 2019			AEDB & Banks	Ministry of Water and Power, EAD, UN Agencies, Provincial Govts,
	1.3. Develop credit programs and procedures	Aug 2018	Aug. 2019			Banks	AEDB

	including MIS and risk management system for micro hydropower plants						
	1.4. Recruitment of sales agents			Aug. 2019	June. 2023	Banks	AEDB
	1.5. Loan disbursement, its documentation under one window operation and recovery			Sept. 2019	June. 2023	Banks	AEDB
2. Training and Awareness raising	2.1. Awareness raising through electronic, print and social media.	Aug 2018	Feb. 2019	March 2019	Dec. 2022	AEDB	PCRET, Provincial Govts, NGOs
	2.2. Identification of accredited training institutes and conducting trainings.	Aug. 2018	Dec. 2018	Jan 2019	Dec. 2022	NUST, Taxila University of Sci. and Tech, TEVTA & NAVTTC	AEDB, PCRET, Provincial Govts, NGOs
	2.3. Follow up of trainings and lessons learnt			Jan 2020	Dec 2022	Provincial Govts, Local NGOs	AEDB, PCRET
3. Establishment of quality standards and labeling for micro hydropower plants	3.1. Identification and approval of standards from competent forum.	July 2018	July 2019	Aug. 2019	June 2023	PSQCA, AEDB	PCRET, Provincial Govts
	3.2. Development of legal	July 2018	July 2019	Aug. 2019	June 2023	PSQCA, AEDB	PCRET, Provincial

	framework to support standardization and labeling and its approval from competent forum.						Govts. Ministry of Law
	3.3. Development of Lab. facilities for measuring standards	Jan 2019	June 2019	July 2019	June 2023	PSQCA, AEDB	PCRET, NUST, Taxila Univ. of Sci. and Tech; UET
	3.4. Labeling of micro hydropower plants available in the market.			Jan. 2019	June 2023	PSQCA	AEDB
	3.5. Training and awareness of producers and consumers on standards and labeling			Jan. 2019	Dec. 2022	Federal and Provincial Govts.	NGOs

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

The AEDB will conduct training needs assessment for developing project proposals and implementation of micro hydropower plants. 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 Authority (TEVTA), or National Vocational and Technical Training Commission (NAVTTTC) can play an important role. The capacity needs of these institutes will be assessed and enhanced. The activities and estimated costs/ budget is indicated in Annexure-VI.

2.2.6. Step 5: Management Planning

a. Risks and Contingency Planning

The possible risks to micro hydropower plant technology and proposed contingency action are described in Table 17.

Table 17: Overview of risk categories and possible contingencies for micro hydropower 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 changes.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	Pakistan is subjected to vulnerabilities due climate change.	Under take climate change resilient infrastructure and adaption measures.

b. Next Steps

The AEDB may coordinate with relevant NGOs and donor agencies for preparing projects and mobilizing resources for installation of micro hydropower plants.

Further, standardization and labeling program may be initiated for manufacturing quality micro hydropower plants and its associated components and accessories. In areas having maximum potential for micro hydropower plants, the network of metrological stations needs to be increased to overcome the unavailability of temporal hydrological data which is required for designing appropriate micro hydropower plants. .

Table 18: Identification of immediate requirements and critical next steps

Immediate Requirements	For scaling up the technology, prepare proposals for mobilizing resources for micro hydropower plants.
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 micro hydropower plants infrastructure.

Chapter 3. Forestry Sector Technology Action Plan

Sector Overview

Forests sequester CO₂ from the atmosphere through photosynthesis and store this carbon in the form of biomass and soil organic matter in the forest ecosystem. The world's forest ecosystems hold more than half of all terrestrial carbon. According to FAO (2006) this carbon is more than one trillion tons, twice the amount found in the atmosphere. About 17% of GHG emissions are contributed by deforestation and degradation of forests.

Considering the vast potential of forest in carbon sequestration, diffusion and dissemination of the technology for sustainable forest management in Pakistan is extremely promising. Forests occupy approximately 5% of land area in Pakistan which is deteriorating both in quality and quantity. The main forest types include sub-alpine, dry and moist temperate, sub-tropical pine and evergreen broadleaved thorn, dry tropical thorn, juniper, chilghoza (*Pinus gerardiana* forests), riverine and mangrove forests, 21 different types of wetlands and rangelands of different types are distributed though out the country. All these ecosystems have played a crucial role in meeting the needs of local communities as well as in economic development and growth of the country. Most of the forest area is in the northern part of the country i.e. Khyber Pakhtunkhwa (KP), Northern Areas and Azad Jammu and Kashmir (AJK). Irrigated plantations have been raised mainly in Punjab and Sindh provinces.

The forest cover is depleting at the rate of 2.1% per annum, which is the highest in Asia due to which Pakistan is ranked at 110 in forest cover of the world²⁹. The main drivers of deforestation and forest degradation include population pressure; ineffective land use planning, weak governance, intensification of agriculture, increased settlements, communication infrastructure and industries. It is further aggravated by poverty, absence of affordable alternatives, livelihood activities and climate change. The direct and indirect drivers resulting in high rate of deforestation of prevailing forest ecosystems in Pakistan.

The Government of Pakistan recognizing the challenges has taken a number of initiatives to expand the forest cover to secure multiple benefits. These include conservation of forests and sustainable land management programs to combat desertification and land degradation process in the arid and semi-arid regions of the country. The Vision 2025 has also outlined the path for sustainable growth of the country through integration of environmental considerations in development.

3.1. Sustainable Forest Management Plan Technology Action Plan

3.1.1. Introduction

Sustainable forest management (SFM) contributes to productive, protective, environmental, regulatory and aesthetic ecosystem services in the forests, which is important for water, food, energy and economic security. This will help in achieving the sustainable development goals related to forest based climate change mitigation and adaptation.

²⁹ Abubakar, S.M; 2015; Climate change issues, save falling trees; <http://wwwf.org.pk/blog/2015/02/03/save-falling-trees/>

Forests are also important for conservation of biodiversity, provision of socio-cultural services, livelihood support and poverty alleviation. Carbon financing through Reducing Emissions from Deforestation and Forest Degradation (REDD+) are additional benefits and incentives for the sustainable forest management on government and privately owned forests. The SFM addresses forest degradation and deforestation while increasing direct benefits to people and the environment. Moreover it results into retention or increase of forest cover over time and maximizes carbon sequestration which is sustaining or increasing carbon stock in forestlands. This provides economic incentives for local communities to conserve forest cover and increases carbon sink.

Sustainable forest management is an effective tool to address forest degradation and deforestation. At the social level, sustainable forest management contributes to livelihoods, income generation and employment. At the environmental level, it contributes to important services such as carbon sequestration, water, soil and biodiversity conservation. Forest management in Pakistan followed the policy top-down of command and control approach aiming at saving public forests increasing forest area by acquiring the land under the control of forest departments. This faced challenges of conflicting needs and interests of the users and led to mass scale deforestation.

To overcome this challenge the Forest policy, 1975 for the first time recognized the involvement of people living in and around forest areas as stakeholders. The emphasis on community engagement was further recognized in the subsequent policies. The Forest Policy 1991, focused on meeting the environmental needs of the country in a sustainable manner. It also targeted to increase forest production by introducing concepts like forestry extension, educating farmers to develop farm forestry and involvement of local people in the forest management.

The 2016 Forest Policy addresses the overall ecological setting of the country and the conservation of wild life. It focuses on promoting ecological, social and cultural functions of forests through active participation of stakeholders as well as recognizes the role of sustainable forest management as mitigation and adaptation measure for climate change. It seeks to provide greater focus on carbon stored in forests as a new commodity to attract the benefits related to forests under the UNFCCC, such as REDD+, and other financial mechanisms including Green Climate Fund.

3.1.2. Step 1: Ambition for promoting Sustainable Forest Management (SFM)

The SFM aims to protect critical forest habitats, conserve forest ecosystem, biodiversity, and securing carbon benefits. The SFM intervention will cover federal, provincial and territorial forest lands to deliver SFM over 67,861 ha³⁰ of critical forest habitats by 2020 through a GEF-UNDP funded project, conserving globally important biodiversity, as well as secure carbon benefits totaling 9,908.1 KtCO₂-eq, calculated for a period of 30 years. Furthermore, the Federal Government's Green Pakistan Program aims at additional plantation of 100 million new plants (on about 100,000 hectares) by 2021. In addition provincial governments have their

³⁰ Sustainable forest management to secure multiple benefits in Pakistan's high conservation value forests. UNDP Project.: <https://info.undp.org/docs/pdc/Documents/PAK/PIMS%204674%20Pakistan%20SFM%20ProDOC%20-%20final.pdf>

own plans through which large-scale tree plantation programmes are introduced to increase forest cover. Among these, the Khyber Pakhtunkhwa government has the largest program of tree plantation and SFM on one million hectare through one billion tree plantation/protection. The World Bank has shown their interest to finance the initiatives related to capacity building and livelihood improvement under the Green Pakistan program in Punjab and KP³¹. Such efforts are expected to increase forest cover of the country from the current 5 percent to 6 percent; using domestic and international resources to meet the Nationally Determined Contribution (NDC) target of 2020 and to increase the forest cover from 6 to 10 percent by the year 2030.

The SFM will benefit conservation and protection of forest resources as well as provision of sustainable ecosystem services³². Legal, policy and institutional framework constitutes an important element of SFM as well as it ensures participatory decision making, governance, law enforcement, monitoring and assessment of progress. SFM supporting an integrated approach of managing forest ecosystems helps in achieving socio-economic and multiple global environmental benefits, including those related to the protection and sustainable use of biodiversity, climate change mitigation and adaptation and combating land degradation.

Reforestation and reducing forest degradation practices will help in increasing forest cover and sequester carbon by taking CO₂ out of the atmosphere through photosynthesis and store it as organic carbon in above-ground biomass (trees and other plants) and in the soil through root growth and the incorporation of organic matter. Thus, the process of release of more CO₂ to the atmosphere can be reversed, at least partially, through growing more trees and protecting of already existing forest cover that serves as a sink for CO₂. Regeneration of forest on degraded or deforested lands help in removing CO₂ from the atmosphere through the build-up of biomass, making forest lands a sink of greenhouse gases.

3.1.3. Step 2: Actions and Activities for the TAP

a. Summary of Barriers and measures to overcome barriers

The key barriers for preparation and implementation of SFM plans for reducing deforestation and forest degradation identified in TNA Barrier Analysis includes the economic and financial and non-financial barriers. Regarding the economic and financial barriers, resource users and landowners are not rewarded for resource conservation as no funding and economic incentive mechanism exist to cover opportunity costs related to sustainable use of forests. Institutional and regulatory frameworks are not effective in supporting Payment for Ecosystem Services (PES) or Reducing Emissions from Deforestation and Forest Degradation (REDD+). The barriers related to eligibility measures for REDD+ payments include absence of Measurement, Reporting and Verification (MRV) system, national level Reference emission level; Development of REDD+ Strategy and Action plan; Multiple Benefits, Impacts, Governance and Safeguards system and feedback and grievance redress mechanism. The barriers can be overcome through compensation payments for watershed protection or sustainable forest management in upstream areas by providing provision in the national and provincial forest

³¹ The daily "NEWS", 11th June 2017.

³² FAO; Sustainable Forest Management; <http://www.fao.org/forestry/sfm/en/>

policies and regulatory frameworks. Once the provision is made, the relevant institutions like Water and Power Development Authority (WAPDA) and National and Provincial Disaster Management Authorities, may enter into agreement with the owners of the watershed areas for plantation and soil conservation measures in these areas. These arrangements will help in actualizing the compensation payments to the owners of the watershed areas.

The major non-financial barriers includes policy and regulatory measures not supportive to SFM; low capacity of staff for development of SFM plans; limited participation of community in decision making; alternate strategies in case of disasters and forest fires is missing in the policy. The non-financial measures includes sound policy and regulatory measures; alternate strategies in case of disasters and forest fires defined; enhanced capacity of staff for development of SFM plans and adequate participation of communities in decision making. The main barriers and its mitigation measures identified in the TNA process are described in the Table 19.

Table 19: Overview of Barriers and Measures to overcome these for SFM

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	<ul style="list-style-type: none"> No economic incentive mechanism in place for SFM 	<ul style="list-style-type: none"> Economic incentive for staff and forest community in place for SFM
Non-financial	<ul style="list-style-type: none"> Non supportive policy and regulatory measures for SFM Low staff capacity for development of SFM plans Limited participation of community in decision making. 	<ul style="list-style-type: none"> Sound policy and regulatory framework for SFM Enhanced capacity of staff and forest communities for development of SFM plans by integrating professional skills and trainings with traditional knowledge and skills.

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

Based on the UN Environment guidelines for preparation of TAP, the assessment and ranking of identified measures have been made on the basis of effectiveness, efficiency, interaction with other measures, suitability of SFM within the country, benefits and costs in the Table 20.

Table 20: Framework for ranking measures of promoting SFM for inclusion as Actions selected for inclusion in the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
<i>Economic Incentive mechanism for staff and forest community in place for SFM</i>	Effectiveness	➤ Better access to economic incentive to forest communities serves as a strong motivation towards protection and sustainable management of community forests through RED+ etc.	1 Livelihood and well-being of forest community is dependent on the forest

		<ul style="list-style-type: none"> ➤ Carrier planning of forest officers at par with civil service cadre officers can open opportunities to serve in allied disciplines. This will reduce stagnation in a scale for a longer period of time and increase their promotion opportunities. The lower staff of forest department may be given training opportunities and their induction in other relevant positions. It will help in overcoming the governance issues in Forest Departments. ➤ Economic incentives will result in improving coordination and trust building among line departments and communities that will increase efficiency in preparation and implementation of sustainable forest management plans for all types of state forests and other community forest lands. 	ecosystem. Lack of economic resources compels them to indiscriminately consume forest resources. Hence, providing economic incentive will promote SFM at community level. The incentive measures for Forest Department staff will encourage them to improve their performance and interaction with local communities. It will also reduce governance issues in the department.
	Efficiency	<ul style="list-style-type: none"> ➤ The efficiency in SFM can be enhanced by promoting non-timber products (NTFP), ecotourism, enterprise development and land stabilization resulting in reduced disaster like floods and landslides. Wide information dissemination regarding economic incentives help in changing the mindset of the forest community ➤ The IRR of demonstrating SFM on 2000 hectare of Temperate and 2000 hectare of Scrub forests with economic incentives is 26%. 	Through SFM, NTFP, ecotourism, enterprise development can be promoted. Further, SFM helps in land stabilization reducing the effects of disasters like floods and landslides.
	Interactions with other measures	<ul style="list-style-type: none"> ➤ The economic incentives mechanism for SFM on watersheds will reduce siltation of rivers, canals and dams which will protect the physical infrastructure and floods incidence downstream as well as provide additional irrigation water to increase agricultural production in the command area of rivers, canals and 	Benefits of SFM are not only local but global as it will increase the carbon sink and will reduce GHG emissions.

		dams. Due to siltation, Tarbela alone had lost about 35 per cent of its designed capacity. In Mangla dam, reservoir capacity had reduced to 4.674 MAF from 5.88 MAF due to sediment deposition. The Government had to invest about US\$1 billion for raising Mangla dam to increase its storage capacity.	Based on the importance of the measure, it has been ranked as top priority.
	Suitability within country/ sector	<ul style="list-style-type: none"> ➤ The mechanism is in line with traditional system of forest protection both in rural and tribal system. Further, the measure is suitable in forestry sector in government and community owned forests. ➤ The SFM is suitable mechanism for controlling landslides, reducing floods and siltation in rivers, canals and dams which helps in protection of downstream infrastructure, life and property of people as well as protects food, water and energy securities of the country. 	
	Benefits and costs	<ul style="list-style-type: none"> ➤ According to cost benefit analysis of SFM, the cost required for 30 years is US\$1.524 million and net profit is US\$57.876 million on 2000 hectare of Temperate and 2000 hectare of Scrub forests, it does not include the cost of the land³³. ➤ SFM technology has not only local benefits but has global benefits as it will increase the carbon sink and will reduce the GHG emissions³⁴. The estimated GHG emission reduction due to SFM in 2000 ha of dry temperate forests found in northern areas of Pakistan are estimated to be 182,726 tons of 	

³³ It includes non-tangible benefits also.

³⁴ There are three tiers of calculating GHG emission. are simple methods with. It involves Tier 1 by simple methods with default values using IPCC's "Good Practices Guidelines for land-use, land-use change and forestry" or FAO's guidelines "EX-Ante Carbon-balance tool (EX-ACT). Tier 2 are similar but with country specific emission factors and other data and Tier 3 are more complex approaches, possibly models.

		<p>CO_{2eq}³⁵ and that of 2000 ha of scrub forests in the country are estimated to be 175,549 tons of CO_{2eq}³⁶.</p> <ul style="list-style-type: none"> ➤ The measure will reduce sedimentation and increase the life of dams and other infrastructures leading to cost saving on dams rising. ➤ The benefits of SFM will bring forests under conservation management, resulting in increased ecosystem services and climate change resilience. 	
<i>Sound policy and regulatory framework for SFM</i>	Effectiveness	<ul style="list-style-type: none"> ➤ Sound policy and regulatory framework focusing on SFM helps in balanced forest use and conservation. Effective regulations will decrease mass destruction of forest resources and safeguard downstream infrastructure. 	<p>3</p> <p>Policies, laws and regulations are essential and vital instruments that play an important role in preparation and implementation of SFM plans. However, approval of policies and regulatory framework is a long term process and at present it is not on the priorities of politicians and bureaucrats. Therefore, the measure is not taken as an action.</p>
	Efficiency	<ul style="list-style-type: none"> ➤ Efficiency of the measure can be enhanced by recognizing “carbon” in the forest cover as a commodity for taking financial benefits. The provincial governments in their policies are now in a process of recognizing “carbon” as a commodity and making appropriate amendments in their legislation e.g. AJK has already approved ‘carbon’ as a commodity for taking financial benefits from State forests through REDD+ and CERs. ➤ Local benefits of SFM will increase when benefits of carbon NTFP including eco-tourism are added in the financial gains. 	
	Interactions with other measures	<ul style="list-style-type: none"> ➤ Policy and regulatory framework has strong interaction with other measures like economic incentives, capacity 	

³⁵ As per FAO’s guidelines “EX-Ante Carbon-balance tool (EX-ACT)”, temperate mountain largely degraded forests converted to moderately degraded forests with SFM.

³⁶ As per FAO’s guidelines “EX-Ante Carbon-balance tool (EX-ACT)”, subtropical mountain scrub forests extremely degraded forests converted to largely degraded forests with SFM.

		building and community participation in decision making in implementation of SFM plans will lead to decrease in mortality rate and increase forest cover in the country.	
	Suitability within country/ sector	➤ Mainstreaming SFM in the policies and regulatory framework will increase local and global benefits of forest plantation including carbon sequestration, increase in climate change resilience and reduction in disasters intensity and frequency will lead to increased economic, water, food and energy securities of the country.	
	Benefits and costs	➤ This is a cost effective measure and implementation of all other SFM measures is dependent on the policy and regulatory framework. As this measure plays a strong role in correcting market behavior and ensuring SFM benefits.	
<i>Enhanced capacity of staff and forest communities for development of SFM plans by integrating professional skills and trainings with traditional knowledge.</i>	Effectiveness	<ul style="list-style-type: none"> ➤ Enhanced capacity of staff and forest communities creates an enabling environment for development and implementation of SFM plans ➤ Training and successful demonstrations of good practices further strengthens ability of staff to design, manage and implement SFM Plans. ➤ Enhance interactions of forest communities and institutions involve in forest management through local representatives. ➤ Integrate professional skills and trainings with traditional knowledge and resources of local population for effective forest management. ➤ The enhanced capacities of staff and forest communities in SFM will increase livelihood opportunities from wood and non-timber forest products 	2 Enhancing capacity and dissemination of knowledge and information will facilitate designing and implementation of effective SFM Plans. The enhanced capacities of staff and forest communities in SFM will increase livelihood opportunities from wood and non-timber forest products like medicinal plants,

		like medicinal plants, honey and mushrooms.	honey and mushrooms.
	Efficiency	<ul style="list-style-type: none"> ➤ Enhanced staff capacity for well thought-out SFM plans taking into account the upstream, downstream and climate change challenges will reduce the cost and the manpower requirement, by optimization of natural resource base through properly managing the forests, planning and types of trees to be planted to replace the harvested trees and conserving biodiversity. ➤ Sufficient knowledge and recognition of values of the ecosystem services by the communities will allow determination of optimal management objectives, and sustainable financing options for SFM. ➤ Forest communities will be involved in decision making through participatory process in forest management. ➤ Capacity enhancement of staff will lead to resource mobilization from national and international funding for SFM. The IRR for capacity building of staff and forest communities is 24%. 	Moreover, integration of traditional knowledge and involvement of community in decision making will lead to efficient designing and implementation of SFM Plans. This measure has been ranked as second highest in priority.
	Interactions with other measures	<ul style="list-style-type: none"> ➤ This measure has strong linkages with policy and regulatory framework for effective planning and implementation of SFM. 	
	Suitability within country/ sector	<ul style="list-style-type: none"> ➤ The capacity building of staff and forest communities is a suitable measure for ensuring sustainable management, monitoring and verification of forests. 	
	Benefits and costs	<ul style="list-style-type: none"> ➤ The capacity building measure is cost effective and beneficial in introduction and promotion of improved technologies for the efficient designing and implementation of SFM 	

		plans in the rapidly deteriorating forests in Pakistan. ➤ According to cost benefit analysis, the cost required for capacity building is US\$1.733 million and net profit is US\$57.667 million ³⁷ .	
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c. Final selection of Actions for inclusion in the TAP

Top two priority measures have been selected as actions for promoting Sustainable Forest Management (SFM) after assessment of possible measures and consultation with Expert Working Group on Mitigation are described in the Table 21.

Table 21: Selection of Actions for promoting SFM

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	<ul style="list-style-type: none"> Economic incentive(s) for staff and forest communities in place for SFM (1) 	<ul style="list-style-type: none"> Economic incentive(s) for staff and forest communities in place for SFM
Non-Financial	<ul style="list-style-type: none"> Sound policy and regulatory framework (3) Enhanced capacity of staff and forest communities for development of SFM plans by integrating professional skills and trainings with traditional knowledge (2). 	<ul style="list-style-type: none"> Enhanced capacity of staff and forest communities for development of SFM plans by integrating professional skills and trainings with traditional knowledge and skills

d. Identifying activities for the selected Actions

Action 1: Economic incentive for staff and forest communities in place for SFM

Provide economic incentives through development and approval of policies and regulatory frameworks; promoting REDD+ program and establishing national and sub-national REDD+ funds and carbon credit generation giving financial and capacity building incentives to forest department staff ; encouraging harvesting of non-timber products and, sharing the benefits with the communities. Develop guidelines for preparing SFM plans; development of requisite

³⁷ In a forest of 2,000 hectares, 100 households are dependent, 20 community forest guards are employed to protect this forest. The households are supported with liquefied petroleum gas (LPG) and social forestry as an alternative and compensation of their rights in the forest for fuelwood, timber and fodder needs. The capacity of 100 households is built for in-situ and ex-situ cultivation and harvesting of NTFP like medicinal plants, honey, mushroom, eco-tourism and income generating livelihood activities. For these, estimated cost required for 30 years is US\$1.733 million. The benefits are in the form of trees saved (on average 2 trees per HH per year from fuelwood and 20 trees per year from timber), non-timber forest products (NTFP), soil erosion control, carbon credits, water quality & other non-tangible eco-system benefits. Moreover, as a result of conservation of the forest 30,000 cft new wood will be added in the forest in 30 year. The estimated value of total benefits is US\$57.667 million.

infrastructure for acquisition, storage, analysis, interpretation of satellite forest data and ground truthing for MRV of forest cover and carbon stock.

