Funding Proposal

SAP026: Extended Community Climate Change Project-Drought (ECCCP-Drought)

Bangladesh | Palli Karma-Sahayak Foundation(PKSF) | Decision B.36/05

3 August 2023

GREEN CLIMATE FUND

Contents

Notes to accredited entities on the use of the SAP funding proposal template

- The Simplified Approval Process Pilot Scheme (SAP) supports projects and programmes with a GCF contribution of up to USD 25 million with minimal to no environmental and social risks. Projects and programmes are eligible for SAP if they are ready for scaling up and have the potential for transformation, promoting a paradigm shift to low-emission and climate-resilient development.
- This template is for the SAP funding proposals and is different from the funding proposal template under the standard project and programme cycle. Distinctive features of the SAP funding proposal template are:
  - *Simpler documents*: key documents have been simplified, and presented in a single, up-front list;
  - *Fewer pages*: A shorter form with significantly fewer pages. The total length of funding proposals should **not exceed 20 pages,** annexes can be used to provide details as necessary;
  - *Easier form-filling*: fewer questions and clearer guidance allows more concise and succinct responses for each sub-section, avoiding duplication of information.
- Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other funding proposal documents such as project appraisal document, pre-feasibility studies, term sheet, legal due diligence report, etc.
- Submitted SAP Pilot Scheme funding proposals will be disclosed simultaneously with submission to the Board, subject to the redaction of any information which may not be disclosed pursuant to the GCF Information Disclosure Policy.

Please submit the completed form to:
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Please use the following name convention for the file name:
"SAP-FP-[Accredited Entity Short Name]-[yymmdd]"

LIST OF ACRONYMS	
AE	Accredited Entity
AF	Adaptation Fund
AMA	Accreditation Master Agreement
ARA	Adaptation results area
BARC	Bangladesh Agriculture Research Council
BCCRF	Bangladesh Climate Change Resilience Fund
BCCTF	Bangladesh Climate Change Trust Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BDT	Bangladeshi Taka (currency)
BMDA	Barind Multipurpose Development Authority
CCAG	Climate Change Adaptation Group
CCCP	Community Climate Change Programme
DAE	Department of Agriculture Extension
DASCOH	A local NGO in Bangladesh working & experimenting on MAR systems
EE	Executing Entity
EoI	Expression of Interest
ET0	Evapo-transpiration
GCF	Green Climate Fund
GCM	General Circulation Model
GEF	Global Environmental Facility
GW	Groundwater
GWT	Ground water Table
IAS	International Accounting Standard
INDC	Intended Nationally Determined Contribution
IWRM	Integrated Water Resource Management
LDC	Least Developed Country
MAR	Managed Aquifer Recharge
MRA	Mitigation results area
MOEF	Ministry of Environment and Forest (renamed now as Ministry of Environment, Forest and Climate Change)
MOWR	Ministry of Water Resources
NAP	National adaptation plans
NDA	National Designated Authority
NDC	Nationally determined contribution
NGO	Non-Government Organization
NWR	North-western region
PET	Potential Evapo-transpiration
PKSF	Palli Karma Sahayak Foundation
PMU	Project Management Unit
PO	Partner Organization
RTE	Real Time Evaluation
SDG	Sustainable Development Goal
SPI	Standard Precipitation Index
ToC	Theory of change
USD	United States Dollar (currency)

A. PROJECT/PROGRAMME SUMMARY

A.1. Has this FP been submitted as a SAP CN before?	Yes ☒ No ☐				
A.2. Is the Environmental and Social Safeguards Category C or I-3?	Yes ☒ No ☐				
A.3. Project or programme	☒ Project ☐ Programme	**A.4. Public or private sector**	☒ Public sector ☐ Private sector	**A.5. RfP**	Not applicable

A.6. Result area(s)		**GCF Contribution**	**Co-financers' contribution[1]**
	Mitigation total	Enter number %	Enter number %
	☐ Energy generation and access	Enter number %	Enter number %
	☐ Low emission transport	Enter number %	Enter number %
	☐ Buildings, cities and industries and appliances	Enter number %	Enter number %
	☐ Forestry and land use	Enter number %	Enter number %
	Adaptation total	Enter number %	Enter number %
	☒ Most vulnerable people and communities	0 %	90 %
	☒ Health and well-being, and food and water security	100 %	10 %
	☐ Infrastructure and built environment	Enter number %	Enter number %
	☐ Ecosystem and ecosystem services	Enter number %	Enter number %

A.7.1. Expected mitigation outcome *(Core indicator 1: GHG emissions reduced, avoided or removed / sequestered)*		**A.7.2 Expected adaptation outcome** *(Core indicator 2: direct and indirect beneficiaries reached)*	*Indicate total number of direct and indirect beneficiaries*	
			Number of direct beneficiaries is 215,000	*Indicate number of direct beneficiaries All people of selected 14 upazilas of Rajshahi, Naogaon and Chapainawabganj (approximately 3,513,523)*
			0.0013%	*0.02%*

[1] Co-financer's contribution means the financial resources required, whether Public Finance or Private Finance, in addition to the GCF contribution (i.e. GCF financial resources requested by the Accredited Entity) to implement the project or programme described in the funding proposal.

A.8.1. Total investment (GCF + co-finance[2])	Amount: 29,961,990 USD	**A.8.2 Total GCF funding requested** (max USD 25M)	Amount 24,957,990 USD
A.9. Type of financial instrument requested for the GCF funding	*Mark all that apply.* ☒ Grant ☐ Loan[3] ☐ Equity ☐ Guarantees ☐ Others:		
A.10. Implementation period (months)	*48 months.*		
A.11. Total project/ programme lifespan (years)	*20 years*	**A.12. Expected date of internal approval**	*6/30/2023*
A.13. Executing Entity information	*Palli Karma-Sahayak Foundation (PKSF)*		

A.14. Scalability and potential for transformation (Eligibility for SAP, max. 100 words)

The project intends to reduce the vulnerability to droughts of poor communities in the area of Bangladesh that is most affected by drought. Integrated water management will be promoted using '4-R' approach, which stands for Reuse, Recharge, Recycle, and Reduce. The ultimate purpose is to make the target area less vulnerable to climate change-induced drought and to promote sustainable use of water resources. This will be achieved through an integrated strategy that builds on three main elements: i) improving capacities of relevant government institutions and grassroots level organisations to address drought problems and to sustainably manage water resources, ii) improving access to surface water for poor communities and promoting ground water aquifer recharge, and iii) promoting less consuming cropping patterns and use of drought-tolerant crop varieties. In addition, the project will train local/community level NGOs on climate change issues and the Real Time Evaluation (RTE) system so that they are able to understand the negative impacts of climate change on their development activities and take necessary initiatives. Knowledge and practice on drought-induced climate change will be transferred to communities by establishing Climate Change Adaptation Groups (CCAGs). The credit system that PKSF has already in place in the project area will also help farmers to replicate and expand promoted cropping patterns and varieties.

A.15. Project/Programme rationale, objectives and approach (max. 300 words)

[2] Refer to the Policy on Co-financing of the GCF.
[3] Senior loans and subordinated loans.

Bangladesh is one of the most vulnerable countries in the world to the effects of climate change. According to the ND-GAIN Country Index[4], Bangladesh ranks 162th out of 181, thus showing the high vulnerability of the country to climate change and related resilience capacity. The average annual economic loss due to climate change in Bangladesh is around 1.15% percent of Gross Domestic Product (GDP) over the period from 2005 to 2050 [5]. The average loss in agricultural GDP due to climate change is a third of the agricultural GDP losses associated with existing climate variability. Agricultural GDP will be 3.1 percent lower each year as a result of climate change over the period of 2005 to 2050[6]. Nationally Determined Contribution (NDC) of Bangladesh estimated that implementation cost for adaptation activities would be USD 42 billion up to 2030.

Almost every year, the country experiences hazards in the form of floods, droughts, and cyclonic storm surges. A few of such hazards turn into disasters due to inadequate institutional arrangement and management capacities. Climate-induced disasters cause heavy losses in terms of life and property and jeopardise development activities[7]. High spatial and temporal climatic variability and extreme weather events have made Bangladesh highly vulnerable to disasters along with high population density, high incidence of poverty and social inequity, poor institutional capacity, inadequate financial resources, and poor infrastructure[8].

Drought is a very common natural hazards in the North-western region (NWR) of Bangladesh[9]. Available analytical account suggests that the NWR is the most drought-prone area in the country[10]. Every year Bangladesh experiences a dry period for seven months, from November to May. The lack of appreciable rainfall combines with seasonal heat stress and/or desiccation during hot summer months to give rise moisture stress[11]. Moisture deficits are compounded by very high seasonal evapo-transpiration from paddy-dominated agricultural practices. The result is the phenological drought which is manifested by a net top soil moisture deficit. Figure 1 exhibits very low winter (January-February) and summer (March-April) rainfall availability as against high evapo-transpiration (ET0) occurring simultaneously to give rise moisture deficit. Drought in the NWR is linked to climatic conditions and rainfall patterns. About 70% of people in the proposed project area depend on agriculture directly or indirectly[12]. Most importantly, more than 60% of the population are small, marginal farmers and agricultural wage-labourers who suffer from food and nutritional deficiency caused by droughts[12].

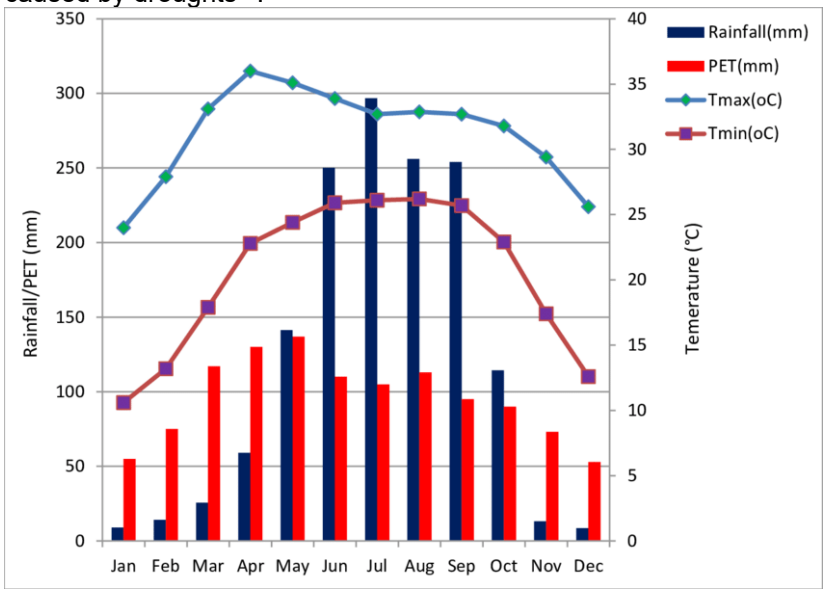


Figure 1: Long-term month-wise variability of maximum and minimum temperatures, average rainfall and evapo-transpiration (1980-2015) in Bangladesh

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that Bangladesh will experience severe floods and droughts in the coming decades due to the effects of climate change. Also, the National Drought Mitigation Center of the year 2006 reports that Bangladesh has already shown an increased frequency of droughts in recent years.

Climate change is aggravating drought condition in several ways. Firstly, the surface temperature are becoming increasingly higher across seasons, especially during winter months and summer months (November-May). Secondly, the Heat Index during February onwards in found to be increasing steadily in the past few decades starting 1980s. Thirdly, the already miniscule rainfall during winter and subsequent pre-monsoon months have been declining in recent decades. The combination of all these climate change induced effects have given rise to more pronounced drought in the NWR. The moisture deficits at the crop root zones are severely aggravated due to climate change induced increase in evapo-transpiration, especially involving paddy-based cropping practices. Barind is a Pleistocene Terrace located within the NWR, where the impacts of agricultural drought is felt most severely. Historical data shows that the number of consecutive dry days and temperatures have increased steadily over the past 30 years[13].

[4] https://gain-new.crc.nd.edu/ranking
[5] Yu, Winston &Alam, Mozaharul& Hassan, Ahmadul& Khan, Abu &Ruane, Alex &Rosenzweig, Cynthia & Major, David &Thurlow, James. (2010). Climate Change Risks and Food Security in Bangladesh. 10.3424/9781849776387.
[6] The World Bank (2010). *Bangladesh - Economic of adaptation to climate change: Main report (English).* Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/841911468331803769/Main-report
[7] Ali, A. (1996). Vulnerability of Bangladesh to climate change and sea level rise through ropical cyclones and storm surges. *Water Air Soil Pollution* 94(d):171–179
[8] Ahmed, A.U. (2004). Adaptation to climate change in Bangladesh: learning by doing. *UNFCCC Workshop on Adaptation,* Bonn, 18(3): 67-70
[9] Dina RA, Islam ARMT (2020) Assessment of drought disaster risk in Boro rice cultivated areas of Northwestern Bangladesh, *European Journal of Geosciences*. EURAASS 2(1):19–29
[10]Shahid, S., Behrawan, H., (2008). Drought Risk Assessment in the Western Part of Bangladesh. *Natural Hazards*
[11] Ahmed, A.U., Iqbal, A., & Chowdhury, A.M., (2005). Agricultural drought in Bangladesh, In V.K. Boken et al. (Eds), *Monitoring and predicting agricultural drought–a global study*, New York, Oxford University Press, pp. 313-322.
[12]BCAS, (2010) (unpublished) Feasibility Study for Adaptation Strategies and Options to Reduce Climate Change Risk of the most Vulnerable Communities in Bangladesh, Bangladesh Centre for Advanced Studies, funded by Oxfam Novib.
[13]MOEF, (2009) Bangladesh Climate Change Strategy and Action Plan (BCCSAP), Ministry of Environment, Forests and Climate Change (MOEFCC), Government of Bangladesh.

Drought causes several challenges for communities in the Barind region. The terrain landform lends itself to fast run-off. There is a thick clay layer towards the upper strata beneath surface which allows extremely slow percolation of water in the ground water (GW) aquifer. During dry months, almost all the natural surface water-sources evaporate. The crop water requirement increases due to excessive ET0 losses during the summer/pre-monsoon months, which is why summer time cultivation in the Barind requires significant irrigation. Water is abstracted from GW sources.

Under current climate regime, drought is intensifying. There are evidences from time-series meteorological data that average temperature is increasing, while total annual rainfall is decreasing. Figure-2a and 2b bear evidences of such claims. As a result of such changes, drought is becoming prolonged and negatively affecting water and food production severely. As a result, water is becoming scarcer for irrigation and household use. Water scarcity is affecting the food security, nutrition, and health of poor communities in the Barind region.

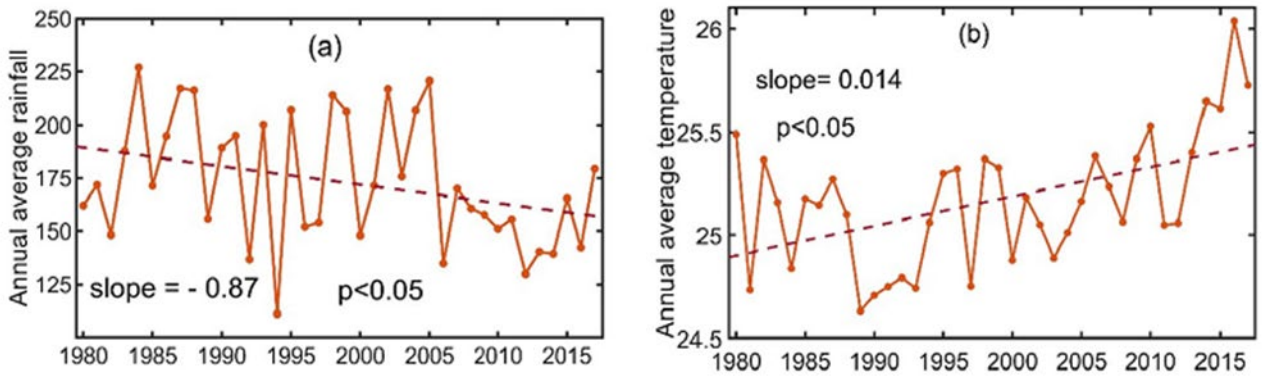


Figure 2: Rainfall and temperature in North and Northwest Bangladesh[14]The higher occurrence of droughts in the north-western part of the country is due to the high annual variability of rainfall in the region. For instance, the rainfall recorded in the north-western part of the area in 1981 was about 1,738 mm, but in 1992 it was about 798 mm[15].

The typical government response is to extract ground water from a deep aquifer, which will eventually contribute to lowering the Ground Water Table (GWT). Many old tube-wells cannot supply water in the dry period due to irregular and lower rainfall in the lean period and consequential low recharge of ground water caused by higher evapo-transpiration. Women often walk miles to find water in the dry season, leaving not enough time for more productive activities. Scientific probing into hydrographs involving GWT has revealed that there have been net draw-down of GWT at various parts of Barind area. Figure-3 provides an evidence of lowering of GWT in the recent past.

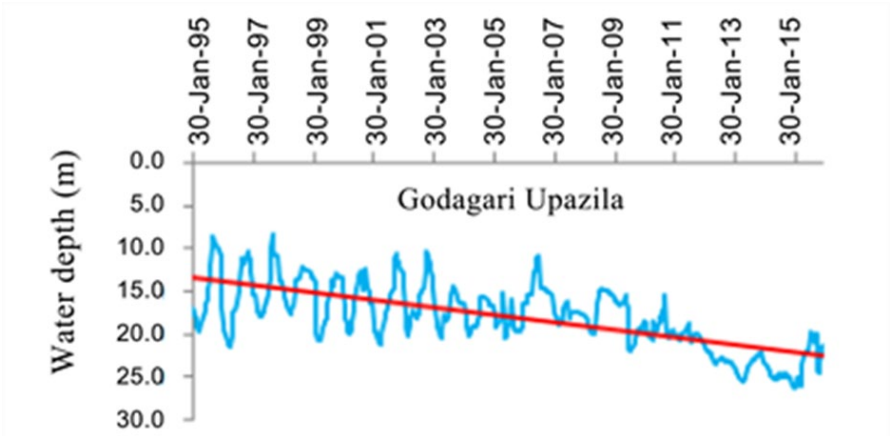


Figure-3: Declining hydrographs exhibiting a trend of ground water table in Godagari sub-district, Rajshahi

Traditional agriculture, particularly rice cultivation, depends largely on the quantity of available water through the practice of flood irrigation, which competes with other uses of surface water and further exacerbates the problem of over abstraction of water from an underground aquifer. Communities' capacity to address these problems with water usage is constrained by a limited understanding of the root causes and limited knowledge of correct adaptive responses.

The project areas were selected based on the intensity of drought and vulnerability of exposed populations. An analysis of the spatial distribution of severe drought using the Standard Precipitation Index (SPI) shows that the

[14] Islam, ARMT. Karim, MR., Mondol, MAH (2021), Appraising trends and forecasting of hydroclimatic variables in the north and northeast regions of Bangladesh. *Theoretical and Applied Climatology* 143, pp. 33–50

[15] Dina RA, Islam ARMT (2020) Assessment of drought disaster risk in Boro rice cultivated areas of Northwestern Bangladesh, *European Journal of Geosciences*. EURAASS 2(1):19–29

highest frequency of extreme droughts is in the Northwestern part of the country, especially in the high Barind Tract, which includes the districts of Naogaon, Chapai nawabganj and Rajshahi (more information is in section B1; further details are provided in Annex-2, the pre-feasibility study report). Although drought incidence is not confined to North-western Bangladesh, the frequency of drought is higher in the districts of the Barind Tract[16]. Records also show that there were only five severe droughts from 1791 to 1900 and that the frequency increased significantly after 1951[13]. Since 1981, four severe droughts have affected the agriculture sector. They were mostly concentrated in North-western Bangladesh[13].

