

Climate Technologies for Agriculture, Water and Energy Sectors in Afghanistan

Technical Assistance Summary

Afghanistan has been identified among the countries with most vulnerability to climate change impacts. The decades of war and conflict have not only damaged the country's infrastructure, but also reduced capacity for development inside the country.

Afghanistan's response to climate change will consist of both mitigation and adaptation actions. The country has identified its urgent needs for adaptation in its National Adaptation Programme of Action (NAPA), drafted its Low-carbon Development Strategy and Nationally Appropriate Mitigation Action (NAMA), and finally adopted its Mitigation and Adaptation Agenda in its Intended Nationally Determined Contribution (INDC).

Understanding the importance of Climate Technologies, the government of Afghanistan has asked for technical assistance from CTCN, to identify technology needs in three most vulnerable sectors (according to NAPA) to climate change impacts.

The objective of the technical assistance is to support the Government of Afghanistan in identifying and advocating for suitable technologies for low-carbon and climate resilient development in agriculture, water, and energy. The technical assistance will focus on three interrelated areas; (i) raising political will and interest for low carbon and climate adaptation technologies through targeted briefings and advocacy papers and its integration in the national development planning processes, (ii) generating promising project concepts for climate technology deployment. and (iii) strengthening capacities for identifying priority technologies and related enabling frameworks, including support for the technology discussions in the 2015 United Nations Climate Change Conference (COP 21) in Paris.

Response to the Technical Assistance

Based on the Response Plan developed for this Technical Assistance, this paper summarizes the prioritized technologies for the three sectors.

Climate-smart Technologies are vital to address both Climate Change Adaptation and Mitigation. Technologies, refers to physical infrastructure, equipment, and machineries (Hardware); knowledge, skill and approaches (Software), and the capacity for use of the two previous ones.

Identification of Climate Technologies for three most vulnerable sectors, is one of the objectives of this Technical Assistance.

Climate technologies were identified through a literature review process and then prioritized in a participatory consultation workshops. Technologies were prioritized based on six following criteria: Environmental Priorities, Social Priorities, Economic Priorities, GHG Reduction Potential, Vulnerability Reduction, and Cost Efficiency.

Agriculture Sector

Agriculture is the key sector for economic and social development in Afghanistan. More than 70 % of the population are engaged, directly or indirectly, in the Agriculture sector for their livelihood. This important sector is among the three most vulnerable sectors to the adverse impacts of Climate Change.

Since, the Agriculture Sector relies directly on environmental conditions, changes in Climate can impact significantly this sector. Changes in rainfall, decreases in water availability, drought, water excesses or flooding, and changes in environmental conditions are the significant impacts of climate change in the country.

The prioritization process of Climate-Smart Technologies focused on four important sub-sectors and identified one to two important technologies for each sub-sectors:

1. Climate Technologies for Crops

Crop Diversification and New Varieties (Adaptation): Diversifying crops and introducing improved varieties of crop is a technology that is deployed to enhance plant productivity, quality, health, nutritional value and to enhance crop resilience to environmental stresses and change, pest, and disease. Introduction of drought-resilient crops in drought-prone areas, is one of the important example of this technology.

2. Climate Technologies for Irrigation

Drip Irrigation (Adaptation): The constant application of specific amount of water to soil crop, is called Drip Irrigation. This system provides adequate level of soil moisture and suitable environment for better use of available nutrients in the rooting areas. This system as enhance water efficiency and avoid water wastage.

3. Climate Technologies for Livestock

Livestock Disease Management (Adaptation): Livestock diseases cause a significant number of problems within livestock production systems, which can include animal welfare, productivity losses, uncertain food security, loss of income and negative impacts on human health. Adequate management of Livestock disease can reduce disease through developed animal husbandry practices. These include: controlled breeding, controlling entry to farm lots, and quarantining sick animals and through developing and improving antibiotics, vaccines and diagnostic tools, evaluation of ethno-therapeutic options, and vector control techniques.

4. Climate Technologies for Forestry

Agro-forestry: Based on the World Agro-forestry Centre's definition, is "a dynamic, ecologically based, natural resources management system that, through the integration of trees on farms

and in the agricultural landscape, diversifies and sustains production for increased social, economic, and environmental benefits for land users at all levels”

Water Sector

Water is Afghanistan’s most critical natural resource and key to the health, economy, and social development of Afghan people. In Afghanistan, the quality of, access to and availability of water are major challenges that can be a source of conflict or a driving force for migration. The arid climate of the country makes water resources limited particularly during drought periods. This vital natural resource is highly vulnerable to the temperature rise and precipitation changes.

Climate-smart technologies play important role in coping with climate change adverse impacts in this sector. The prioritization process of Climate-Smart Technologies focused on three important challenges of this sector and identified one to two important technologies for each challenges:

1. Climate Technologies for Water Availability

Rainwater Harvesting: As part of the Watershed Management, rainwater harvesting is one of the important technologies to be deployed. Rainfall can be a good source of cleanest naturally occurring water that is available. This water can be collected, through different approaches, before huge losses occur due to transpiration, evaporation, and runoff and drainage or before it becomes contaminated by natural or man-made means. At the absence of surface water, and deep availability or inaccessibility of groundwater, rainwater harvesting is one of suitable technologies.