Table 22. Identification and description of specific activities to support Action 1

Activity 1.1: Promote REDD+ (Reduction of Emissions from deforestation and degradation) program for preservation of forests by developing: (i) Measurement, reporting and verification system (MRV) system; (ii) National and Sub-national REDD+ strategies/ Independent Forest Monitoring Systems; (iii) Forests Reference/ Reference emission levels; (iv) Safeguards and Safeguards Information System and (v) REDD+ Cells in provinces/ Territories through REDD+ Preparedness projects.
Activity 1.2: Establish national and sub-national REDD+ funds under private companies limited by guarantee.
Activity 1.3: Develop and get approved the enabling policies and regulatory frameworks for giving incentives to the staff and the communities
Activity 1.4: Encourage sustainable harvesting of non-timber products for income generation and poverty alleviation of forest communities.
Activity 1.5: Develop infrastructure for satellite forest data acquisition, analysis, interpretation and ground truthing for MRV of forest cover and carbon stock.

Action 2: Enhanced capacity of staff and forest communities for development of SFM plans by integrating professional skills and trainings with traditional knowledge

Enhance capacity of staff and forest communities for development and implementation of SFM plans by: drafting effective rules and regulations and defining roles and responsibilities of diverse stakeholders as well as taking into consideration traditional laws and governance system and mass awareness and involve forest communities through participatory process.

Table 23: Identification and description of activities for Action 2

Activity 2.1: Conduct workshops and exposure visits for capacity building of staff for development and implementation of SFM plans.
Activity 2.2: Drafting effective rules and regulations and clearly define roles and responsibilities of diverse stakeholders for SFM.
Activity 2.3: Develop guidelines containing realistic criteria and indicators for preparing SFM plans taking into consideration traditional laws and governance system.
Activity 2.5: Mass awareness through electronic, print, social media, workshops and seminars.
Activity 2.5. Capacity building of forest communities and involving them in development and implementation of SFM Plans through participatory process.

3.1.4. Step 3: Identifying Stakeholders and determining timelines

The timeline of the plan is five years commencing from July 2018 till June 2023. The primary institutions and stakeholders include Forestry Wing, Ministry of Climate Change, Provincial/ Territorial Forest Departments and local communities is presented in Table 24.

Table 24: Characterization of activities for Implementation of Actions

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary
1. Economic incentive for staff and forest communities in place for SFM	1.1. Promote REDD+ program: <ul style="list-style-type: none">• Develop MRV system	July 2018	Jan 2019			Forestry wing, MoCC	Provincial/ Territorial Forest Departments and local communities
	<ul style="list-style-type: none">• Develop National and Sub-national REDD+ strategies/ Independent Forest Monitoring Systems	Sept 2018	March 2019				
	<ul style="list-style-type: none">• Prepare Forests Reference/ Reference emission levels	Sept. 2018	March 2019				
	<ul style="list-style-type: none">• Develop Safeguards and Safeguards Information System.	Sept. 2018	Feb. 2019				
	<ul style="list-style-type: none">• Develop REDD+ Cells	March 2019	Aug 2019			Provincial/ Territorial	MoCC, local communities

	in provinces/ territories					Forest Deptts	
	1.2.Establish national and sub-national REDD+ funds	Sep 2019	Jan 2020	Feb. 2020	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities
	1.3. Develop and get approved the enabling policies and regulatory frameworks for giving incentives	Sept 2019	Feb. 2020	March 2020	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities
	1.4.Sustainable harvesting of non-timber products for income generation			Jan 2020	June 2023	Provincial/ Territorial Forest Deptts	MoCC, local communities
	1.5:Develop infrastructur e for satellite forest data acquisition, analysis, interpretatio n and ground trothing for MRV of forest cover and carbon stock.	Feb. 2019	Dec. 2020	Jan. 2021	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities
2. Enhanced capacity of staff and forest communitie s for developmen t of SFM plans by	2.1.Conduct workshops and exposure visits for capacity building of staff for development and	Sept 2019	Dec. 2019	Jan. 2020	Dec. 2022	MoCC, Provincial/ Territorial Forest Deptts	Local communities

integrating professional skills and trainings with traditional knowledge	implementation of SFM plans.						
	2.2.Drafting effective rules and regulations for SFM	Sept. 2019	March 2020			MoCC, Provincial/ Territorial Forest Deptts	Local communities
	2.3.Develop guidelines containing realistic criteria and indicators for preparing SFM plans taking into consideration traditional laws and governance system	Sept 2019	March 2020	April 2020	Dec 2022	MoCC, Provincial/ Territorial Forest Deptts	Local communities
	2.4.Mass awareness through electronic, print, social media, workshops and seminars.	Oct. 2019	March 2020	April 2020	June 2022	MoCC, Provincial/ Territorial Forest Deptts	Local communities & PEMRA
	2.5.Capacity building of forest communities and involving them in development and implementation of SFM Plans	Oct. 2019	Jan 2020	Feb 2020	Dec 2022	MoCC, Provincial/ Territorial Forest Deptts	Local communities

	through participatory process.						
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3.1.5. Step 4: Determining capacity needs and estimating costs and funding needs

The stakeholders need to develop their capacities in areas of development of SFM, REDD+, MRV, Grievance redressed mechanism, forest reference and reference emission levels, forest monitoring system, drivers of deforestation and how to address these, natural resource based livelihood opportunities, MIS and documentation, PES and sustainable harvesting of non-timber products for income generation. For training programs training institutes will be identified for accreditation by the relevant concerned institutions like Pakistan Forest Institute, Peshawar; Punjab Forestry Research Institute, Faisalabad; Forest Services Academy, Murree; Kashmir Forest School, Muzaffarabad; Pakistan National Accreditation Council (PNAC) and Higher Education Commission (HEC). The capacity needs of relevant institutes will be assessed and enhanced. The activities and estimated costs/ budget is indicated at Annexure-VII.

3.1.6. Step 5: Management Planning

a. Risks and Contingency Planning

The main risks of SFM technology have been described in Table 25.

Table 25: Overview of risk categories and possible contingencies

Risks	Description	Contingency action
Low political commitment because of uncertain macro-economic and financial condition of Pakistan	The slow pace of economic growth is impacting macro-economic conditions of the country.	International and regional support increased for global benefits.
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.
The slow pace of decision making by major stakeholders.	With devolution of power decision making at federal, provincial and district government organizations, may delay the performance and accomplishment of the program.	Create linkages with the local communities and decision makers in the program to solicit support and their buy in and also by focusing on lobbying with the government and enhancing their awareness on potential impacts.

b. Next Steps

The REDD+ Preparedness projects and REDD+ Funds at national and sub-national levels and REDD+ Cells at provincial/ territorial levels may be initiated. Develop satellite forest data

acquisition, analysis, interpretation and ground truthing for MRV of forest cover and carbon stock. Professionals may be designated in Ministry of Climate Change, Government of Pakistan and provincial/ territorial Forest Departments for identifying opportunities and preparing projects for mobilizing resources for SFM/REDD+ and establishment of linkages with the potential stakeholders for implementation of different components of the SFM/REDD+ technology.

In addition to Forest Departments, universities, relevant local research institutions and civil society organizations and communities would be involved in SFM plan preparation and technology implementation programs.

Table 26: Identification of immediate requirements and critical next steps

Immediate Requirements	The REDD+ Preparedness projects, REDD+ Funds, REDD+ Cells, GIS and remote sensing based data systems and mobilizing resources for SFM/REDD+.
Critical steps	For effective planning and implementation of SFM all stakeholders including communities should be involved from the inception till the implementation of the program. Through regular monitoring and feedback follow up measures should be adopted to help achieve project objectives.

3.2. Social Forestry Technology Action Plan

3.2.1. Introduction

Social forestry is a useful technology for GHG emission reduction. It is based on participatory approach by raising woodlots or raising tree plantations along with agricultural crops or shelter-belts on community lands, private lands and in homestead³⁸. Its main purpose is to fulfill the needs of communities including fuel-wood, food, fruit, fiber, timber, sport goods, furniture and fodder as well as to conserve the ecosystem and environment³⁹. Social Forestry also facilitates watershed management, groundwater recharge, soil stabilization, protection from wind erosion, soil fertilization and reducing impacts of climate change and associated disasters.

In Pakistan, large scale social forestry projects were initiated in 1981 with Kalam Integrated Development Project for helping communities to organize themselves for collective action. This was followed by a National Social Forestry Program in 1984 for a period of 10 years with an action to expand tree planting for improving rural welfare and sustaining the long-term economic and ecological viability of small farms. In 1987, the Social Forestry Project in Malakand worked with rural women to enhance productive capacity. Social forestry is a feasible solution for increasing forest area in the country. Farmers view farm forestry as economically beneficial and environmentally friendly.

The Forest policy of Pakistan, 1991 for the first time recognized “social forestry” as a viable approach for forest protection, conservation and as an effective mechanism to counter the ill effects of deforestation. The policy established forestry extension services and appointed forest extension workers to promote farm forestry. The Siran Forest Development Project (SFDP) with the participation of local communities along with forest departments formed joint forest management committees. The success of this project led to amendment in the old Forest Act, 1927 known as Hazara Protected Forest Rules, 1996. This modification mandated the formation of Joint Forest Management Committees (JFMC), including operational guidelines and production-sharing agreement with the provincial government.

In Sindh, state forestland has been leased out by the forest department (FD) for agro-forestry to raise forest trees on 20% of the leased area and use the remaining area for cultivation of agricultural crops. Social forestry was success in certain parts of Pakistan like Northern areas, central and southern Punjab, Rawlakot in AJK etc. The activities to promote social forestry includes raising nurseries through women participation, income generating activities, enhancing skills of community organizations (COs) and women organizations (WOs) have been implemented at a large scale in Pakistan.

3.2.2. Step 1: Ambition for promoting Social Forestry

Pakistan envisages doubling carbon sink through adoption and dissemination of Social Forestry technology to mitigate climate change impacts and build resilience against climate change triggered disasters. In the short term, the aim is to increase the forest cover from 5% to 6% by

³⁸ Social Forestry and Farm Forestry (Item No. 6); http://www.tnrd.gov.in/reports/Jain_Report/english/index4_6.pdf

³⁹What is the meaning and aim of Social Forestry? <http://www.preservearticles.com/2012032829046/what-is-the-meaning-and-aim-of-social-forestry.html>

2020 and to 10 % by 2030⁴⁰ through launching extensive community managed social forestry programs. This technology will help in restoring ecological balance (ground water recharge, soil conservation etc.), expansion of tree cover, production of fuel wood, fodder, and timber. Thereby, improve rural welfare and sustain long term economic and ecological viability of small farms and fulfill basic rural needs.

3.2.3.Step 2: Actions and Activities for the TAP of Social Forestry

a. Summary of barriers and measures to overcome barriers

The key barriers for social forestry identified in TNA Barrier Analysis include the economic and financial and non-financial barriers. One of the biggest impediments hindering the promotion of social forestry is financial return from forestry which requires a longer period of time. There is competition between forest trees and agricultural crops as the later provides early financial return. From an economic point of view, access to capital and technical capability are vital for long-term plantation investments. Other economic barriers include inadequate funds for forest tree plantation and lack of incentives for social forestry. These barriers can be overcome through introduction and promotion of financing mechanisms include microfinance, out-grower schemes, remittances for owning a woodlot. Partnership of local communities will encourage recognition of long-term socio-economic incentives from trees. These opportunities will lead to reduction of encroachment of forest for cultivation of agricultural crops, unemployment and meeting the expanding population needs.

The non-financial barriers include unsustainable forest management due to use of unhealthy and low quality seedlings and alien invasive species and unavailability of land resources for forestry. These barriers can be removed by preparing SFM plans with successful demonstration of good forestry practices and capacity building of line agencies as well as the communities. Dissemination of knowledge and awareness about appropriate trees for a particular area and negative impacts of alien and invasive species will support appropriate decision making in selection of healthy and high quality seedlings of indigenous trees. Availability of private land resources for forestry can be increased by growing forests through water resource development and management in the form of micro catchments etc. in the forest, intercropping with high value crops, vegetables and medicinal plants appropriate for the area. In this way, the private land owners will have the opportunity to get quick as well as long-term benefits from the same land. Hence, they would be ready to spare their land for establishing and maintaining forests. Introducing activities like bioengineering with indigenous trees whose root network has better capacity to hold the soil coupled with erosion control structures will result in ecosystem rehabilitation and soil erosion control. Appropriate SFM planning, strategy and its implementation would further help the communities in getting maximum benefits from their forest area.

The main barriers and its mitigation measures identified in the TNA process are described in the Table 27:

⁴⁰ Pakistan's Intended Nationally Determined Contribution (Pak-INDC)

Table 27: Overview of Barriers and Measures to overcome these for social forestry

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	<ul style="list-style-type: none"> • Return from forestry require a long period of time 	<ul style="list-style-type: none"> • Incentives for social forestry
	<ul style="list-style-type: none"> • Inadequate funds or no Incentives for social forestry 	
Non-financial	<ul style="list-style-type: none"> • Lack of knowledge and awareness on benefits of social forestry 	<ul style="list-style-type: none"> • Training and awareness raising
	<ul style="list-style-type: none"> • Unavailability of land resources for forestry due to water shortage 	<ul style="list-style-type: none"> • Availability of land resources for forestry by rainwater harvesting and intercropping.

b. Framework for ranking measures as actions selected for inclusion in TAP

Based on the UN Environment guidelines for preparation of TAP, the assessment and ranking of identified measures have been done on the basis of effectiveness, efficiency, interaction with other measures, suitability of social forestry within the country, benefits and costs has been made in Table 28.

Table 28: Framework for ranking measures of promoting social forestry for inclusion as Actions selected for inclusion in the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
<i>Incentives for social forestry</i>	Effectiveness	<ul style="list-style-type: none"> ➤ The farmers are unable to change from traditional agricultural farming practice to the concept of social forestry due to lack of knowledge and incentives. ➤ Effectiveness of the measures can be increased through foreign direct investments, introduction of private financing mechanisms like microfinance, out-grower schemes, remittances for owning a woodlot. ➤ Awareness raising for availability of funds and co-financing of inputs, such as plants and provision of extension services. The indirect incentives of research and access to market information to the 	<p>1</p> <p>The farmers do not have the knowledge of benefits of social forestry. The farmers need to invest from the beginning such as purchase of quality seedlings, site selection and preparation etc. To encourage social forestry government can support the</p>

		<p>communities may also strengthen effectiveness.</p> <p>➤ Further, introduction and implementation of supporting policies, laws and regulations will promote social forestry.</p>	<p>farmers by incentives like microfinance, out-grower schemes, remittances for owning a woodlot, public-private partnerships and provision of quality plants and extension services as incentives.</p> <p>Hence, incentives can play a pivotal role in promotion of social forestry increasing forest area as well as carbon sink in Pakistan with high degree of success.</p> <p>The measure has been ranked as top priority.</p>
	Efficiency	<p>➤ The forestry is traditional practice in rural areas where human resources and capabilities are available. The measure will be enhanced through incentives in the form of nurseries, subsidized saplings, training and support in managing operational costs are provided.</p> <p>➤ Moreover, partnership of local communities will encourage recognition of long-term socio-economic incentives from trees.</p> <p>➤ The IRR of the technology is 26% to 33% based on addition of intercropping including vegetables along with social forestry on 10 acre.</p>	
	Interaction with other measures	<p>➤ The incentives for social forestry are encouraged in the National Forest Policy and also supported by other sectors of development like Agriculture, Livestock and Eco-tourism. Hence there is no conflict with other sectors.</p>	
	Suitability with the country and sector context.	<p>➤ Social forestry is suitable and is being encouraged at the national level. Through social forestry, the forest area will also increase thus increasing the carbon sink.</p>	
	Benefits and costs	<p>➤ The calculated costs of social forestry with non-timber forest products (NTFPs) on 10 acres are about US\$113,188 and benefits are about US\$195,526⁴¹. If carbon benefits included, the total benefits comes to US\$198,491⁴².</p> <p>➤ The estimated emission reduction from 10 acres land in extremely degraded dry sub-</p>	

⁴¹ The costs include dry afforestation, re-forestation, solar pump, execution of water bores, water distribution system and community nurseries for 30 years. The benefits include fuelwood and timber for 30 years. This does not include NTFP, non-tangible eco-system and carbon benefits. With carbon benefits the total benefits comes to US\$198,491.

⁴² Assuming 1 tone of CO_{2eq} emission reduction @ US\$1.

		tropical climate zone in Thal areas converted to very low degradation areas with forest plantations is 2,965 tons of CO _{2eq} over a period of 30 years.	
Training and awareness raising	Effectiveness	➤ Training and awareness raising will familiarize the farmers about the right type of forest plants to be planted and silvicultural practices for getting increased income from forest trees, NTFPs and intercropping of agricultural crops. Effectiveness can be increased by providing the farmers with the knowledge of incentives available for social forestry from the government and other donors. Thus they will be motivated for adoption of social forestry.	2 Training and awareness are the most effective tools for the promotion of social forestry among the farmer community as well as forestry staff. Trained staff and farmers will be able to effectively utilize the economic incentives offered by social forestry. Hands on training and awareness raising will increase the efficiency of the farmers by familiarizing them about the benefits of social forestry practices and NTFPs. This measure will not only increase the capacity and capability of farmers and the forest staff but will also lead to increase in forest cover and carbon sink. The measure has been
	Efficiency	➤ Hands on training and awareness raising will increase the efficiency of the farmers by familiarizing them about the benefits of social forestry practices and NTFPs. The IRR is about 33%. ⁴³	
	Interaction or conflict with other measures	➤ Trained staff and farmers will be able to effectively utilize the economic incentives offered by social forestry. The National Forest Policy also supports social forestry thus the activity does not conflict with other government policies.	
	Suitability within the country or the sector	➤ Training and awareness raising is used for the promotion of most of the sustainable activities including social forestry. The activity is suitable within the country and with other sectors like agriculture, forestry, enterprise development and eco-tourism etc.	
	Benefits and costs	➤ The capacity building and awareness raising is cost effective and beneficial in introduction and promotion of social	

⁴³ The total cost (US\$113,188) include dry afforestation, re-forestation, solar pump, execution of water bores, water distribution system and community nurseries for 30 years. The total benefits (US\$211,505) include fuelwood, timber, and NTFP including fodder, medicinal and vegetable plants for 30 years. This does not include non-tangible eco-system and carbon benefits. With carbon benefits the total benefits comes to US\$214,470 and the IRR remains the same as the change is negligible.

		<p>forestry in the rapidly deteriorating forests in Pakistan.</p> <p>➤ According to cost benefit analysis, cost required for 30 years for social forestry on 10 acres is US\$113,188 and net profit is US\$214,470, it does not include the cost of the land.</p>	ranked as second priority.
<i>Availability of land resources for forestry by rainwater harvesting and intercropping</i>	Effectiveness	<p>➤ The non-availability of land for social forestry in Pakistan is due to lack of water resources and erosion. The measure could be made effective through dry-afforestation techniques containing establishment of micro-catchments for rainwater harvesting along-with the planted forest saplings. To get optimum benefits farmers will be trained on benefits from intercropping of agricultural crops.</p>	<p>3</p> <p>Pakistan has about 80% of arid and semi arid land as such availability of land for forest cultivation is a challenge because of competition with the agricultural crops. Moreover, the farmers are unaware of the benefits of intercropping which has better economic return. As such it has been ranked a third.</p>
	Efficiency	<p>➤ Traditional methods of rainwater harvesting will be promoted and innovations like solar pumps, water distribution system and intercropping with agricultural crops will increase the efficiency of the measure. The IRR is 26% to 33% based on addition of intercropping including vegetables along with social forestry.</p>	
	Interaction or conflict with other measures	<p>➤ Measures like rainwater harvesting and intercropping are in conformity with the national sectoral policies thus the measure do not conflict with other government policies.</p>	
	Suitability within the country or the sector	<p>➤ Measures like rainwater harvesting and intercropping with agricultural crops are not new but have been practiced in isolation by local communities. The promotion of the activity is suitable within the country and with other sectors like agriculture, forestry, enterprise development and eco-tourism etc. However, the adopted approach will be according to different land capability classifications.</p>	

	Costs and benefits	➤ The cost required for 30 years for social forestry on 10 acres is US\$113,188 and net profit is US\$85,303 and this does not include the cost of the land. The gross profit is US\$198,491 so the C:B ratio is positive.	
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c. Final selection of Actions for inclusion in the TAP

First two prioritized measures have been taken as actions for promoting social forestry after assessment of possible measures and consultation with the Expert Working Group on Mitigation and are described in the following table.

Table 29: Selection of Actions for promoting Social forestry

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	<ul style="list-style-type: none"> • Incentives for social forestry (1) 	<ul style="list-style-type: none"> • Incentives for social forestry
Non-Financial	<ul style="list-style-type: none"> • Awareness raising and training (2) • Availability of land resources for forestry by rainwater harvesting and intercropping (3) 	<ul style="list-style-type: none"> • Awareness raising and training

d. Identifying activities for the selected Actions

Action 1: Incentives for Social Forestry

Provide incentives for social forestry through designing and providing tax rebate and, subsidies for private nurseries and seedlings to forest and upstream communities. To promote social forestry, provide concessional loans with an interest rate that is lower than the market rate, long maturity period and expanding its network for increased rural outreach so that it can provide bridge financing during gestation periods for plantation activities. Design policies to invest in social forestry sector that promote small holders or community benefits in out grower schemes. Train farmers for direct contact with the forester, other natural resources professional and interested private sector and provide incentives for protection of fragile ecosystem and watersheds.

Table 30: Identification and description of specific activities to support Action 1

Activity 1.1: Design and provide tax rebate and, subsidies for private nurseries and seedlings.
Activity 1.2: Offer concessional loans.

Activity 1.3. Encourage private sector by designing policies to invest in social forestry sector that promote small holders or community benefits in out grower schemes.
Activity 1.4. Introduce incentives such as microfinance, out-grower schemes, remittances for owning a woodlot, awareness raising for availability of funds and co-financing of inputs for communities.

Action 2: Awareness raising and training

Provide awareness and training by focusing social forestry in curriculum; use of mass media; providing technical knowledge to the farmers through workshops and train forest staff and selected local community members on social forestry.

Table 31: Identification and description of specific activities to support Action 2

Activity 2.1: Focussing social forestry in curricula in educational institutions
Activity 2.2: Introduce awareness programs through mass media.
Activity 2.3. Provide extension and technical guidance to the farmers
Activity 2.4: Provide training to the forest staff and selected local community members on social forestry.

3.2.4. Step 3: Identifying Stakeholders and determining timelines

The timeline of the plan is five years commencing from July 2018 till June 2023. The primary and secondary responsible institutions and other stakeholders have been described at Table 32. The primary institutions and stakeholders include Forestry Wing, Ministry of Climate Change, Provincial/ Territorial Forest Departments and local communities.