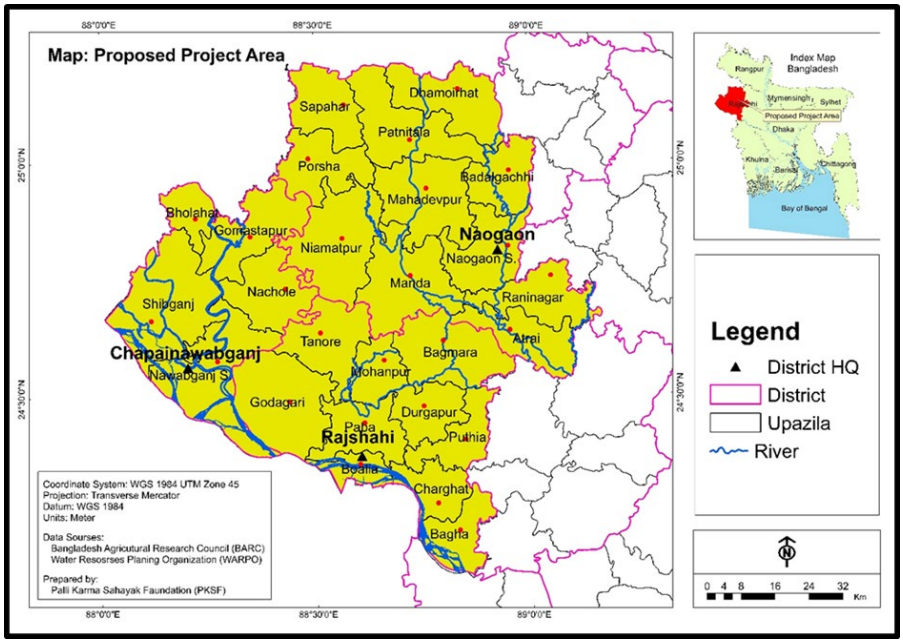


Figure 4: A map showing the target district and sub-district locations in the Barind area

The Bangladesh Agricultural Research Council (BARC) identified seasonal drought-prone areas and ranked by *Upazila*[17] on the basis of the Bangladesh Agricultural Research Council (BARC) drought map[18].The third national communication of Bangladesh to the United Nations Framework Convention on Climate Change (UNFCCC) has identified ten drought hotspots, which are located in six districts of the NWR. Out of ten hotspots, four are in Naogaon (Sapahar, Patnitala, Porsha and Niamatpur), two in Chapai nawabganj (Nachole and Gomastapur) and one in Rajshahi district (Godagari) representing the Barind area. However, when one superimposes rainfall runoff and infiltration characteristics of Barind area and hydrological limitations (details in Annex-2) and also socio-economic aspects of affected communities, several other sub-districts are found to extremely vulnerable to droughts. The additional sub-districts (i.e, Upazilas) include Dhamoirhat, Badalgacchi, Mohadevpur, Manda and Naogaon Sadar of Naogaon district; Shibganj Upazila under Chapainawabganj and Godagari upazila under Rajshahi districts, which are also severely affected by drought (MoEF, 2009)[19]. Figure 4 presents the map of Barind areas including the three target districts and their sub-districts. The details regarding the selection of target drought-affected sub-districts are provided in section-2.2 of the pre-feasibility study report (Annex-2).

The project intends to promote a paradigm shift towards sustainable water management through replenishment and water-saving technologies. The project will implement an Integrated Water Resources Management (IWRM) concept using '4-R' (Reuse, Recharge, Recycle, and Reduce) approach for increasing resilience of the drought-vulnerable communities.

More precisely, the project intends to address the above-mentioned drought-related problems by promoting good water management, adaptive technological practices, infrastructure maintenance, and planning for irrigation, drinking and household usage. Also, the project intends to reduce water needs by promoting the cultivation of crops with low water requirements in the dry season, thus reducing irrigation needs up to 70% during the winter season. In addition, the project will provide more water access points for drinking purposes too, thereby reducing the burden on women. In this regard, the project will rehabilitate and improve the design of ponds and canals, which represent an additional source of surface water in the dry season for irrigation purposes and household usages. The project will bring 3,500 hactares of land under irrigation by rehabilitating 140 kms of canal in the three selected districts.

In order to promote a sustainable use of groundwater resources, the project will implement a Managed Aquifer Recharge technique (rainwater directed through tubes to the aquifer) to replenish the ground water. It is expected that

2,500 rooftop-based MAR will replenish about 560,000 $m^3$of water into the aquifer annuallywhich will increase access to drinking water of the selected communities in proposed districts. 40inject wells in ponds will replenish 400,000 m^3 of water into the aquifer annually. In addition, these ponds will also preserve about 150,000 m^3 of water as surface storage. Also, 15,000 farmers will apply drought-adaptive cropping patterns.

In order to improve institutional capacities, the project intends to support the establishment of a climate change unit within the Barind Multipurpose Development Authority (BMDA). The ultimate purpose is to mainstream climate change adaptation into the development activities of BMDA. This unit will integrate the impact of climate change into their conventional projects through changes in project design and implementation process. The proposed climate change unit of BMDA will analyse present and future climate change data and information while designing new projects. Based on this analysis, they will bring changes in the engineering design of their future irrigation infrastructure like canal excavation and/or re-excavation[20], pond management, water shed management, etc. The project will also provide technical and logistical support to the Government of Bangladesh to establish and operate the MAR center. Thus, enhanced institutional capacities will enable the project to scale up approaches to address water scarcity problems caused by climate change in drought-prone areas.

In order to measure the effectiveness and efficiency of the proposed interventions, the project will develop a Real Time Evaluation (RTE) system. The RTE will include baseline information on climate change-induced drought as well as effectiveness and efficiency performance indicators of proposed adaptation interventions. The RTE will establish the foundations for an informed scaling up of proposed interventions. In addition, the project will share the knowledge and lessons learned through workshops, seminars, websites and other communication systems with all levels of stakeholders working on climate change issues. It is expected that 100 NGOs (mainly local level organisations working in the drought-prone region) will adopt the proposed RTE system and integrate it into their core programmes.

Proposed project area:
The project area was selected based on the relative intensity of climate hazard and severity of impact within The Barind Tract Figure 5 presents geographic distribution of project areas within Barind, where the drought intensity is the highest under prevailing conditions.

An analysis of spatial distribution of severe drought using Standardised Precipitation Index (SPI) shows that the frequency of extreme droughts is the highest in the central part of the area that covers the whole high Barind Tract, which includes Naogaon, Chapainawabganj and Rajshahi districts. The third national communication of Bangladesh has identified 10 drought hotspots which are located in six North-west districts. Seasonal drought-prone areas were identified and ranked *upazila* (sub-district)-wise based on the drought map by BARC (2000).
In addition to these 10 most drought vulnerable upazilas, Gomostapur of Chapainawabganj and Godagari of Rajshahi district are also severely affected by drought (MoEF, 2009). So, the project proposed at least 14 upazilas of the three selected districts of which 9 from Naogaon, 3 from Chapainawabganj and 2 from Rajshahi. These districts are located in the High Barind Tract. Among the upazilas (sub-districts), four of Naogaon, four of Chapai nawabganj and three of Rajshahi districts are located in the High Barind Tract. Other upazilas of these districts belong to Medium High Barind Tract. The poverty situation of the three districts is also worse than other districts of Barind Tract. In the High Barind Tract, poverty concentration (Head Count Ratio) is the highest in Chapainawabganj district (39.6%) followed by Naogaon (32.2%), and Rajshahi (20.1%). Overall vulnerabilities of these three districts are also higher than other Barind districts (i.e. Natore, Pabna, Bogura etc. due to severity of other conditions including frequent and prolonged drought, limited access to water, depletion of ground water, and harsh and dry soils of Barind Tract. The project considered administrative area of the selected upazilas for effective implementation and reducing monitoring cost.
The details regarding the selection of target districts and sub-districts including justification of selection are provided in Annex-2, the pre-feasibility report.

[16]FAO, (2006) Livelihood adaptation to climate variability and change in drought-prone areas of Bangladesh, Implemented under the project 'Improved Adaptive Capacity to Climate Change for Sustainable Livelihoods in the Agriculture Sector – DP9/1-BGD/01/004/01/99', Food and Agriculture Organization, VialedelleTerme di Caracalla, 00153 Rome, Italy.
[17]Upazila, formerly called thana, is an administrative region in Bangladesh. They function as sub-units of districts.
[18] BARC (2001). Application of agro-ecological zones database in drought management and water availability assessment report, prepared by environment and GIS support project of water sector planning, Ministry of Water Resources, Government of Bangladesh, Dhaka
[19]MoEF (2009). National Adaptation Programme of Action (NAPA), 2009, Ministry of Environment, and Forest (MOEF), Government of Bangladesh.
[20] While manual labour will be engaged for the re-excavation works, the workers will be provided with safety gears such as helmets, gloves, etc. in a bid to avoid accidents/occupational hazards.

B. PROJECT/PROGRAMME DETAILS

B.1. Context and baseline (max. 500 words)

Climate change in the selected districts

The North and North-western parts (area of the three selected districts) of Bangladesh are experiencing an increase in temperature and a reduction in rainfall. More precisely, the mean annual temperature has significantly increased by 0.014 °C/year in the 1980-2017 period, while rainfall has decreased significantly by 0.87 mm/year in the same period. The increase in temperature has an exacerbating effect on droughts and is directly implicated in the health impacts of climate change.

Drought in Bangladesh is primarily an agricultural phenomenon that refers to conditions where plants are responsive to certain levels of moisture-stress that affect both the vegetative growth and yield of crops. Usually, drought occurs in the pre-monsoon season when the potential evapotranspiration (PET) is higher than the available moisture due to uncertainty in rainfall. Drought also occurs in the post-monsoon season due to prolonged dry periods without appropriate rainfall[21].

The average occurrence of drought in the country is once in 2.5 years[22]; nineteen droughts occurred in Bangladesh between 1960 and 2010, which affected 47% of the country's area and 53% of the current population[23]. The geographical distribution of droughts in different cropping seasons is presented below (Figure 5). Presently, (CCS0 presents climate change baseline scenario in 2005) most of the areas of Naogaon, Rajshahi, and Chapainawabganj districts fall under very severe drought (red coloured shed) during the three cropping seasons, i.e.,*kharif* (monsoon), *rabi* (dry winter) and *pre-kharif* (pre-monsoon) season[24]. The rest of the area of these three districts is affected by severe drought. So, these three districts are mainly drought hotspot areas of the country.

The drought situation of the area becomes severe during April -May due to the cumulative effect of low moisture-holding capacity of soils (<200 mm available moisture), an increasing number of dry days (precipitation <0.5 PET), and the occurrence of extreme summer temperature of more than 40°C[25].

[21]Karim, Z., Hussain, S. and Ahmed, M., (1990) Salinity Problems and Crop Intensification in the Coastal Regions of Bangladesh, Bangladesh Agricultural Research Council, Dhaka.
[22] Adnan, S. 1993. Living without floods: lessons from the drought of 1992, Research and Advisory Services, Dhaka
[23]Mirza, MQ. and Paul, S. (1992). Prakritikdurgojob o Bangladesh paribesh (Natural disaster and environment in Bangladesh), Centre for Environmental Studies and Research, Dhanmondi, Dhaka
[24]MOEF (2005, updated in 2009). National Adaptation Programme of Action (NAPA), Ministry of Environment and Forests, Government of Bangladesh
[25]BCAS, (2010) (unpublished). Feasibility Study for Adaptation Strategies and Options to Reduce Climate Change Risk of the most Vulnerable Communities in Bangladesh, Bangladesh Centre for Advanced Studies (BCAS), funded by Oxfam Novib.

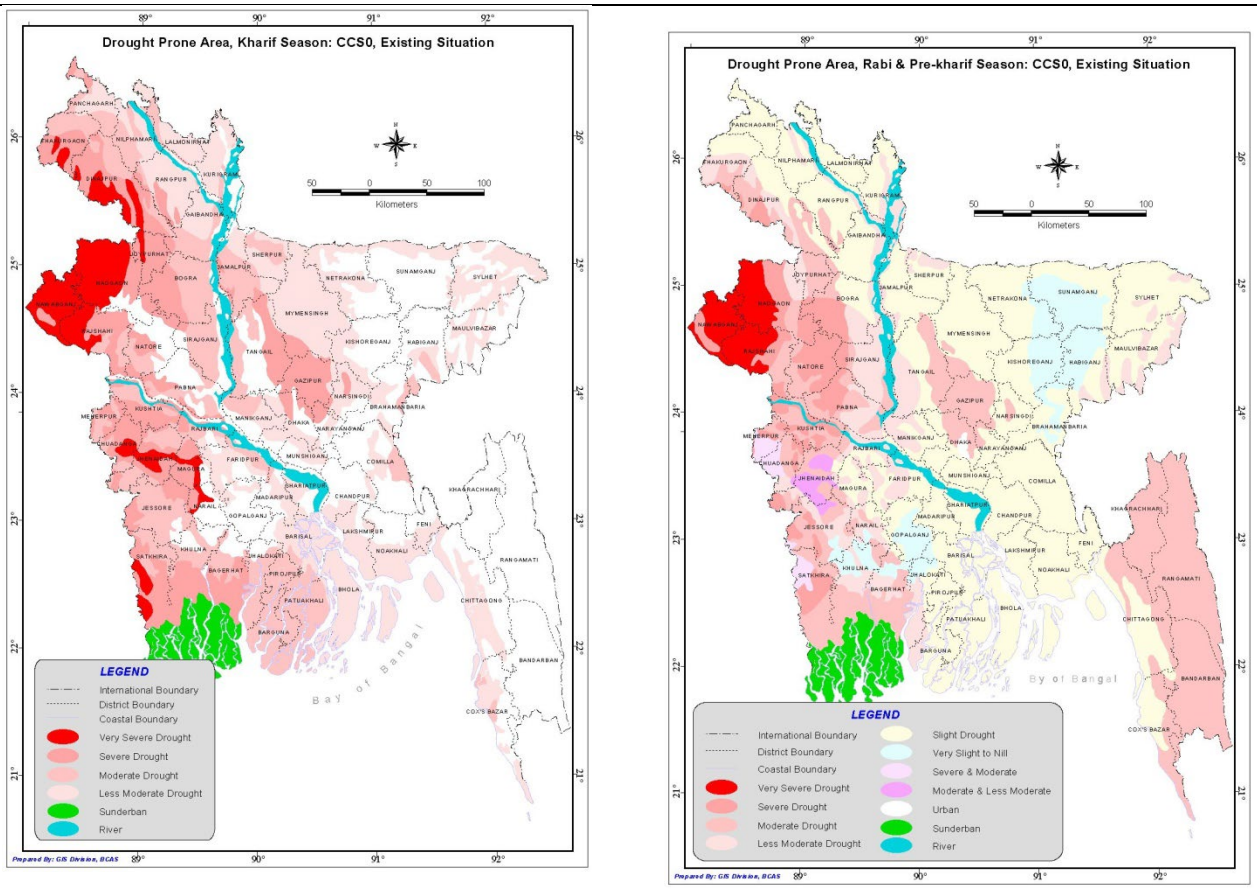


Figure 5: Geographical distribution of different types of drought for different seasons

Figure 6-8 depicts the geographic distribution of dryness throughout the project area's several cropping seasons, including Rabi season (winter crop season from November to April), pre-kharif season (March to June), and Kharif season (rainy season from June to October). In the Rabi season, extreme drought affects 10.32% and severe drought affects 33.78% of the selected districts[26][27]. On the other hand, 43% of the area is affected by moderate drought[28]. Thus, 87% of the area of the districts is affected by moderate to extreme drought. The pre-Kharif season (summer) has the highest area of extreme drought at 39.21%, followed by severe drought at 30.78%, mild drought at 19.32%, and moderate drought at just 10.69%. Again, moderate to severe drought affects more than 80% of the area of the selected districts, which eventually limits food production and the development of water resources. Similar to this, during the Kharif season, moderate to severe drought affects more than 82% of the districts. The districts chosen are affected by severe drought in 37.28% of cases and moderate drought in 37.20%.