2. Climate Technologies for Water Risks Reduction

Flood Hazard Mapping: Water, the source of life, can also be turned into sources of death through flooding and other harsh forms of water. Climate Change can cause and/or exacerbate flooding in developing countries. Therefore, it is extremely important to identify flood zones for further best-practices to be deployed.

Flood Warning Systems: A flood warning system is the technology of detecting threatening events in advance. This system warns the public so that adequate actions can be taken to reduce the adverse impacts of the event.

3. Climate Technologies for Water Safety

Household water treatment and safe storage: "Household or point of use drinking water treatment and safe storage (HWTS) helps to improve the quality of their water by treating it in the home. These technologies aim to improve the microbiological and, in some cases, the chemical quality of potable water and to reduce diarrheal disease.

Energy Sector

Afghanistan's energy sector has been particularly hard hit by decades of conflict and neglect. Currently, domestic energy production is at a very low level, and the country has been importing most part of its energy from the neighboring countries. Afghanistan, as a late starter of providing clean energy to its rural population, has considerable advantages. There is now a huge body of experience to guide policymakers in identifying better technologies for both energy generation and consumption. Afghanistan has abundant resources for energy generation from solar technologies, wind (particularly in the southwest), biomass, and potentially geothermal energy.

Climate-smart technologies regarding the generation and consumption of energy can play important role in climate change mitigation and adaptation measures. The prioritization process of the energy sector has identified the following technologies by focusing on Generation and Consumption of energy.

4. Climate Technologies for Energy Generation

Solar Thermal: in this technology the energy of sun is used, instead of fossil fuels, to generate low-cost and environmentally friendly thermal energy, which can be used further to heat water or other fluid, and to power solar cooling systems.

Solar Photovoltaic: the solar cells, or photovoltaic cells are used to convert sunlight directly into electricity. In Afghanistan, solar resources are abundant across the country, and if fully exploited, could provide over 220,000 MW of additional generation capacity¹.

Integrated Coal Gasification: this system uses a coal gasification system to convert coal into a synthesis gas (syngas), use partial oxidation of coal with oxygen as the oxidant.

Small Scale Hydro Energy: small-scale hydropower system generates electricity using the natural flow of water. The technology has been used in many villages of Afghanistan.

Geothermal: The presence of geothermal resources (as evidenced through surface hot springs) has been documented at many locations in Afghanistan, particularly along the main axis of the Hindu Kush mountains², but further site-specific studies are needed. Resources appear to be more than adequate for direct heat applications, which could provide a cheap source of heat for houses, businesses, and for commercial applications (such as greenhouses, and food drying). Where resources exist, electricity generation from geothermal energy is among the cheapest of

¹ *Afghanistan Renewable Energy Policy*, Government of the Islamic Republic of Afghanistan, 2015

² Saba, D. S. (2004). *Geothermal Energy in Afghanistan: Prospects and Potential*. Retrieved from Mindfully.org: <http://www.mindfully.org/Energy/2004/Afghanistan-Geothermal-Energy1feb04.htm>

energy sources and offers the promise of providing cheap baseload power to the grid. However, further studies are needed to identify the sites most appropriate for energy generation.

Biomass: Energy generation from biomass (agricultural products / waste / residue) has an estimated electricity generation capacity potential of 4000 MW³. In the rural context, energy generation from manure, biogas and agricultural residue has promise and has had some small-scale applications. In the urban context, energy generation from municipal solid waste (MSW) offers the potential both for waste generation and for environmental protection; as the vast majority of Afghanistan's MSW is untreated.

5. Climate Technologies for Energy Consumption

Building Insulation: By building insulation technology, it is referred here to thermal insulation of a building to prevent energy loss in a building. The technology contributions in energy efficiency and reduce energy consumption.

Building ventilation: this technology is referred to the natural ventilation of buildings for thermal, dehumidification, and displacing indoor pollutants purposes. The technology can ensure energy efficiency and contribute in less consumption of energy.

Daylight Building: this technology refers to the control of direct and diffuse sunlight to enter the building and reduce the lighting energy daily consumption.

Compact Fluorescent Light Bulbs and LEDs: CFLs lights uses (1/3 - 1/5) of the simple incandescent lamps electric power, and also last (5-8) times longer than incandescent lamps. LEDs are assembled into a lamp (or light bulb) for using it in lighting purposes, its efficiency is several times more than CFLs light and far more than incandescent lamps. LEDs lamps are one of the most fast growing light in the current markets.

Solar lanterns: Also called solar lamp uses LEDs or CFLs lights has rechargeable batteries which provides lights during nights. It's mostly used to replace kerosene lamps in rural areas.

Solar Cookers: Curved concentrator cookers, Panel cookers are using solar for cooking purposes with the most common one of panel cookers mainly used in developing countries and some developed countries like china and India.

³ *Afghanistan Renewable Energy Policy*