Table 32: Characterization of activities for Implementation of Social forestry

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary
1.Incentives for Social Forestry	1.1. Design and provide tax rebate and, subsidies for private nurseries and seedlings.	July 2018	Jan 2019	Feb. 2019	Dec 2022	Provincial/ Territorial Forest Departments	Forestry wing of MoCC, NGOs
	1.2. Offer Concessionary loans			Jan. 2019	Dec. 2023	Banks & NGOs	Provincial/ Territorial Forest

							Departments , Forestry wing, MoCC
	1.3.Encourage private sector by designing policies to invest in social forestry sector that promote small holders or community benefits in out grower schemes.	July 2018	Jan. 2019	Feb. 2020	Dec. 2022	Provincial/ Territorial Forest Departments and local communities	Forestry wing, MoCC, NGOs
	1.4.Introduce incentives such as microfinance,, out-grower schemes, remittances for owning a woodlot, awareness raising for availability of funds and co-financing of inputs for communities			July 2019	Dec. 2022	Provincial/ Territorial Forest Departments and local communities	Forestry wing, MoCC, NGOs
2.Awareness raising and training	2.1.Focusing social forestry in curricula	July 2018	June 2019	July 2019	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities & Pakistan Forest Institute (PFI)
	2.2.Introduce awareness programs			July 2019	Jan. 2023	Electronic media, MoCC, Provincial/	Local communities & PEMRA

	through mass media.					Territorial Forest Deptts	
	2.3. Provide extension and technical guidance to the farmers			July 2019	Jan. 2023	Print media, MoCC, Provincial/ Territorial Forest Deptts	Local communities
	2.4. Provide training to the forest staff and selected local community members on social forestry.			July 2019	Dec. 2021	MoCC, Provincial/ Territorial Forest Deptts	Local communities

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

The stakeholders need to develop their capacities in areas of social forestry, payment for Ecosystem Services (PES) and sustainable harvesting of non-timber products for income generation. The training institutes will be identified for accreditation by the relevant concerned institutions like Pakistan Forest Institute, Peshawar; Punjab Forestry Research Institute, Faisalabad; Forest Services Academy, Murree; Kashmir Forest School, Muzaffarabad; Pakistan National Accreditation Council (PNAC) and Higher Education Commission (HEC). The capacity needs of relevant institutes will be assessed and enhanced. The activities and estimated costs/ budget is indicated in Annexure-VIII.

3.2.6. Step 5: Management Planning

a. Risks and Contingency Planning

The main risks of social forestry have been described in table below.

Table 33: Overview of risk categories and possible contingencies

Risks	Description	Contingency action
Low political commitment because of uncertain macro-economic and financial condition of Pakistan.	The slow pace of economic growth is impacting macro-economic conditions of the country.	International and regional support increased for global benefits.
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.

Risk of climate change and associated disasters.	Pakistan is subjected to vulnerabilities due climate change.	Under take climate change resilient infrastructure and adaption measures.
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b. Next Steps

In Green Pakistan Program social forestry may be given priority and new projects and programs for social forestry at provincial/ territorial levels may be initiated. In addition to Forest Departments, universities, relevant local research institutions and civil society organizations would be involved in expansion of social forestry programs.

Table 34: Identification of immediate requirements and critical next steps

Immediate Requirements	Professionals may be designated in the Ministry of Climate Change, Government of Pakistan and provincial/ territorial Forest Departments for identifying opportunities and for preparing projects to mobilize resources for social forestry and establishment of linkages with the potential stakeholders for its implementation.
Critical steps	Involve academia, relevant local research institutions and civil society organizations in programs of social forestry.

Chapter 4: Transport Sector Technology Action Plan

Sector Overview:

Transport plays an important role in economic development as it facilitates mobility of goods and passengers from one destination to another. The transport sector contributes about 13.7 % to Pakistan's gross domestic product and more than 5 % to the country's overall employment⁴⁴. As the population and economy have grown, the number of vehicles has increased from 2.7 million in 1990 to 9.8 million by 2010. The numbers of registered vehicles are 17 million in 2015⁴⁵.

The transport sector is the most CO₂ emission intensive sector, which contributes 21 percent to the national carbon emissions, and is responsible for more than half of the country's oil consumption. Greenhouse gas (GHG) emissions from the transport sector are projected to rise by 128% i.e. approximately 35.4 MtCO₂e in 2012 to approximately 80.7 MtCO₂e in 2030⁴⁶. Pakistan produces more than twice the amount of CO₂ emissions from transport sector than the region's average⁴⁷. Currently road transport in Pakistan accounts for 91 percent of the national passenger traffic and 96 percent of freight. Excessive reliance upon road transport is also causing increased congestion, degradation of air quality with dramatic increase in GHG emissions. The associated ecological, social, economic and health related impacts are also increasing significantly.

The role of Sustainable Urban Transport (SUT) is vital for improved living conditions particularly for urban dwellers in Pakistan. In this scenario, the Technology Action Plan proposes to take practical measures by targeting the key stakeholders to reduce the environmental impact and other issues associated with the transport sector of Pakistan.

The Bus Rapid Transport (BRT) System and Vehicle Tune-up technologies were found to have highest GHG emission reduction potential in transport sector in Pakistan. Hence, these technologies ranked highest in prioritization of mitigation technologies for development of TAP and project idea note in the transport sector.

4.1. Bus Rapid Transport (BRT) System Technology Action Plan

4.1.1. Introduction

The cities of Pakistan have low level of public transport services. It comprises mainly of old buses, mini-buses, vans, which are insufficient to cater the needs of daily commuters. The solution to this is Bus Rapid Transport (BRT) systems, which can deliver fast, comfortable, and cost-effective urban mobility.

Pakistan has launched Bus Rapid Transport (BRT) systems in Lahore, Rawalpindi and Islamabad. The BRT has brought immediate relief not only in the mobility of passengers but also in controlling the air pollution and reduction of GHG emissions. The efficient BRT system

⁴⁴ Greenhouse Gas Mitigation Options for Pakistan: Transport Sector: <https://cdkn.org/wp-content/uploads/2016/10/fact-sheet-Pakistan-Transport-sector-.pdf>

⁴⁵ Short roundup n transport infrastructure of Pakistan, 2000-2015.

⁴⁶ Greenhouse Gas Mitigation Options for Pakistan: Transport Sector: <https://cdkn.org/wp-content/uploads/2016/10/fact-sheet-Pakistan-Transport-sector-.pdf>

⁴⁷ http://www.lead.org.pk/cc/attachments/Blogs_Discussions/WB_SA_CC_Strategy/8_The_Transport_Sector.pdf

in the country will lead to positive impact on environment as well as improve social and economic dimensions viz. quality of life, productivity, public health and safety, employment generation and mobility. An integrated urban transport system can reduce travel times and end-user cost significantly. Access to safe and affordable public transport systems can improve the connectivity between rural and urban areas and improve the mobility of social groups who may not have access to private modes of transportation such as the urban poor and women in particular.

4.1.2. Step 1: Ambition for promoting BRT system

The Pakistan Vision 2025 sets the target to provide access to safe, affordable, accessible and sustainable transport systems for all⁴⁸. It envisages to cut down usage of private transportation in urban centers and to implement public transportation means including mass transit systems. The technology action plan for BRT system includes buses as well as allied infrastructure.

BRT system in Pakistan currently covers network in major cities namely Rawalpindi-Islamabad (22.5 km, active), Lahore (27 km, active), Karachi Metro-bus (109 km, in progress), and Multan systems (32 km, in progress). The ambition is to expand the network up to 300 km by 2030, which will provide ridership to about 9.6 billion passengers per year, added to the system progressively. The GHG savings by expansion of BRT network are estimated at 47% in line with fuel savings compared to minibus technology⁴⁹. The BRT vehicles offer lower CO₂ emissions per passenger mile and mitigate climate change impacts. In addition, efficient BRT system will also result in switching from independent cars to public transport.

4.1.3. Step 2: Actions and activities selected

a. Summary of Barriers and Measures to overcome barriers

The major barriers in the wide diffusion of Bus Rapid Transport (BRT) system identified in TNA Barrier Analysis and Enabling Framework report includes high capital cost for establishment of mass transit system as the major barrier. In addition, non-availability of soft term loan facilities for private investors discourages investment in the business of BRT and establishment of feeder routes. To provide an enabling framework to the technology, reduction of capital cost is most important which can be done by exempting duties and taxes on import of BRT buses and improving infrastructure etc. Providing more opportunities to private sector by extending soft term loans will encourage their participation and will facilitate expansion of BRT system.

The major non-financial barrier of BRT system is absence of a comprehensive policy framework. The National Transport Policy is still being drafted. While the National Automotive Development Policy 2016-21 has been approved but it does not cover the subject of BRT. Hence, the BRT system is operating without a comprehensive policy framework. The other non-financial barrier is the resistance from existing transport operators, which is the strongest lobby against the expansion of the BRT system because it directly affects their businesses as well as livelihoods. The measures that can be taken to overcome non-financial

⁴⁸ Pakistan Vision 2025

⁴⁹ Greenhouse Gas Mitigation Options for Pakistan: Transport Sector: <https://cdkn.org/wp-content/uploads/2016/10/fact-sheet-Pakistan-Transport-sector-.pdf>

barriers is to develop and approve national policies supportive to BRT system. The development of policy should be taken on priority basis as Pakistan is going to be predominantly urbanized by 2030. A mechanism should also be developed to provide alternative business opportunities to the existing transport operators and other businessmen affected by the BRT system. The main barriers and its mitigation measures identified in the TNA process are described in Table 35.

Table 35: Overview of Barriers and Measures to overcome barriers for BRT system

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	<ul style="list-style-type: none"> High Capital Cost Less participation of private sector 	<ul style="list-style-type: none"> Reduced capital cost through tax incentives/ soft term loan @3%⁵⁰ on BRT system. Involvement of private sector for promotion of BRT.
Non-financial	<ul style="list-style-type: none"> No National Policy Supporting BRT Opposition from existing transport operators and other affected parties 	<ul style="list-style-type: none"> National Policies supporting BRT development Resolution of grievances of affected parties by offering them alternate route permits and other business opportunities.

b. Framework for ranking measures for inclusion as actions selected for inclusion in the TAP

Based on the UN Environment guidelines for preparation of TAP, the assessment and ranking of identified measures have been done on the basis of effectiveness, efficiency, interaction with other measures, suitability of BRT within the country, benefits and costs. These have been summarized in Table 36.

Table 36: Framework for ranking measures of promoting BRT System for inclusion as Actions selected for inclusion in the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
<i>Reduced capital Cost by giving tax incentives/ soft term loan for BRT system</i>	Effectiveness	➤ Reducing capital cost is an effective way of improving public transport system in congested urban areas. Tax rebate/ soft term loan for BRT can improve effectiveness of the measure.	1 Giving tax rebate/ soft term loans will reduce the capital cost to promote BRT system. Tax incentives for local manufacturing of buses, allied machinery and equipment will

⁵⁰ Asian Development Bank's current interest rate for BRT extended to the Government of Khyber Pakhtunkhwa is @3%.

	Efficiency	<p>➤ Accessing soft term loans from the government/DFIs for BRT system is an efficient way of promoting the system by the private sector⁵¹. Giving tax incentives/soft term loan for local manufacturing of buses, allied machinery and equipment will further reduce the cost of the system and lead to expansion of the BRT network in the country. Providing technological knowhow as well as facilities for assembling and manufacturing efficient buses for the BRT system locally can further reduce capital cost.</p> <p>➤ The IRR is 13%⁵².</p>	encourage private sector investment. BRT system will not only provide relief in the mobility of passengers but also in controlling air pollution and reduction of GHG emission. Further, BRT system is effective and highly accepted by the people. Hence, it is ranked as first priority.
	Interaction or conflict with other measures	<p>➤ The policies related to transport sector are in support of improving public transport system and BRT is one of the measures to achieve this objective. The measure is strongly linked to GHG emission reduction and environmental improvement.</p>	
	Suitability within country/ sector	<p>➤ The measure is suitable for the country as</p>	

⁵¹ Pakistan Vision 2025

⁵² The costs include land acquisition, construction of infrastructure, environmental mitigation, traffic maintenance, landscaping, interest rate of 3% etc. The main benefits through fare have been included. However, intangible benefits and carbon credits have not yet been calculated and added in the IRR calculation. These calculations will further improve the IRR.

		<p>Pakistan is going to be predominantly urbanized by 2030. It is estimated that the percentage of population in the urban areas will be more than 50% of the total national population. Reduction of capital cost for BRT can facilitate the economic growth as well as environment. The BRT system is very much acceptable by the people because in addition to its benefits, there are separate chambers for male and female passengers.</p>	
	Benefits and costs	<ul style="list-style-type: none"> ➤ BRT is a cost effective and efficient system as its fare is even less than the private vans and buses operating on the same routes and provide opportunities for earning livelihood and business. Moreover, the BRT system in Pakistan has helped women with their safe and easy travel from one destination to another. ➤ The cost of establishing BRT system in Islamabad from Peshawar Morr to New International airport is US\$494 million and the expected return from fare @US\$0.2 is US\$2,747 million over a period of 30 years. 	

<i>Involvement of private sector for promotion of BRT.</i>	Effectiveness	<p>➤ Providing opportunities for private investors is an effective way to boost implementation of BRT. The government alone cannot provide BRT system in all major cities. The involvement of private sector can bridge this gap and meet the increasing demand of BRT system in congested parts of the major cities. Increasing availability and access to soft-term loans through awareness can further promote effective involvement of private sector. So far, the availability of this soft-term loan facility is very limited. The private sector can also be involved in the BRT feeder system. International donor agencies like Green Climate Fund can increase the effectiveness of the measure</p>	<p>2</p> <p>Considering the economic development of the country, the involvement of private sector for promotion of BRT system can play a vital role.</p> <p>Providing opportunities like increasing access and availability to soft-term loan facility, tax incentives, public private partnerships, and accessing international donor agencies to private investors can boost the technology implementation. Therefore, the measure is ranked second.</p>
	Efficiency	<p>➤ The efficiency of BRT network and its feeder system can be enhanced by promoting public private partnership. The IRR is 10% to 15% depending on the rate of interest for the private sector from 0% to 10%, respectively⁵³.</p>	

⁵³ The costs include land acquisition, construction of infrastructure, environmental mitigation, traffic maintenance, landscaping, interest rate of 0% to 10% etc. The main benefits through fare have been included. However, intangible benefits

	Interactions with other measures	➤ The measure has direct interaction with national policies supporting BRT. Provision of soft-term loan facility and tax rebate for BRT has been supported by the National Auto policy 2016 and National Climate Change Policy 2012.
	Suitability within country/ sector	➤ The measure is suitable for the country and through public private partnership BRT network can be established to meet the demand of efficient public transport system in all the major cities.
	Benefits and costs	➤ The cost of establishing BRT system by the private sector with interest of 10% and without interest in an area of 25 km is US\$817 million and US\$356 million, respectively. The expected return from fare @US\$0.2 is US\$2,747 million in a period of 30 years. Further there are many other benefits including improvement in local environment, health and social benefits including poverty alleviation.

and carbon credits have not yet been calculated and added in the IRR calculation. These calculations will further improve the IRR.

National Policies supporting BRT System	Effectiveness	<p>➤ The BRT system in Pakistan is operating without a comprehensive policy framework. The National Transport Policy is still being drafted. While the National Automotive Development Policy 2016-21 has been approved but it does not cover the subject of BRT. Effectiveness of the policies will be enhanced once National Transport Policy is developed and approved. Tax rebate for BRT in national transport policy can improve effectiveness of the measure.</p>	<p>3</p> <p>The BRT system being the priority project of the government is being facilitated despite the absence of the National transport policy. Hence, the other measures such as reduction in capital cost and involvement of private sector are more critical to the promotion of BRT in Pakistan in the present scenario. Hence, the National Policy supporting BRT is ranked third.</p>
	Efficiency	<p>➤ The policy should focus on measures and timeline for promotion of BRT and other modern mass transit systems in the country.</p> <p>➤ A mechanism must be developed to streamline coordination among relevant institutions and continuous feedback from stakeholders to review and improve the BRT system. It must also be backed up with research, demonstration and capacity building of relevant institutions to</p>	

		effectively run and expand the BRT network in the major populated cities of the country.	
	Interaction with other measure	➤ It has strong interactions with other measures like reducing capital cost of BRT system and involvement of private sector.	
	Suitability within the Country	➤ Mainstreaming BRT in the policies and regulatory framework will increase local and global benefits of reduction of GHG emissions and reduction in air pollutants, which will lead to increased economic, securities and improve health conditions in the cities.	
	Benefits and costs	<p>➤ The cost of formulation of policy and regulatory framework are negligible but the benefits are huge and tangible as it provides enabling environment for promotion of BRT benefits.</p> <p>➤ This is a cost effective measure and implementation of all other BRT measures is dependent on the policy and regulatory framework. As this measure plays a strong role in correcting</p>	

		market behavior and ensuring BRT benefits.	
Resolution of grievances of affected parties	Effectiveness	<ul style="list-style-type: none"> ➤ A mechanism should be established to provide alternative business opportunities to the existing transport operators and other businessmen affected by the BRT system network. Effectiveness of the measure could be enhanced by giving priority to possible local private transportation companies to participate as operators of the new transit system. 	4 <p>The BRT technology has low acceptance in the country due to several factors e.g. loss of existing business, less alternative development opportunities and low implementation of master plans of cities. However, the measure has not been ranked high as its impact is comparatively much less than the benefits of other measures.</p>
	Efficiency	<ul style="list-style-type: none"> ➤ Developing mechanisms to facilitate participation of the people affected by BRT network and recognizing their local experience as a factor for bid evaluation in the concession process. ➤ Provide alternate route permits to the affected parties from the Metro-bus station to the feeder route areas as well as on the new routes will improve efficiency of the measure. 	
	Interactions with other measures	<ul style="list-style-type: none"> ➤ The measure has direct linkage with other measure i.e. involvement of private sector for promotion of BRT. 	

	Suitability within country/ sector	➤ Resolution of grievances of affected parties helps in rehabilitation of effective stakeholders and will promote sustainability.	
	Benefits and cost	➤ The measure is cost effective as benefits of BRT overrides the cost of rehabilitation of affected parties.	

c. Final selection of Actions for inclusion in the TAP

After assessment of possible measures and consultation with the Expert Working Group on Mitigation, two measures have been taken as actions for promoting BRT and described in the Table 37.

Table 37: Selection of Actions for promoting BRT System

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	• Reduce capital Cost by giving tax incentives for BRT system (1)	• Reduced capital Cost by giving tax incentives for BRT system
	• Involvement of private sector for promotion of BRT (2)	• Involvement of private sector for promotion of BRT
Non-Financial	<ul style="list-style-type: none"> • National Policies supporting BRT development (3) • Resolution of grievances of affected parties by offering them alternate route permits and other business opportunities (4) 	

d. Identifying activities for the selected Actions

Action 1: Reduced capital Cost by giving tax incentives/ soft term loan for BRT system

Reduce capital cost for installation of BRT system by conducting studies for developing tax incentive mechanism and strategies of revenue generation; meetings with policy makers; providing fiscal and financial incentives such as special fiscal treatments (favorable tax treatments, soft term loans) for developing infrastructure and local manufacturing of buses.

Table 38: Identification and description of specific activities to support Action 1

Activity 1.1	Conduct study demonstrating the tax incentives and its role in the promotion of BRT system and alternate strategies of revenue generation for the government.
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Activity 1.2	Conducting workshops and meetings with policy makers to discuss options for reducing capital cost for BRT system.
Activity 1.3	Design and provide fiscal and financial incentives to encourage BRT system, such as special fiscal treatments (favourable tax treatments and soft term loans) for developing infrastructure and local manufacturing of buses.
Activity 1.4.	Provide technological knowhow as well as facilities for assembling and manufacturing BRT busses locally.

Action 2: Involvement of private sector for promotion of BRT

Private sector can play key role in promotion of BRT system through developing proposals for creating incentives for private sector investments; offering soft term loans with an interest rate that is lower than the market rate; and promoting public private partnerships.

Table 39: Identification and description of specific activities to support Action 2

Activity 2.1	Development and submission of proposals for creating incentives for private sector investment.
Activity 2.2	Offer soft term loans with an interest rate that is lower than the market rate, repayment schedule where interest is not paid for a period of time and long maturity.
Activity 2.3	Promote public private partnerships

4.1.4. Step 3: Identifying Stakeholders and determining timelines

The timeline of the plan is 5 years commencing from July 2018 until June 2023. The primary parties include, Ministry of Communication, National Transport Research Centre, Provincial/ Territorial Transport Departments and Ministry of Finance and Board of Revenue.

Table 40: Characterization of activities for Implementation

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary and Secondary Focal point	
1.Reduced capital cost by giving tax incentives/ soft term loan for BRT system	1.1.Conduct study demonstrating the tax incentives needed, its role in the promotion of BRT system and alternate	July 2018	June 2019	Aug . 2019	June 2021	National Transport Research Centre, Min. of Communication, Ministry of Finance and Board of Revenue	Provincial/ Territorial Transport Departments

	strategies of revenue generation for the government						
	1.2. Conducting workshops and meetings with policy makers to discuss options for reducing capital cost for BRT system.	July 2018	June 2019	July 2019	June 2022	National Transport Research Centre, Ministry of Communication, Ministry of Finance and Board of Revenue	MoCC, Provincial/ Territorial Transport Departments
	1.3. Design and provide fiscal and financial incentives to encourage BRT system, such as special fiscal treatments (favourable tax treatments and soft term loans) for developing infrastructure and local manufacturing of buses.	July 2018	June 2019	Aug . 2019	December 2022	National Transport Research Centre, Ministry of Communication Ministry of Finance and Board of Revenue	Provincial/ Territorial Transport Departments
	1.4. Provide technological knowhow as well as facilities for assembling and manufacturing of BRT			Jan. 2020	Dec. 2022	NTRC	Provincial/ Territorial Transport Departments & NEECA

	busses locally.						
2. Involvement of private sector for promotion of BRT	2.1. Development and submission of proposals for creating incentives for private sector investment.	Aug . 2018	Dec. 2019			Ministry of Communication	Provincial/ Territorial Transport Departments
	2.2. Offer soft term loans			Aug 2019	Dec. 2021	Banks	MoCC, Provincial/ Territorial Transport Departments
	2.3. Promote public private partnerships			Aug . 2018	Jan. 2019	Ministry of Communication Ministry of Finance and Board of Revenue	Provincial/ Territorial Transport Departments

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

The stakeholders need to develop their capacities in areas of BRT system costs and benefits, identification of potential donors and writing proposals for the potential donors. The capacity needs of relevant institutes will be assessed and enhanced. The activities and estimated costs/ budget are indicated at Annexure IX.

4.1.6. Step 5: Management Planning

a. Risks and Contingency Planning

The main risks of BRT system have been described in Table 41.

Table 41: Overview of risk categories and possible contingencies

Risks	Description	Contingency action
The socio-economic situation of Pakistan 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 changes.	Review and readjust the program in the light of policy changes.

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.
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b. Next Steps

A Task manager may be identified in NTRC or NEECA and given the task to identify potential donors and develop and submit projects to get donor funding for BRT system. In addition to Government, Private sector may be encouraged to establish BRT system.

Table 42: Identification of immediate requirements and critical next steps

immediate Requirements	Potential donors may be identified and projects may be developed to get donor funding for BRT system.
Critical steps	Active engagement of private sector may be promoted.

4.2. Vehicle Tune up Technology Action Plan

4.2.1. Introduction

Vehicles tune up is an efficient and effective technology for saving fuel consumption and GHG emission reduction. Vehicles need to be tuned up regularly after every 15,000 Km as recommended by National Energy Efficiency and Conservation Authority (NEECA). At the moment, such a requirement exists only for commercial vehicles. Establishing a proper testing system is important in order to ensure that this measure is followed with actual emission reductions.