[26] A “extreme drought” is characterised by 45-70 percent crop loss (BARC, 2001)
[27] In a “severe drought” crop losses amount to 35-45 percent (BARC, 2001)
[28] A moderate drought occurs when crop losses amount to 20-35 percent (BARC, 2001)

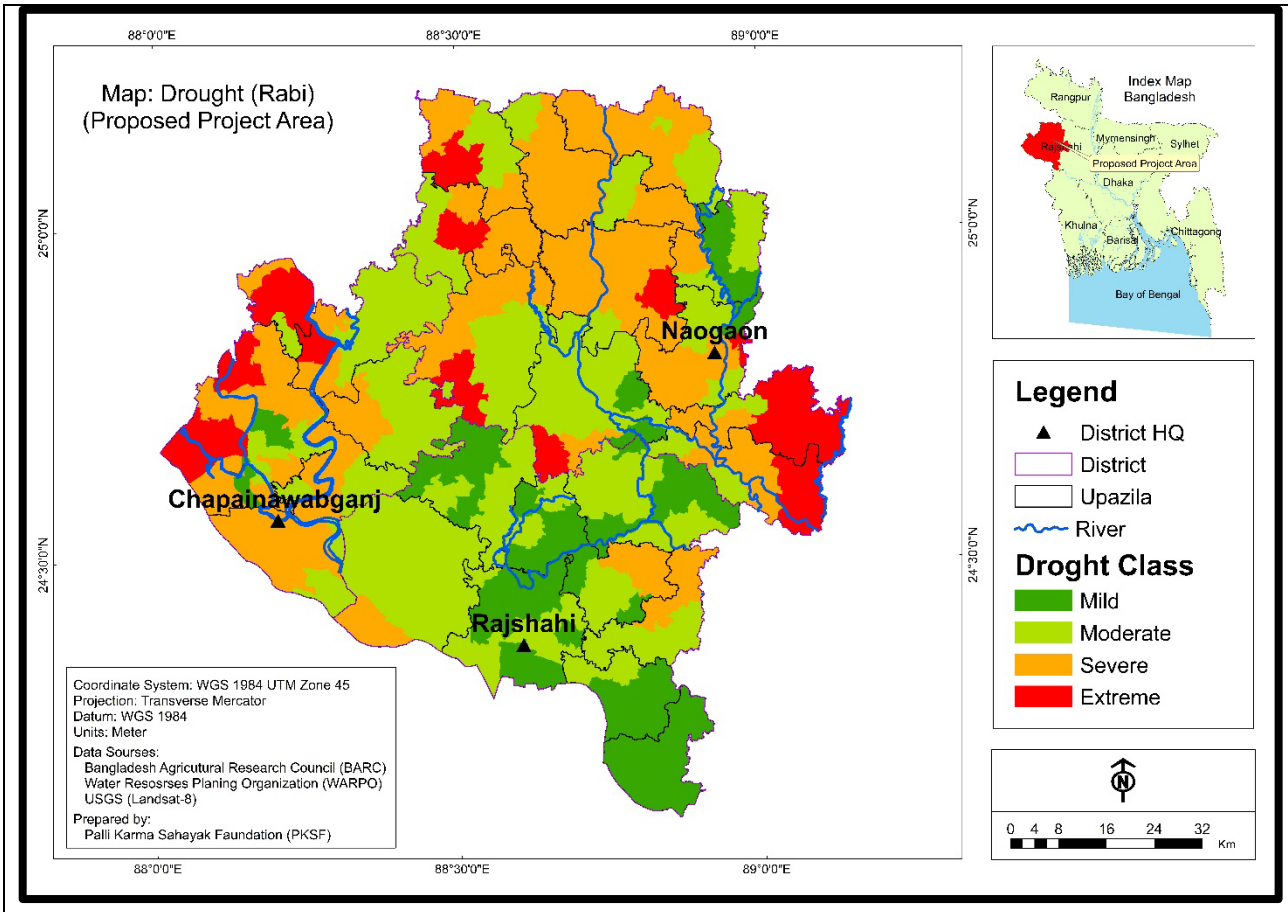


Figure 6: Spatial distribution of drought in the project area (Rabi season)

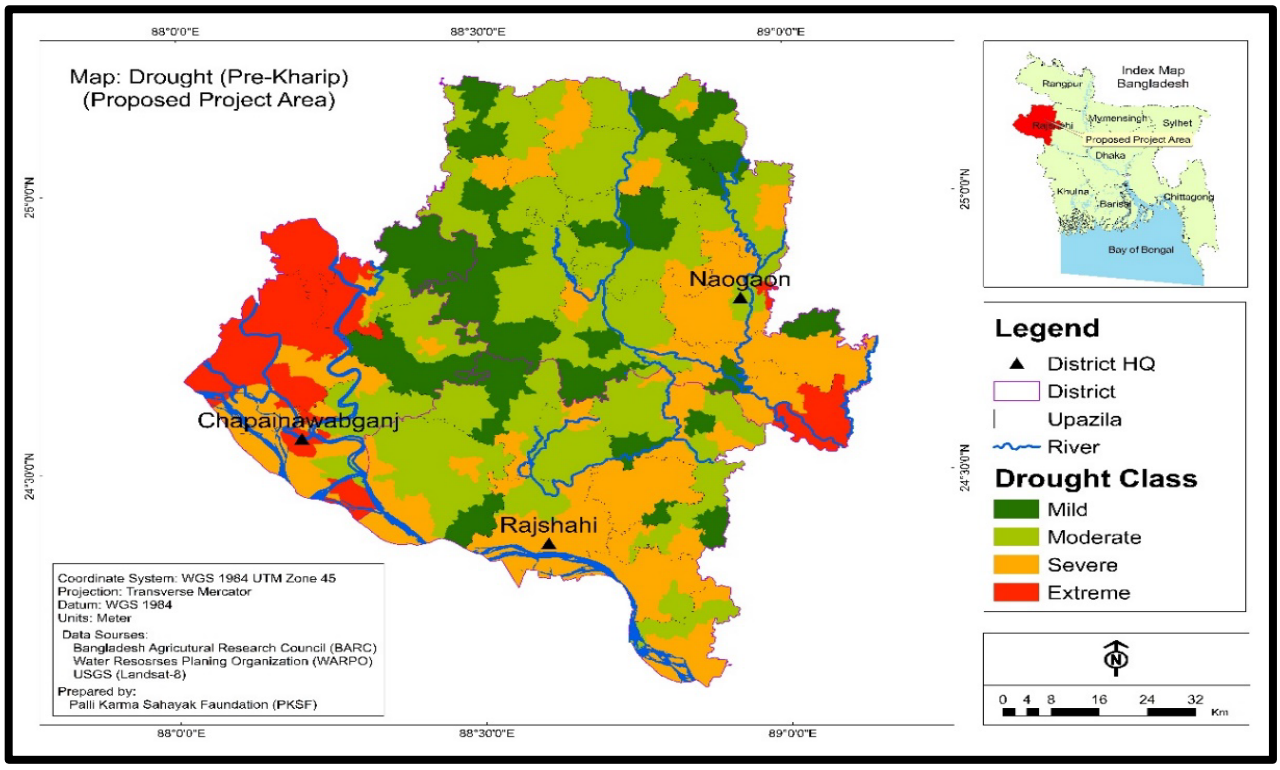


Figure 7: Spatial distribution of drought in the project area (pre-kharif season)

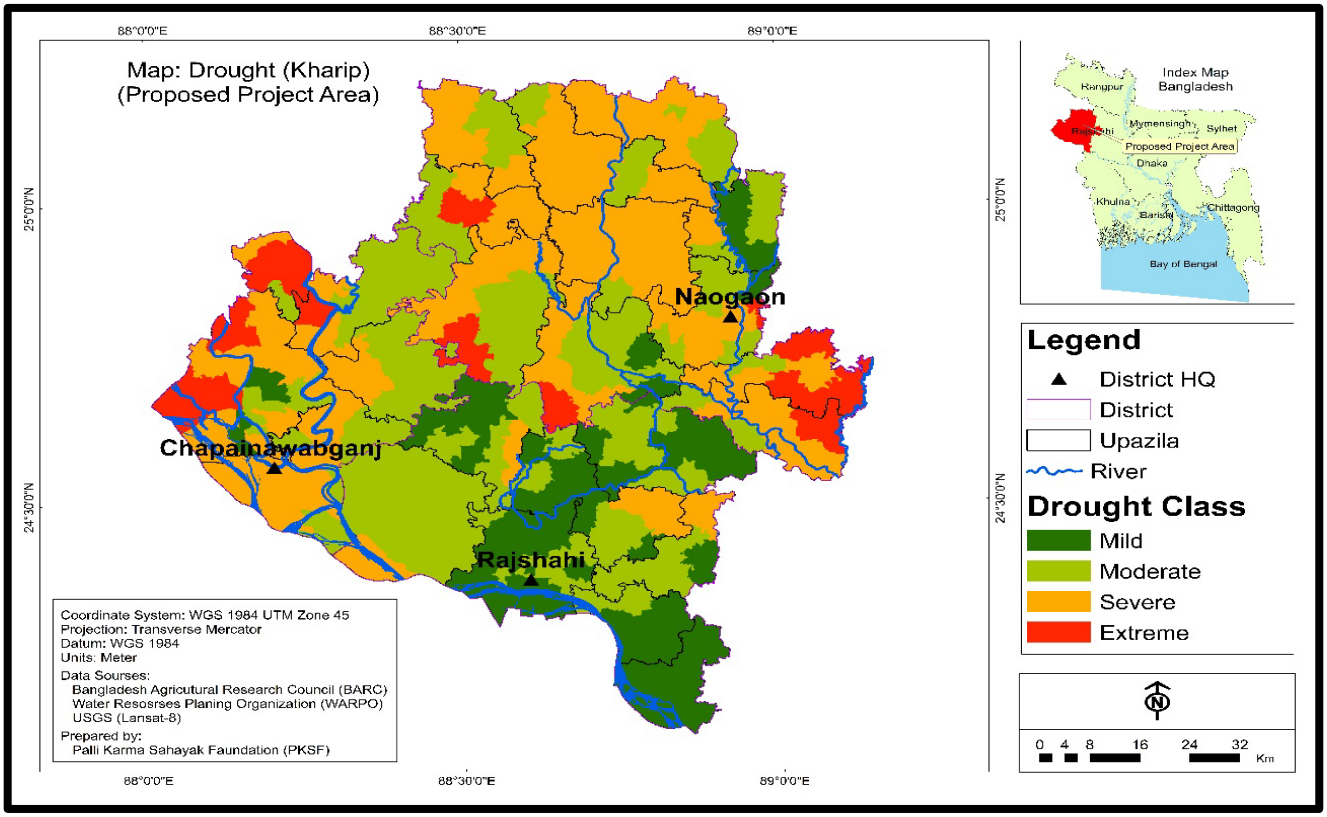


Figure 8: Spatial distribution of drought in the project area (Kharif season)

Boro rice is the major dry season crop of Bangladesh. For the *Boro* (winter) paddy cultivated areas of Western Bangladesh, General Circulation Models (GCM) based on the IPCC SRES (Special Report on Emissions Scenario) A1B scenario indicate that the increases in potential evapotranspiration (PET) will surpass that of precipitation, thus resulting in intensified drought events. More precisely, the average modelled precipitation during the *Boro* rice growing season in North-western Bangladesh will be ranging from 94.95 mm to 78.77 mm (depending on the GCM output models) by the 2041-2070 period, which is higher than the 67.20 mm of the 1984-2013 period. However, the average seasonal PET from January to May in the North-western region was 111.41 mm during the observed period (1984-2013) and it will increase up to 134.87-147.63 mm (depending on the model), by the period of 2041-2070.

The widespread increase in PET is expected as a consequence of the rise in temperature and amounts of solar radiation that dominates in the north-western part of Bangladesh (detail in pre-feasibility report)[29]. Higher increases in PET than that of precipitation will aggravate the frequency and intensity of drought with serious consequences for agricultural production.

By using General Circulation Models (GCMs) and the A1B scenario of the IPCC Special Report on Emissions, the same projections show that the potential drought hazard region will shift from the South-western to North-western part of the country in the near future.

Economic impacts of climate change induced drought

[29] Islam, A.R.M.T., Shen, S., Hu, Z. and Rahman, M. A., (2017) Drought Hazard Evaluation in Boro Paddy Cultivated Areas of Western Bangladesh at Current and Future Climate Change Conditions, Hindawi Advances in Meteorology, Volume 2017, Article ID 3514381, https://doi.org/10.1155/2017/3514381.

The project will target 215,000 beneficiaries in Naogaon, Rajshahi and Chapai nawabganj districts with a particular focus on poor and ultra-poor communities. Their main source of livelihoods is agricultural wage-labour. Annual households' average income ranges from US$700-800. 73.3% and 44.2% of the households of the selected districts own homestead and cultivable lands respectively. Around 70% of household heads' main occupation is crop cultivation[30]. About 36.5% of households cultivate their own lands, whereas 26.2% are farm labourers and 7.6% are share-croppers. 32% of households are very poor and poor, are absolutely landless, and do not have adequate income for meeting basic needs, i.e., food, health, housing, and education. 19% of the households belong to marginal and medium wealth categories. Poor households are also engaged in aquaculture, poultry and livestock production, rickshaw/van pulling, and other small businesses and informal services. Poor farmers have limited access to irrigation-water. They mainly depend on rain-fed crop cultivation. Hence, loss of crops caused by droughts is a recurrent event in these selected districts. Besides, they have very limited access to water for drinking and household purposes.

Drought primarily causes water deficiency for irrigation, drinking, and other household uses particularly in the rural areas of the Barind region. It causes drying-up of surface water sources like ponds, canals, and small rivers, *beels* (bowl-shaped depressed areas which are seasonally flooded by rain water) as well as accelerates the depletion of ground-water, since groundwater that functions as a is very important source of water during dry periods.

In addition to impacts on water resources, drought has both primary and secondary effects on agriculture. Primarily, it causes soil-moisture deficits and thus damages crops. Secondarily, it reduces the sources of irrigation and affects crop yields. The nature of drought is gradually changing due to changes in temperature and precipitation. Sometimes, it occurs early in the monsoon delaying germination and the planting of crops, and sometimes occurs during the post-monsoon, it constrains grain-filling leading to crop damage. Drought delays the timely planting of *T. Aman* (rain-fed) rice, the main crop of the High Barind Tract (HBT), while drought in September and October drastically reduces the yield of the said crop.

The Ministry of Agriculture found that the average crop production was reduced by about 25–30% because of the effects of drought in Bangladesh over the period from 2009 to 2014 and most of them was occurred in the Barind region. Drought caused losses of US$141 million over the same period. Of the total estimated losses, more than 87% were from the crop sector (US $122 million)[31]. In addition to direct crop losses, drought made lands uncultivable (estimated foregone production amounted to US$9.31 million).

Variations in rainfall pattern over the growing period have been found to affect rice yield and water requirement. *Boro* rice is the major dry season crop of Bangladesh, which requires irrigation from January to April. Water is needed for *Boro* paddy rice during its growing seasons. Bangladesh needs to increase the rice yield in order to meet the growing demand for food caused by population growth. Irrigated rice or *Boro* rice is a potential area for increasing rice yield, which currently accounts for about 50% of total rice production in the country. Devastating and regular droughts caused by a lack or a late/early arrival of rainfall happen very often in many parts of Bangladesh, badly affecting agriculture[32].

Impacts of drought on households

Drought severely affects sources of irrigation and drinking water by depleting the ground water table and drying up ponds and canals. Safe drinking water sources of 59.2% of households were negatively impacted by drought over the 2001-2009 period. Among them, 57% of households' water sources were affected at a moderate scale, and 31%, and 20% of the households were affected at low and severe levels respectively[33].

[30]BCAS, (2010) (unpublished). Feasibility Study for Adaptation Strategies and Options to Reduce Climate Change Risk of the most Vulnerable Communities in Bangladesh, Bangladesh Centre for Advanced Studies (BCAS), funded by Oxfam Novib.

[31]BBS, (2015) Bangladesh Disaster-related Statistics 2015: Climate Change and Natural Disaster Perspective, Impact of Climate Change on Human Life Programme, Statistics and Informatics Division, Bangladesh Bureau of Statistics, Ministry of Planning, Government of Bangladesh.

[32] Dina RA, Islam ARMT (2020) Assessment of drought disaster risk in Boro rice cultivated areas of Northwestern Bangladesh, *European Journal of Geosciences*. EURAASS 2(1):19–29

[33]BCAS, (2010) (unpublished) Feasibility Study for Adaptation Strategies and Options to Reduce Climate Change Risk of the most Vulnerable Communities in Bangladesh, Bangladesh Centre for Advanced Studies, funded by Oxfam Novib.

The percentage of households affected by droughts from 2009 to 2014 is much higher in the Barind tract (25.39%) where the selected districts are located compared to the national average (14.8%)[34]. Over this period (2009-2014), 8.7% of the households did not have any work or source of livelihoods due to drought. Drought and heat waves in the selected districts are strongly affecting human health. 133,610 people suffered from diseases due to drought and improper use of water resources over the period of2009-2014[34]. The main diseases are diarrhoea, dysentery, skin diseases, flu cough, fever, jaundice, etc. 77% of the households in Rajshahi, Naogaon and Chapainawabganj districts are affected by drought-induced health complication[33]. Moreover, by using descriptive and inferential statistics, Islam[35] found that there is a significant correlation between literacy and occupation type with social and agro-ecological impacts of drought.

Droughts are an important cause of drudgery for women. Droughts and dry spells and increased water withdrawal have lowered the ground water table. As a consequence, traditional hand tube-wells and shallow tube-wells are not often working. Women are forced to fetch water from sources that are far away from their homes, walking up to 3 or more miles. The time wasted in fetching water could be used for more productive activities. Opportunity costs for fetching water are high. If we consider the minimum labour rate in the area is BDT 400-500 per day, foregone incomes due amounts to BDT 100-150 (US$1.20 to 1.50) per day per person[36].

Knowledge about climate change issues is very low**.** Only 14.07% of HHs in the Barind tract have some knowledge of climate change[34]. This means, there is a lack of knowledge and understanding of drought-affected communities about climate change. Knowledge on climate change is important to adapt to changing situations. Without knowledge and information, communities are not able to identify current and future problems caused by climate change. Hence, they fail to make appropriate decisions on crop production as well as other livelihoods. Thus the poor becomes poorer.

Relevant complementary on-going activities

Activities of the Barind Multipurpose Development Authority (BMDA)

BMDA is a key government agency to implement need-based development programmes aimed at improving the socio-economic conditions of the people and protecting environmental balance in the Barind Tract. As of September, 2019, BMDA has installed 11,703 deep tube-wells; installed 217 low-lift pumps; constructed 15,789 irrigation water distribution systems; and constructed 722 cross-dams. This water infrastructure brought 296,139 hectares of *Boro* field (winter rice) under irrigation along with 248,717 hectares of *Aman* field (rain-fed rice), 37,191 hectares *Aus* (summer rice) and 209,574 hectares of other crops in the Barind region (covering 16 districts). It has provided training to 142,947 farmers so far on water management and cultivation of new crop varieties. BMDA also helps avail drinking water in water-scarce villages through water supply from deep tube-wells and dug-wells. BMDA constructed 1,475 water supply networks (micro-scale) and excavated 145 dug-wells. BMDA is currently implementing various development interventions including improved seed production and cultivation, underground irrigation networks, extension of irrigation facilities through ground water development, reconstruction of old deep tube-wells etc. Though ground water is a great concern for the Barind region, BMDA has not taken any significant initiative in facilitating ground water recharge. This is mainly due to the lack of innovative water technology and technical capacity to address sustainable water management in the context of climate change.

Bangladesh Weather and Climate Services Regional Project:

The Government of Bangladesh approved a project titled “Bangladesh Weather and Climate Services Regional Project (BWCSRP)” in February 2017 with financial support from the World Bank. Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), and Department of Agricultural Extension (DAE) are jointly implementing the project. Under this project, DAE is implementing a component on “Agro-Meteorological Information Systems Development Project (Component-C of BWCSRP)”. The objective of the project is **“**to strengthen the capacity of the Government of Bangladesh to deliver reliable weather, water, and climate information services and improve access to such services by priority sectors and communities”. Under this project,

[34]BBS, (2015) Bangladesh Disaster-related Statistics 1015: Climate Change and Natural Disaster Perspective, Impact of Climate Change on Human Life Programme, Statistics and Informatics Division, Bangladesh Bureau of Statistics, Ministry of Planning, Government of Bangladesh

[35] Islam, A.R.M.T., Tasnuva, A., Sarker, S.C., Rahman, M.M., Mondal, M.S.H., Islam M.M.U. (2014). Drought in Northern Bangladesh: Social, Agroecological Impact and Local Perception, *International Journal of Ecosystem* 2014, 4(3): 150-158

[36]Calculated by the project design team with data collected during communities consultations

DAE is disseminating district-wise early warning information on its website. Information messages also provide suggestions on crop management during this time. The proposed GCF project will establish a linkage between its participants and the early warning system so that farmers can get the required information that is helpful for their crop management.

Ecosystem based adaptation (EbA) project in Barind Tract and in Haor

The Ministry of Environment, Forests and Climate Change (MOEFCC) is currently implementing a Global Environmental facility (GEF) financed EbA project, in cooperation with United Nations Environment Programme (UNEP). The USD5.2 million project is being implemented (mid-2019 till mid-2025) partly in drought-prone Barind Tract, which finds relevance to this project. Since the project is micro-sized and only a part of it will be implemented in Barind area, the learnings of this micro-sized project will be taken into consideration towards implementing the proposed project. The following are the intended activities under the project: Re-excavation of *khals* and ponds (by BMDA), afforestation and reforestation (Bangladesh Forest Department), rainwater harvesting (by BMDA), training on EbA for the community, local government officials and government officials (joitly by DOE, DAE and BMDA), quick-growing orchard establishment (by DAE), farming/gardens (DAE+BMDA) and spice cultivation (by DAE).