4.2.2. Step 1: Ambition for promoting Vehicle Tune up

The government has launched the National Automotive Development Policy 2016⁵⁴, which among other measures, pledges to promote pollution mitigation measures to protect public health and property. The ambition for vehicle tune up is to establish 100 new vehicle tune up centers and to upgrade the existing commercial vehicle testing procedure in the major cities of Pakistan to tune up all types of vehicles to increase the efficiency and reduce fuel consumption. In addition, vehicles fitness certification facilities with tune-up centers will be established at selected outlets and filling stations of the oil distributing companies in Pakistan in order to provide efficiency support to the transport sector.

The vision of the technology is to develop a modern, competitive and viable automobile and auto-parts industry capable of meeting national and regional demand through inter alia establishment of infrastructure for quality, safety and environmental standards⁵⁵. Moreover, it aims for promoting regulatory and enforcement mechanisms for quality, safety and environmental standards including development of regulations based on global regulations. The National Energy Efficiency and Conservation Authority (NEECA) plans to establish model Motor Vehicle Examination (MVE) centers in collaboration with federal and provincial traffic police departments. Along the routes of China Pakistan Economic Corridor (CPEC) as well as national highway networks of the authority. The government is planning to support the private sector for the establishment of vehicle tune up centers.

4.2.3. Step 2: Actions and activities selected

a. Summary of Barriers and measures to overcome barriers

The major barriers in the wide diffusion of Vehicle Tune up identified in TNA Barrier Analysis and Enabling Framework report include the economic barriers as high capital cost of computerized tune-up facility. While the non-financial barriers include non-availability of locally available computerized tune up equipment and machineries, limited demonstration of computerized tune up and limited dissemination of awareness raising information through print and electronic media, training and demonstration.

⁵⁴Government of Pakistan, Automotive Development Policy 2016-21, Engineering Development Board, Ministry of Industries and Production, Islamabad <http://boi.gov.pk/userfiles1/file/AutoPolicy/AP.pdf>

⁵⁵ibid, page 73

The enabling framework to overcome barriers are revolving loan fund⁵⁶; domestic manufacturing and installation of the computerized tune up equipment and machineries; wider demonstration, training and awareness. The main barriers and their mitigation measures identified in the TNA process to overcome the barriers are described in Table 43.

Table 43: Overview of Barriers and Measures to overcome these for vehicle tune-up

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	<ul style="list-style-type: none"> • High capital cost of computerized tune-up facility 	<ul style="list-style-type: none"> • Initial capital cost of computerized tune up facility made affordable through revolving loan fund
Non-financial	<ul style="list-style-type: none"> • Computerized tune up equipment and machineries not locally available • Lesser information and awareness raising 	<ul style="list-style-type: none"> • Computerized tune up equipment and machinery locally available through technology transfer program • Training and awareness raising

b. Framework for ranking measures for inclusion as Actions selected for inclusion in the TAP

Based on the UN Environment guidelines for preparation of TAP, the assessment and ranking of identified measures have been done on the basis of effectiveness, efficiency, interaction with other measures, suitability of Vehicle Tune Up within the country, benefits and costs.

Table 44: Framework for ranking measures of promoting Vehicle tune up for inclusion as Actions selected for inclusion in the TAP

Measures	Considerations	Assessment	(Initial) ranking (with rationale)
<i>Initial capital cost of computerized tune up facility made affordable through revolving loan fund</i>	Effectiveness	<ul style="list-style-type: none"> ➤ The computerized tune up have high capital cost due to high price of the machinery and equipment. The measure can be made effective by providing finances for the purchase of tune-up equipment through Revolving Loan Fund (RLF). This RLF will be used for extending soft term loan facility. ➤ The establishment of the fund will increase the affordability of the investors for procuring computerized tune up systems and help in capturing wider market 	1 The Fuel Efficiency and Road Transport Project (FERTS) and Energy Conservation Fund under NEECA have demonstrated the benefits of computerized tune-up facilities. This awareness

⁵⁶ Through the establishment of a revolving loan fund (RLF), loans at concessionary borrowing rates could be disbursed to sustain the growth of tune-up centers.

	Efficiency	<ul style="list-style-type: none"> ➤ The efficiency of loan program can be enhanced by developing business plans with the guidance of NEECA and the funding institution. The measure can be made efficient by providing technical support, such as training of workshop owners interesting in acquiring equipment under the loan fund program. ➤ The IRR is 12% based on 10% rate of interest, respectively⁵⁷. 	<p>has led to submission of a large number of applications for getting soft term loan for establishment of computerized tune-up centers.</p> <p>The revolving fund will be created with the support of government and DFIs. The RLF will be used for extending soft term loan facility with recovery of principle amount and the service charges. Furthermore, support for developing business plans and providing technical support will help to scale up the technology. Therefore, the measure is given top priority as an action.</p>
	Interactions with other measures	<ul style="list-style-type: none"> ➤ Arranging initial capital cost is in conformity with the National Auto policy 2016-21, National Energy Conservation and National Climate Change policies. 	
	Suitability within country/sector	<ul style="list-style-type: none"> ➤ Provision of revolving loan fund (RLF) is required because the tune-up technicians and graduates from vocational training centers cannot afford the initial capital cost for setting up the business. Moreover, reducing capital cost will work when awareness regarding benefits of computerized tune up facilities has been raised among the customers and operators. 	
	Benefits and costs	<ul style="list-style-type: none"> ➤ Workshop owners in the country generally do not have access to capital, and it is expected that availability of credit will greatly accelerate the adoption of advanced engine diagnostic technologies by the private sector. ➤ The cost of the support through revolving fund for Tune up centers is US\$1.786 million and US\$1.212 million at interest rate of 10% and 0%, respectively in 30 years. In addition to environmental and social benefits, the financial net benefits 	

⁵⁷ The costs include Revolving fund for providing loans for the establishment of tune-up centers and the benefits are the service charges received for providing tune-up facility.

		from service charges of the tune-up facility are about US\$5.732 in 30 years.	
<i>Computerized tune up equipment and machinery locally available through technology transfer program</i>	Effectiveness	<ul style="list-style-type: none"> ➤ The equipment required for computerized tune-ups is expensive as it has to be imported. Manufacturing of the equipment locally is necessary for promotion of the technology. The measure could be made effective by providing requisite manufacturing unit, raw material and technology transfer through experts. 	3 The measure will encourage domestic manufacturing of the computerized tune up equipment and machineries. The measure will lead to reduction in cost of equipment with the scaling up of the technology; provide employment opportunities in the country and reduction in air pollution. However, the measure is long term due to unavailability of funding resources and trained technicians. Therefore, the measure is not prioritized as action to be included in technology action plan.
	Efficiency	<ul style="list-style-type: none"> ➤ Study visits of engineers to manufacturing units of computerized tune up centers and expert exchange programs will increase efficiency of the measure. ➤ Networking of the local and foreign manufacturing units to facilitate in manufacturing of equipment's according to standards. Moreover, developing manufacture standards and capacity building of computerized tune up centers will increase the efficiency. ➤ The IRR is 12% but with the passage of time, the cost will reduce when the scale of business expands and becomes economically viable for local manufacturers⁵⁸. 	
	Interactions with other measures	<ul style="list-style-type: none"> ➤ The measure is in conformity with relevant national policies. ➤ The measure has close interaction with the reduction of capital cost for computerize tune up facilities. At present, the machinery and equipment is imported but domestic manufacture of these will not only reduce the operational cost but also increase employment opportunities. 	

⁵⁸ The costs include fund for providing loans for the establishment of tune-up centers and the benefits are the service charges received for providing tune-up facility

	Suitability within country/sector	➤ The measure is suitable for the country because local manufacture will lower the cost of equipment and machineries and provide employment opportunities and other socio-economic benefits.	
	Benefits and costs	➤ The measure is cost effective. The cost and benefit of tune up equipment center is US\$1.786 million and US\$5.158 million, respectively ⁵⁹ . The environmental, social and economic benefits are in addition to the financial benefits.	
Training and awareness raising	Effectiveness	<ul style="list-style-type: none"> ➤ With the provision of computerized tune up centers, adequate training of the operators is important for full effectiveness. ➤ Effectiveness of the measure can be enhanced by explaining the benefits and potential advantages of using diagnostic equipment to the owners. Its management aspects including quality control, importance of trained mechanics, and techniques for building customer confidence and marketing. ➤ A nation-wide publicity and awareness campaign to be launched parallel with the establishment of the tune-up demonstration centers. The purpose of the campaign will be to develop the market for tune-ups. The campaign to be based on information materials and media messages to inform the vehicle owners and drivers of the benefits of tune-ups. 	<p>2</p> <p>Among both the service sector and the customers, there is a serious lack of awareness and understanding concerning modern engine diagnostic practices and the equipment required for the diagnostics. Vehicle engine tune-ups are normally conducted manually by informally trained technicians who learn the trade on the job and perform engine analysis while relying almost entirely on subjective sensory clues and personal</p>
	Efficiency	➤ In addition to technical trainings, training on quality control, techniques for building customer confidence and marketing will enhance the efficiency of the activity.	

⁵⁹ The costs include Revolving fund for providing loans for the establishment of tune-up centers and the benefits are the service charges received for providing tune-up facility.

		<ul style="list-style-type: none"> ➤ Efficiency can be enhanced by involving and cost sharing with car dealers and oil marketing companies in awareness campaigns and use their retail outlets for distribution of information material. ➤ Capacity building of institutions to provide trained labour for manufacture of computerized tune up equipment and machinery will increase the efficiency. The measure will build confidence of financial institutions and the suppliers of the technology. This will result in promoting the technology at a large scale in the country. The IRR is 12%⁶⁰. 	<p>experience. This leads to the propagation of faulty and incorrect engine diagnosis and maintenance practices. Therefore, the training of technicians and awareness raising has been given second high priority.</p>
	Interactions with other measures	<ul style="list-style-type: none"> ➤ The measure is in conformity with national policies. Awareness raising of general public and accredited technicians will mobilize the investment of common people and the banks' loan portfolio towards automated vehicle tune up. 	
	Suitability within country/sector	<ul style="list-style-type: none"> ➤ The number of goods and passenger transport vehicles have increased manifold over the past 5-10 years. Therefore, there is a need for proper tune up of these increasing numbers of vehicles to save fuel consumption, money and environment. 	
	Benefits and costs	<ul style="list-style-type: none"> ➤ The benefits of the measure are manifold including economic, health improvement, enhancement of environmental quality and reduced climate change impacts. ➤ The costs and benefits of the technology are US\$1.786 million and US\$5.158 million, respectively. 	

⁶⁰ The costs include fund for providing loans for the establishment of tune-up centers and the benefits are the service charges received for providing tune-up facility

c. Final selection of Actions for inclusion in the TAP

Two measures selected as actions for promoting vehicle tune up after assessment of possible measures and consultation with the Expert Working Group on Mitigation are described in Table 45.

Table 45: Final selection of Actions/Measures for promoting Vehicle Tune-up for inclusion in the TAP

Categories	Identified measures to overcome barriers (ranking)	Measures selected as actions for inclusion in TAP
Economic and Financial	<ul style="list-style-type: none"> Initial capital cost of computerized tune up facility made affordable through revolving loan fund (RLF) (1) 	<ul style="list-style-type: none"> Initial capital cost of computerized tune up facility made affordable through revolving loan fund
Non-Financial	<ul style="list-style-type: none"> Computerized tune up equipment and machinery locally available through technology transfer program (3) Training and awareness raising (2) 	<ul style="list-style-type: none"> Training and awareness raising

d. Identifying activities for the selected Actions

Action 1: Initial capital cost of computerized tune up facility made affordable through revolving loan fund

The action will involve developing proposals to establish the Revolving Loan Fund to finance the vehicle tune up program; design its implementing and management structure; disburse and recover loans; and documentation and monitoring of the loan program.

Table 46: Identification and description of specific activities to support “Action 1”

Activity 1.1. Identification of potential donors developing and submitting proposal to finance the vehicle tune up program.
Activity 1.2. Study the feasibility and consult with potential operating partners for establishing revolving loan Fund (RLF)
Activity 1.3. Design RLF implementing and management structure
Activity 1.4: Establishment of a revolving loan fund (RLF).
Activity 1.5. Secure the services of a financial institution to manage the RLF to disburse and recover loans
Activity 1.6. Documentation and monitoring of loan fund program.

Action 2: Training and Awareness raising

Training and awareness raising through identifying training centers; developing communications strategy taking into account the structure of market, customer background and psychology, established norms and practices, decision systems, cultural preferences and real incentives offered by tune-ups.

Develop awareness materials and organize demonstration events; develop training manuals and provide training to vehicle service providers through short courses on dissemination of information to vehicle owners, users and motor vehicle examiners. Mass awareness through electronic and print media and social media and involve vehicle distributors and oil marketing companies in awareness campaigns and their retail outlets can be used for distribution of information materials.

Table 47: Identification and description of specific activities to support Action 2

Activity 2.1. Identify training centres and conduct trainings for workshop owners and motor mechanics
Activity 2.2. Develop communications strategy
Activity 2.3. Development of awareness materials and demonstration events in cities to show how to maintain vehicles efficiently
Activity 2.4. Develop Training manuals and provide training to vehicle service providers.
Activity 2.5. Mass awareness through electronic and print media and Social media.

4.2.4. Step 3: Identifying Stakeholders and determining timelines

The timeline of the plan is 5 years starting from July 2018 until June 2023. The main primary parties include Technical Education and Vocational Training Authority (TEVTA), National Energy Efficiency and Conservation Authority (NEECA), National Transport Research Center (NTRC) and the bank providing loaning facilities presented in Table 48.

Table 48: Characterization of activities for Implementation of Actions for vehicle tune up

Action	Activities	Planning		Implementation		Responsibility	
		When?				Who?	
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary
1. Initial capital cost of computerized tune up	1.1. Identification of potential donors developing and submitting	July 2018	Dec. 2019	Oct. 2019	Dec. 2020	NEECA	MoCC, NTRC

facility made affordable through revolving loan fund	project proposals						
	1.2. Study the feasibility and consult with potential operating partners for establishing Revolving Loan Fund (RLF)	Aug 2018	Jan. 2019			NEECA	MoCC, NTRC
	1.3.Design RLF implementing and management structure	Feb. 2019	July 2019			NEECA	MoCC, NTRC
	1.4.Establishment of a Revolving Loan Fund (RLF)			Aug. 2019	June 2020	NEECA	MoCC, NTRC
	1.5.Secure the services of a financial institution to manage the RLF to disburse and recover loans			Aug. 2019	June 2023	NEECA	MoCC, NTRC
	1.6.Documentation and monitoring of RLF program.			Aug. 2019	June 2023	Banks	NEECA MoCC, & NTRC
2.Training and Awareness raising	2.1.Identify training centres and conduct trainings for workshop owners and motor mechanics	July 2018	Dec. 2018	Jan. 2019	Dec. 2022	NEECA, TEVTA	NTRC, MoCC
	2.2.Develop communications strategy	Dec. 2018	June 2019			Ministry of Communication, NTRC	MoCC, NEECA
	2.3.Development of awareness materials and demonstration events in cities to	Dec. 2018	June 2019	July 2019	Dec. 2022	NEECA, NTRC	TEVTA

	show how to maintain vehicles efficiently						
	2.4.Training of vehicle service providers and Motor Vehicle Examiners			July 2019	Dec. 2022	TEVTA	NEECA, Motor Vehicle Examiners
	2.5.Mass awareness through electronic ,print and social media	July 2018	June 2019	July 2019	Dec. 2022	NEECA, Media	PEMRA

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

In training programs training institutes will be identified for accreditation by the relevant concerned institutions like Pakistan National Accreditation Council (PNAC), Higher Education Commission (HEC), Technical Education and Vocational Training Authority (TEVTA), or National Vocational and Technical Training Commission (NAVTTTC). The capacity needs of these institutes will be assessed and enhanced. The capacity of NEECA will be assessed and built. The activities and budget is indicated at Annexure-X.

4.2.6. Step 5: Management Planning

a. Risks and Contingency Planning

The field of automated vehicle tune up is among the most emerging technology and rapid innovations are taking place in this field. Many of the risks like high upfront cost have already been covered to some extent. The main risks of vehicle tune up technology have been described in table below.

Table 49: Overview of risk categories and possible contingencies for promoting vehicle tune up

Risks	Description	Contingency action
Change in government policies.	With change of government usually the priorities also changes.	Review and readjust the program in the light of policy changes.
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.
Low political commitment because of uncertain macro-economic and	The slow pace of economic growth is impacting macro-economic conditions of the country.	International and regional support increased for global benefits.

financial condition of Pakistan		
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b. Next Steps

A dedicated desk may be established in NEECA for establishing linkages with the potential stakeholders, resource mobilization and project preparation to establish and upgrade vehicle tune up centers for enhancing efficiency and reduction in fuel consumption. Establish linkages with academia and relevant research and development institutions and collaborate with international technology providers. Universities and relevant local industries should be involved in technology transfer programs.

Table 50: Identification of immediate requirements and critical next steps

Immediate Requirements	A Task Manager may be designated in NEECA for preparing proposals for mobilizing resources for automated vehicle tune up and establishment of linkages with the potential stakeholders including donors for support for implementation of different components of vehicle tune up.
Critical steps	Create mass awareness on vehicle tune up so that people are more attracted to promote the technology. Universities and relevant research and development institutions should be involved in technology transfer programs.

Chapter 5: Project Idea Notes on Prioritized Technologies

This chapter presents six project idea notes, two in each of the three prioritized mitigation sectors i.e. energy, forestry and transport sectors based on their contribution to socio-economic development and climate change mitigation potential. The project idea notes are comprehensive description of selected actions from the Technology Action Plan (TAP). These notes include brief project background, objectives, outputs, their relationship to the country's sustainable development priorities, project deliverables, and the project budget.

It is envisaged that the project idea notes will facilitate the Ministry of Climate Change to engage with potential bilateral and multilateral donor agencies. This will also facilitate access to funding through Green Climate Fund (GCF) and Global Environment Facility (GEF). These facilities were created under the convention to provide funding support to developing countries to implement projects that can help to reduce GHG emissions and move towards low carbon growth trajectory.

Following are the project idea notes on energy, forestry and transport sectors

5.1. Energy Sector

5.1.1. Project Idea Note on “Promotion and Diffusion of Solar PV Technology at Household Level in Pakistan”

a. Introduction and Background

Solar PV technology at household levels has vast diffusion and dissemination potential in the current scenario of frequent power breakdowns. To overcome this challenge, Pakistan Vision 2025 focuses on increasing production of electricity by optimizing energy generation mix with reference to its indigenouslyness, economic feasibility, scalability, and environmental impact to meet the energy demand through adoption of low GHG emission mitigation technologies. According to the World Bank, approx. 44 percent of households in Pakistan are not connected to the national grid⁶¹. Promotion of Solar PV is the best solution to the energy crisis because lighting off-grid households with solar require only a one-off cost and effort, it also avoids greenhouse gas emissions and provides a more reliable supply of power.

The proposed project focuses on the promotion of Solar PV technology for home electrification in urban (on-grid) and rural (off-grid) to reduce GHG emissions as well as provide electricity. In the current business as usual scenario, the State Bank of Pakistan has established a dedicated credit line for financing renewable energy projects including solar energy at 6% rate of interest. Therefore, the proposed project has been designed to extend this soft-term loan facility through commercial banks for solar PV installation at household level.

The proposed financing mechanism aims to cover both on-grid and off-grid solar battery based system. The on-grid system is proposed for urban and peri-urban households that are connected to national grid power system but are facing frequent electricity breakdown. The on-grid solar PV will provide electricity supply backup to the households as well as an opportunity to sell extra electricity produced to the electric supply companies through reverse metering. This

⁶¹ Solar energy: The alternative: <http://nation.com.pk/25-Jan-2017/solar-energy-the-alternative>

system has proved to be extremely successful in many developed and developing countries around the world and the financial institutions have created a wide market. The reverse metering mechanism helps the borrowers to pay back the loan through selling of extra electricity generated by the solar PV system. Hence, the rate of default is relatively very low. While, the off-grid solar system market are not connected to the national grid but have a strong potential of growth for generation of economic activity provided the electric power supply is made available to the areas lacking access to electricity.

In exploring different levels of support, the private sector investment is important, which will ultimately lead to a long-term sustainable market for solar PV. It is also anticipated that in future years the technology costs of solar PV will reduce, thus increasing affordability and reducing the payback period.

Innovative public-private business models can be developed by financial institutions to attract large population to provide affordable residential solar PV in both rural and urban areas. The public support and involvement in the initiative can be led by the Alternate Energy Development Board (AEDB), working together with other key stakeholders like Ministry of Climate Change, Government of Pakistan, private sector solar PV installers, and financing institutions.

b. Objective of the project:

The objective of the project is to create enabling environment for the promotion of solar PV for reducing pressure on existing energy demand and supply gap and reduction of GHG emissions. The project will support the successful implementation of a sustainable energy financing mechanism to provide soft-term loans through commercial banks to ensure that there is at least 1,600 MW of installed capacity of off-grid residential solar PV in 1.6 million households⁶² by the end of the project. The mitigation potential of the project is in the range of approximately 33.2 million tons of CO_{2e} for the life of solar PV which is 25 years.

c. Project Outputs and measurable

Following are the project outputs:

- The project is targeting 1.6 million households by end of project in rural and urban households, which will provide 1,600 MW.
- Enhanced enabling policy environment within which a commercial bank develops sustainable energy 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
- The commercial banks successfully provide soft term loans to contribute to the deployment of solar PV to at least 1.6 million HHs;

⁶² Each HH will have solar PV system of 1KW capacity

- The project will not only reduce GHG emissions from fossil fuel to clean energy but will help in saving energy crisis, reducing deforestation, forest and land degradation in the country.

d. Relationship to the country's sustainable development priorities

Pakistan National Sustainable Development Strategy focuses on “eliminating electricity demand supply gap by diversifying and optimizing energy generation mix”. Moreover, the project will help Pakistan in fulfilling its commitments made in the Intended Nationally Determined Contributions (INDC) and Pakistan Vision 2025 of using low emission greenhouse gas technologies thus increasing the share of renewables to 15% by the year 2025. Therefore, the proposed project is in conformity with the sustainable development priorities of the country.

The present project conforms to the Pakistan Vision 2025 and Integrated Energy Plan 2009-2022 that recognizes establishment of renewable energy power projects. The Integrated Energy Plan suggests harnessing 5,500 MW of solar energy potential comprising of 1,500 MW from on-grid; 2,000 MW from off-grid solar power generation (PV) and 2,000 MW from solar thermal. For remote areas, the plan is to encourage hybrid power generation system. The plan also includes adding at least one million customers and approximately 3000 MW of solar power through Net metering by 2025.

e. Project deliverables

- The project will provide support to solar PV installation to about 1.6 million households.
- Global environmental benefits from this project are expected to be substantial. Over a period of 25 year lifetime of the solar PV systems approximately 33.2⁶³ million tons of CO_{2e} will be reduced.
- Benefits of the solar PV will be widely disseminated and will create market for solar installation and employment opportunities for about 200,000 persons all over Pakistan.
- The project will expand funding for solar PV installations.
- The project will help in reducing shortfall of electricity in the country and burden on the national grid.

f. Project scope and possible implementation

The project scope covers rural and urban households of the country. Pakistan has very good solar resource potential as its geographical location is highly favorable for the utilization of solar energy. The country, being located in the sun-belt region, has plenty of solar radiation daily available throughout the year. The annual average solar radiation on a horizontal surface varies from 4.7 kWh/m² to 6.2 kWh/m². The number of clear sunny days in the country varies from 250 in the northern region to above 300 days in most part of the country, therefore harnessing this potential is the basis of the proposed scenario. At present in Pakistan 28 projects

⁶³ As per CDM methodology “ACM0002 (Version 13): Consolidated baseline methodology for grid-connected electricity generation from renewable sources”

of 956.8 MW capacity are under implementation within the framework of AEDB. The proposed project will add to the already established solar photovoltaic systems. For installation of solar PV soft loan @6% interest will be made available to the consumers as per the circular # 3 dated 20 June 2016 of the State Bank of Pakistan.

g. Project activities

The project will be implemented by Ministry of Climate Change 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 to expand the solar PV technology and credit portfolio.
- Implementation of policy and institutional framework of the banks for supporting sustainable energy financing mechanism for off-grid and on-grid solar PV systems.
- Capacity building:
 - training of local level technicians on solar PV systems 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 for solar loans, installation and maintenance.
 - Training of financial institutions and solar PV suppliers
- Promotion of Special Credit line for renewable energy established by State Bank of Pakistan;
- Quality control of solar PV system by the Pakistan Standards and Quality Control Authority (PSQCA) and Alternate Energy Development Board to ensure that high quality solar PV systems are imported;
- Develop monitoring and evaluation system for quality control of solar PV;
- Institutional collaboration mechanism between the government, private sector, NGOs and community groups.
- Supporting marketing campaign by the private sector of solar PV suppliers

h. Timelines

The life of the project is five years (5 years).

i. Project budget (Tentative)

The total project budget is US Dollars 30 million. Details of project budget presented in table below:

Tentative budget for solar PV Systems

No.	Item	Total cost (Mil PKR)
1	Awareness raising campaigns through print and electronic media and involvement of Civil society	2000
2	Support for Policy and Institutional Framework of the banks	50

3	Training/ Capacity building of financing institutions, local technicians & suppliers	150
4	Promotion of special credit line for renewable energy	400
5	Support to PSQCA & AEDB for standardization and labeling of solar PV systems	200
6	Project Management Cost (including M & E)	200
	Total cost in Mil. PKR	3000
	Total cost in (Million US\$)*	30.0

* The conversion rate assumed is 1 US\$ = 100 PKR

j. Measurement/Evaluation

The project will assist in providing solar PV based electricity to 1.6 million households. The spill-over effect will further increase this portfolio. The project will involve mid-term and end of project evaluation.

k. Possible Complications/Challenges

The barriers, in the promotion of solar energy technology in Pakistan are summarized below.

Awareness Barriers: There is a lack of awareness about the policy to support renewable energy as well as about the benefits and economic feasibility of solar PV projects. There is a lack of awareness about how carbon finance might provide the stimulus towards additional investment in solar renewable energy. This project will help to raise awareness about the benefits of solar PV.

Technical Barriers: There is a lack of capacity among the solar PV value chain actors (solar installers, utilities, banks, end-users, local level technicians) to conduct proper due diligence on proposed renewable energy solar PV projects. The local level technicians do not have accredited certified trainings so the banks are hesitant to rely on using their assessment for considering grant of loans. In addition, within banks, there is a lack of technical capacity to establish sustainable energy financing programme. Technical barriers need to be overcome by training and targeted capacity building activities.

Institutional Barriers: There is a lack of approved institutional framework/ project assessment MRV systems, quality standards and approval procedure by which banks can assess renewable energy solar PV projects. The project will assist in overcoming institutional barriers.

Financial Barriers: There is a lack of ability among the private sector to finance solar PV due to the lack of capital, and lack of ability to raise finance. In addition, risks of payment default are higher. Soft loans will instantly make financing available for solar PV projects in urban and rural areas.

l. Responsibilities and Coordination

The project will be coordinated by Alternate Energy Development Board (AEDB), Government of Pakistan and implemented by the provincial energy departments in collaboration with the PSQCA, banks, Local Government, CBOs and the private sector. Training and awareness raising will be the responsibility of the AEDB, PCRET, TEVTA and the Provincial Energy Departments during and after the execution of the project. The operation

and maintenance of the plants after its installation will be the responsibility of the CBOs in the rural areas in the country.

5.1.2. Project Idea Note on “Promotion of Micro hydropower plants in Pakistan”

a. 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 Pakistan’s to reduce GHG emissions.

Pakistan has about 50,000 MW potential of micro hydropower plants. The current gap between electricity demand and supply in Pakistan is more than 8,000 MW. The government has a plan to add additional 25,000 MW by 2025 and improve the energy mix in favor of renewables⁶⁴. Moreover, the capacity of electricity transmission and distribution through national and regional grids is also being upgraded. The country is also working on improving the energy efficiency of electrical equipment and transmission and distribution through various projects. The proposed project will provide 150 MW of renewable energy to 200,000 households⁶⁵ for mountainous and forested area of the country. The households will have access to the credit line for financing renewable energy projects including hydro at 6% interest rate established by State Bank of Pakistan.

b. 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. The mitigation potential of the project is about 29 million tons of CO₂eq for 30 years⁶⁶.

c. Project Outputs and measurable

⁶⁴ Pakistan Vision 2025

⁶⁵ Each HH will get electricity of 750 watts capacity

⁶⁶ CDM Methodology used in the following project was adopted:

https://cdm.unfccc.int/filestorage/H/2/I/H2I7FOADNZC3P9XMW58Y0EQV1T6KUS/1713_PDD_ver10.pdf?t=WXV8b3ptMG5yfDDxVJZn4sORpZa-HV8Sie9I

The project will provide 150 MW of renewable energy to 200,000 households and build capacity of institutions and technicians for its installation. The households will have access to the credit line for financing renewable energy projects at 6% interest rate established by State Bank of Pakistan.

d. Relationship to the country's sustainable development priorities

Pakistan National Sustainable Development Strategy focuses on “Eliminating electricity demand supply gap by diversifying and optimizing energy generation mix”. Therefore, the proposed technology is in conformity with the sustainable development priorities of the country.

e. Project deliverables

- Provide electricity to about 200,000 households in the mountainous and forested areas of the country.
- In addition to this, about 100,000 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 which are the major cause of reduction of life of big dams e.g. Tarbella and Mangla dams.
- 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.

f. Project scope and possible implementation

The project is proposed for Khyber Pakhtunkhwa (KP) province, Gilgit Baltistan (GB) and Azad Jammu and Kashmir (AJK). The production of electricity from hydropower is among the cheapest sources of energy in Pakistan. 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.

In Gilgit Baltistan there are 126 units of Micro, mini and small hydropower plants that are producing a cumulative capacity of 131 MW but in winter its generation drops to 77 MW. The total demand in Gilgit Baltistan is more than 2,628 GWh/yr. There are more than 100 units of micro hydropower plants in AJK with a cumulative capacity of around 100 MW. The total demand in AJK is more than 3,504 GWh/yr. In AJK micro, mini and small hydropower plants with a cumulative capacity of 2,000 MW are under consideration. In Khyber Pakhtunkhwa province, about 250 micro, mini and small hydropower projects (MHPs) will become fully operational and functional to provide electricity to around 245,000 people in hilly areas of Khyber Pakhtunkhwa through community-based local institutional mechanism.

It has been noted that the project life of Tarbella Dam has been reduced by about 25 years due to siltation from upstream areas and the production of cheap electricity through micro hydropower plants will help in reducing deforestation that will ultimately reduce siltation and soil erosion. The proposed project will add to the already established micro hydropower plants.

g. Project activities

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 State Bank of Pakistan.
- Develop monitoring and evaluation system for micro hydro power plants.
- Institutional collaboration mechanism between the government, private sector, NGOs and community groups.
-

h. Timelines

The life of the project is five years (5years).

i. Project budget (Tentative)

The total proposed project budget is US\$5.35 million. Details of tentative budget presented in table below:

Tentative budget for micro-and small hydropower plants

#	Item	Total cost (Mil PKR)
1	Awareness raising of general public	300
2	Training/ Capacity building of financing institutions, manufacturers, suppliers and local technicians	100
3	Promotion of special credit line for renewable energy	100
4	Project Management Cost (including M & E)	35
	Total cost in Mil. PKR	535
	Total cost in (Million US\$)*	5.35

* The conversion rate assumed is 1 US\$ = 100 PKR

j. Measurement/Evaluation

The project will assist in producing 150 MW of electricity. The spillover effect will further increase the electricity production capacity. The project will involve mid-term and end of project evaluation.

k. Possible Complications/Challenges

The barriers in implementation of micro hydropower plants are as under,

Initial High Capital cost: On an average, the initial capital cost of micro hydropower plant of 100 KWs capacity costs between 7.0 million to 10.0 million PKR that can serve a cluster of 130 households. Average cost per household is around PKR 20,000, which is high considering the income level of the target population. The potential areas of micro hydropower plants are remote and these areas are generally inaccessible due to poor infrastructure network. The operation and maintenance of the system, is often affected due to non-availability of spare parts in the local towns.

Difficulty to Access Finance: The procedure for accessing soft term loan is cumbersome and takes time. Due to this reason, the potential small hydropower sites remain unharnessed.

Lack of integrated policy and programs: The Federal Policy for Development of Renewable Energy for Power Generation 2006 does not adequately address the diffusion of micro hydropower plants. The local level concerned government institutions lack capacity as well as regulatory mechanisms to establish efficient implementation and diffusion of the technology. Further, there is a poor coordination among line agencies, which create hurdles in up-scaling of the technology. Absence of strategies and programs for the promotion of the technology and the specific guidelines for micro hydropower plants are hindering diffusion of the technology despite having a huge potential.

Absence of information and knowledge: Generally, people are ignorant about the basic technical information about the hydropower plants. There is no knowledge about machineries, equipment and accessories, their costs, and relevant agencies from where necessary technical and financial information and support can be obtained for micro hydropower plants. The local technicians and mid-level professionals do not have adequate knowledge and experience of installation of micro hydropower plants as well as providing back up support. Further, non-availability of certified technicians and trainers results in high risk factor, hence the banks are hesitant to extend loans for micro hydropower plants.

1. Responsibilities and Coordination

The project will be coordinated by Alternate Energy Development Board (AEDB), Government of Pakistan and implemented by the provincial energy departments in collaboration with the banks, CBOs and the private sector. Training and awareness raising will be the responsibility of the AEDB, PCRET, NGOs and the provincial Energy departments during and after the execution of the project. The operation and maintenance of the plants after its installation will be the responsibility of the CBOs in remote areas.

5.2. Forestry Sector

5.2.1. Project Idea Note on “Preparation and implementation of Sustainable Forest Management Plans”

a. Introduction and Background

Forest ecosystems are major source of carbon sink and play a vital role in climate change mitigation. Pakistan being a country with arid and semi-arid climatic conditions has about 5 percent of its area under forest cover. The forest cover is depleting at the rate of 2.1 % per annum, which is the highest in Asia due to which Pakistan is ranked at 110th in forest cover of the world⁶⁷. The main causes of deforestation and forest degradation include population pressure; no proper land use planning, intensification of agriculture, increased settlements and industries. It is further aggravated by poverty, affordable alternatives are not available at remote areas, livelihood activities and climate change. The ecosystem services include provisioning/ productive services like wood products; regulating services like climate change control through carbon storage; supporting services like nutrient cycle and cultural services like recreational benefits.

The Pakistan’s Vision 2025 recognizes that deforestation and forest degradation pose serious risks to Pakistan’s environmental protection and climate change mitigation efforts. Keeping this in view, the Government of Pakistan plans to plant 1.5 billion trees over the next five years under the Federal Government’s Green Pakistan Program and other provincial programs include spring and monsoon tree plantation and Tsunami one billion tree plantation program. These programs will help in reducing emissions by afforestation, reforestation and social forestry through sustainable forest management. Women, senior citizens, youth, progressive farmers and provincial Forest Departments, are major stakeholders in these programs.

About 40% of the total area of forests in Pakistan is in the Khyber Pakhtunkhwa Province, mostly located in the mountainous tract of Malakand and Hazara civil divisions. The remaining forests are in Balochistan (14%), Punjab (14.4%), Sindh (9.4%), Gilgit Baltistan (GB) 15.7%) and AJK (6.5%). The average per capita forest and woodland area in the country is 0.023 ha/capita, which is amongst the lowest in the world.

The forest ecosystems in the country include alpine and sub-alpine, dry and moist coniferous forests, including Juniper forests, sub-tropical pine forests, sub-tropical; broad leaved (scrub) forests, tropical dry thorn forests and riverine and mangrove forests. Among these forest ecosystems, moist temperate coniferous, sub-tropical scrub and riverine forests are targeted by this project.

b. Project Objective

The objective of the proposed project is to promote sustainable forest management in Pakistan's Himalayan Temperate coniferous, Sub-tropical broadleaved evergreen thorn (Scrub) and Riverine forests for biodiversity conservation, mitigation of climate change and securing of forest ecosystem services. In particular, it aims at implementation of three inter-related and mutually complementary components that are focused at addressing the barriers of inadequate

⁶⁷ Abubakar, S.M; 2015; Climate change issues, save falling trees; <http://wwf.org.pk/blog/2015/02/03/save-falling-trees/>

planning, regulatory and institutional frameworks to integrated forest resource management, and enhancing the limited experience among key government and civil society stakeholders in developing and implementing SFM practices on the ground.

c. Project Outputs and measurable

The proposed project will promote SFM in 67,861 ha of conifer, scrub and riverine forests and conserve globally important biodiversity. The spillover effect of the project on the surrounding areas will multiply this figure.

d. Relationship to the country's sustainable development priorities

Pakistan National Sustainable Development Strategy and Target 15.b of Sustainable Development Goals stresses on sustainable forest management.

e. Project deliverables

The project will secure carbon benefits totaling 9,908.1 KtCO₂-eq calculated for a period of 30 years. The project will also help in successful demonstration of landscape approach to SFM and UN REDD+ implementation in Pakistan. It will also save these critical forest landscapes of high biodiversity significance from habitat destruction and loss of globally important species and ecosystems.

f. Project scope and possible implementation

The project is proposed for Punjab, Sindh, Khyber Pakhtunkhwa provinces and Azad Jammu and Kashmir. The sustainable management through protection of forests is a cost effective way to protect the existing forest area. The Government is implementing projects like Green Pakistan Program and Sustainable Forest Management to Secure Multiple Benefits in Pakistan's High Conservation Value Forests. Provincial governments have their own projects for forest management. Even then, the area of forests is not increasing in Pakistan because of high rate of deforestation. This project will support the afforestation activities throughout the country.

g. Project activities

The components of the proposed project include:

- a. Component 1 will support the incorporation of sustainable forest management objectives and safeguards in forest management planning, forestland allocation and compliance of monitoring systems at the local level, as well as capacity building and awareness raising.
- b. Component 2 will identify, demarcate and implement on-the-ground approaches to improving management of high conservation value forests within seven landscapes covering an area of 67,861 ha with the aim of protecting and conserving the threatened forest ecosystems and its habitats such as breeding areas, feeding areas, water sources, dispersal and connectivity corridors, etc. Community will contribute 20% of the on-the-ground activities, in cash or in kind.
- c. Component 3 will develop practical approaches to enhancing carbon sequestration through restoring degraded and former forested areas (LULUCF activities) by a

combination of restoration and reforestation of 10,005 ha of degraded conifer forests; 3,400 ha of degraded scrub forests, and reforestation of 13,099 ha of Riverine forests with native species.

h. Timelines

The life of the project is five years.

i. Project budget (Tentative)

The total budget of the project amounts to US\$15.0 million. The component wise budget is as below:

Tentative budget for SFM project

#	Item	Project cost (Mil PKR)
1	Component 1	176.70
2	Component 2	290.89
3	Component 3	847.48
4	Project Management (including M & E)	184.93
	Total cost in Mil PKR	1500.00
	Total cost in Mil US\$*	15.00

* The conversion rate assumed is 1 US\$ = 100 PKR

j. Measurement/Evaluation

The project will protect forests on about 67,861 ha of critical forest habitats directly. The spillover effect will further increase this area. The project will involve mid-term and end of project evaluation.

k. Possible Complications/Challenges

There are threats of loss or degradation of biological diversity, and accelerated deforestation and forest degradation in many parts of the country. The threats and underlying causes of forest degradation are:

Increase pressure on natural resources and land – Rapid increase in Pakistan’s population and industrial growth has resulted in overexploitation of forests. The poor rural forest dependent communities are forced to over utilize forests for meeting their livelihood requirements in the absence of alternatives to fuel wood and timber as well as alternative livelihoods. Deforestation causes drying of aquifers, reduced carbon sequestration, aridity in climate, reduction in water retaining capacity of soil, excessive water runoff, destruction and deterioration of wildlife resulting in lower numbers of wild animals and birds and lost or degraded habitats.

Government priority and policies: Forestry is amongst the low priority sector in the country. The government policies, like lease of state forests to people, have resulted in deforestation and degradation of forest land. Besides there is a lack of integration of sustainable forest management in development planning at the national and provincial level.

Natural disasters and climate change - As an impact of deforestation and climate change, floods have been occurring every year since 2010, one of the main reasons for such amplified intensity of floods is the increased runoff due to absence of trees and ground flora in the deforested mountainous areas. The water storage capacity of the biggest dam – Tarbela – is decreasing by 90,000 acre feet each year. Water storage capacity of other dams like Mangla and barrages has also been decreased. This results in reduced power generation and limited control of floods, due to the decreased capacity of the dams. The damages due to floods increases due to dislodging and washing away of timber with the floodwater, weakening the dams and retaining walls, which were otherwise supposed to protect the land from floods; sweeps away bridges, people and anything else in its way.

Absence of financial/social incentives for resource dependent communities: Resource dependent communities and land owners are not rewarded for resource conservation as no funding and sharing mechanisms exist to cover their opportunity costs related to forest exploitation. For example compensation payments for watershed protection paid by downstream provinces to an upstream province are not specifically used for SFM in the latter territories at local level. Institutional and regulatory frameworks at provincial level are not effective in supporting Payment for Environmental Services (PES), including REDD+ and tuning with national strategies and requirements in the framework of UNFCCC.

1. Responsibilities and Coordination

The project will be coordinated by Inspector General (Forests) office, Ministry of Climate Change and implemented by the provincial Forest Departments in collaboration with local NGOs and CBOs. Forest protection and plantation on government land will be the responsibility of the Provincial Forest Department and on private lands, it will be the responsibility of the local communities.

5.2.2. Project Idea Note on “Social Forestry in Dry Areas of Punjab (Thal desert)”

a. Introduction and Background

Pakistan has one of the lowest proportions of forest area in the world. Existing forests cannot meet the growing needs of wood and wood-based products. Forest resources in the country are depleting due to commercial overexploitation. In order to reclaim degraded forest lands, ensure sustainable use of marginal lands, protect good quality land and tree planting on farm lands. Among all the available options, the practice of social forestry is the most feasible and viable option in improving forests and forestry situation in Pakistan.

Social forestry contributes to carbon sequestration and thereby play a vital role in retarding global warming and climate change. Social Forestry means development of forests by the community to meet fuel, fodder and timber needs. The other benefits of Social Forestry are to increase tree cover to conserve biodiversity, reduce soil erosion, protections against disasters, protect aquifers and watershed areas. The tree cover absorbs CO₂ out of the atmosphere through photosynthesis and stores it as organic carbon in above-ground biomass (trees and other plants)

and in the soil through root growth and incorporation of organic matter. Thus, the process of release of more CO₂ to the atmosphere are reversed, at least partially, through growing more trees and protecting of already existing forest cover which serves as a carbon sink. Shading crops and the rhizosphere by the trees also reduces evapo-transpiration (ET) of the cropped area. The organic carbon and nitrogen contents in the soil increase in the top 10 cm depth of an improved forestry plantation.

There is active participation of women, and youth in this sector. The main objective of social forestry is to involve the rural communities in creation and maintenance of woodlots or raising tree plantations along with agricultural crops or shelter-belts on community lands, private lands and in homestead.

As per National Forest Policy, 2016 the Federal Government shall sponsor mass afforestation programs in FATA and Gilgit-Baltistan that would be implemented by Forest Departments, concerned line departments, community based organizations and farmers. All Provincial, territorial and local governments shall provide incentives for promoting farm forestry, commercial and industrial forestry by encouraging private investments for increasing area under forests and plantations. These programs will help in reducing, reforestation and social forestry through sustainable forest management. Women, senior citizens, youth, progressive farmers and provincial Forest Departments, are major stakeholders in these programs.

Almost 50% of the total land area of Punjab covering Bhakkar, Liah district, Noorpur Thal tehsil of Khushab is susceptible to land degradation and desertification. Due to construction of Thal canal, in many parts of these dry areas, groundwater is available at 20-50 feet depth, which is very suitable for growing woodlots helpful in climate change mitigation.

b. Project Objectives

The specific objectives of planned interventions are as under:

- Mobilize local CBOs for establishing woodlots to combat land degradation and desertification;
- Promote woodlots to reduce wind erosion and stabilize sand dunes;
- Introduce solar pumps to provide necessary irrigation to the woodlots and
- improvised irrigation system to establish woodlots.

c. Project Outputs and measurable

The project will deliver social forestry by establishing woodlots on 30 compact blocks of 10 acres each. The project will result in sand dune stabilization, reducing soil erosion, increasing area under forests, job opportunities, income and socio-economic conditions of local communities. The micro-climate of the area will change over time. Planting of indigenous tree species in the area will contribute towards increasing species diversity.

d. Relationship to the country's sustainable development priorities

Pakistan National Sustainable Development Strategy and Target 15.b of Sustainable Development Goals stresses on sustainable forest management and afforestation.

e. Project deliverables

The project will deliver afforestation, sand dune stabilization and prevent soil erosion through establishing woodlots by using solar pumps as a renewable source of energy. In each of 30 compact blocks, there will be a solar pump and water distribution system. The project will secure carbon benefits through its sequestration, which is estimated to be about 30,000 tons of carbon in 300 acres over a period of 5 years.

f. Project Scope

The project is proposed for Bhakkar, Liah district, Noorpur Thal tehsil of Khushab. These areas are considered to be important for establishing woodlots because plenty of land is available which consists of mostly sand dunes and groundwater is available at a depth of about 20-50 feet.

During 2010-2013, the Sustainable Land Management Project of Ministry of Climate Change, Government of Pakistan has supported Punjab Forest Department in establishing woodlots in Bhakkar and many private farmers have established such woodlots by their own.

g. Project Activities

The activities of the project would be as follows:

- *Mobilize local CBOs and WO's*: CBOs of local communities already formed under several past projects in the area would be revived or if such CBOs do not exist new CBOs will be formed to combat issues related to afforestation, land degradation and desertification. These will be mobilized to implement the planned project activities.
- *Raising of Woodlots*: To control sand dunes, planting of local tree species in the shape of woodlots considerably control the wind erosion. It is planned that 300 acres sandy land will be planted under woodlots by providing improvised irrigation system. The system will involve lifting groundwater through Solar engines/ pumps and using it for irrigating the forest plants. Each woodlot will be planted with a minimum of 450 trees/shrubs of plant species like *Tamarix aphylla*, *Acacia tortilis*, *A. albida*, *Prosopis juliflora*, *Zizyphus numularia* and *Albizia lebbek* per acre. A total of 120,000 of trees/shrubs will be planted over 300 acres.
- *Improvised irrigation system for Woodlots*: Water will be distributed to different points in the field through High Density Polyethylene (HDPE) or PVC pipes.
- *Solar Pumps for Shelterbelts*: Solar operated engines and pumps will be used for raising shelterbelts on private farms through community based organizations. One solar operated pump/ engine will be provided for each 10 acres of woodlot. The digging of water bore and clearance of land shall be the responsibility of the farmer.