A total of 12 km *khals* and as many as 19 ponds will be brought under re-excavation, enabling to capture rainwater and help supplementary irrigation and maintenance of orchards/vegetable gardens. In addition, 27 rain water harvesting systems will be established under the project. It is expected that, by doing the above, the project will contribute to the sustenance of ecosystems in the drought affected selected sub-districts and help people adapt to climate induced droughts better.

Barriers

Low level of technical and institutional capacity of government institutions to promote sustainable water resources management

Over-exploitation problems of ground water are not properly addressed by relevant government authorities. While surface water is scarce during drought periods, exploitation of ground aquifers keeps reducing the ground water table. This is caused by both the lack of knowledge regarding alternative technical solutions to address over-exploitation problems of ground water resources and the lack of financial resources from relevant authorities. Also, storage and use of surface water for agricultural purposes are not properly promoted by relevant authorities. As a consequence exploitation of ground water resources is generally the only considered option to supply water.

The project will promote MAR as a practical alternative solution to address ground water depletion problems. MARs have been piloted in coastal zones and Barind area but they are not promoted in the project intervention area because primarily there is no authority to promote MAR in the country. Secondly, the government has adopted a national MAR strategy, but finance is not ensured yet. There is also a lack of available technical experts for mass scaling up of the MAR. These problems remain nationwide including in the selected districts.

Weak capacities of development actors to propose effective solutions for drought adaptation

The intervention area is characterized by a significant presence of governmental and non-governmental organisations (NGOs) working on a variety of development topics, including disaster risk reduction and livelihood diversification. However, there is a clear lack of capacities in mainstreaming actions addressing climate change challenges in development interventions, especially with regards to drought adaptation. One vital reason is the fact that climate change adaptation is still an emerging issue. The local institutions and actors have a limited understanding of how to address adaptation in the local contexts. Besides, studies on effectiveness and efficiency of climate change adaptation options are very limited, which ultimately limits understanding on adaptation issues. The specialised knowledge and experience in designing climate change adaptation projects are also limited. In addition, indicators on drought resilience are not used and therefore, practitioners do not understand whether their interventions are effective in terms of adaptation to drought.

Low community awareness on adaptive responses to climate change impacts

Community awareness about alternative options to address climate change problems (especially, droughts) is very low in the project area. Moreover, technical knowledge of alternative and less water-consuming cropping patterns as well as of drought-resistant crop varieties are very limited among farmers.

The project will raise awareness among selected communities at monthly group meetings of the Climate Change Adaptation Groups (CCAGs) on climate change issues. It will also address the above-mentioned barriers by scaling up the results and lessons learned from previous relevant projects like the Community Climate Change Project (CCCP) and the Livelihood Adaptation to Climate Change project. The former proposed simple management systems and technologies to make local communities resilient to drought by increasing access to safe water. The latter (implemented by UNDP and funded by the UK Department of International Development and the European Union) designed location-specific adaptation strategies, implemented more than 300 demonstrations and field testing and identified different adaptation options.

The project will address the above-mentioned barriers by improving technical and institutional capacities to address over-exploitation problems of the groundwater aquifer among relevant governmental and non-governmental authorities. More precisely, the project will enhance the capacity of the BMDA by establishing a climate change unit within the same organisation and by providing training and technical support for mainstreaming climate change in development activities. The planned establishment of an MAR centre under the Ministry of Water Resources will ensure that the sustainable recharge aquifer technique is implemented by the project and further scaled-up. Community awareness on climate change and related droughts will be promoted by establishing CCAGs and farmers will be trained and supported to adapt to droughts and climate change. More specifically, drought-tolerant crops and varieties will be promoted to avoid the effects of early droughts, to reduce the duration of the production cycle (thus escaping late droughts) and to reduce water requirements.

Justification for selected activities and delivery modalities

The concerns around present day drought and future implications of climate change-induced drought for Barind area and its inhabitants are explained with facts and figures in sections 2 and 3, while the activities undertaken to address such issues, although in a disjointed manner, are summarized in sections 7 (table 6) of the feasibility report. Based on these facts, the following summary table is constructed to provide a bird's eye view of justifications for selected activities against each problem being identified and various delivery modalities to effectively implement such activities under the proposed project.

Table-1: Climate change induced problems regarding drought and justification of proposed activities

Problem identified	Actions proposed	Justification for undertaking the action	Proposed processes	Comments & Reference*
Drought-induced reduced rainfall causes surface water reservoirs & running streams to dry up (thereby their storage capacities are reduced) Elaborated in section(s): 2 & 3, pre-feasibility report	Improve storage capacity of selected surface water reservoirs & running streams (*khals*/*kharis*) by digging	Digging or taking away earth from choked/filled in ponds and streams will increase depth and enhance capacity to harvest and store increased volumes of water	Manual digging with spades and baskets. GOB's food-for-works programme (FFW) under social protection for the underprivileged provides employment, while maintain rural infrastructure	Highly successful FFW programme towards poverty reduction and maintenance of rural infrastructure.
CC-induced drought causes increased GW abstraction, thereby forces further lowering of GWT much beyond aquifer recharge Elaborated in section(s):2, 3 & 4, pre-feasibility report	Improve aquifer conditions by facilitating recharge	Install "Managed Aquifer Recharge (MAR)" at (i) roof-top of buildings (i.e, roofs as catchment for rainwater harvesting) and (ii) within ponds	Bringing in technical fix to the problem, forcing human-induced recharge of GWT (since natural recharge capacities have been exhausted)	Piloting in the NWR, especially in Barind provided for promising results. Depleted GWT exhibited gradual upward movement, scientifically proven & managed. Hossain et al., 2019, Hossain et al., 2021
Present day cropping patterns (CPs) are highly water-inefficient & will become	Promotion of drought adaptive low-water requiring/ consuming crops	Boro paddy consumes excess amounts of GW for sustenance. If Boro is replaced by low	Partner NGOs will convince farmers and provide them information, technical support (involving extension	BMDA, along with DAE of MOA and NGOs have tested crops with low irrigation demand (i.e,

increasingly inefficient under CC scenarios Elaborated in section(s):2, 3 & 4, pre-feasibility report	and cropping patterns	water requiring crops/varieties, dry season GW abstraction will be reduced due to lowering of irrigation demand	service) & inputs, even micro-credit to try out new water-efficient CPs involving crops preferred by market demand	Maize, Wheat, mungbeans, etc.). Farm profitability involving new CP appears much higher with a co-benefit of reduction of irrigation demand Reza et al., 2020; Islam et al., 2019.
The viability of fruit trees is reduced significantly with lesser availability of water and subsequent decline in GWT much below root zone of such orchard trees Elaborated in section(s): 2, 3 & 4, pre-feasibility report	Promote Adaptive fruit orchard cultivation	The selection of fruit species which are less vulnerable to declining water table, however thrive well under drought and provide good farm gate price	Partner NGOs will convince farmers and provide them information, technical support (involving extension service) & inputs, even micro-credit to try out new water-efficient fruit trees	BMDA, along with DAE of MOA and NGOs have tested the concept and the farmers' level response is promising. [The region is known for mango orchards, done autonomously] Reza et al., 2020; Islam et al., 2019.
The regional institutions lack understanding on CC, monitoring is weak Elaborated in section(s): 5, 6 & 7 of the pre-feasibility report	Enhance capacity of government institutions for IWRM/ water saving	Due to lack of understanding and monitoring capacity, such state-run agencies cannot enforce measures towards IWRM	Establish CC Unit at BMDA Establish a MAR centre	The needs for such units within government agencies have been highlighted in the consultative processes.
	Enhance capacity of service providers & intermediaries	Due to lack of knowledge and technical capacity, adaptation towards IWRM and climate resilient agriculture is poorly approached/ implemented	1. Knowledge-level improved 2. Real time evaluation of CC response studied 3. Develop intervention database 4. Training of NGO 5. Training of project management 6. Sharing info & outreach	The needs for building capacity will enhance service delivery within the governance system of an LDC.
Communities and farmers are unaware of CC-induced issues, reluctant to implement CRA	Enhance capacities and knowledge level of community people including farmers, promote peer-to-peer learning	Without enhancing community-level knowledge and without building confidence among community people, long-term sustenance of adaptation measures will be lost	1. Beneficiary groups formed & made aware 2. Socio-economic profiles are developed 3. Group meeting for peer-to-peer learning 4. Trainings 5. Exchange visits	This is a chronic problem felt everywhere throughout the LDCs

Note: * Assuming such actions/solutions are already tested

B.2.1. Project/Programme description (max. 1,000 words)

Objective of the project

The main objective of the project is to increase the resilience of climate vulnerable-communities in drought-prone areas of Bangladesh. This objective is expected to be achieved by implementing activities covering three main components: i) improved institutional and technical capacities to address climate change-induced drought, ii) increased availability of surface and ground water for irrigation and drinking, and iii) drought-resilient livelihoods created through sustainable agricultural production.

Related activities are reported below:

Component/outcome 1: Improved institutional and technical capacities to address climate change-induced drought

This first component intends to build capacities among government institutions and NGOs to address climate change impacts, particularly related to droughts. This will be achieved by improving capacities among different interrelated scales of institutional and community organisations: at the ministry, subnational, and at community levels.

Result1.1: Enhanced capacities of government institutions to implement and monitor water resources management and climate change (CC) adaption projects

Activity 1.1.1: Establishment of climate Change unit at the Barind Multipurpose Development Authority (BMDA)

The BMDA is the key government organisations, which has been working in irrigation development, water management and crop production in the drought-affected areas of the country. However, the BMDA has limited technical and institutional capacity to address climate change impacts on water resources and agriculture production in drought-vulnerable areas. The BMDA has been expanding an unsustainable use of water for irrigation through the installation of diesel-fuelled deep tube-wells. As a result, ground water has been depleting rapidly. The present climate change has a significant contribution to depleting ground water as explained in section B1. The BMDA does not have climate change professionals for addressing present and future climate change in water and crop management. The project will support the BMDA to establish a climate change unit within the organisation. This unit will provide an analysis of climate data while developing future projects. Based on the analysis, the unit will bring changes in the design of water and irrigation infrastructures to integrate climate change into their development activities. The unit will provide technical inputs to integrate climate change issues into BMDA's new projects or programmes. This unit will also monitor implementation of new projects of BMDA in order to ensure that climate change impacts are addressing as per the design of the project or programme. Besides, the unit will develop knowledge-base on climate change, drought, and adaptation responses in the drought-vulnerable areas of the country. In addition, the unit will work for increasing access to climate finance including the Green Climate Fund (GCF) and Adaptation Fund. It will provide technical, logistical, and human resource support for the project period. More specifically, the project will recommend the BMDA to deploy three staff from its existing human resources for the climate change unit as the initial step of establishment of the unit. The project will provide salaries to these staffs for the project period as they will be working dedicatedly on addressing climate change. GCF grant will be used for this activity. After the project duration the climate change unit will be run solely by BMDA with financing from their own revenue source. This unit will be responsible to ensure the continuation and sustainability of the project activities. PKSF's role will be both for executing entity and implementing entity for this activity.

Activity 1.1.2: Establishment of a MAR centre

The project will support the Ministry of Water Resources in establishing an MAR centre proposed in the Managed Aquifer Recharge (MAR) strategy of the Government of Bangladesh[37]. The project will provide necessary training to at least 3 staffs of the centre. It will also provide logistical support for the project period as an initial investment to make the MAR centre operational. Office furniture and computers for 3 staffs will be provided. GCF grant will be used to implement this activity. PKSF will play the role of both Executing Entity and Implementing Entity.

Result 1.2: Knowledge and technical capacities of climate change adaption interventions improved

Presently, there is not an established system to measure the effectiveness and efficiency of adaptation options in the country. As a result, it is very difficult to distinguish between conventional development interventions and climate change adaptations. Most importantly, the design of adaptation projects fails to address core climate change problems. Under this result, the project will provide tools and indicators to measure effectiveness and efficiency of proposed adaptation interventions and will establish a baseline on the resilience of communities against drought. This will be carried out through a systematic research. The indicators will not only be used to measure the effectiveness of the proposed interventions but also to design future projects and programmes addressing climate change-induced drought in Bangladesh. In addition, the project will train relevant authorities and NGOs on the use of the tools and of climate change adaptations. This activity will be implemented with GCF grant. PKSF will be the executing entity.

[37]Government of Bangladesh (2020). National MAR Strategy (Draft final), Office of the Prime Minister, Government of Bangladesh.

Activity1.2.1: Real Time Evaluation (RTE) study

The project will identify and develop indicators to capture the effectiveness and efficiency of adaptation interventions for drought-vulnerable regions of Bangladesh. A complete list of indicators and tools will be developed during the implementation of the activity. However, the proposed tools will capture (among other aspects) the availability of water during dry season, the functionality of existing tube-wells, use of water for irrigation, and types of crops cultivated.

A baseline study will be carried out using these indicators through household surveys, key informant interviews, and focus group discussions. About 120 staffs of about 15 selected NGOs as described in activity1.2.4 will be trained by PMU/PKSF Experts on the use and measurement, and relevance of selected indicators. The project will select 15 NGOs as implementing entities at the inception phase of the project (details in activity 1.2.4). These NGOs are the same as described in activity 1.2.4). Each selected NGOs will require about 8 project staff. So, 15 NGOs will have about 120 staff. These staff will be recruited through Viva/interview following a competitive written examination. The PMU/PKSF Expert Panel will conduct the written examination for the selection of staff for RTE. The RTE study will design and test a questionnaire based on identified indicators for measuring resilience against climate change induced-drought. Periodic studies (typically annual basis) will be carried out for evaluating the interventions.

The knowledge and lessons developed through this study (and the other studies developed by the project) will be shared with relevant stakeholders, including government organisations, NGOs, and development partners. PKSF will implement this activity with grant finance from the GCF. PKSF will play the role of both executing and implementing entity.

Activity1.2.2: Analyse results and develop database of intervention impacts

The project will develop a repository of lessons learned through the RTE system. The project will publish newsletters, booklets, and articles. It will also carry out a policy recommendation on adaptation to climate change-induced drought for the country. A website will be developed where the project data, information, and knowledge will be shared for global communities. PKSF will implement this activity with grant support from the GCF. PKSF will play the role of both executing and implementing entity.

Activity 1.2.3: Training to NGOs on climate change

The NGOs in Bangladesh play an important role in the socio-economic development of the country, particularly in the rural areas. Development results in many cases are hindered by climate change and related disasters. Mainstreaming climate change in the development activities of the NGOs is crucial for sustained development results. The project will provide training on 'climate change and development' to the NGOs so that they are able to address the impacts of climate change while designing development interventions. The training will include tools and techniques for analysing climate change related data and information, climate change related problem identification and vulnerability assessment, preparation of a plan for integrating climate change in development activities, etc. The project will select 100 NGOs, which are based in drought affected districts and have projects or programmes that are directly or indirectly linked with climate change-induced drought. The criteria for selecting these organisations should be as follows:

- The NGO should have prior working experience in drought-prone areas, preferably as a partner organization of PKSF,
- Have experience in implementing tangible development interventions,
- Their physical existence in any drought-vulnerable districts of Bangladesh,
- Who incorporated disaster, climate change and other environmental issues in their vision, mission and objectives.

The Project Management Unit (PMU) will select the NGOs based on these criteria through physical visits and assessment of their programme documents. Once, the NGOs are selected, PMU will request them to nominate three permanent staffs to take part in the training programme.

A training manual will be developed under the ongoing readiness support project of PKSF (as delivery partner) that will be used for delivering training. The training will be conducted as per the approved training plan. The PKSF staffs trained by the readiness support project will provide the training. PKSF will implement the activity with grant support from the GCF. PKSF will play the role of both executing entity and implementing entity.

Activity 1.2.4: Trainings on CC issues and project management

IEs are the NGOs that will be selected through a competitive process for implementing the activities under the project. Approximately, 15 NGOs will be selected to implement project activities at the community and household levels. The selection criteria are as follows:

a) Valid legal documents, including formal registration.
b) A permanent presence of the organizations in the project areas.
c) At least five years of experience in implementing climate change induced drought related projects or programs.
d) A good track record of financial turnover of at least BDT 50 lakhs (Taka 5 million) annually or BDT 1 crore (10 million) in two consecutive years within the last three years .
e) Preference will be given to NGOs meeting PKSF's partnership selection criteria, which include financial efficiency, operational efficiency, growth indicators, financial strength & risk management, accounting & internal control system, social performance, human capacity and governance.

The project management unit (as EE) in association with the administration division of PKSF (as AE) will prepare procurement documents (preferably Expression of Interest-EoI). The Managing Director of PKSF as Head of Procuring Entity will approve the procurement document. Once, it is approved, the administration department will publish the notice of EoI in several national dailies. The EoIs will be received from the NGOs based will be evaluated by a technical team (to be formed during the procurement of NGOs) of different sectoral experts, including climate change, environmental and social safeguards, gender, water resource management experts etc. This committee will recommend (based on the criteria) the qualified NGOs for approval by the Managing Director.

About 120 staffs from the selected IEs will receive training. PKSF staffs trained by the readiness support project will provide these trainings. A training manual on 'PKSF's compliances and adaptation project management' will be developed under the ongoing readiness support project of PKSF and will be used in delivering training. This broad title of the manual will include the basics of climate change, climate change and development linkages, climate finance, GCF modalities and procedures, Environment and Social Safeguards (ESS), etc. In addition to this manual, a training on project management for the IEs' staffs will be arranged that will include project management cycle, logical framework, accounts and finance, reporting of projects, ESS compliances, beneficiary selection process and profiling, etc. PKSF will implement this activity with grant support from the GCF. PKSF will play the role of both executing and implementing entity.

Activity 1.2.5: Organize knowledge sharing workshops and seminars

The project will organize 20 workshops at the national and local levels. The workshop will include project inception, project closing, quarterly progress review workshops, annual learning-sharing workshops, training workshops, etc. In

addition to the National Designated Authority (NDA), representatives from relevant government technical and political agencies will be invited to these workshops, along with representatives of the IEs' staffs and the most active NGOs.

The project will identify best practices and lessons learned throughout the project implementation, which will be shared during workshops. Government representatives will learn about best practices and lessons of the project. This will help the relevant stakeholders incorporate lessons learned in their development works and in future projects. PKSF will implement this activity with grant support from the GCF. PKSF will play the role of both executing and implementing entity.

Result 1.3: **Communities are organized and aware of climate change issues and potential responses**

The project will establish groups named Climate Change Adaptation Groups (CCAGs) for raising awareness and delivering support services. With the help of local government organisations and relevant NGOs, CCAGs will also play a role in the maintenance of community infrastructure after the project end. PKSF will play the role of executing entity and the selected 15 NGOs will implement the community level activity. Grant support from GCF will be used to implement this activity. PKSF will play the role of executing entity while the IEs will play the role of implementing entity for this project.

Activity 1.3.1: Beneficiary selection, group formation and mobilization

The project will select 215,000 beneficiaries, of which 50% will be women, in consultation with local government institutions and community people. Among them, 60,000 will be selected for promoting climate resilient agriculture in the project area. These 60,000 farmers will represent 15,000 households ((average household size is 4). The project will form CCAGs with one representative from each of household. Hence, 15,000 participants will be the members of the CCAGs. They will be organised into 600CCAGs, with each group having approximately 25 persons. The main objectives of group formation are to facilitate participation and collective decisions of involved communities and to reduce the delivery and transaction costs of project support services. CCAGs will also be used to raise awareness on climate change issues. Group participants will receive training on climate change issues and potential community responses. CCAG will also be involved in looking after community infrastructures (like ponds, canals, MAR etc.) after the project ends. PKSF will play the role of executing entity and the IEs will play the role of implementing entity.