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h. Timelines

The life of the project is five years.

i. Project Budget (Tentative)

The tentative budget of the project is as follows:

Tentative budget for Social Forestry project

Sr.#	Items	Unit	# of units	Total cost (mil PKR)
1	Woodlots: Planting of trees on sand dunes/sandy soil, including cost of plants/cuttings, transportation and excavation of pits	Demos of 10 Acre each	30	10.93
2	Fixation of Solar Engines for irrigation of woodlots along with pumps and accessories and water reservoir	No.	30	8.70
3	Excavation of water bores to provide water for woodlots/shelterbelts	No.	30	0.45
4	Water distribution system for woodlots through solar pumps	Demos of 10 Acre each	30	0.57
5	Production of containerized forest plant in Com nurseries	120,000	plant saplings	1.80
6	Operation and Management Cost (MandE included)			2.7
	Total cost in Mil PKR			25.15
	Total cost in Mil. US\$*			0.251

* The conversion rate assumed is 1 US\$ = 100 PKR

j. Measurement/ Evaluation

The project will demonstrate social forestry on 300 acres of sandy areas directly. The spillover effect will further increase this area. The project will involve mid-term and end of project evaluation.

k. Possible complications/ Challenges

The major causes of deforestation, land degradation and desertification in the project area are briefly described as under:

Deforestation and Desertification: Large scale de-forestation for the purpose of timber and fuel wood also results in enhanced land degradation. Due to increase in population, the consumption of household firewood is increasing at a high rate. Above 90% of the wood consumed is obtained from farmlands, hence, process of deforestation will have to be reversed in the rural areas to prevent land degradation. Deforestation is resulting in excessive soil and water erosion,

drying of aquifers, reduced carbon sequestration, aridity in climate, reduction in water retaining capacity of soil, excessive water runoff, destruction and deterioration of wildlife resulting in lower number of wild animals and birds.

Over-grazing: Increase in sheep, goats and cattle population is well above the carrying capacity of most rangelands that results in over-grazing. It results in reducing the productivity of rangelands because of removal of vegetation and subsequent destruction through water and wind erosion. Degradation of rangelands has direct consequences on the pastoral economy since rural communities are dependent on income from livestock.

Soil Erosion: Soil erosion is taking place at an alarming rate and is mainly due to deforestation. The area is facing wind erosion. Wind erosion is a major problem in the project area where the higher average wind speeds, a dominantly sandy terrain, sparse vegetation cover and high human activities on the sand dunes and sandy plains lead to accentuation of sand blowing. It often leads to erosion of top soil containing precious organic matter, damages to crop plants, burial of good agricultural lands and infrastructures, as well as disruption of transportation network.

Climatic Factors: The main climatic factors such as droughts disrupt traditional land use patterns and force people to abandon arable lands, exposing such areas to wind erosion. Drought incidences are likely to increase with climate change. Land degradation is suspected of depleting the gene pool of native plant species while clearing a path for invasive plant species. Degradation is upsetting traditional land management practices with forced migrations. As the dual influences of climate change and population growth continue, land degradation is projected to accelerate. The increase in temperature and decrease in annual average rainfall is affecting the availability of fresh water resources negatively.

Scarcity of Water: The area has two main sources of natural water i.e. river and underground water. Shortage of canal water during droughts tends to exacerbate the problem of groundwater overdraft which is likely to increase in future.

1. Responsibilities and Coordination

Punjab Forest Department will implement the project in partnership with local communities represented by their respective Community Based Organizations (CBOs) and Women Organizations (WOs). The CBO will implement the pilot interventions related to afforestation and SLM with the technical support of the implementing partners (IP) while the supervision and execution on the ground will be through field managers. A Project Management Committee (PMC) comprising of key stakeholders will ensure better coordination between the field formations at the local level.

Terms of Partnership would be finalized and signed between the concerned Forest department and the CBO. Operation and management of the activity after its construction/implementation would be the responsibility of the community and it would be clearly described in the signed Terms of Partnerships (ToP).

5.3. Transport Sector

5.3.1. Project Idea Note on “Feasibility Study on Faizabad- Rawat Bus Rapid Transport system”

a. Introduction and Background

Globally, the city’s urban transport sector is supported by its unique urban structure of uniform land use, which has created a significant need for travel. Islamabad-the capital of Pakistan was designed on a virgin land as a twin city of Rawalpindi in 1960. Over the years, its population has reached to about 2 million and the public transport system has become inefficient to cater to the needs of population commuting to the capital from its suburbs. It is estimated that within Islamabad, there are about 700,000 daily trips originating and terminating within the city, and up to a further 500,000 daily trips which either travel to or from the city to adjoining urban areas. It is beginning to have an impact on Islamabad’s clean environment and the overall liveability of the city. Public transport in Rawalpindi and Islamabad is dominated by the private sector, which operates small vans and minibuses in a largely unregulated and unmonitored environment. They contribute about 35 percent of mode share of overall traffic, a share that is on the decline due to the relatively poor level of service and widespread customer dissatisfaction with the services. Recently, the Government of Pakistan has undertaken establishment of Bus Rapid Transport system in major cities of the country. The present project focuses on feasibility study on BRT from Faizabad to Rawat in the capital city.

b. Objective of the Project

The objective of the project is to identify potential donor and develop the project proposal based on the feasibility study for establishment of BRT system from Faizabad to Rawat, cost and energy efficient procurement of hardware including buses. BRT feeding network to link BRT with other potential routes and dispute resolution/ redressal mechanism to investigate, analyze, assess the economic, social and environmental impacts of the proposed network and to provide guidance in the local decision making process.

c. Project Outcomes:

The outcomes of the project will be the identification of potential donor and development of project proposal based on the results of the feasibility study undertaking: development of business model; infrastructure design; number and type of buses required; traffic management; station locations and design; operational plan; bottleneck sections and alternate options with cost identification; ridership forecast; fare System; capital, operating and maintenance costing, revenue estimation and preparation of a detailed financial plan; development of evaluation framework; dispute resolution/ redressal mechanism, safety measures, energy conservation measures, scenario evaluation and ranking; estimation of CO₂ emissions and Climate Change Mitigation Framework.

d. Relationship to the country’s sustainable priorities

The Project has direct relationship with the country’s sustainable development priorities including social, economic and environmental. The Pakistan Vision 2025 sets the target to provide access to safe, affordable, accessible and sustainable transport systems for all. It

envisages to cut down usage of private transport in urban centers and devise public transport including mass transit systems. The project will have a significant positive impact from a climate change perspective by reducing the greenhouse gas emissions within the urban area saving approximately 4,290 tons of CO₂ emission per year.

The BRT systems will lead to capturing economic benefits through savings in travel time and operating costs, reduced motor vehicle accidents and lower pollution levels. Increased mobility also generates additional employment opportunities, adding to the economic activity of a city. Increased BRT connectivity and travel efficiency will improve and attract businesses along the alignment, raising land values, and significantly larger volumes of passengers can be moved through congested corridors compared with private vehicles. By linking Rawat Metro project with Faizabad metro station, it will have a marked benefit for the many thousands of commuters relied upon Islamabad for its economic and commercial vibrancy. Women, the elderly and disadvantaged groups will be benefited.

e. Project Deliverables:

- Identification of potential donor
- The study will cover:
 - Compilation of all background information, analysis methods and models, data and other materials relevant to the feasibility study
 - Analysis of elements of the multi-modal system will be described/analyzed in both segment of the demonstration corridor in terms of supply (e.g., quantity of infrastructure, condition), demand (e.g., daily, peak period, peak hour public transport private vehicle travel) and performance (e.g., speeds, travel times, reliability, safety, related air quality, user satisfaction).
 - Over-all corridor service and operating plans, including BRT.
 - Capital, operating and maintenance costing, revenue estimation and preparation of a detailed financial plan
- Final Feasibility Report
- Development of project proposal in consultation with key stakeholders and the donor.

f. Project Scope:

The current project is to develop the feasibility study for BRT system from Faizabad to Rawat. The efficient BRT system in the country will lead to most striking positive impact on economic, social and environmental development, improve quality of life, productivity, public health and safety, especially in urban areas, creating employment and improving equitable mobility. An integrated urban transport system can reduce travel times and end-user cost significantly. It reduces local air pollutants such as citywide smog and exposure to harmful pollutants at stations or in traffic, reduces the number of traffic accidents and injuries, and improves health through increased physical activity. Access to safe and affordable public transport systems can improve the connectivity between rural and urban areas and improve the mobility of social groups who may not have access to private modes of transportation such as the urban poor and women in particular.

The National Highway Authority has undertaken construction of the expressway signal-free corridor from Zero Point to Rawat measuring 24 km. So far, 12 km road has already been extended up to five lanes and service roads.

The BRT Network has been established in the city of Rawalpindi extending up to Islamabad. Following successful completion and execution of the Rawalpindi-Islamabad Metro Bus Service (MBS) project, there is a demand for similar mega transit scheme on Rawat-Islamabad route. The commuters, who travel daily on different routes of the Federal Capital, especially Sihala-District Courts and Rawat-Islamabad, are facing acute shortage of decent public transport as they have no option to travel other than mini vans plying on the routes.

Considering this development, it is proposed that the existing BRT Network be extended from Faizabad to Rawat measuring 20 km. A feasibility study report is therefore proposed to be carried out. The proposed BRT system will connect with the existing Metro-Bus system from Sadar Rawalpindi to Civil Secretariat, Islamabad at Faizabad Interchange.

g. Project Activities

The proposed activities of the project include:

- Conducting feasibility study involving:
 - Development of a study management structure
 - Develop a Public Involvement Plan (PIP) and conduct public workshops
 - Collect Data and coordinate with local transportation organizations
 - Identify Potential Corridors for Rapid Transit Consideration
 - Develop Criteria Screening Process for Corridor Evaluation
 - Conduct Technology Assessment
 - Conduct Corridor Selection and Refinement
 - Prioritize Alternative Service/Configurations
 - Select Final Priority Corridors and Prepare Implementation Plans
 - Develop BRT Project Schedule and Milestones
 - Prepare Draft – Final Report
 - Development and submission of Project proposal and Project Development Document (PDD) for Clean Development Mechanism

h. Timeline:

The timeline of the project is 1.5 years.

i. Project Budget

The tentative project budget for feasibility study is PKR 40 million, which is equivalent to US \$ 0.4 million.

j. Measurement/ Evaluation

The project will prepare the feasibility study and project document for BRT. The project will be monitored by NTRC.

k. Possible complications/ Challenges

The major causes of limited promotion of BRT are briefly described as under:

High Capital cost: The BRT system has high capital cost due to high price of the machineries and equipment.

Long gestation period for recovery of the cost: The time required to recover the initial capital cost is long.

Specialized infrastructure: The BRT system requires special lanes so it takes time to get necessary approvals and arrangements.

l. Responsibilities and Coordination

The project will be implemented by NTRC in collaboration with provincial/ central authorities including Transport department.

5.3.2. Project Idea Note on “Establishment of Vehicle Tune up centers”

a. Introduction and Background

Transport is a key component of economic development and human welfare. It plays a significant role in energy use and emissions of greenhouse gases (GHGs) that are known for causing climate change. In Pakistan, the growth of urban centers and need for improving urban mobility has posed a serious challenge for sustainable development. The transport sector contributes about 13.7 % to Pakistan’s gross domestic product and more than 5 % to the country’s overall employment⁶⁸. As the population and economy have grown, the number of vehicles has increased from 2.7 million in 1990 to 15.168 million in 2014. The inefficiency in the transport system imposes a cost to the economy of 4-6% of GDP⁶⁹.

The transport sector is the most CO₂ emission intensive sector, which contributes 21 percent to the national carbon emissions, and is responsible for more than half of the oil consumed. Greenhouse gas (GHG) emissions from the transport sector are projected to rise by 128% i.e. approximately 35.4 MtCO₂e in 2012 to approximately 80.7 MtCO₂e in 2030⁷⁰. Excessive reliance upon road transport is also causing increased congestion, degradation of air quality with dramatic increase in GHG emissions. The associated ecological, social, economic and health related impacts are also increasing significantly. To improve fuel and vehicle efficiency, the computerized tune up demonstration centers were established by National Energy Efficiency and Conservation Authority (NEECA) through Fuel Efficiency in the Road Transport (FERTS) project. The National Energy Efficiency and Conservation Authority

⁶⁸ Greenhouse Gas Mitigation Options for Pakistan: Transport Sector: <https://cdkn.org/wp-content/uploads/2016/10/fact-sheet-Pakistan-Transport-sector-.pdf>

⁶⁹ Pakistan Vision 2025

⁷⁰ Greenhouse Gas Mitigation Options for Pakistan: Transport Sector: <https://cdkn.org/wp-content/uploads/2016/10/fact-sheet-Pakistan-Transport-sector-.pdf>

(NEECA) have facilitated the private sector in establishing computerized tune-up centers throughout the country.

Regarding vehicle tune up, the Prime Minister of Pakistan has issued a “Strategic Policy Directives of Government of Pakistan”. According to this Directive, “Respective fleet owners and managers/operators shall ensure phased tune-up of vehicles as well as other energy efficient driving practices to be employed to ensure conservation of energy”. As per the National Energy Efficiency and Conservation Authority (NEECA), vehicles need to be tuned up regularly after every 15,000 Km. At present, such a requirement exists only for commercial vehicles. Establishing a proper testing system is important in order to ensure that this measure is followed with actual emission reductions.

b. Project Objectives

The objective of planned interventions is to reduce greenhouse gas emissions and other pollutants through the improvement of fuel efficiency of road transport vehicles by establishment of automated vehicle tune up centers.

c. Project Outputs

The project will improve the vehicle efficiency and reduce its fuel consumption. The project will develop 100 vehicle tune up centers, provide training and awareness raising.

d. Relationship to the country’s sustainable development priorities

Pakistan National Sustainable Development Strategy and Target 15.b of Sustainable Development Goals stresses on sustainable forest management and afforestation.

e. Project deliverables

The project will promote and establish 100 tune up facilities, conduct training courses for workshop owners and automotive mechanics, awareness raising, establishment of model inspection and certification center, establishment of operational Revolving Loan Fund (RLF). The project will provide employment opportunities to about 2,000 persons. The project will also result in reduction of GHG emission and air pollution, which will ultimately lead to reduction in respiratory, eye and skin diseases.

f. Project Scope

The project is proposed for major cities of Pakistan.

g. Project Activities

The activities of the project would be as follows:

- Selection of participants and sites for demonstration centers and bringing stakeholders on board.
- Preparation of technical design, action plan and documentation for vehicle tune up establishment and equipment specifications
- Identification of framework / mechanism for sustainability of the centers
- Training of workshop owners and mechanics and conduct mass awareness

- Design RLF implementation and management structure
- Disbursement and recovery of loans along with documentation, monitoring and evaluation of loan program.

h. Timelines

The life of the project is five years.

i. Project Budget (Tentative)

The total budget of the project is US\$6.40 million. Details presented in table below:

Tentative budget for computerized tune up project

#	Item	Total cost (Mil PKR)	Remarks
1	Revolving Loan Fund for Computerized tune up center	500	<ul style="list-style-type: none"> - The project will provide RLF amount to the Bank, - The Bank will disburse the loan to the consumers and - Will recover the Principle amount of loan disbursed & the service charges by the bank.
2	Capacity building and awareness raising	100	
3	Project Management (including M&E) Cost	40	
	Total cost in mil. PKR	640	
	Total cost in Mil. US\$*	6.40	

* The conversion rate assumed is 1 US\$ = 100 PKR

j. Measurement/ Evaluation

The project will demonstrate 100 computerized tune up centers. The spill over affect will further increase this area. The project will involve mid-term and end of project evaluation.

k. Possible complications/ Challenges

The major causes of limited promotion of computerized tune up are briefly described as under:

High Capital cost: The computerized tune up have high capital cost due to high price of the machineries and equipment..

Computerized tune up machinery not available locally: The computerized tune up machinery not available locally, so its promotion is limited.

Training and awareness raising: The local level technicians are not trained in the use of computerized tune up and the general public is not aware of the benefits of computerized tune up so they do not bother for this.

l. Responsibilities and Coordination

The project will be implemented by NEECA in collaboration with one or two banks.

Way Forward:

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

There is an urgent need that the Government of Pakistan 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 centers 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 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, Corporate Social Responsibility (CSR) budgets, bilateral and multilateral donors and financial windows such as Green Climate Fund (GCF) etc.

Pakistan needs to develop multi-pronged strategy/models for effective utilization of Climate Change Fund, created under the recently promulgated Climate Change Act, 2017. The strategy/model must focus on supporting development and diffusion of climate change mitigation technologies and interventions to build climate resilience promoting socio-economic sustainable development in the country.

It is suggested to study further on other technologies which have the mitigation potential but not prioritized due to the limitation of scope of the present study, so that Pakistan may also benefit from other identified mitigation technologies.

ANNEXURES

Annexure-I:**List of Identified Potential Climate Change Mitigation Technologies**

Sector	Technologies
Industrial	<ol style="list-style-type: none"> 1. Steam boiler and furnace energy efficiency (EE) Improvement 2. Boiler and furnace tune up 3. Boiler air leakage 4. Boiler insulation 5. Clean coal technologies 6. Boiler high turndown burner 7. Controlling boiler blow-down 8. Boiler air pre-heater 9. Variable frequency drive coupled with O2 trimming system 10. Feed water treatment 11. Flash steam recovery 12. Condensate recovery 13. Fouling of heat transfer surfaces 14. Boiler instrumentation and control 15. Combustion controls 16. Boiler water treatment 17. Solar water heating systems 18. Co-generation 19. Improving energy efficiency in electrical system in industries 20. Reducing losses in electrical distribution system 21. Power factor improvement 22. Maximum demand control 23. Efficient lighting systems 24. Efficient motors and pumps 25. Efficient fans and blowers 26. Improving efficiency in compressed air systems 27. Refrigeration improvement 28. Cooling towers 29. Heating, ventilation and air-conditioning system improvement 30. Building envelop improvement and introduction of renewable technologies
Building	<ol style="list-style-type: none"> 31. Building design 32. Air conditioner inverter 33. Power factor improvement 34. Efficient lighting 35. Efficient motors and pumps 36. Efficient fans, over, heaters and other household equipment
Energy	<ol style="list-style-type: none"> 37. Micro hydropower 38. Solar concentrators and cookers 39. Solar PV and LED lighting 40. Solar domestic water heater 41. Biogas – Compressed bio-methane 42. Wind mill and generator

	43. Bagasse 44. Integrated resource recovery or Extracting different products from waste 45. Solar dryer 46. Geothermal 47. Bio-fuels 48. Pressurized fluidized bed combustion (PFBC) for coal 49. Near Zero-Emission Technology (NZET) for coal (Involving super-critical and Carbon capture and storage technologies) 50. Solar thermal electricity 51. Reducing transmission and distribution losses of electricity Coal 52. Coal water slurry fuel 53. Underground gasification 54. Integrated Coal Gasification Combined Cycle (IGCC) 55. Fluidized bed combustion 56. Supercritical 57. Ultra-supercritical 58. Coal bed methane capture 59. Biochar
<i>Waste</i>	60. Pulverized coal integrated gasification combined cycle (IGCC) 61. Waste to energy through fluidized incineration technology 62. Waste to energy through anaerobic fermentation 63. Waste to energy through its gasification 64.
<i>Agriculture</i>	65. Conservation tillage 66. Appropriate application of fertilizers and soil Carbon management 67. Farming practices having enhanced carbon sequestration 68. Increasing use of crop varieties having enhanced carbon sequestration 69. Rice cultivation by alternate wetting and drying/aerobic 70. Off-field crop residue management 71. Energy efficiency improvement of tube-well 72. Nutrient management: mycorrhiza
<i>Livestock</i>	73. Appropriate Diet for reducing Enteric fermentation in ruminant animals 74. Biogas – Compressed bio-methane including Waste 75. and Bagasse 76. Manure management 77. Genetic modification to produce new breeds which have better digestive efficiency and so better GHG mitigation potential

Land Use and Land use change and Forestry (LULUCF)	78. Social forestry as Carbon sink 79. Sustainable Forest Management (SFM) plans for reducing emissions from deforestation and forest degradation 80. Sustainable forest management 81. Rehabilitation of mangroves 82. Fire management in forests 83. Land use Planning at local and provincial levels and legal support to implement the plans 84. Land use management to enhanced carbon sequestration
Transport	85. Bus Rapid Transport 86. Metro train 87. Energy Efficient Railway transportation (Passenger and Freight) 88. GHG emission reduction through improved railway traffic management 89. Inland water ways transportation 90. Vehicle tune-up 91. Engine emission standards 92. Hybrid vehicles 93. GPS Tracking for traffic management 94. Traffic management without GPS 95. Increasing road network 96. Fuel efficient aircrafts 97. GHG emission reduction through improved air traffic management 98. Bike ways and promoting bicycle and walking for shorter distance

Annexure-II

List of participants of Expert Working Group on Mitigation

1. Muhammad Irfan Tariq, Director General (Environment & Climate Change), Ministry of Climate Change, Government of Pakistan, Islamabad (Chair)
2. Dr. Sohail Zaki, Director General, Pakistan Council of Renewable Energy Technologies, Ministry of Science and Technology, Government of Pakistan, Islamabad
3. Asif Sahibzada, Director Policy, Ministry of Climate Change, Government of Pakistan, Islamabad
4. Aqeel Jafri, Director Policy, Alternate Energy Development Board, Ministry of Water and Power, Government of Pakistan, Islamabad
5. Mian Shaukat Shafi, Asian Development Bank
6. Ijaz Ahmed, Deputy Chief Engineer, Pakistan Atomic Energy Commission, Government of Pakistan, Islamabad
7. Usman Yaqoob, Deputy Secretary, Ministry of Water and Power, Government of Pakistan, Islamabad
8. Asad Mahmood, Manager (Technical), National Energy Conservation Center (ENERCON), Ministry of Water and Power, Government of Pakistan, Islamabad
9. Imran Khan, Assistant Director, Ministry of Climate Change, Government of Pakistan, Islamabad
10. Muhammad Irshad Ramay, Coordinator, National Cleaner Production Center, Islamabad
11. Bilal Anwar, Senior Manager, Center for Climate Research and Development, Comsats University, Islamabad
12. Mahboob Elahi, Former D.G. (Environment), Ministry of Environment, Government of Pakistan, Islamabad
13. Abdul Latif Rao, Chairman, Rao Sustainable Development Consulting Services, Islamabad
14. Dr. Bashir A. Wani, Former Inspector General (Forests) Ministry of Environment, Government of Pakistan, Islamabad
15. Hafiz Muhammad Bukhsh, Project Coordinator, WWF-Pakistan
16. Haroon, Sociologist, National Cleaner Production Center, Islamabad
17. Muhammad Naveed, Sociologist, National Cleaner Production Center, Islamabad
18. Dr. Arshad M. Khan, Former-Executive Director, GCISC, Islamabad
19. Dr. M. Mohsin Iqbal, Former Head-Agriculture-GCISC, Islamabad
20. Dr. M. Bashir Khan, DG, EPA, KP
21. Dr. Saleem Janjua, National Project Manager, Pakistan Sustainable Transport Project, Ministry of Water and Power, Government of Pakistan
22. Dr. Muhammad Parvaz, DG, HDIP, Islamabad
23. Dr. Zafar Mahmood Khalid, Professor/ Chairman Biotechnology, International Islamic University, Islamabad
24. Shahbaz Latif, Research Officer, NTRC, Islamabad
25. Nafay Idrees, Research Officer, NTRC, Islamabad
26. Zia-ul-Islam, Research Officer, NTRC, Islamabad
27. Munnaza Naqvi, Program Officer, UNDP, Islamabad
28. Shafiq Ali Siddique, City Planner & Environmentalist
29. Dr. Qamar-uz-Zaman Chaudhry, UN-WMO-Consultant-TNA
30. Mr. Usman Akhtar, Managing Director, Chitral Engineering, Taxilla
31. Prof. Dr. Shahab Khurshid, Dean Faculty of Mechanical Engineering, UET, Taxilla
32. Mr. Hammad Sheikh, UNIDO
33. Akhtar Chaudary, Chief Executive, Chitral Engineering, Taxilla
34. Mujeeb Ahmad, CEO, Designmen Consulting Engineers, Pvt
35. Ghulam Abbas, Engineer, Designmen Consulting Engineers, Pvt
36. Ali Tauqeer Sheikh, CEO, Lead Pakistan
37. Dr. Abdul Majeed, IUCN
38. Jawed Ali Khan, Consultant-TNA Mitigation, Islamabad

39. Ms. Yasmeen Jawed, Freelance Consultant, Islamabad
40. Tayyab Shahzad, Freelance Consultant, Islamabad
41. Adil-Bin-Zahid, Freelance Consultant, Islamabad
42. Faiqa Aziz, Freelance Consultant, Islamabad

Annexure-III

List of Institutions and Stakeholders consulted for Technology Action Plan on Climate Change Mitigation

Federal Government

1. Ministry of Climate Change, Government of Pakistan, Islamabad (**For Energy and Forestry sectors**)
2. National Energy Conservation Authority (NEECA), Ministry of Water and Power, Government of Pakistan (**For Energy, Transport and Forestry sectors**)
3. Alternate Energy Development Board (AEDB), Ministry of Water and Power, Government of Pakistan (**For Energy and Forestry sectors**)
4. Pakistan Council of Renewable Energy Technology (PCRET), Islamabad (**For Energy and Forestry sectors**)
5. Hydrocarbon Development Institute of Pakistan (HDIP), Ministry of Petroleum and Natural Resources, Government of Pakistan, Islamabad (**For Energy and Transport sectors**)
6. Pakistan Atomic Energy Commission (PAEC), Ministry of Defence; Government of Pakistan, Islamabad (**For Energy sector**)
7. Ministry of Industries and Production, Government of Pakistan, Islamabad (**For Energy and Transport sectors**)
8. Ministry of Science and Technology, Government of Pakistan, Islamabad (**For Energy, Transport and Forestry sectors**)
9. Ministry of Planning, Development and Reforms, Government of Pakistan, Islamabad (**For Energy, Transport and Forestry sectors**)
10. Pakistan Environmental Protection Agency (Pak EPA), Government of Pakistan, Islamabad (**For Energy and Transport sectors**)
11. National Transport Research Center (NTRC), Ministry of Communication, Government of Pakistan, Islamabad (**For Transport sectors**)
12. Pakistan Institute of Nuclear Science and Technology, Directorate of Coordination, Islamabad (**For Energy sector**)
13. Global Change Impact Study Center (GCISC), , Government of Pakistan, Islamabad (**For Energy, Transport and Forestry sectors**)
14. Pakistan Sustainable Transport Project, Ministry of Water and Power, Government of Pakistan, Islamabad (**For Transport sector**)

Provincial Government and Territories

15. Environmental Protection Department, Government of Punjab, Lahore (**For Energy and Transport Sectors**)
16. Punjab Small Industries Corporation, Industries, Commerce and Investment Department, Government of Punjab, Lahore (**For Energy, Transport and Forestry sectors**)
17. Sindh Coal Authority, Energy Department, Government of Sindh, Karachi (**For Energy sector**)
18. Directorate of Power Development Sindh, Energy Department, Government of Sindh, Karachi (**For Energy sector**)
19. Energy Department, Government of Sindh, Karachi (**For Energy sector**)
20. Energy Department, Government of Balochistan, Quetta (**For Energy sector**)
21. Industries Department, Government of Balochistan, Quetta (**For Energy and Transport sectors**)

22. Environmental Protection Agency, Government of Balochistan, Quetta (**For Energy and Transport sectors**)
23. AJK-Climate Change Department, Government of Azad Jammu and Kashmir, Muzaffarabad (**For Energy, Transport and Forestry sectors**)

Academia

24. International Islamic University, Islamabad National Cleaner Production Center, Islamabad (**For Energy, Transport and Forestry sectors**)
25. Institute of Information Technology (COMSATS), Islamabad National Cleaner Production Center, Islamabad (**For Energy, Transport and Forestry sectors**)

Financial Institutions and donors

26. World Bank-Pakistan, Islamabad (**For Energy, Transport and Forestry sectors**)
27. Asian Development Bank-Pakistan, Islamabad (**For Energy, Transport and Agriculture/Forestry sectors**)
28. UNDP-Pakistan, Islamabad (**For Energy, Transport and Forestry sectors**)

NGOs/Civil Society

29. National Cleaner Production Center, Islamabad (**For Energy, Transport and Forestry sectors**)
30. NGO Sheher Saaz, Islamabad (**For Energy, Transport and Forestry sectors**)

Private Sector

31. Renewable and Alternate Energy Association of Pakistan (REAP), Islamabad (**For Energy and Forestry sectors**)
32. Energy Conservation Fund (ECF), Islamabad (**For Energy and Transport sectors**)
33. ADMC Consultants, Islamabad (**For Energy, Transport and Forestry sectors**)
34. Waqas Electronics, Islamabad (**For Energy sector**)

Revised State Bank of Pakistan Financing Scheme for Renewable Energy



STATE BANK OF PAKISTAN
Infrastructure, Housing & SME Finance Department
I. I. Chundrigar Road
Karachi

IH&SMEFD Circular No. 03

June 20, 2016

The Presidents/Chief Executives,
All Banks/DFIs

Dear Sir /Madam,

Revised SBP Financing Scheme for Renewable Energy

1. Background

State Bank of Pakistan announced the scheme for Financing Power Plants using Renewable Energy in 2009, with a view to promote renewable energy projects in the country. Keeping the low utilization of the scheme in view, the scope and financial mechanism have been revised to make it more attractive to borrowers and financing banks/DFIs.

2. Objective

Pakistan's economy is currently facing the dual challenge of energy shortage and climate change. The inadequate supply of energy has severely impacted the growth of industries/businesses and the welfare of public in general. Similarly, the effects of climate change have been observed in the form of devastating floods, droughts, heat waves and changing weather patterns. These changes essentially inhibit our ability to develop sustainably.

In order to overcome these challenges, SBP decided to promote green banking i.e. use of indigenous resources especially renewable energy in order to ensure sustainable banking and development. For this purpose, the scheme has been amended based on the feedback received from various stakeholders. The scheme will provide concessionary financing for large renewable energy power projects as well as for small scale renewable energy solutions.

3. Scope

The scheme shall be available for power generated by using alternative / renewable energy sources (solar, wind, hydro, biogas, bio-fuels, bagasse cogeneration, and geothermal as fuel). Scheme is available under two categories, as given below:

- I. Prospective sponsors, desirous of setting up renewable energy power projects with a capacity ranging from more than 1 MW and up-to 50 MW¹, who have completed

¹ Subject to maximum refinance from SBP of Rs 6 billion per project. Banks/DFIs may structure loan as per their own terms & conditions for any amount exceeding this limit.

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State Bank of Pakistan

prescribed requirements of Alternative Energy Development Board (AEDB) and other relevant Government Department / Authority, in compliance with the prevalent Renewable Energy Policy of the Government of Pakistan.

- II. Consumers willing to install facility using renewable energy source for generation of electricity ranging from 4 KW to 1000 KW (0.004 MW to 1 MW) for own use and/or for supply to the distribution company as per the rules set by NEPRA (Alternate & Renewable Energy) Distributed Generation and Net Metering Regulations, 2015.

4. **Participants**

Financing facilities under the scheme shall be provided through all commercial banks and Development Finance Institutions (DFIs).

5. **Grant of Refinance**

- i. The State Bank shall provide refinance to each bank/DFI on service charge (mark-up) basis in terms of Section 17 (2) (d) read with section 22 of State Bank of Pakistan Act 1956.
- ii. Refinance shall be allowed to the Banks/DFIs by the concerned office(s) of SBP BSC (Bank) on submission of documents as may be required by State Bank of Pakistan. The documents initially required are attached herewith.

6. **Category I of the Scheme**

The provisions under this section (section 6) are only applicable for Category I of the scheme.

a) **Eligibility Criteria under Category I:**

- i) Financing shall be available to the prospective sponsors desirous of setting up of renewable energy power projects with a capacity ranging from more than **1 MW to 50 MW**, who have completed prescribed requirements of Alternative Energy Development Board (AEDB) and other relevant Government Departments / Authority (Federal or Provincial), in compliance with the prevalent Renewable Energy Policy of the Government of Pakistan.
- ii) Financing shall be available for projects achieving financial closure from the date of issuance of this circular and up-to **June 30, 2019** only, depending on the availability/utilization of funds earmarked for the Scheme.
- iii) Refinance would be provided for up-to **100%** of financing (**debt**), provided by banks/DFIs to the eligible projects subject to adherence of other rules & regulation. However, maximum refinance allowed under the Scheme cannot be more than Rs. 6 billion for a single Renewable Energy Project.

Phone: 021-99221414

UAN: 111-727-111

Fax: 021-99221139

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**b) Availability of Funds:**

- i) Financing under the scheme shall be provided by the banks/DFIs on first come first served basis within the overall amount earmarked for this purpose. While adequate funds have been earmarked for the scheme under reference, the banks/DFIs shall, however, be required to approach IH&SME Finance Department, State Bank of Pakistan, after their internal approval of financing to each project for confirming the availability of funds. State Bank of Pakistan will respond to the concerned bank/DFI with a copy to the concerned office of the SBP BSC (Bank) from where it will avail refinance. In case banks/DFIs have not disbursed 1st installment / made firm contract with down payment, the confirmation / approval of availability of funds from SBP should lapse within a period of six months.
- ii) State Bank has the right at any time to reject the request or partially offer the refinance facility for the proposed project subject to availability of allotted funds under this scheme or depending on maximum exposure of State Bank of Pakistan on certain renewable energy sector/ technology.

c) Period of Financing and Grace Period:

Financing under Category I of the scheme shall be available for a maximum period of twelve years including a maximum grace period of two years from the date of first disbursement. The grace period may vary depending upon the type of renewable energy source. Therefore, banks / DFIs shall clearly mention the "grace period" in the repayment schedule to be submitted to the concerned office of SBP-BSC (Bank) at the time of availing refinance.

d) Rates of Service Charges / Mark up:

- i) The rate of service charge at which SBP will provide refinance to the Banks/DFIs shall be fixed for the entire duration of the loan, provided the borrowers continue to repay on due dates as per repayment schedule.
- ii) Service charges and rates for end users have been fixed as per the following:-

Tenor	Rate of Refinance	Bank's/DFIs' Spread	End User's Rate
Up-to 12 years	2.00%	4.00%	6.00%

e) Repayment of the loans:

- i) Principal amount of loans shall be repayable in quarterly or half yearly installments after prescribed grace period, if any. However, if a borrower will



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repay the loan amount or its installment, in part or in full, before the due date(s), the banks/DFIs shall be under obligation to repay the amount(s) so received within three working days to the concerned office of SBP-BSC (Bank) failing which fine for late adjustment of loan will be recovered from the concerned bank/DFI, at the rate specified by the State Bank.

- ii) The refinance granted by SBP-BSC offices to the Banks/DFIs shall be recovered on the due dates as reported in the original repayment schedule from the account of the banks/DFIs maintained with the respective office of the SBP BSC (Bank). In case the borrowers fail to make repayment of the amount of installment as per the original repayment schedule, the bank/DFI will be entitled to charge market rate of mark up on such overdue principal amount besides taking other actions to recover the same as are incidental to such defaults. In no case the liability of banks/DFIs to pay/repay to SBP BSC the principal amount of refinance, or mark up or any other charges or penalty thereon shall be dependent upon the recovery from the borrower nor shall such liability be affected by any default on the part of the borrower.
 - iii) Mark-up shall be paid on quarterly basis.
- f) **Other Terms & Conditions:**
- i) Maximum refinance allowed against debt component under the Scheme is Rs 6 billion for a single Renewable Energy Project. In case of consortium arrangements, which are preferred for larger financing requirements, only lead bank/DFI shall be required to approach SBP on behalf of the syndicate/consortium to confirm availability of funding.
 - ii) Financing under the scheme shall be subject to compliance with all rules and regulations including Prudential Regulations for Corporate/ Commercial Banking and foreign exchange related instruction issued by SBP from time to time.
 - iii) Banks/DFIs shall not take more than three months in evaluating an application for financing under the scheme from the date of receipt of complete information from the borrower. Where the request is declined, the bank/DFI will explicitly apprise the reasons for rejecting the application to the prospective borrower.
 - iv) Moreover, banks/DFIs may also ensure that firm commitments for the portion of funding not to be financed by SBP (in the form equity, conventional bank finance etc.) are available for the project being financed by them under the scheme, so that the project does not eventually suffer due to any funding gap. Firm equity commitment from the sponsors may be made in the form which is satisfactory for the financing bank/DFI. The State Bank of Pakistan would, however, not insist on fulfillment of this condition by a specified mode but would let the bank/DFI to satisfy itself in this regard.

Phone: 021-99221414

UAN: 111-727-111

Fax: 021-99221139

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- v) Captive power projects which have already availed financing facilities under LTFF scheme shall not be eligible for financing under this scheme.
- vi) Fixed term loans which have been extended prior to the announcement of this scheme shall not be eligible for refinance.
- vii) Banks/DFIs shall ensure that contracts/agreements between sponsors and suppliers/contractors etc are made on arms length basis in order to avoid any conflict of interest.
- viii) Refinance shall be provided on the basis of certification by the Internal Audit of financing bank/DFI with regard to confirmation that the loan is within the terms and conditions laid down in the scheme. A copy of the said Internal Audit Certificate shall also be submitted to the concerned office of SBP BSC (Bank) at the time of availing the refinance facility.
- ix) Second-hand machinery shall not be eligible under the scheme.

7. Category II of the Scheme

The provisions under this section (section 7) are only applicable for Category II of the Scheme.

a) Eligibility Criteria:

- i) Financing shall be available to consumers (domestic, commercial or industrial) willing to install facility using renewable energy source for generation of electricity ranging from **4 KW to 1000 KW** (0.004 MW to 1 MW) for own use or for supply to the distribution company as per the rules set by NEPRA (Alternate & Renewable Energy) Distributed Generation and Net Metering Regulations, 2015.
- ii) Financing shall be available for new systems installed from the date of issuance of this circular and up-to **June 30, 2019** only, depending on the availability/utilization of funds earmarked for the Scheme.
- iii) Refinance may be provided for **100%** of financing provided by banks/DFIs to the eligible borrowers subject to adherence of other rules & regulations.

b) Terms of Financing:

- i) Financing under the Scheme shall be available for upto a maximum period of **ten years** with no grace period.
- ii) Service charges and rates for end users under Part II of the Scheme have been fixed as per the following provided the borrowers continue to repay on due dates as per repayment schedule:-

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UAN: 111-727-111

Fax: 021-99221139

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Tenor	Rate of Refinance	Bank's/DFIs' Spread	End User's Rate
Up-to 10 years	2.00%	4.00%	6.00%

c) **Repayment of the loans:**

- i) Principal amount of loans and Mark-up shall be repayable in monthly / quarterly installments. However, if a borrower will repay the loan amount or its installment, in part or in full, before the due date(s), the banks/DFIs shall be under obligation to repay the amount(s) so received within three working days to the concerned office of SBP-BSC (Bank) failing which fine for late adjustment of loan will be recovered from the concerned bank/DFI, at the rate specified by the State Bank.
- ii) The refinance granted by SBP-BSC offices to the Banks/DFIs shall be recovered on the due dates as reported in the original repayment schedule from the account of the banks/DFIs maintained with the respective office of the SBP BSC (Bank). In case the borrowers fail to make repayment of the amount of installment as per the original repayment schedule, the bank/DFI will be entitled to charge market rate of mark up on such overdue principal amount besides taking other actions to recover the same as are incidental to such defaults. In no case the liability of banks/DFIs to pay/repay to SBP BSC the principal amount of refinance, or mark up or any other charges or penalty thereon shall be dependent upon the recovery from the borrower nor shall such liability be affected by any default on the part of the borrower.

8. General Terms & Conditions

- i. Financing banks/DFIs shall ensure fulfillment of requisite pre-disbursement formalities by the borrower through due diligence as per their own internal arrangements to avoid malpractices and mis-utilization of funds under the scheme.
- ii. Besides applying due diligence process as per their lending policies, standard / appropriate procedures in such types of financing, banks/DFIs may also impose any specific condition(s), considered appropriate by them in such type of transactions, while sanctioning loan under the scheme to protect their interests.
- iii. Banks/DFIs shall consider financing based on the debt to equity requirements as prescribed in relevant Prudential Regulations. The financing bank/DFI may, however, ask for higher contribution of equity from the borrowers keeping in view individual risk profile.
- iv. Financing under the scheme shall be checked/verified by our Banking Inspection Department (BID) during inspection of the banks/DFIs to ensure that the same have been allowed as per the terms and conditions of the scheme

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UAN: 111-727-111

Fax: 021-99221139



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- v. Where a bank/DFI considers the requests of their borrowers for rescheduling of loans granted under the Scheme, the principal amount of refinance shall only be rescheduled in a way that total tenor of refinancing under the scheme does not exceed maximum period as prescribed under each category from the date of first disbursement made by the banks/DFIs. Further, the borrower shall be liable to make payment of mark-up at the rate applicable on the date of such rescheduling, or the original rate whichever is high.
- vi. Disbursements by banks/DFIs shall not be made to the borrowers directly; instead payments shall be made to the manufacturers / suppliers / contractors.

9. Fines

- i. In case of violation of the terms & conditions of the scheme, the SBP shall reserve the right to recover the amount of refinance granted to the bank/DFI along-with fine at the rate of Paisa 60 per day per Rs 1000/- or part thereof.
- ii. In case, a borrower will make early repayment(s) of the amount of loan/installment(s) and bank/DFI fails to repay the same to concerned office of SBP-BSC within three working days as mentioned above, late adjustment fine will be charged from the concerned bank/DFI at the rate of Paisa 60 per day per Rs 1,000 or part thereof.

Yours faithfully,

(Ghulam Muhammad)

Director

Annexure-V

Summary of Actions, Activities, Implementation Schedule, Responsible Parties, Potential Sources of Funding, Risks, Indicators and Budget of Solar PV

Action	Activities	Planning		Implementation		Responsibility		Potential Sources of funding	Risks	Success criteria	Indicators for monitoring implementation on Solar PV	Budget for Activity (USD) (Million)
		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/ DFIs, other stakeholders.	July 2018	Dec 2022			AEDB and Banks	Ministry of Water and Power, EAD, UN Agencies, Provincial Govts, private sector	AEDB, GEF, GCF	Funding for proposal writing may not be available	Donors identified.	No. of donors identified	10,00000
					No. of concept notes developed							
	1.2.Prepare concept notes and proposals for securing funding according to bank’s guidelines	Aug 2018	Aug 2020				No. of project proposals developed	No. of concept notes and proposals submitted to donors				
	1.3.Banks develops credit policy and procedures.	Aug 2018	Feb. 2019	July 2019	Dec 2019	Banks	AEDB	AEDB/ Donor like Green	Delay in development of the policy	Credit policy developed and	Credit policy drafted and approved	100,000

	1.4.Establish and implement efficient computer based MIS and risk management system.	Aug 2018	Aug 2019	Sept. 2019	June 2023			Climate Fund, GEF, Bi-lateral donors		implemented	Credit disbursement and recovery program drafted and approved MIS developed Credit disbursement and recovery documented in MIS	
	1.5.Disbursement of loans under one window operation.			March 2019	Jan. 2023	The Bank	AEDB, private sector	Donor/ own sources	- Technical and capacity risks - Market and financial risks	- After 5 years the banks will have a sustainable mechanism to provide soft term loans for solar PV promotion.	- Project launched - Project staff recruited - ToRs and contracts signed - No. and amount of soft term loans delivered - Amount of loan recovered - Recovery %age	
	1.6. Recovery of loans according to banks policy.			Sept. 2019	June 2023							
	1.7.Regular documentation and monitoring of loan program.			March 2019	June 2023							

											-No. of sites monitored -No. and Capacity of Solar systems installed. -Electricity produced	
2. Production of accredited technicians and Awareness raising	2.1. Identification of training institutes and its accreditation at national and provincial level.	July 2018	Dec. 2018			AEDB, NUST, TEVTA	PCRET, Taxila University of Sci. and Tech; Provincial Govts, NGOs, private sector, University of Engg. and Technology Lahore and Peshawar, Mehran University Quetta	AEDB, PCRET, Provincial Govts, NGOs, Donor	- Technical and capacity risks	Accredited training institute identified	Nos. of institutes identified	2,000
	2.2. Identified institutions will prepare	Jan 2019	July 2019	Aug. 2019	Dec 2022	AEDB, NUST	PCRET, Taxila University	AEDB, PCRET, Provincial	- Technical and capacity risks	Modules of solar PV and micro	Nos. and types of modules developed	10,000

	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.						y of Sci. and Tech; Provincial Govts, NGOs, private sector	l Govts, NGOs, Donor		hydropower plants training developed		
	2.3.Preparing selection criteria for training participants	Feb. 2019	June 2019			Provincia l Govts, Local NGOs	AEDB, PCRET	AEDB, PCRET, Provincia l Govts, NGOs, Donor	-Technical and capacity risks	Persons to be trained identified at grassroots level	Nos. of pax selected for training each in solar PV and Micro hydropower plants	2,000
	2.4.Accredited institutes to conduct training at national and provincial level.			Aug. 2019	Dec. 2022	NUST, Taxila Universit y of Sci. and Tech.	AEDB, PCRET, Provincial Govts, NGOs, private sector	AEDB, PCRET, Provincia l Govts, NGOs, Donor		Training conducted	Types of training conducted and Nos. of persons trained	500,000
	2.5. Monitoring of learnt skills and design and conduct refresher			Jan. 2020	Dec. 2022	Provinci al Govts, Local NGOs	AEDB, PCRET	AEDB, PCRET, Provincia l Govts,	Technical and capacity risk	Trained persons monitored and	Nos. of persons monitored and guided after	100,000

	training programs.							NGOs, Donor		refresher courses conducted	training, Nos. of refresher courses and persons benefited	
	2.6. Mass awareness through electronic, print and social media.	Sept. 2018	Sept. 2019	Oct 2019	June 2023	AEDB	PCRET, Provincial Govts, NGOs, private sector, PEMRA	AEDB, PCRET, Provincial Govts, NGOs, Donor	Financial risk	Mass awareness conducted through electronic, print & social media	- No. of mass awareness programs prepared and implemented	1.0
3.Expansion of Net metering program	3.1. Installation of necessary systems and streamlining the procedures for Net metering by utility companies to encourage consumers to benefit from the program.	July 2018	Dec. 2019	Jan. 2020	June 2023	Electric supply companies	AEDB, Provincial Govts	Own sources, Donors	Donor funds may not be available, some companies may not be interested in providing own funding	Two new Utility companies establish their systems for Net metering.	No. of new Utility companies establishing their systems for Net metering	1.0
	3.2. Agreement of consumers with Utility			Jan. 2020	June 2023	Electric supply companies	Consumer	Own sources	Number of agreements with utility	1,000 consumers make their agreements	No. of consumers making their agreements	

	companies for Net metering.								companies may be less		with utility companies	
	3.3.Sale of electricity by consumers and getting concessions in electricity bills at par with the price of electricity charged from the consumers.			Jan. 2021	June 2023	Electric supply companies	Consumer	Own sources	Cumbersome procedures	1,000 consumers getting concessions in bills	No. of consumers getting concessions in bills of utility companies	
	3.4.Allowing private sector to sell and purchase electricity directly from the consumers and improve efficiency through market mechanism.			Jan. 2021	June 2023	Utility companies	Consumer ,Private sector	Private sector	<ul style="list-style-type: none"> - The private sector may exploit consumers by adding their own costs and charges along with the bills - They may exploit the government by discontinuing supply for government's approval of 	Private sector allowed Private sector selling electricity	<ul style="list-style-type: none"> - Notification issued for allowing the private sector - No. of private sector entities selling electricity - No. of clients using electricity 	-

									their demands.			
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Annexure-VI