Beneficiary selection criteria

The project has set criteria to select the members of climate change adaptation group (CCAG) (activity 1.3.2). These are:

i. Physical location in villages which are situated in either High Barind areas or Medium High Barind areas;
ii. Being small and marginal farmers and sharecroppers living in drought-affected areas with low household income; Not having direct access to/ownership of sustainable water source (i.e., ponds, tubewells, dugwells, etc.);
iii. Having a single water source that is not accessible throughout the year due to drought.
iv. Priority will be given to woman-headed households. Additionally, all farmers and villagers living in the command area of the canals, ponds, and MAR systems will also be the targeted beneficiaries since they will have access to these facilities.

Activity 1.3.2: Develop beneficiary's socio-economic profiles

Following beneficiary selection and profiling, the IEs' staffs will form CCAGs representing one person from each selected beneficiary household. The selection criteria of group participants include These are: i) being small and marginal farmers and sharecroppers living in drought-affected areas with low income; ii) not having their own water source (i.e., ponds, tube-wells, dug-wells, etc.); iii) having a single water source that is not accessible throughout the year due to drought; iv) being willing to volunteer the operation of the group; and v) having in-depth knowledge of the locality. . Priority will be given to women-headed households[38].

The IEs will have field-level staffs to directly coordinate with the beneficiaries. Field staffs will assist the groups in organising meetings, discussions on climate change and other environmental and health issues. The meeting notes will be preserved in a register book. Upon the facilitation of the project, each group will meet at least once per month and discuss about climate change and its impacts on their lives and livelihoods. They will decide who will get what types of support from the project based on their needs. Grant support from the GCF will be used to implement this activity. PKSF will oversee and monitor this activity as the executing entity and the selected NGOs will play the role of implementing entities.

Activity 1.3.3: Arrange monthly group meetings on climate change issues of CCAG

The IEs will have field level staffs to directly coordinate with the beneficiaries. S/he will assist the groups in organizing meetings, discussion on climate change and other environment and health issues. The meeting notes will be preserved in a register book. The groups will take necessary decisions in addressing climate change impacts by the project interventions. They will decide who will get what types of support from the project, based on their needs. Thus, community level informal institutions will be shaped and carry forward by these group members. USD 0.5 million is in-kind contribution from the IEs to be used for implementing this activity which involves organizing monthly group meetings, paying the salary of the PMU's project coordinator and purchasing office supplies. Grant support from the GCF will be used to implement this activity. PKSF will play the role of both executing entity and selected IEs will play the role of implementing entity.

[38]In Bangladesh, a household is generally headed by the senior male member of the family. If the senior male member is absent (due to divorce or death or separation etc.), then the household is considered headed by a senior female member. This household is called 'woman headed household.'

Activity 1.3.4: Trainings of beneficiary groups

Each selected IE will prepare a training plan to deliver training to the selected CCAG members on climate change and adaptation. This training will include the basics of climate change, impacts of climate change and drought in their locality, drought-resilient cropping patterns, maintenance of community infrastructure, etc. This training plan will require approval from the PMU. PMU staffs will closely monitor the training sessions as per plan. Trainings will be provided by Implementing Entities' (IEs') staff. More specifically, three members from each CCAG will receive trainings. The CCAG members will select the three members by applying the following criteria:

i. Must be an agile member of a CCAG (thereby a permanent inhabitant within the community)
ii. Have at least primary level education
iii.
iv. Have eagerness/willingness in volunteering social services
v. Well informed about local socio-economic context
vi. Have a leadership quality.

The three trained members of each CCAG are expected to discuss climate change issues in their respective groups. Thus, other members will learn about climate change issues in their lives and livelihoods. IEs' staffs will facilitate CCAG meetings

to ensure that the trained CCAG members properly report to their groups about what they learn. The PMU will oversee the training activities at the community level. Grant support from the GCF will be used to implement this activity. PKSF will play the role of executing entity and selected IEs will play the role of implementing entities for this project.

Activity 1.3.5: **Organize exchange visits for CCAG members and IEs' staffs**

The project will organise 10 exchange visits for IEs' staffs and CCAG representatives in the other drought-vulnerable areas of the country. They will learn from each other and be encouraged to adopt climate-resilient technologies and practices. Exchange visits will be conducted in the project areas or in other areas of the country where similar activities are implemented. The selected NGOs will play the role of implementing entity while PKSF will play the oversight role as executing entity. Grant support from the GCF will be used to implement this activity.

Component/outcome 2: Increased availability of surface and ground water for irrigation and drinking

The average annual rainfall (1400 mm) in the selected area is far below than that of the national average (i.e., 2,300 mm). Rains do not percolate into aquifers easily because of the presence of clay soils, which have a low porosity. So, a large amounts of rain-water evaporate before percolating into the soil. In addition, there are no large and deep surface water sources, such as lakes or rivers, and hence groundwater recharge is very slow. During times of drought, when surface water dries up, communities traditionally use hand-pumped tube-wells for drinking purposes. These extract water from shallow aquifers that depend on seasonal rainfall and the availability of surface water. However, under current drought regimes, shallow aquifers are dry and hand-pumped tube-wells are of no use.

Under this component water access will be provided for CCAGs through different mechanisms. Canals and ponds will be used as per site specifications and substrate adequacy. The project will also demonstrate the effectiveness of managed aquifer recharge system by harvesting rainwater and injecting it into the aquifer. Piezometres will be used to check changes in the water table level. Communities will have increased access to water for household drinking and irrigation. In order to improve access to water, multiple interventions[39] will be implemented, including the use of 140km of renovated canals, 300 renovated ponds for surface water storage, 40ponds with recharge wells and 2,500 rooftop MAR systems. It is estimated that by the end of the project, about 215,000 people will have improved access to water use.

Result/Output 2.1: Improved storage of surface water

Activity 2.1.1: Re-excavation of ponds

The project will re-excavate 300 ponds to harvest and preserve rainwater for supplementary irrigation and household usage. Traditional water storage earthen ponds that are gradually silted up will be brought under the re-excavation

[39] By design, these interventions are micro- or small-scale and will not be destructive to natural environment of the area. Rather, the carefully designed interventions will eventually enhance aboveground micro-watersheds (canals and ponds) for maintenance of biodiversity and also contribute to the below ground groundwater aquifer replenishment.

scheme, where micro-scale removal of silts will be accomplished by using human labour and traditional equipment such as hand shovels/spades and baskets. The following criteria will be applied towards selecting the ponds:

(a) Ponds located in most water scarce villages;
(b) ponds where community access is ensured (preference given on public ponds);
(c) ponds having dimensions to provide storage of an appreciable volume of rainwater (say about 2,000 square metres);
(d) ponds that are silted up and lost storage capacity due to accumulated sediments, and
(e) Ponds that women have easy access, etc.

Primarily the IEs will prepare a list of potential ponds in consultation with local communities, farmers, BMDA and local government representatives. The IEs will submit the list to PKSF. PMU members will visit the sites and finalize the ponds for re-excavation.

On average, the micro-scale re-excavation will be up to a depth of 2 to 2.5 metres, with defined water collection steps for women to collect water. Considering an average depth of 2 metres, these 300 re-excavated ponds will provide a storage of about 1.2 million m^3 of rain water. Approximately 75% of the re-excavated ponds will be designated (only) for collection of drinking water, strictly prohibited for bathing and washing clothes. The rest 25% of restored ponds may be used for such activities.

Following excavation, the soil removed from the pond bed will be used to build the pond dyke of about 3 metres in width. The project will raise pond dykes to protect soil deposits from surrounding runoff. The project will also plant grass and deep-rooted trees on the slopes of the ponds to protect the dykes from erosion and to provide shadow on the surface of the pond, thus reducing evaporation.

In addition, the project will establish a community mechanism for regular maintenance of the ponds. This will include a maintenance committee that will be formed by CCAG members. The committee will collect fees from the pond users and operate maintenance activities. The CCAG members will open a bank account in association with the IE to manage the financial resources needed for pond management and maintenance. Each CCAG, with the help of respective local government bodies and the responsible NGO staffs, will develop a maintenance plan, clearly identifying dates for bi-weekly monitoring and monthly maintenance operation. BMDA will monitor water quality in the ponds (and also in the recharge wells) three times during the course of monsoon (beginning of monsoon, in the mid-monsoon and at the end).

The IEs will look after the activities of the committee as they have a permanent presence in the project area. The IE will also bring the CCAG members under their financial services including savings, credits, etc. This approach is expected to create a long-term relationship with the IE and the CCAG members. Ponds will support roughly 30,000[40] households covering 120,000 beneficiaries in selected communities. PKSF will play the role of executing entity while BMDA will provide technical support for preparing technical specification and cost estimation. The selected IEs will play the role of implementing entities. Grant support from the GCF will be used to implement this activity. GCF proceeds/other financing from this project will be used to fund the bank accounts.

Activity 2.1.2: Canals re-excavation

The proposed project will re-excavate 140 km of canals to store rainwater for irrigation purposes. The silted up khals (rivulets), and kharis (i.e, narrow natural creeks) close to agricultural fields will be given priority for re-excavation and restoration. The canals will be selected based on the following criteria: (a) Canals located in most water scarce villages near agricultural land; (b) Canals where community access is ensured (preference given on public ponds); (c) Canals having dimensions to provide storage of an appreciable volume of rainwater; (d) Canals that are silted up and lost storage capacity due to accumulated sediments, etc. Primarily the IEs will prepare a list of potential canals in consultation with local communities, farmers, BMDA and local government representatives. The IEs will submit the list to PKSF. PMU members will visit the sites and finalize the canals for re-excavation. Silts will be removed by engaging labours (the cash for work model[41] used by local government bodies), and the process will be small-scale[42] and manually accomplished involving hand shovels/spades and baskets. It will bring 3,500 hectares of cultivable land within the command area of the restored canals under supplementary irrigation.

[40] Considering 400 to 500 HHs in each villages, we expect that 100 hhs would be benefited by each pond.
[41] Mascie-Taylor et al, (2010).
[42] On an average, about 10 km stream to be re-excavated per 280km^2 area.

Considering the national per capita land size (0.056 hectares, calculated based on World Bank data)[43], it will directly benefit more than 60,000 people. The IEs will select the ponds (in activity 2.1.1) and canals for re-excavation, in consultation with communities, BMDA and local government representatives. Based on these, they will propose the sites. PKSF as executing entity will visit the proposed sites and finalize the ponds and canals to be re-excavated.

The IE will receive necessary technical advice from the local offices of the BMDA. PKSF will play the role of executing entity and the selected IEs will play the role of implementing entities. Grant support from GCF will be used to implement it.

Result/output 2.2: Improved recharge of aquifers

As stated in the feasibility report and in section B1, the High Barind Tract is affected by severe water-scarcity due to climate-induced drought, compounded by an excessive evapotranspiration, leading to over-exploitation of ground water (GW) resources and an eventual draw-down of groundwater table (GWT). As indicated in the pre-feasibility report (i.e, Annex-2), GWT in High Barind and Medium High Barind is gradually depleting at an alarming rate. GW is absolutely crucial source of water for poor farming communities in Barind. A net depletion of GWT therefore put GW-based food security at high risk. Unfortunately, climate change induced diminishing rainfall in the long dry season cannot supplement the evapotranspiration and cannot replenish extracted GW. To ensure the sustainability of GW resources, effort must be made to help augmentation of recharge potential by predominantly using surface runoff (through creeks/*khals*) and storages (ponds and wells). In doing so, Managed Aquifer Recharge (MAR) model was piloted in drought-vulnerable Barind areas[44]. Based on the results of these pilot projects, implementation of MAR is suggested in the 2014 National Strategy for Water Supply and Sanitation of Bangladesh[45]. During the rainy season, the MAR model injects rain/runoff through recharge pipes/shafts and dug-well to increase quantity of groundwater.

Activity 2.2.1: Installation of rooftop managed aquifer recharge systems

The project will increase access to safe drinking water for the selected communities through the installation of rooftop-managed aquifer recharge systems on the rooftop of public buildings. The rooftop of public buildings can be easily maintained as designated rainfall micro-catchment areas and the collected rainfall runoff can be diverted into a dug-well (i.e, water tank) constructed next to the building. The design of the dug-well accommodates the MAR-infrastructure so that the collected water is pushed for infiltration into the aquifer. Such MAR systems have been piloted well in Barind areas by BMDA, in cooperation with academia (i.e., University of Rajshahi), with highly encouraging results concerning effective aquifer replenishment.

To increase access to safe drinking water, the project will install 2,500 roof-top MAR models. On average, 200 m^2 of the rooftop area is considered for capturing rainwater. A rain water harvesting system will be developed using water collection PVC pipes, a plastic-made storage tank of 1,000 litre capacity and a recharge well with a pond-sand-filter box. It is estimated that 2,500 rooftop-MAR systems will inject 560,000 m^3 of water into the aquifer annually. This water will improve access to water for about 25,000 persons annually (considering 62.43 litres/person/day). In addition, 2,500 litres will be stored in the water tank which will be used during dry seasons for a few months. The project will carry out water quality tests after the implementation of MAR.

The primary selection of the MAR sites will be carried out by the selected IEs in consultation with communities, local institutions, DASCOH, BMDA, University of Rajshahi and local government representatives. PKSF as executing entity will visit the proposed sites and finalize and approve the sites.

2,500 MAR will be installed in 14 target upazilas of Naogaon, Rajshahi and Chapainawabganj districts. About 15 implementing entities will implement this activity in 4 years. On an average, each implementing entity will implement approximately167 MAR in 4 years, i.e., 42 MAR in one year. Required infrastructures are available in the project area. For example, there are more than 5,000 educational institutions, government and non-government offices

[43]https://data.worldbank.org/indicator/AG.LND.AGRI.K2?locations=BD

[44] Jahan et al., 2015; Rahman et al., 2017; Rahman et al., 2019; Hussain et al., 2019; Hussain et al., 2021. For further details, please see Annex-2, the pre-feasibility report.

[45]Local Government Division (LGD) (2014). National Strategy for Water Supply and Sanitation 2014, Local Government Division, Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh.

(*Upazila* offices and *Union Parishad* (UP) buildings) and private houses that could be used to install roof-top MAR system.

The project will install a total of 28 shallow piezometres to monitor the effectiveness of MAR. At least two piezometers will be installed in each upazila to monitor hydrographs throughout the dry seasons. Necessary technical support will be provided by the BMDA and the University of Rajshahi. Detailed technical specifications will be prepared in consultation with these organisations.

The selection of sites for MAR implementation will be based on the following criteria: i) presence of vvillages where drinking water scarcity is severe and tube-wells for drinking water do not work, ii) areas with high poverty incidence, iii) high population density, and iv) presence of public buildings (e.g., school, mosque, temple, UP office, etc.) that can be used for the MAR systems. This should be considered as the final selection criteria. The primary selection of the MAR sites will be carried out by the selected IEs in consultation with communities, local institutions, DASCOH, BMDA, Rajshahi University, and local government representatives. PKSF, as the executing entity will visit the proposed sites and finalize and approve them.

The IEs' staffs will consult *Upazilas* (sub-district) and *Unions* (the lowest administrative unit) to select villages where MARs will be established. The same consultations will also help identify villages having community organisations like mosques, schools, temples, UP office buildings etc. Then consultations with individual households and local government representatives will be carried out for selecting buildings to be used for capturing rain water for the proposed MARs. University of Rajshahi and DASCOH (local research-based NGOs who piloted the MAR[46] in the proposed districts) will provide technical support to design MAR, prepare technical specification and cost estimation. PKSF will play the role of executing entity and the selected IE will play the role of implementing entities. Grant support from the GCF will be used to implement this activity.

Activity 2.2.2: Installation of recharge wells for ground water recharge in ponds

Natural recharge of GWT with rainfall runoff is rather slow owing to an impermeable thick claye layer above the aquifer, especially in the High Barind and Medium High Barind areas. The project therefore proposes to consider technical measures, already proven in the target area as effective, to artificially accelerate recharge of GWT. The project defines the recharge well as a groundwater recharge technique that is constructed at the bottom of a recharge shaft with 20 cm diameter penetrating through the impermeable layer. In order to facilitate the GW recharge in Barind area particularly in the selected districts, the project will apply these techniques considering the lithological characteristics of the area (detailed lithological and hydrological information is presented in the pre-feasibility study). To do so, the project will re-excavate 40 ponds[47] of about 2,000 m^2 area each with a depth of 5 m in addition to the 300 ponds described in activity 2.1.1. The selection criteria of the 40 ponds are:

a) Private or public pond that must have access to all people of the locality;
b) The ponds that are located in densely populated area;
c) The size of the pond should be around 2000 square meters;
d) Ponds that women have easy access;
e) Ponds that are located in the most water scarce villages.

Then a recharge well will be installed in each of the pond as defined above. On the top of the well at 2 m height from the bottom, a concrete box will be constructed with the shaft. The shaft will be filled with brick chips, coarse sand, and sand from bottom to top. The shaft along with the well will mimic underground (earthen) layers and allow water to pass through (again, mimicking natural seepage and percolation). Practical piloting in the Barind areas found that the water collected from the well appears free from contamination (as because the source is rainwater), satisfying the national standards. These ponds will preserve bottom 2 meters of water that will be used for drinking as well as for supplementary irrigation. The upper 3 meters will be injected through inject well. These designated ponds for GW recharge will not allow community usage such as bathing and washing clothes, with a view to keep water free from contaminants (i.e, detergents, soaps, etc.). Since the ponds will be in use, the water bodies will not be still, thus allowing mosquitoes to propagate. Moreover, regular monitoring by CCAG members will prevent spread of mosquitoes.

[46] Miah and Jahan, 2020.

[47] One such pond in every 13 km^2 area.

It is expected that these ponds will be able to inject into the underground about 400,000 m^3 of water annually. The pond will also store more than 150,000 m^3 (40ponds x 2000 sq.m x 2 m) of water that could be used for supplementary irrigation and other household purposes. The whole community around the pond area will benefit from this activity.

The users will be charged at a nominal cost to raise a CCAG-based fund, which will be utilized for operation and maintenance (O&M) purposes. The local inhabitants are already habituated to receive water for irrigation from BMDA deep TW operations. For such services, they generally pay an amount based on water consumption for irrigation. The intended O&M charge will be within 10 to 15% with respect to the amount paid to BMDA for water services. Since at least 100 households will be directly benefitting from each pond, the total amount raised per re-excavated pond will be adequate to cover O&M costs. The net amount levied per household for O&M will be within their willingness to pay as well as ability to pay, as it has been discussed in the consultative meetings.

For similar pilot activities under BMDA, a user household-based levy has been determined in cooperation with users, BMDA, University of Rajshahi, and local government bodies (UPs etc.). A similar approach will be followed towards raising the O&M fund for each CCAG. University of Rajshahi and DASCOH (local research-based NGOs who piloted the MAR in the proposed districts) will provide technical support to design MAR, prepare technical specification and cost estimation. PKSF will play the role of executing entity and the selected IEs will play the role of implementing entities. Grant support from GCF will be used to implement this activity.