Summary of Actions, Activities, Implementation Schedule, Responsible Parties, Potential Sources of Funding, Risks, Indicators and Budget of Micro Hydropower Plants

Action	Activities	Planning		Implementation		Responsibility		Potential Sources of funding	Risks	Success criteria	Indicator for monitoring implementation	Budget for Activity (USD)(Million)
		When?				Who?						
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary					
1. Promotion of credit line (soft term) for micro-hydro-power plants.	1.1.Develop portfolio of opportunities by identifying and mapping micro hydropower plant sites	July 2018	Jan. 2019			AEDB and Banks	Ministry of Water and Power, Provincial Govts,	NGOs, private sector, banks, AEDB, PCRET	The information may not be up to date.	Information in the portfolio of opportunities verified by AEDB.	- Number of micro and small HPPs identified and mapped in the portfolio.	20,000
	1.2.Prepare concept notes and project proposals to secure funding for microhydro power plants	Aug. 2018	Aug 2019			AEDB and Banks	Ministry of Water and Power, EAD, UN Agencies, Provincial	AEDB, GEF, GCF	Funding for proposal writing may not be available	Donors identified.	Number of donors identified Number of concept notes developed Number of project proposals developed	10,00000

							al Govts,				No. of concept notes and proposals submitted to donors	
	1.3. Develop credit programs and procedures including MIS and risk management system for micro hydropower plants	Aug 2018	Aug. 2019			Banks	AEDB	AEDB/ Donor like Green Climate Fund, GEF, Bi- lateral donors	- Lack of technical capacity	New concept notes and proposals to get funding from donors are available.	Credit policy drafted and approved Credit disbursement and recovery program drafted and approved MIS developed Credit disbursement and recovery documented in MIS	100,000
	1.4. Recruitment of sales agents			Aug. 2019	June. 2023	Banks	AEDB	AEDB/ Donor like Green Climate Fund, GEF, Bi- lateral donors	Non availability of local level skilled agents	Local level skilled agents recruited	No. of local level skilled agents recruited	2

	1.5.Loan disbursement, its documentation under one window operation and recovery			Sept. 2019	June. 2023			Donor/ own sources	- Technical and capacity risks - Market and financial risks	- After 5 years the banks will have a sustainable mechanism to provide soft term loans.	- Project launched - Project staff recruited - ToRs and contracts signed - No. and amount of soft term loans delivered - Amount of loan recovered - Recovery %age - No. of sites monitored - No. and Capacity of micro hydel systems installed. - Electricity produced	6
2. Training and	2.1.Awareness raising through electronic,	Aug 2018	Feb. 2019	Mar. 2019	Dec. 2022	AEDB	PCRET, Provincial Govts,	AEDB, PCRET, Provincial Govts,	Financial risk	Mass awareness conducted through electronic,	No. of awareness programs	1.0

Awareness raising	print and social media.						NGOs, PEMRA	NGOs, Donor		print and Social media	produced and implemented	
	2.2. Identification of accredited training institutes and conducting trainings	Aug. 2018	Dec. 2018	Jan 2019	Dec. 2022	NUST, Taxila University of Sci. and Tech, TEVTA & NAVTTC	AEDB, PCRET, Provincial Govts, NGOs	AEDB, PCRET, Provincial Govts, NGOs, Donor	Technical and capacity risks	Training conducted	Types of training conducted and Nos. of persons trained	500,000
	2.3. Follow up of trainings and lessons learnt			Jan 2020	Dec 2022	Provincial Govts, Local NGOs	AEDB, PCRET	AEDB, PCRET, Provincial Govts, NGOs, Donor	Technical and capacity risks	Trained persons monitored and guided	Nos. of persons monitored and guided after training, Nos. of refresher courses and persons benefited	100,000
3. Establishment of quality standards and labeling for micro hydropower plants	3.1. Identification and approval of standards from competent forum.	July 2018	July 2019	Aug. 2019	June 2023	PSQCA, AEDB	PCRET, Pro. Govts.	Government, donor funding	Local manufacturers may not be able to meet the standards	Standards developed and accepted by relevant federal stakeholders and provincial	Quality standards developed and approved	1

										governments		
	3.2.Development of Legal framework to support standardization and labeling and its approval from competent forum.	July 2018	July 2019	Aug. 2019	June 2023	PSQCA, AEDB	PCRET, Pro. Govts. Ministry of Law	Government, donor funding	Funding for development of legal framework may not be available, Legal framework may not be acceptable to all provinces/territories, National Assembly and Senate	Legal framework developed and approved by National Assembly and Senate	Preparation of draft legal framework; its approval from National Assembly and Senate	1
	3.3.Development of Lab. Facilities for measuring standards	Jan 2019	June 2019	July 2019	June 2023	PSQCA, AEDB	PCRET, NUST, Taxila Univ. of Sci. and Tech; UET	Government, donor funding	Funding for establishment of Lab. Facilities may not be available, Issues in taking samples and payment of testing, Testing of equipment may increase its cost	Labs established in Islamabad and Provincial/Territorial headquarters; Sampling technique used to test all local micro	Nos. and types of micro HPPs tested	8

										HPPs sold in the market.		
	3.4.Labeling of micro hydropower plants available in the market.			Jan. 2019	June 2023	PSQCA	AEDB	Government, donor funding	Political pressure may influence enforcement of labeling	Labeling of micro and small HPPs products of all local companies	No. of local companies with labeling of their products	2
	3.5.Training and awareness of producers and consumers on standard and labeling			Jan. 2019	Dec. 2022	Federal and Provincial Govts.	NGOs	Government, donor funding	Technical and capacity risks	Training and awareness raising programs conducted	No. of producers and consumers aware of standards and labeling	3

Annexure-VII

Summary of Actions, Activities, Implementation Schedule, Responsible Parties, Potential Sources of Funding, Risks, Indicators and Budget for Sustainable Forest Management (SFM)

Budget for Sustainable Forest Management (SFM)												
Action	Activities	Planning		Implementation		Responsibility		Potential Sources of funding	Risks	Success criteria	Indicator for monitoring implementation	Budget for Activity (USD) (Million)
		When?				Who?						
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary					
1. Economic incentives for staff and forest communities for SFM	1.1. Promote REDD+ program • Develop MRV system	July 2018	Jan 2019			Forestry wing, MoCC	Provincial/ Territorial Forest Departments and local communities	Forest Carbon Partnership Facility, World Bank, UN-REDD, Federal and Provincial Governments	Technical and capacity risks	Initiation of REDD+ projects at national and sub-national levels.	- National report on GHG emissions and Climate Change - Published forest cover maps with yearly data - Reports on national carbon stocks and changes in forest carbon stocks	12.0

	<ul style="list-style-type: none"> Develop National and Sub-national REDD+ strategies/ Independent Forest Monitoring Systems 	Sept 2018	Mar. 2019								<ul style="list-style-type: none"> - Publish REDD+ strategy - No. and type of comments of stakeholders on the strategy, identified and incorporated - No. of workable options in the strategy 	
	<ul style="list-style-type: none"> Prepare Forests Reference/ Reference emission levels 	Sept . 2018	Mar. 2019								<ul style="list-style-type: none"> - Published national and provincial RELs - No. and type of comments of experts and stakeholders on RELs, 	

											identified and incorporated	
	• Develop Safeguards and Safeguards Information System	Sept. 2018	Feb. 2019								- Feedback and Grievance Redress Mechanism developed - Safeguards Information System developed	
	• Develop REDD+ Cells in provinces / territories	March 2019	Aug 2019			Provincial/Territorial Forest Deptts	MoCC, local communities	Provincial governments and international donors funding	Funding may not be available	Initiation of REDD+ projects	- REDD+ Cells established - No. and type of projects prepared by REDD+ Cells	3.0
	1.2.Establish national and sub-national REDD+ funds	Sep 2019	Jan 2020	Feb. 2020	June 2023	MoCC, Provincial/Territorial Forest Deptts	Local communities	Initially with govt. funding.	Funding may not be available	REDD+ Funds established and amount received	- REDD+ Funds established at national and sub-national levels. - Amount received under funds	3.2.

	1.3.Develop and get approved the enabling policies and regulatory frameworks for giving incentives	Sept 2019	Feb. 2020	March 2020	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities	REDD+ Preparedness Project; Govt. funding	Policies and regulatory frameworks for giving incentives may not be approved.	Policies and regulatory frameworks for giving incentives approved by Federal/ Provincial govts.	- policies and regulatory frameworks for giving incentives drafted - policies and regulatory frameworks for giving incentives approved	0.1
	1.4.Sustainable harvesting of non-timber products for income generation			Jan 2020	June 2023	Provincial/ Territorial Forest Deptts	MoCC, local communities	Govt. and other donors funded projects	Technical and capacity risks	Sustainable production of NTFPs	- No. of training workshops and trainees - Amount, Nos and type of NTFPs sustainably harvested	0.1
	1.5:Develop infrastructure for satellite forest data acquisition, analysis, interpretation and ground	Feb. 2019	Dec. 2020	Jan. 2021	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities	Govt. and other donors funded projects	Funding, technical and capacity risks	GIS and remote sensing based MRV system developed and updated annually	- GPS coordinates of required sites taken - No. of training workshops and trainees	1.0

	trothing for MRV of forest cover and carbon stock.										<ul style="list-style-type: none"> - Resolution decided and required GIS based data procured - Data analyzed - Data interpreted - Ground trothing of data carried out 	
2. Enhanced capacity of staff and forest communities for development of SFM plans by integrating professional skills and trainings with traditional knowledge	2.1. Conduct workshops and exposure visits for capacity building of staff for development and implementation of SFM plans.	Sept 2019	Dec. 2019	Jan. 2020	Dec. 2022	MoCC, Provincial I/ Territorial Forest Deptts	Local communities	Govt. and other donors funded projects	Technical and capacity risks	- SFM, REDD+ and PES initiated	<ul style="list-style-type: none"> - No. of training workshops and trainees - SFM, REDD+ and PES initiated - Amount received through REDD+ and PES 	2.0
	2.2. Drafting effective rules and	Sept 2019	March 2020			MoCC, Provincial I/ Territorial	Local communities	REDD+ Preparedness Project;	Rules and regulations for SFM	Rules and regulations for SFM approved	Rules and regulations for SFM drafted and approved	0.1

	regulations for SFM					1 Forest Deptts		Govt. funding	not approved			
	2.3. Develop guidelines containing realistic criteria and indicators for preparing SFM plans taking into consideration traditional laws and governance system	Sept 2019	Mar. 2020	April 2020	Dec 2022	MoCC, Provincial / Territorial Forest Deptts	Local communities	Govt. and other donors funded projects	Funding, technical and capacity risks	Guidelines for preparing SFM plans developed and published	No. of Guidelines for preparing SFM plans developed and published	0.2
	2.4. Mass awareness through electronic, print, social media, workshops and seminars.	Oct. 2019	Mar. 2020	April 2020	June 2022	MoCC, Provincial/ Territorial Forest Deptts	Local communities, PEMRA	Govt. and other donors funded projects	Technical and capacity risks	SFM, REDD+ and PES initiated	<ul style="list-style-type: none"> - No. of programs aired. - No. of publications prepared and disseminated - No. of articles in newspapers published No. of articles & 	6.0

											programs disseminated through social media	
	2.5. Capacity building of forest communities and involving them in development and implementation of SFM Plans through participatory process.	Oct. 2019	Jan 2020	Feb 2020	Dec 2022	MoCC, Provincial/Territorial Forest Deptts	Local communities	Govt. and other donors funded projects	Technical and capacity risks	Capacity building of forest communities developed	- No of trainings conducted - No. of local people trained and ToT	1.5 million

Annexure-VIII

Summary of Actions, Activities, Implementation Schedule, Responsible Parties, Potential Sources of Funding, Risks, Indicators and Budget for Social Forestry

Action	Activities	Planning		Implementation		Responsibility		Potential Sources of funding	Risks	Success criteria	Indicator for monitoring implementation	Budget for Activity (USD) (Million)
		When?				Who?						
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary					
1.Incentives for Social Forestry	1.1. Design and provide tax rebate and, subsidies for private nurseries and seedlings.	July 2018	Jan 2019	Feb. 2019	Dec 2022	Provincial / Territorial Forest Departments	Forestry wing, MoCC, NGOs	Provincial and national governments and international donors	Funding may not be available	Incentives provided and used effectively	- Amount and type of incentives provided - Area under forest cover. - No. of HHs benefitted	3.1
	1.2.Offer Concessional loans			Jan. 2019	Dec. 2023	Banks, NGOs	Provincial / Territorial Forest Departments, Forestry wing, MoCC	Provincial and national governments international donors and Banks	Loan recovery %age may be less.	Provision of loans and its effective utilization	- Amount of loans provided - Amount recovered - Area under forest cover. - No. of HHs benefitted	7.0
	1.3.Encourage private sector by designing	July 2018	Jan. 2019	Feb. 2020	Dec. 2022	Provincial / Territorial Forest	Forestry wing, MoCC, NGOs	Provincial and national governments and	Private sector may not be interested for social forestry	Incentive provided to private sector to	No of incentives provided	8.0

	policies to invest in social forestry sector that promote small holders or community benefits in out grower schemes.					Departments and local communities		international donors		encourage social forestry		
	1.4. Introduce incentives such as microfinance, out-grower schemes, remittances for owning a woodlot, awareness raising for availability of funds and co-financing of inputs for communities			July 2019	Dec. 2022	Provincial / Territorial Forest Departments and local communities	Forestry wing, MoCC, NGOs	Provincial and national governments and international donors	Downstream communities may not be ready to provide incentives to upstream communities	Incentives provided and used effectively	- Amount and type of incentives provided - Area under forest cover. - No. of HHs benefitted	4.0
2.Awareness raising and training	2.1.Focusing social forestry in curricula	July 2018	June 2019	July 2019	June 2023	MoCC, Provincial/ Territorial Forest Deptts	Local communities, PFI	Provincial and national governments and	Funding may not be available	Social forestry focused in curricula at primary,	- No. of sessions introduced in curricula at primary,	3.0

								international donors		secondary and tertiary levels.	secondary and tertiary levels.	
	2.2. Introduce awareness programs through mass media.			July 2019	Jan. 2023	Electronic media, MoCC, Provincial/ Territorial Forest Deptts	Local communities, PEMRA	Provincial and national governments and international donors	Electronic media may not provide time for free advertisement and Funding may not be available	Awareness campaign effectively launched	- No. of programs aired on radio and television	4.0
	2.3. Provide extension and technical guidance to the farmers			July 2019	Jan. 2023	Print media, MoCC, Provincial/ Territorial Forest Deptts	Local communities	Provincial and national governments and international donors	Funding may not be available	Incentives provided and used effectively	- Amount and type of printed material prepared and disseminated - No. of articles in newspapers	5.0
	2.4. Provide training to the forest staff and selected local community members on social forestry.			July 2019	Dec. 2021	MoCC, Provincial/ Territorial Forest Deptts	Local communities	Provincial and national governments and international donors	Funding may not be available Training may not be utilized effectively	Training provided and utilized successfully to increase tree cover area	- No and type of training events - No. of participants trained - No. of participants utilizing trained skills.	4.0

Annexure-IX

Summary of Actions, Activities, Implementation Schedule, Responsible Parties, Potential Sources of Funding, Risks, Indicators and Budget for BRT

Action	Activities	Planning		Implementation		Responsibility		Potential Sources of funding	Risks	Success criteria	Indicator for monitoring implementation	Budget for Activity (USD)(Million)
		When?				Who?						
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary					
1.Reduced capital Cost by giving tax incentives / soft term loan for BRT system	1.1.Conduct study demonstrating the tax incentives needed, its role in the promotion of BRT system and alternate strategies of revenue generation for the government	July 2018	June 2019	Aug. 2019	June 2021	National Transport Research Centre, Ministry of Communication Ministry of Finance and Board of Revenue	Provincial/ Territorial Transport Departments	Ministry of Communication, Ministry of Finance and Board of Revenue	Non availabil ity of funding	Study conducted in given period of time	Study conducted Strategies developed for revenue generation	0.1
	1.2.Conducting workshops and meetings with policy makers to discuss options for	July 2018	June 2019	July 2019	June 2022	National Transport Research Centre, Ministry of Communicat ion, Ministry	Provincial/ Territorial Transport Departments	ADB, World Bank, and other DFI's	Delay in approval process	Approval of strategies and studies	No of workshops conducted	0.25

	reducing capital cost for BRT system.					of Finance and Board of Revenue						
	1.3. Design and provide fiscal and financial incentives to encourage BRT system, such as special fiscal treatments (favourable tax treatments and soft term loans) for developing infrastructure and local manufacturing of buses.	July 2018	June 2019	Aug. 2019	December 2022	National Transport Research Centre, Ministry of Communication Ministry of Finance and Board of Revenue	Provincial/ Territorial Transport Departments	Ministry of Finance and Board of Revenue	Delay in approval process	Tax rebate and subsidies provided	Notification for tax rebate issued No. of beneficiaries	9
	1.4. Provide technological knowhow as well as facilities for assembling and manufacturing of BRT busses locally.			Jan. 2020	Dec. 2022	NTRC	NEECA, Provincial/ Territorial Transport Departments	Govt. of Pakistan	Imposition of new govt. taxes.	Local manufacturing of quality buses	- No. of quality buses locally assembled - No. of manufacturers	10

2. Involvement of private sector for promotion of BRT	2.1. Development and submission of proposals for creating incentives for private sector investment.	Aug. 2018	Dec. 2019			Ministry of communication	Provincial/ Territorial Transport Departments	ADB, World Bank, GCF	Delay in approval of proposals No response from private sector	No. of proposals implemented on the ground	No. of project proposals developed and approved	0.2
	2.2. Offer soft term loans			Aug 2019	Dec. 2021	Banks	MoCC, Provincial/ Territorial Transport Departments	Provincial and national governments international donors and Banks, GCF	Loan recovery %age may be less.	Provision of loans and its effective utilization	- Amount of loans provided - Amount recovered -	5.0
	2.3. Promote public private partnerships			Aug. 2018	Jan. 2019	Ministry of Communication Ministry of Finance and Board of Revenue	Provincial/ Territorial Transport Departments	Provincial and national governments, donors and Banks, GCF	Less response from private sector	No. of joint venture projects initiated	No. of partnerships developed	0.05

Annexure-X

Summary of Actions, Activities, Implementation Schedule, Responsible Parties, Potential Sources of Funding, Risks, Indicators and Budget for Vehicle tune up

Action	Activities	Planning		Implementation		Responsibility		Potential Sources of funding	Risks	Success criteria	Indicator for monitoring implementation	Budget for Activity (USD)(Million)
		When?				Who?						
		Start Date	End Date	Start Date	End Date	Primary and Focal point	Secondary					
1. Initial capital cost of computerized tune up facility made affordable through revolving loan fund	1.1. Identification of potential donors, developing and submitting project proposals	July 2018	Dec. 2019	Oct. 2019	Dec. 2020	NEECA	MoCC, NTRC	NEECA, Ministry of Planning and Development,	Delay in availability of funds	Donors identified and proposals prepared	-no of project proposals submitted	0.2
	1.2. Study the feasibility and consult with potential operating partners for establishing Revolving Loan Fund (RLF)	Aug 2018	Jan. 2019			NEECA	MoCC, NTRC	NEECA,	Delay in availability of funds	- Feasibility study conducted, - Potential operating partners identified	- No. of consultations -Feasibility study conducted - No. of potential operating partners identified	0.2

	1.3. Design RLF implementing and management structure	Feb. 2019	July 2019			NEECA	MoCC, NTRC	NEECA,	Project funding not available	RLF implementation and management structure developed	- RLF implementation and management structure designed - No. and type of components of the RLF implementation and management structure	0.5
	1.4.Establishment of a Revolving Loan Fund (RLF)			Aug. 2019	June 2020	NEECA	NTRC	GCF	Misuse of RLF	Revolving loan fund established	No. of loans provided from RLF No. of Vehicle tune up centers established	5
	1.5.Secure the services of a financial institution to manage the RLF to disburse and recover loans			Aug. 2019	June 2023	NEECA	Commercial banks	GCF	Non-transparent fund management	RLF successfully managed by the financial institution	No. of loans provided from RLF No. of Vehicle tune up centers established	1
	1.6.Documentation and monitoring of RLF program.			Aug. 2019	June 2023	Banks	Commercial banks, NEECA,	Commercial banks	Lack of capacity of financial institution to	RLF successfully documented by the	- MIS for documentation developed	1.5

							MoCC, NTRC		document and monitor RLF	financial institution	- Measurement, reporting and verification (MRV) system developed	
2.Training and Awareness raising	2.1.Identify training centres and conduct trainings for workshop owners and motor mechanics	July 2018	Dec. 2018	Jan. 2019	Dec. 2022	NEECA , TEVTA	NTRC, MoCC	NEECA, ADB, World bank, GCF	Less response from the workshop owners	Training centers established and identified	No of Training centers established	5
	2.2.Develop communications strategy	Dec. 2018	June 2019			Ministry of Communi- -cation, NTRC	NEECA, MoCC	Ministry of communi- -cation, NEECA, NTRC	Lack of commitment from lead agencies and partner organization	Communic ation strategy developed	Communication strategy developed	0.5
	2.3.Development of awareness materials and demonstration events in cities to show how to maintain vehicles efficiently	Dec. 2018	June 2019	July 2019	Dec. 2022	NEECA , NTRC	TEVTA	Ministry of communi- -cation, NEECA, NTRC	Less participation of community in the events	Demonstrat ion events held	No. of Demonstration events held	0.5

	2.4.Training of vehicle service providers and Motor Vehicle Examiners			July 2019	Dec. 2022	TEVTA	NEECA, Motor Vehicle Examiners	ADB, GCF, World Bank	Delay in grant of allocation of funds	Trainings provided to vehicle service providers and Motor Vehicle Examiners Manuals prepared	No. of trainings provided Manuals prepared	5
	2.5.Mass awareness through electronic and print media and Social media			July 2018	Dec. 2022	NEECA, Media	PEMRA, Press Information Department	Ministry of communication, NEECA, NTRC	Lack of commitment from lead agencies partner organizations	Awareness raised	No. of mass awareness campaigns launched	1