Component 3: Drought resilient livelihoods created through sustainable agricultural production

Climate change-induced drought not only reduce availability of drinking water and aggravates lowering of groundwater table, it also increases moisture deficit due to increased potential-evapotranspiration of standing crops. An attempt must be made to popularise low-water requiring crops and varieties as well as increasingly water-efficient fruit varieties so that farmers can maintain food security defying climate change. Long-term sustenance of GWT is a key requirement here, for which the existing calendar needs to be optimised with water efficient varieties and crops.

This component will promote drought-adaptive cropping patterns. A cropping pattern will include rotation of crops in a year on a single piece of land, which enable farmers to achieve both food self-sufficiency for the household and simultaneously earn cash from excess production. It will include different types of crops. The crops will be chosen based on moisture-stress tolerant capacity, duration of the production cycle, water requirement even when stressed due to drought. However, the choice must also help maintain household food security and simultaneously be market responsive. Considered crops include rice, wheat, maize, mustard, sunflower and mung bean. For example, a suggested cropping pattern is *BRRI Dhan*-56 (rice variety)-*BARI Gom*-24 (a wheat variety)-*BARI Mung*-6 (a pulse variety). Fruit trees will also be promoted since they require a minimal amount of water. Besides, cotton will also be promoted since it is a crop with high agronomic and economic potentials in the Barind region and is drought-tolerant. The project will link CCAG members to the local office of the Department of Agricultural Extension (DAE) and/or Bangladesh Agricultural Development Corporation (BADC) to get seeds. The crops will be carefully chosen so that the suggested cropping pattern does not force farmers to apply any additional amount of chemical fertilizer per unit of cultivated land. Overall, the alternative cropping pattern will be water and input-wise more conservative and environmentally friendly.

Through this component, it is expected that farmers will increase productivity and incomes from agriculture. It is also expected that water requirements for agricultural production will be reduced by 70% (see the pre-feasibility study for description on how this reduction was estimated).

Result/output 3.1: Drought-resilient crops are adopted by farmers

Activity 3.1.1: Promotion of drought-adaptive cropping patterns, crop varieties

7,500 farmers will be selected to implement this activity. The project will provide seeds, fertilisers, and irrigation equipment to the selected farmers. The activity will directly benefit 30,000 people (the household members of the selected farmers). The IEs' staffs will select the potential farmers in consultation with the CCAG members. Criteria to select farmers are the following:

i) being involved in farming activities,

ii) having access to farmland larger than 1500 square metres,

iii) farmland should be medium-high land and medium-low land[48].

It is to be noted that these beneficiaries are included in 215,000 beneficiaries of water related interventions.

The IEs will primarily select the farmers in consultation with local people and local government representatives and prepare a list of potential farmers. Then they will submit the list to PKSF for approval. The PMU staff will visit the and carry out consultations randomly for verifying the lists whether it complies the selected criteria or not. Based on the visit and consultation results, PKSF will approve the final list of farmers.

The project will promote organic fertilizer i.e., vermicompost to reduce the excess use of chemical fertilizer. The Department of Agriculture Extension (DAE) will be consulted for appropriate doses of fertilizers. In addition, the project will train the selected farmers on National Good Agricultural Practices (NGAP) as adopted by the Government of Bangladesh. In fact, through project intervention the farmers will use less fertilizer than the BAU.

IEs will provide training to the selected farmers on crop management including topics such as crop variety characteristics, fertiliser application, soil and water management, pest and disease control, weeding and mulching, among others. The training will also include information on various early warning systems including that one to be developed by the World Bank financed project. The selected farmers will increase access to this EW information through this training programme. The resource persons from the Department of Agricultural Extension will be invited to delivers some of the training sessions particularly related to the early warning information.

The PKSF will provide loan to purchase seeds, organic fertilizers, labour cost for cultivation, irrigation cost etc. The grant part from the GCF will be used for supporting staffs, logistics, local travel etc. The loan will be disbursed by Panel Leaders of PKSF to the IEs while supporting costs i.e., grant part will be reimbursed by the PMU based on satisfactory performance of the IEs. Similar approach will be applicable for activity 3.1.2. PKSF will play the role of executing entity and selected IEs will play the role of implementing entities.

PKSF's loan is concessional compare to other accessible loan for the farmers. Since they are unable to provide any form of collateral to the lending institutions, marginal farmers cannot obtain loans from commercial sources. They might, however, get loans from local moneylenders, but the interest rates are too high—up to 100%. PKSF will offer marginal farmers a microfinance facility with an interest rate of 18–20%, a maximum loan term of 2 years, and flexible repayment schedules based on the nature of their activities. In addition, for the housing loan, the interest rate will be as low as 12% with a longer amortization period, e.g., a maximum of 5 years.

Activity 3.1.2: Promotion of drought adaptive fruit cultivation

The project will promote drought-adaptive fruit varieties (e.g., jujube, date, and dragon). These are high value fruits that require a low amount of water. 7,500 farmers will be selected for cultivating these fruit varieties. The project will provide saplings and organic fertilisers to the selected farmers. The project will also provide training on cultivation of these fruits including land preparation, irrigation management, fertiliser management, harvesting, post-harvest management and marketing. Around 30,000 people (mainly, the family members of the selected farmers) will be benefitted from this activity. Like activity 3.1.1, there beneficiaries are also included in 215,000 beneficiaries of water related interventions.

The IEs will primarily select the farmers in consultation with local people and local government representatives and prepare a list of potential farmers. The selection criteria are:

i) being involved in farming activities,
ii) having access to farmland larger than 1500 square metres,
iii) farmland should be medium-high land and medium-low land.

Then they will submit the list to PKSF for approval. The PMU staff will visit the and carry out consultations randomly for verifying the lists whether it complies the selected criteria or not. Based on the visit and consultation results, PKSF will approve the final list of farmers.

The PKSF will provide loan to purchase seeds, organic fertilizers, labour cost for cultivation, irrigation cost etc. The grant part from the GCF will be used for supporting staffs, logistics, local travel etc. The loan will be disbursed by

[48] For agro-ecological zoning land is classified based on inundation level in Bangladesh. There are five types of land. These are: a) high land that remains above normal flood level, b) medium high land that is flooded about 90 cm deep during flood season, c) medium low land that is flooded between 90-180 cm deep during flood season, d) low land that is flooded between 180-300 cm during flood season and e) very low land that is flooded deeper than 300 cm during flood season.

Panel Leaders of PKSF to the IEs while supporting costs i.e. grant part will be reimbursed by the PMU based on satisfactory performance of the IEs. Similar approach will be applicable for activity 3.1.2. PKSF will play the role of executing entity and selected IEs will play the role of implementing entities.

Beneficiaries will be consulted in order to identify local tree species. Local offices of the Forest Department (FD) and Department of Agricultural Extension (DAE) will also be consulted for identifying and promoting local tree species. Under Bangladesh law, to introduce invasive species are not allowed without getting the no objection from FD and DAE.

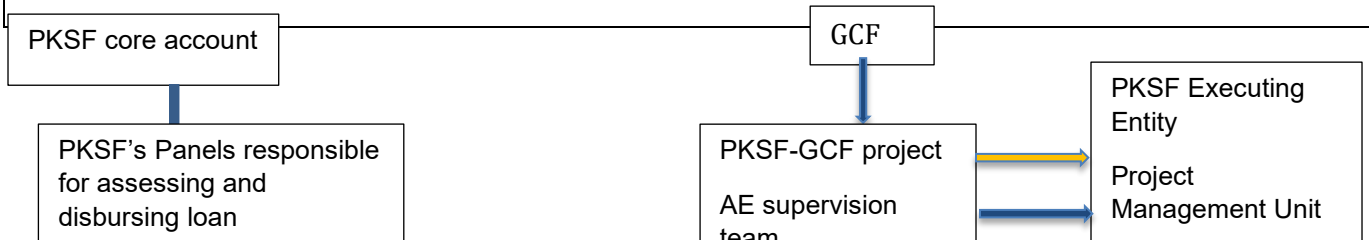
The project would offer loans to extremely marginal farmers and households headed by women, as mentioned in the selection criteria. Not everyone from the project area will enjoy it. These farmers are now unable to obtain loans from commercial banks or other official financial organizations i.e., there is no financial source for these targeted people in the project areas. As a result, the market will not be distorted. The GCF proceeds, which are grants, will largely be used for capacity building and provisioning basic infrastructure for the project participants. PKSF's loan will be utilized to expand their economic activities. So that, there will be a sustainable transition for the poor. On the one hand, they will have a few basic structures coupled with knowledge transfer and technical advice, and then they will be able to scale up their economic activities with loans. It will be an important avenue for the project's exit strategy.

PKSF operates a flexible loan programme for the extremely poor people which is called 'Buniad.' The Buniad programme is more flexible than any other programmes of the PKSF or any other programmes of other financial institutions. For example, it offers 4% less interest compared to other available sources and needs minimum documentation, which saves the borrower's time. It is also flexible in terms of repayment schedule. Borrowers can repay weekly, monthly, or even in one shot after the harvest. As agriculture is a risky activity and the extreme poor are largely treated as risky borrowers, for this reason, these types of loans are not available in the project area for them. They might, however, get loans from local moneylenders, but the interest rates are too high—up to 100%. Under this project, the loans will be provided to women, and preference will be given to women-headed households. As a result, it will help project participants become more resilient and assist them in sustainably escaping poverty. Here is the terms and conditions of the PKSF loans under this project for the borrowers

Target groups	Women, particularly women-headed households, vulnerable to the adverse impacts of climate change living in drought-prone areas and poor households, particularly the extremely poor households.
Loan Purpose	To undertake agriculture activities.
Loan Amount	Maximum of BDT 100000 (US$ 1000), depending on the nature of activities.
Rate of Interest	IEs will charge 20% per annum, which is lower than the rate fixed by the Microcredit Regulatory Authority (MRA) in Bangladesh.
Tenure	Maximum of 2 years, depending on the nature of activities.
Loan Security	It will be a collateral-free loan.
Repayment	IEs will offer borrowers weekly, monthly installment or one shot for loan repayment based on their respective production cycles of the activities.
Processing Fee	There will be no processing fee.
Technical Assistance	IEs will provide technical assistance free of charge to the borrowers.
Risk fund	IEs usually offer a risk coverage service or an insurance cover for life, and accident as a bundled product.

The grants and loans under this project will be different. The loans against which financing is obtained from PKSF will be flagged and be easily identifiable in the books of the borrowing institutions, i.e., IEs. In addition, proper books of accounts, registers, loan documentation, and MIS, etc., will be maintained by the IEs with respect to loans financed from PKSF. It is to be noted that using grants in the project will not create any chance to increasing the loan concesionality.

Flow of GCF grant proceeds and PKSF's loan



It is to be mentioned here that loans will be disbursed in two stages. First, it will be disbursed from PKSF to IEs. Then, IEs will disburse to borrowers. The terms mentioned in the above table are for the end borrowers. Therefore, there will be two loan agreements: one between PKSF and IEs and another between IEs and borrowers. All loans will be disbursed in local currency, i.e., BDT. At the PKSF-IEs level, IEs will get sufficient time to repay their loans to PKSF. PKSF will take the necessary steps to make these loan programmes financially sustainable by providing subsidized loans to IEs.

B.2.2. Outcome mapping to GCF results areas and co-benefits categorization

Outcome number	GCF Mitigation Results Area (MRA 1-4)				GCF Adaptation Results Area (ARA 1-4)			
	MRA 1 Energy generation and access	**MRA 2** Low-emission transport	**MRA 3** Building, cities, industries, appliances	**MRA 4** Forestry and land use	**ARA 1** Most vulnerable people and communities	**ARA 2** Health, well-being, food and water security	**ARA 3** Infrastructure and built environment	**ARA 4** Ecosystems and ecosystem services
Outcome 1: Improved institutional and technical capacities to address climate change-induced drought	☐	☐	☐	☐	☐	☒	☐	☒
Outcome 2: Increased availability of surface and ground water for	☐	☐	☐	☐	☒	☒	☐	☐

irrigation and drinking								
Outcome 3: Drought resilient livelihoods created through sustainable agricultural production	☐	☐	☐	☐	☒	☒	☐	☐

Co-benefit number	Co-benefit					
	Environmental	Social	Economic	Gender	Adaptation	Mitigation
Co-benefit 1: Improved biodiversity by planting trees and preserving water in ponds and canals	☒	☒	☒	☐	☒	☒
Co-benefit 2: Increased income for farmers and women	☐	☐	☒	☒	☐	☐
Co-benefit 3: Improved overall health of the community	☐	☒	☐	☐	☐	☐

B.3. Implementation / institutional arrangements (max. 750 words)

Implementation Arrangements

PKSF will serve as both Accredited Entity (AE) and Executing Entity (EE) whereas selected NGOs will be responsible for implementing the activities at the community level. PKSF's AE and EE functions will be well-separated internally in order to differentiate the Project supervision and the Project coordination functions. PKSF as the AE will supervise, manage, and approve the work plans of the IEs. As AE, PKSF will ensure compliances for the whole project implementation including fiduciary standards and ESS. As the Executing Entity, PKSF will take responsibility for the effective implementation and coordination of all Project components through a dedicated team. PKSF will be in charge of ensuring coordination of the planning and implementation of Project activities financed by GCF proceeds.

PKSF will establish a Project Management Unit (PMU) to handle the coordination and implementation of the Project. The role of the PMU is to ensure that work on the three components is conducted consistently. The PMU will be responsible for awarding contracts, supervising the activities implemented by the procured parties (government, NGOs, private actors), and monitoring and evaluating compliances with Safeguards. The PMU will work in close collaboration with various ministries and government agencies, which have a key role to play in supporting the implementation of certain Project activities. The PMU will be headed by a Project Coordinator (PC) and PKSF staff members. The PC will directly report to a Deputy Managing Director (DMD), who is the focal person to GCF for

PKSF and the Contact Person at PKSF for the GCF Secretariat and NDA. The DMD will review the submissions of Annual Performance Report (APR) and Intermediary Unaudited Financial Reports, make queries and approve project documents to be submitted to GCF.

Involved government agencies (BMDA and Ministry of Water Resources) will designate a focal point for the Project implementation and monitoring. The PMU will meet every week or more often, if necessary, to monitor Project activities.

A team of technical reviewers will be engaged when required to appraise projects. Technical experts will review the Project locations. PKSF, as EE, will monitor the implementation activities of IEs. PKSF will adhere to the Results-based Monitoring (RBM) system to ensure reaching the Project goals efficiently and effectively.

Implementation of GCF funded activities will also be via contracts with Implementing Entities (in compliance with Public Procurement Rules, 2008 and Public Procurement Act, 2006). PKSF will select these partners through a call for Expression of Interest (EoI) to perform services against a set of general and technical criteria that would include, inter alia, expertise in the technical field and past successful engagement with PKSF. Along the same lines, the framework for collaboration will be developed at the beginning of each annual exercise through the development of complementary/combined Annual Work Plans and approved Budgets.

PKSF will execute contracts with IEs to implement the project activities at the community level. PKSF's procurement policies and procedures will be used to contract IEs.

PKSF will carry out procurement required for establishment of PMU, various studies and publication in association with the administration division. Establishment of PMU will include procurement of IT equipment (computers, scanners, laptops, photocopiers, cameras etc.). For this, PMU will prepare a procurement plan and get approval from the Head of Procuring Entity at PKSF level i.e. the Managing Director. This plan will be incorporated in the Annual Procurement Plan (APP) of PKSF. The entries in the submitted procurement plan are for procurement to be carried out by the IEs. So, Under this project, procurement will be carried out at the PKSF and IE levels. For IE level, IEs will complete the procurement process, in accordance with PKSF procurement policy, while PKSF will monitor, oversee, and approve the procurement by the IEs.

IEs will monitor the output activities, outcomes, and impacts of the activities, as well as impacts on the environment and society. They will ensure proper gender participation in the Project field staff and among beneficiaries. They will report to PKSF's PMU on the progress of the project. The IEs will be required to employ a dedicated monitoring officer, who will report to the Chief Executive or a senior official of the IE.

In order to select IEs, a committee will be formed. The committee will invite Expression of Interest (EoI) from the IEs using two national news-papers (both Bangla and English). It will be an open competition. The eligible criteria for submitting the EoI are:

a) Valid legal documents including formal registration
b) A permanent presence of the organisations in the project areas.
c) At least five years of experience in implementing climate change related projects or programmes.
d) A good track record of financial turnover of at least BDT 50 lakhs (Taka 5 million) annually or BDT 1 crore (10 million) in two consecutive years within the last three years.
e) Preference will be given to NGOs meeting PKSF's partnership selection criteria, which include financial efficiency, operational efficiency, growth indicators, financial strength & risk management, accounting & internal control system, social performance, human capacity and governance.

Organizations will be ineligible on the grounds of involvement in any Money Laundering and Terrorist Financing. Before the final selection, PKSF will physically visit the organisations and examine all documents including accounts and finance for examining strength of financial capacity and whether the organisations have any involvement in illegal financial transactions.

The project will also directly sign a Memorandum of Understanding (MoU) with the BMDA for providing technical and advisory support to the Implementing Entities. The BMDA will provide technical support particularly in implementing ponds and canals related activities. The BMDA will provide engineering designs for the ponds and canals and will support the preparation of technical specifications of the ponds and canals to procure works. The BMDA will be involved in Tender Opening Committee and Tender Evaluation Committee to implement works needed

for ponds and canals rehabilitation. In order to ensure quality, the BMDA will monitor and supervise the implementation of works. Finally, the BMDA will conduct quality tests of ground water (recharged through MAR) in its own laboratory to verify whether the water quality is consistent with national standards for drinkable water.

The BMDA will be paid a consultancy fee for providing this technical support, which is included in the activity budget. A Memorandum of Understanding (MoU) between the BMDA and PKSF will be singed clearly mentioning the tasks to be done by the BMDA and the payment schedule.

The following flow chart represents the implementation arrangement at PKSF level:

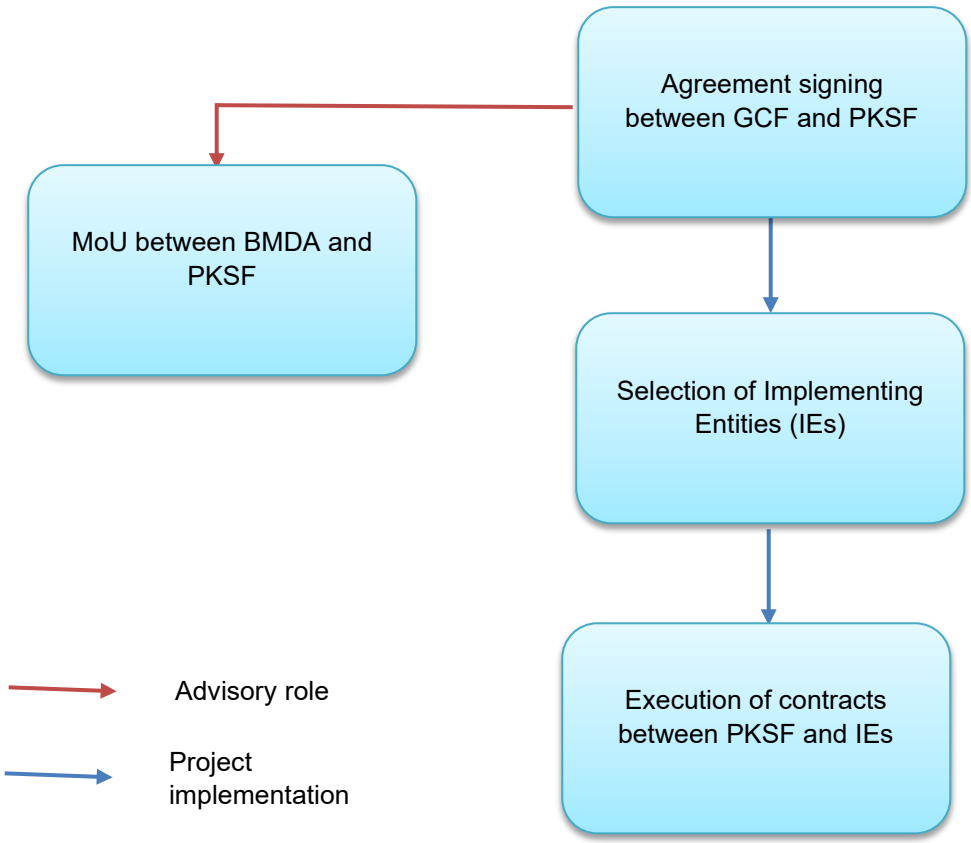


Figure 9: Implementation arrangement

Fund flow of the project:

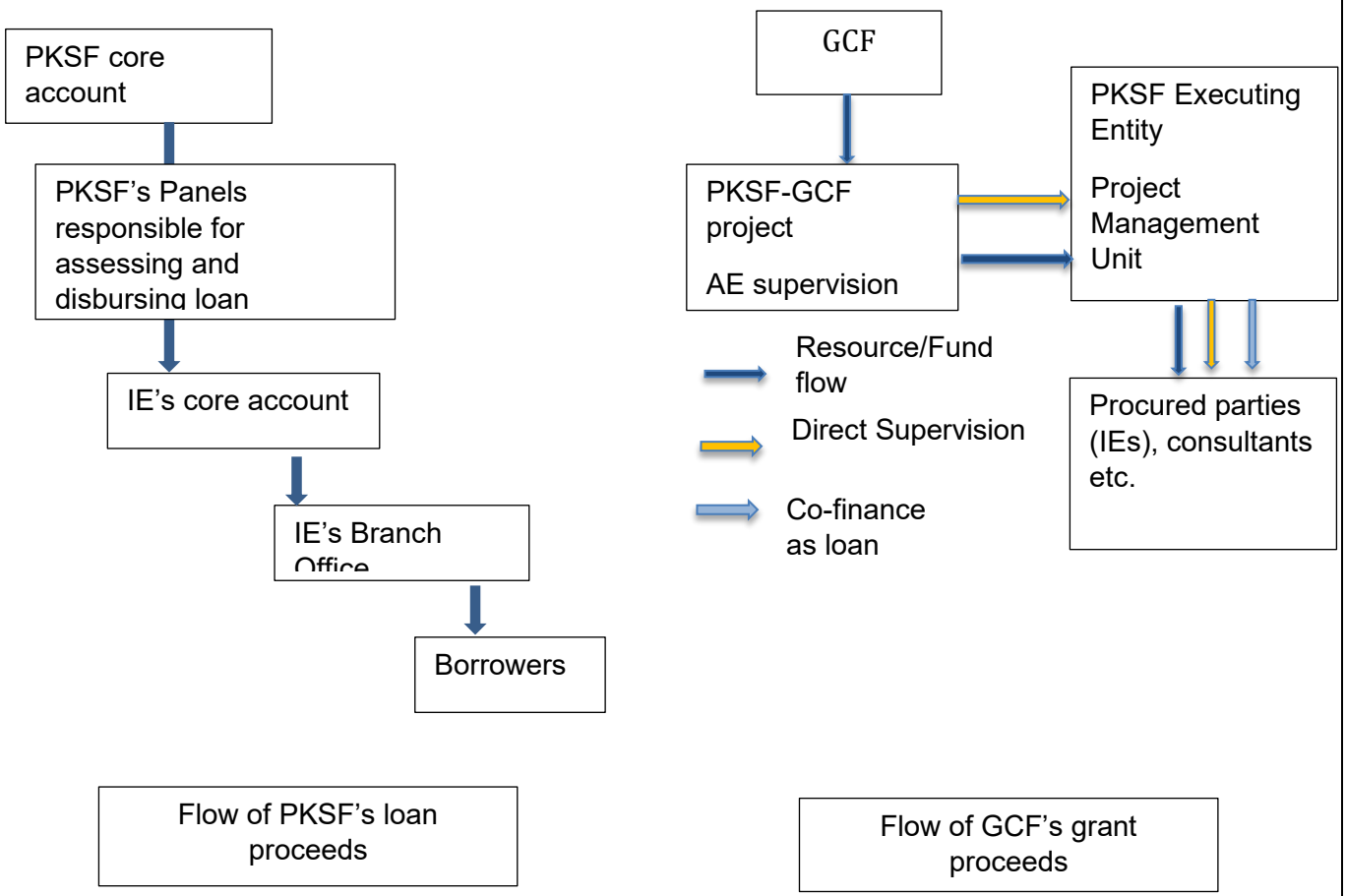


Figure 10: Fund flow diagram of the project

Funds will be directly disbursed to PKSF from GCF. PKSF will receive the GCF Proceeds in a special account in the name of the 'GCF-PKSF project' in a commercial bank. To carry out the interventions at the local level, IEs won't receive the whole grant amount all at once. They will receive up to 70% of the entire agreed amount for a financial year in advance in order to hold them responsible. They will provide a summary of expenses after carrying out the field-level activities and request reimbursement for the remaining funds. PKSF will provide 4.5 million USD as loans to co-finance the project. These funds will be used to promote climate-resilient agriculture in the drought-prone areas. 15,000 selected farmers will receive loans. Existing credit staffs of the IEs (IEs must have credit programmes in the selected areas) will disburse loans based on an assessment of loan demands in the agriculture section of the project areas. PKSF will also contribute US $0.5 million grants to the project.

C. FINANCING INFORMATION

C.1. Total financing

(a) Requested GCF funding (i + ii + iii + iv + v + vi)		Total Amount: 24.96		Currency: million USD ($)	
GCF Financial Instrument		**Amount**	**Currency**	**Tenor**	**Pricing**
(i)	Senior loans	Enter amount	Options	Enter years	Enter %
(ii)	Subordinated loans	Enter amount	Options	Enter years	Enter %
(iii)	Equity	Enter amount	Options		Enter % equity return
(iv)	Guarantees	Enter amount	Options	Enter years	
(v)	Reimbursable grants	Enter amount	Options		

(vi)	Grants	24.96	million USD ($)		

(b) Co-financing information[49]	Total amount	Currency
	5.0	million USD ($)

Name of institution	Financial instrument	Amount	Currency	Tenor & Grace	Pricing	Seniority
PalliKarm-Sahayak Foundation (PKSF)	Subordinated Loans	4.5	Million USD	4 years NO grace period	12 %	Options
PalliKarm-Sahayak Foundation (PKSF)	In kind	0.5		4 years	Enter %	Options

	Amount	Currency
(c) Total investment (c) = (a)+(b)	29.96	million USD ($)
(d) Co-financing ratio (d) = (b)/(a)	0.20	
(e) Other financing arrangements for the project/programme (max ½ page)	*Not applicable*	

C.2. Financing by component

Outcome	Output	Indicative cost (USD)	GCF financing		Co-financing		
			Amount	Financial Instrument	Amount	Financial instrument	Name of institutions
Component/Outcome 1: Improved institutional and technical capacities to address climate change-induced drought	1.1 Enhanced capacities of government institutions to implement and monitor water resources management and climate change (CC) adaption projects	216,000	216,000	Grant			
	Result/Output 1.2: Knowledge and technical capacities of climate	490,850	490,850	Grant			

[49] If the co-financing is provided in different currency other than the GCF requested, please provide detailed financing information and a converted figure in the GCF requested currency in the comment box. Please refer to the date when the currency conversion was performed and the reference source.

	change adaption interventions improved						
	Result/Output 1.3: Communities are organized and aware of CC issues and potential responses	996,400	756,400	Grant	240,000	Grant in Kind	
Component/Outcome 2: Increased availability of surface and ground water for irrigation and drinking	Result/Output 2.1: Improved storage of surface water	16,184,000	16,184,000	Grant			
	Result/Output 2.2: Improved recharge of aquifers	5,973,500	5,973,500	Grant			
Component/Outcome 3: Drought resilient livelihoods created through a sustainable agricultural production	Result/Output 3.1: Drought resilient crops are adopted by farmers	4,812,000	312,000	Grant	4,500,000	Loan	PKSF
Project monitoring and supervision		240,000	240,000	Grant			
Total Activity Cost		**28,912,750**	**24,172,750**	**Grant**	**4,740,000**		
	PMC	1,049,240	785,240	Grant	264,000	Grant in Kind	PKSF
Grand Total		**29,961,990**	**24,957,990**	**Grant**	**5,004,000**		

C.2.1 Financing structure (if applicable, mandatory for private sector proposal (max.300 words)

Not applicable

C.3 Capacity Building and Technology development/transfer

The capacity building and technology transfer component of the project is estimated to take up 31% of the GCF funding. A major part of this budget will be used to establish MAR systems in the project areas. The project expects that this technology will improve groundwater storage and increase access to water, particularly for women who are mainly responsible for collecting water for households. There are low risks that the establishment of MAR will not occur or produce results because it is a proven technology. PKSF will also engage experienced and specialized organizations to produce the results.

C.3.1 Capacity building	Amount: 1,768,850 USD

C.3.2. Technology development	Amount: 5,932,000 USD

C.4. Justification for GCF funding request (max. 500 words)

The government of Bangladesh requires huge investment in securing health, education, and infrastructural development for the implementation of annual development program and 8th five-year plan. The country spends US$3 billion a year, around 8 to 10 per cent of its annual budget, on climate change adaptation. Intended Nationally Determined Contribution (INDC) estimated investments for adaptations in Bangladesh amounted to 42 billion USD over the period of 2015-2030. In addition, in the recent National Adaptation Plan (NAP) published in 2022, an appraisal of the cost of the 113 interventions, including 90 high-priority and 23 moderate-priority ones, defined a total investment of BDT 20,037 billion (equivalent to US $230 billion) for 27 years (2023-2050), an implementation period that runs until the 13th Five Year Planning cycle of Bangladesh. The NAP proposes to mobilize around 72.5 percent of the total investment cost by 2040. Developing climate resilience will require seven times the current spending to transform adaptation at a rate of USD $8.5 billion per year, with US $6 billion per year from external source. So, Bangladesh is trying to raise funds from various bilateral and multilateral sources to tackle climate change. The GCF financial support in the form of a grant is needed to adapt the most vulnerable region of Bangladesh to climate change. Bangladesh's financial needs to reduce vulnerability to climate change are significant, whereas the resources available are very limited. The Bangladesh Climate Change Trust Fund (BCCTF) has undertaken 789 projects with an investment of 443 million USD to implement strategic actions identified in the Bangladesh Climate Change Strategy and Action Plan in 2009[50].Also, the Bangladesh Climate Change Resilience Fund (BCCRF) was established in 2010 to raise funds from the World Bank and other development partners to support the implementation of Bangladesh Climate Change Strategy and Action Plan (BCCSAP). The BCCRF raised USD 190 million, of which 130 million were received and projects were implemented. Presently, BCCRF is closed[51]. These figures show how far the actual investments were made and funds raised are from the estimated 42 billion USD financial needs up to 2030.

Furthermore, The World Bank estimated that up until 2030, Bangladesh will have to invest a minimum of $32.5 billion and a maximum of $143.7 billion in climate finance. This is between 3.28 and 7 percent of the GDP. The private sector investment potential is estimated to be 5.1 percent of the total investment at an annual rate of $0.42 billion. Prioritization of finance to facilitate extensive research, capacity development, and innovation is recommended. Successful implementation of the NAP will complement the national development vision of becoming a high-income country by 2041 and achieving the SDGs by 2030. There has been a strong appeal from the Government of Bangladesh in the international climate forums for the extended financing needed to combat the impacts of climate change. It justifies the urgency of GCF's fund.

Requested resources will be used to overcome the Government's constraints to use public funding to invest in measures needed to adapt to climate change-induced drought in the Barind region of the country that is most vulnerable to droughts.

A grant is also needed because the interventions considered have a public-good nature. This is the case for Component 1, which intends to build capacities to adapt to climate change at the community level and among NGOs, at the regional government level and at the central government level. For component 2, the initial investment costs to improve access to water and to implement MAR system are too high for the beneficiaries. Also, the aquifer that the project will recharge through MAR system also represents a public good with very limited (or inexistent) incentive to invest for the private sector. The improved knowledge and skills that will be promoted among farmers under Component 3 will extend over the boundaries of individual farms since less water will be used for agricultural production. Also, small-scale farmers in the targeted regions face many substantial barriers that prevent them from using resilient crops and varieties. In particular, farmers lack knowledge, capacities, and expertise in climate-smart agriculture. Technical assistance and capacity building support funded by the GCF grant will address these crucial barriers.

Considering the urgency and scale of adaptation deficits in Bangladesh at this stage, PKSF does not find any duplication of efforts and mobilization of fund with respect to the IMF's new Resilient Support Fund, The latter fund is a budgetary support to the government in a special circumstance, and the proposed proposal submitted to GCF. As it is understood, PKSF is trying to set up examples of adaptation best practices blended with small-scale support

[50]Government of Bangladesh (2020). Nationally Determined Contributions 2020 (Interim): from Vision to Action
[51] The World Bank (2016). Implementation Completion Report, Community Climate Change Project.

from GCF. These are particularly locally-led and community-based adaptive actions, most likely to be scaled up in due course. However, PKSF will accept in-kind and other organizational endowment support from BMDA, which are not monetized as such and are not included as co-finance to this project. It is to be noted that the BMDA is engaged in implementing projects for the development of the Barind Tract in Bangladesh. PKSF's small-scale interventions are more associated with local communities.

C.5. Exit strategy (max. 300 words)

The project will build needed institutional capacities for replication and continuation of main activities after the project end. More precisely, under Component 1, the project will enhance the capacity of the BMDA by establishing a climate change unit within the BMDA with necessary staff and logistics. The established unit staffs will receive training and technical support to integrate climate change into their regular activities. During the implementation phase, the unit staff will also be involved in designing ponds, canals, and MAR models. The project will also support the Ministry of Water Resources to establish an MAR Centre at the central level. The MAR Centre staff will develop skills and knowledge on MAR models by participating in the design and implementation of the MAR models that the project will implement. After the project end, it is expected that the MAR Centre will replicate the MAR models promoted by the project in the project intervention areas and in other regions.

PKSF also plans to introduce the RTE system developed under this project in order to scale-up adaptation interventions in other PKSF spearheaded projects and programmes. These interventions are implemented by the Partner Organisations (POs) of PKSF, who are national and local level NGOs. All of the NGOs have development projects and/or programmes other than their core credit programmes. It is expected that most of the selected POs who will receive training on CC under this project will adopt the RTE system. NGOs will learn to assess the effectiveness and efficiency of adaptation interventions and hence improve or modify their project or programme interventions to make them more resilient to climate change. The project also expects that they will assess the impacts of climate change on their credit programmes. Currently, the NGOs are doing the same for disaster but not climate change.

The project will form community groups and build their capacity by providing trainings, raising awareness, and linking communities to relevant stakeholders. The IEs' staffs will help the CCAG members in preparing the action plans on maintenance and management of water infrastructure to be implemented after and during the project implementation period. A coordination mechanism will be established between the CCAG members and the BMDA for post-project implementation of the plan. Designated persons from the CCAG members will communicate with BMDA staffs if there is a need for any repair or maintenance of the infrastructure. The BMDA staffs will provide necessary technical support including cost estimation of maintenance works, labour engagement for maintenance, design of infrastructure, etc. as per the plan. Finance for maintenance activities will be sourced from the water users by selling water.

In this way, communities can take responsibilities for continuing project activities after the project end. Community infrastructure like ponds, canals, and managed aquifer recharge infrastructure will be maintained by communities themselves guided by the climate change unit of the BMDA. All physical assets developed by the project will be accompanied by comprehensive skills through training and financial support.

Earlier maintenance works have two major problems in the system. The first one is the lack of an institutional mechanism in the maintenance system. For example, the BMDA re-excavated ponds only once and they did not have maintenance plans and source of finance for maintenance works in the project design. And the second reason is that there was no community participation. So, local ownership was not promoted. This project will involve BMDA, CCAGs, and the IEs for future maintenance. Water pricing will be introduced so that post-project maintenance works are not constrained due to a lack of finance. The respective CCAG members will inform BMDA for re-excavation if any pond or canal is silted and lose water holding capacity.

PKSF will hand over the infrastructures rehabilitated (ponds and canals) and developed (MAR) to relevant government and community authorities. The focal person of the climate change unit within the BMDA will be responsible to carry out maintenance of the canals and ponds with support from IE and the local community. Also, in agreement with the BMDA a water usage fee and pricing system will be established to properly maintain ponds and canals.

For agricultural activities, the continuation of benefits will be facilitated by the use of PKSF credit programme called '*Sufolon*' (credit programme on crop agriculture). Under this programme, the Partner Organisations provide loans

to farmers to plant crops. After the implementation of the project, the Partner Organisations will provide similar loan to cultivate the drought-adaptive cropping patterns promoted by the project in the Barind area[52].

Also, the project will implement activities at the community level by involving local NGOs and IEs. One main criterion to select NGOs is that they need to be already present in the intervention areas. The project will build capacities of selected NGOs by providing dedicated trainings. After the project end, it is expected that IEs will continue operating in the project intervention area with the same communities, thus providing follow-up support if needed.

The project will implement dissemination activities and workshops with relevant national and regional stakeholders to share outputs and outcomes that are achieved through this project intervention. Major challenges, feedbacks, opinions, and recommendation from the phase-out workshop will be noted and taken into account to design new PKSF interventions.

Operation and Maintenance Plan

The project will apply technical means for (a) harvesting of rainwater during monsoon (in natural streams/khals, ponds, and on rooftops), and (b) collecting/directing such water in micro-scale reservoirs, by passing through pipelines and shafts. Moreover, natural streams and ponds will be re-excavated to increase water holding capacities of such reservoirs. All these activities are subject to weathering effect. Moreover, the filtering materials within the shafts are likely to be clogged because of the presence of dirt and sediments that will flow along rainfall runoff. This is why, efforts must be made to maintain the systems during the implementation phase and beyond.

The piloting of MAR systems has been accomplished by DASCOH, an NGO based in Rajshahi district, under the aegis of BMDA. The NGO is provided with technical support from both the BMDA and University of Rajshahi. The operation and maintenance (O&M) activities are supervised by the collective efforts of these organizations, all under the leadership of BMDA. PKSF will have a Memorandum of Understanding (MoU) under the project, in which the O&M issues will be incorporated so that BMDA can play an important role in the post-project O&M of the water infrastructure under this project for long term sustainability, in addition to the CCAG described below. For this, there will be a commitment letter from the BMDA and from appropriate stakeholders.

The household-based MARs will be requiring maintenance, just once in a year – only at the beginning of the monsoon. The MARs involving designated ponds and concrete building structures for rooftop MARs, cleaning/washing of filtration material and retrofitting piping system need to be checked at the beginning of every monsoon season and also once during the mid-monsoon (say, between 1 and 15 of July every year).

The chance of erosion of edges of the banks of re-excavated ponds and streams could be avoided if these are kept under surveillance and maintenance. The BMDA-led technical team suggests a three-time surveillance during each monsoon season and subsequent maintenance.

Each CCAG will be asked to nominate/elect at least three members as volunteers for the O&M activities. The BMDA and University of Rajshahi technical team will provide training involving such volunteers. PMU will organize such training sessions, one in every district. PKSF technical team will supervise and provide technical support during the course of the training for O&M.

However, identification of actors representing each CCAG and scheduling their activities will not be adequate to get the O&M actions done. These micro-level efforts will require mobilization of necessary funds. Since the MAR application is a fairly new initiative in Bangladesh, the costs for O&M spent from pilot activities must be taken into consideration. For MAR system, each maintenance routine involving cleaning of filtration material requires about BDT. 2,500 to 3,000. For identification of points of erosion and potential bank failure in ponds, the cost is BDTk 1,000 per pond and BDT. 2,000 per 2 kilometers length of stream/khal.

The BMDA offer water supply services and they charge a flat rate of BDT 50 per household, irrespective of social and economic standing of the benefit recipient household. The stakeholder consultations provided insights into raising fund by the participation of service recipients. It is found that, even the poorest has willingness to pay up to BDT. 100 per month, which is roughly about 1.4% of the monthly average household expenditure of a household of 4 to 5 persons belonging to poor strata of the society in Barind area. When asked, these poorest people indicated

[52]During the financial year 2018-19, loan disbursement from PKSF to Partner Organisations was US$ 440.32 million and from PO to beneficiaries, it was US$609.03 million.

that they would be happy to pay any amount between BDT. 50 to 70, which indicates that their ability to pay is within the ballpark of 0.7 to 1.0% of their monthly average expenditure.

Since it is assumed that for both rooftop and pond-based MAR, at least 100 households will be sharing benefits of water availability for drinking and supplementary irrigation, if not directly considered to be the long-term beneficiaries of replenishment of GWT. If these households are levied BDT. 70 per month (i.e, 1% of average monthly expenditure of a household belonging to the poorest class, falling within their ability to pay), the amount generated will be more than sufficient to cover the occasional costs for O&M activities as outlined above.

It Is proposed that each CCAG will be given responsibility to raise the amount from their participating households. The fund thus generated will be kept by opening a bank account, which will be operated by selected members. The NGO as the Partner Organization will help them and guide, if needed for the maintenance of the fund. The CCAG sub-committee on O&M, as proposed earlier, will identify dates of O&M activities and request NGO supervising personnel to help withdraw fund from the bank account and mobilize. The overall supervision will be provided by the technical team, which is led by BMDA and the University of Rajshahi.

Since at least 100 households will be directly benefitting from each pond, the total amount raised per re-excavated pond will be adequate to cover O&M costs. The net amount levied per household for O&M will be within their willingness to pay as well as ability to pay, as it has been discussed in the consultative meetings.

An operation and maintenance plan is presented in the following table:

Table 2: Post-project operation and maintenance plan of water infrastructure under the project

Intervention	Timeframe of maintenance interventions	Responsibility	Source of fund	Remarks
Ponds	3 times during monsoon (July, August and September)	• BMDA will provide technical support • CCAG members will maintain and operate ponds	BMDA will apply their existing mechanism, i.e., pricing of water for raising funds	iEs will ensure implementation of the plan as they continue their financial support to the beneficiaries from their core programme.
Canal	3 times during monsoon (July, August and September)	• BMDA will provide technical support • CCAG members will maintain and operate the re-excavated canals	BMDA will apply their existing mechanism, i.e., pricing of water for raising funds	
Artificial Ground water recharge	Annual	• BMDA will provide technical support • CCAG members will maintain and operate MARs	BMDA will apply their existing mechanism, i.e., pricing of water for raising funds	
Drought adaptive agriculture	Based on crop season	• Farmers • Department of Agriculture Extension (DAE) will provide necessary technical support under their regular duties		

C.6. Financial management/procurement (max. 300 words)

Financial management and procurement under this project will be guided by relevant PKSF rules and regulations, as well as relevant provisions in the Accreditation Master Agreement (AMA) signed by PKSF and the GCF. These

rules and regulations were reviewed and deemed satisfactory by the GCF Secretariat and Accreditation Panel as part of PKSF's accreditation to the GCF.

The project will follow A''s guidelines on Financial Management and Procurement. PKSF, having a long experience in managing projects supported by donors and other development partners, has developed efficient Financial Management and internal control systems. PKSF has an established finance division headed by a Deputy Managing Director (Finance). In order to monitor the activities of its Partner Organizations, a properly staffed internal audit cell is in place and is headed by the PKSF General Manager, who directly reports to the Managing Director of theorganization. PKSF has built a system and capacity for disbursing funds to IEs based on a comprehensive review of IE's activity progress reports and financial progress reports by the PMU and the PKSF audit department, in coordination with field-level monitoring. The potential iEs have long term partnership with PKSF. PKSF regularly visits these organisations for monitoring purposes and examines their accounts, transactions, and other related documents. Most of these organisations have legal agreement with PKSF's various projects and programmes. So, the procurement risks would be very low. The PMU will prepare suitable procurement guidelines and procurement documents for the iEs to perform the procurement at the field level. In addition, the PMU will provide training to the IE staff on the simplified procurement guidelines. They will also learn through on-the-job training. Thus, the project will enhance capacity of the iEs and minimize the risk. An independent audit firm will audit the project expenses. As per GCF guidelines, PKSF will provide financial management report and letter to GCF within six months of the A''s fiscal year-end. Both internal and external audit is carried out once in a year. An external audit will be done using International Accounting Standard (IAS).

Books of Accounts and Financial Reporting:

The accounts of PKSF are conducted in accordance with the International Accounting Standard (IAS) as adopted by the Institute of Chartered Accountants of Bangladesh (ICAB), under Generally Accepted Accounting Principles. PKS''s accounts are maintained on an accrual basis-under historical cost convention.

Procurement

PKSF fully implements the 2006 Public Procurement Act and the 2008 Public Procurement Rules. As per PKSF procurement policy, IEs will prepare and submit procurement plans to be approved by the PKSF. The procurement plan may include several packages based on types of procurement (i.e., goods, works, services, etc.) and ceiling of procurement methods (open tender method, request for quotation, limited tendering method, etc.). The first package of goods and services will be subject to prior review. The rest of the packages will be reviewed by the PMU staffs at the field office of the iEs after procurement is over. In this way, PKSF will ensure that all procurements are conducted as per PKSF's policy and rules.

The procurement unit of PKSF carries out all procurement activities. The unit in association with PMU will issue calls for Expression of Interest (EoI) in the national newspapers (both Bangla and English). A selection committee will be formed for evaluating the EoIs to be submitted by the NGOs.The selection committee evaluates the applications and makes recommendations to select suppliers. PKSF's Governing Body selects the supplier in its Annual General Meeting based on the recommendations provided by the technical committee.

D. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

D.1. Impact potential (max. 300 words)

Results	Targets	Climate justification
Increased resilience of health and well-being, and food and water security	215,0,000 beneficiaries will have access to reliable and safe water supply and food production despite climate shocks and stresses	Climate change-induced drought reduces access to water and consequently damages crops. This has multiple effects on society. The reduced crop production affects income and nutrition, whereas human health is affected by a limited access to safe drinking water. The project will increase access to reliable sources of safe water for drinking and irrigation.

Increased resilience and enhanced livelihoods of the most vulnerable people, communities, and regions	15,000 farmers benefitting from the adoption of diversified, climate-resilient livelihood options	Drought is the most common climate risk in the target area. In order to enhance resilient livelihoods options, the project will promote the use of crops and varieties that are drought-tolerant and are not commonly used by farmers.

D.2. Paradigm shift potential (max. 300 words)

The analysis of climate change context in the feasibility report suggests that the monsoon period is gradually shifting and becoming shorter. At the same time, ground water depletion due to over-exploitation together with rainfall variability and temperature rise are worsening drought conditions. Hence, drought causes a decrease in agricultural output leading to loss of livelihoods and food insecurity. It also has direct health impacts since it reduces access to safe water and force people to use unclean water. Moreover, water infrastructure is not properly maintained, which reduces the availability of water at source.

Traditional agriculture depends largely on quantity of available water extracted by the deep tube-wells for the flood irrigation and women must walk several miles to fetch water during the dry season. The current government policy response is mal-adaptive, relying on large infrastructure projects (e.g., ground water irrigation infrastructure by BMDA) to install deep tube-wells that abstract ground water from the underlying aquifer for irrigation and drinking. This leads to an over abstraction of groundwater and lowers the GWT. It is expected that this vicious cycle will in the end lead to the functional extinction of the aquifer.

The paradigm shift that the project will be based on the promotion of an Integrated Water Resource Management (IWRM) concept using a '4-R' –pproach - Reuse, Recharge, Recycle and Reduce to the resilience of drought-vulnerable communities. More specifically, the paradigm shift will consist of the following key elements: i) shifting from unsustainable use of scarce water resources to a sustainable management of ground water and surface water resources; ii) building institutional capacities to address water scarcity problems at the grassroots level, among regional government authorities and the central government; iii) substantially reducing water consumption needs for agricultural productions; and iv) promoting cropping patterns and crops that are drought-tolerant.

The proposed interventions are in line with relevant national policies and the proposed technical solutions are tested and found to be low cost. The capacity building activities that the project will promote will enable NGOs and government authorities to scale up and replicate the typologies of project interventions that will be promoted by the project. More precisely, the establishment of a climate change unit within BMDA will facilitate the replication of the innovations promoted by the project in the whole region. In the same manner, the establishment of an MAR centre within the Ministry of Water Resources will enable the government to gain specialised skills to increase the number of MARs in the country, thus compensating for ground water over-exploitation. Both the BMDA and the Ministry of Water Resources play a key role in the water management issues in the country and are expected to scale up the proposed interventions in the future with support from the government budget and other development partners. Figure 11 presents the Theory of Change (ToC) of the project.

Figure 11: Theory of Change (ToC) of the project.

D.3. Sustainable development (max. 300 words)

The project will cause substantial benefits as it intends to build the resilience of vulnerable communities to climate change and create positive environmental impacts. It will also contribute to the achievements of the following Sustainable Development Goals (SDG): 1 (no poverty), 2 (no hunger), 5 (gender equality), 6 (clean water and sanitation), and 13 (Climate Action).

The project will have significant positive impacts on the environment. First, the project will refill more than 960,000 m^3 ground water per year through the proposed two types of MAR systems. Second, the project will save irrigation water by 70% for 15,000 selected farmers by promoting adaptive cropping patterns. In addition, the project will re-excavate 300 large ponds, which will have the capacity to store 1,500,000-1,800,000 m^3 of rain water for supplementary irrigation. A large volume of water (roughly estimated 6,000,000 m^3per year) will also be stored in 140km re-excavated of canals in the selected districts. The use of irrigation water provided by ponds and canals will reduce water extraction from the underground aquifer. The project will also plant trees around the ponds and canals, thus increasing biodiversity in the project areas.

The project will support the use of drought-tolerant crop varieties and drought-adaptive cropping patterns. It is expected that the farmers will raise agricultural productivity as a result of these interventions. Higher agricultural production will also result from the use of additional sources of water such as re-excavated canals and ponds. This will bring about an increase in household incomes, improved access to food, and reduced economic vulnerability to drought.

Although the project will not provide technical assistance for fish farming it is expected that local communities will practice fish farming in the ponds excavated by the project, which will bring additional income for the beneficiary communities.

The MAR model will increase the availability of ground water in the project area. It is expected that the water pumps that are currently not working (because the water table is too low) will be used again since MAR will increase the level of the water table. This will reduce drudgery for women since water collection for drinking and other household purposes are traditionally done by women.

One of the benefits of the project will be accrued through the restoration of ponds, which will offer potable water to the inhabitants. However, the cultural practice suggests that women being the collectors of potable water for their respective households, they will be particularly benefitted from increased availability of potable water. They will be able to avoid drudgery, especially during the summer months when it is difficult to walk for hours under scorching sun.

A gender assessment and action plan has already been developed. Special attention will be paid to ensure gender balance in the project staff. Also, PKSF will give priority to selecting women-headed households in the project activities. 50% of the beneficiaries of the project will be women. Most importantly, the project will select 50% women members to establish the CCAGs. This is expected to increase their role in decision-making. Inclusion of women in the CCAGs will increase their capacity in making decision on water management and on aspects such as site selection of interventions and water pricing.

The improved abilities of the beneficiaries in accessing or securing community and other resources will further influence gender dynamics at the household and community levels, with the ultimate result being that women will be able to improve the productivity of their assets, human capabilities, and ensure protection from shocks. In this way, the project contributes to reducing the gender gap of climate change-exacerbated social, economic and environmental vulnerabilities.

D.4. Needs of recipient (max. 300 words)

According to the Global Climate Risk Index by think-tank Germanwatch Bangladesh ranked sixth among the world top 10 countries most affected by extreme weather events in the last 20 years. In addition, Germanwatch reports that on an average, a total of 679.05 people died in 185 climatic events in Bangladesh within the period from 1996 -2015.

Every year 3 to 4 million hectares of lands are affected by droughts of different magnitudes in Bangladesh. Drought caused substantial economic losses in the 2009-2014 period[53]. More precisely, damages amounted to BDT 10,569.20 million (USD141 million) over the five years, of which more than 87% were from the crop sector. Droughts are also causing significant food security problems. For instance, the droughts of 1994-95 in the North-western districts of Bangladesh led to a shortfall of 3.5 million tonnes of rice and wheat production, while the 1997 drought caused losses of approximately 1 million tonnes of food grain (of which about 0.6 million tonnes was rice valued at around USD 500 million)[54].

Drought severely affects the sources of irrigation and drinking water by depleting the ground water table and drying up ponds and canals. As a result, waterborne diseases (diarrhea, dysentery, etc.) occur at a higher rate and household expenditure increase. Safe drinking water sources of 59.2% of the households were negatively impacted by drought (of which 57%, 31%, and 20% were affected at moderate, low, and severe levels respectively)[55] during the 2001-2009 period.

Drought is an important reason for poverty since poor people makes their living in the agricultural sector, which is affected by drought. In spite of significant achievements in poverty reduction, 20.5% of the national population is still living under the poverty line in Bangladesh[56]. The intervention area is characterised by high level of poverty. The poverty rate in the selected Naogaon district is 32.2%, Rajshahi 20.1% and Chapainawabganj 39.6% (BBS, 2016)[57].Poor are landless and having inadequate income for meeting their basic needs with respect to food, health, housing, and education.70% of the households in rural areas of the selected districts are engaged in crop production.The distribution of occupation by different wealth categories shows that the main occupation of the marginal, medium, and rich household heads is agriculture (the percentage of marginal, medium and rich households engaged in agriculture is 49.6%, 68%, and 68.7%, respectively), whereas the very poor and poor household heads main occupation is working in the agricultural sector for wage–labor (51.4% and 37.4% of the very poor and poor households make income from agriculture wage), sharecropping, and fishing. Droughts are a reason for poverty also for landless labourers, who are employed in farms. When droughts cause production losses, landless labourers have lower employment opportunities since they are no longer required to conduct agricultural operations.

BBS carried out a study analysing the impacts of various disasters during the period of 2009-2014. The report shows that 25.39% of the total 613,704 households (HHs) of the Barind tract were affected by drought, while the national average was 14.80%. Over this period, 8.7% of the households did not have any work due to drought[55]. The study also reports that 7% of the households affected by drought have health complications. More precisely133,610 people suffered from various diseases caused by drought. Water-borne diseases and health complications like diarrhea and dehydration are prevalent in the dry season, putting stress on household finances. Skin disease due to an improper access to water was also found to be a common problem during the dry season in the project areas[58].

The current livelihoods of poor farming communities in the Barind area are largely dependent on irrigation water. Since almost entire such irrigation is dependent on extraction of ground water source, any impact on its sustenance would be detrimental for maintaining the livelihoods of the poor. Climate change is likely to add further stresses on lowering of ground water table. Effort must be made to force a reversal of the process, beyond the phenomenon reaches a tipping point. This project will apply advanced science-based knowledge, technology and simultaneously persuade farmers to adjust their cropping patterns to optimize production of food with minimal water. In doing so, it is expected that the project will have the largest impact towards maintaining sustainability of a vital resource base: the GWT.

Only 14.07% of HHs in the Barind tract have some knowledge and perception of the climate change problem[58]. Among them, 7.87% have knowledge and perception on long-term climate change, whereas only 1.62% know about regional changes in temperature/rainfall, and 1.92% about sudden extreme events affecting human life. Knowledge on climate change is important to adapt to a changing situation. Without knowledge and information, communities are unable to

[53]BBS, (2015) Bangladesh Disaster-related Statistics 2015: Climate Change and Natural Disaster Perspective, Impact of Climate Change on Human Life Programme, Statistics and Informatics Division, Bangladesh Bureau of Statistics, Ministry Planning, Government of Bangladesh.
[54]Selvaraju, R., Subbiah, A.R., Baas, S., &Juergens, I. (2006). Livelihood adaptation to climate variability and change in drought prone areas of Bangladesh: Developing institutions and options. *Asian Disaster Preparedness Centre*, FAO, Rome
[55]33.
[56] https://www.adb.org/countries/bangladesh/poverty
[57]BBS (2016) Poverty Map of Bangladesh, 2016, Bangladesh Bureau of Statistics, Ministry of Planning, Government of Bangladesh.
[58]BBS, (2015) Bangladesh Disaster-related Statistics 1015: Climate Change and Natural Disaster Perspective, Impact of Climate Change on Human Life Programme, Statistics and Informatics Division, Bangladesh Bureau of Statistics, Ministry Planning, Government of Bangladesh.

identify current and future problems caused by climate change. One of the results is that communities cannot make an appropriate decision on crop production.

The project will address these vulnerabilities in an integrated way by improving capacities at institutional and grassroots level to sustainably manage scarce water resources and by targeting 215,000 people (most of them are poor) in the selected Rajshahi, Naogaon and Chapainawabganj districts to improve their livelihoods and food security through an integrated strategy to adapt to drought. As agriculture is extremely sensitive to drought, the project will select 15,000 farmers for implementing drought-adaptive cropping patterns and to plant drought-tolerant crop varieties. In this way, farmers will reduce crop losses and consequently will increase income and food security. Most importantly, the project will increase the availability of safe drinking water through improved recharge of ground water. As a result of the project interventions, about 215,000 people will have access to clean water for household use including drinking purposes and irrigation. This is also expected to bring about a reduction in the incidence of drought related diseases.

In recent times, Bangladesh has made great strides towards reducing people's poverty and vulnerability. Despite COVID pandemic and global fallout of economic growth, the country has been trying to come out of the group called the Least Developed Countries (LDC) by 2026. However, as an LDC member, the country has a few burning issues to address and find sustainable solutions. The water issues prevailing in the Barind area needs to be tackled quickly, otherwise the country's shared dream to eradicate poverty will remain non-achievable even if it attains a Middle Income Country status. For the poor and marginal population facing stern challenges of climate change in the Barind areas of Bangladesh, this need for the project support from GCF is the most befitting.

D.5. Country ownership (max. 500 words)

The project is in line with national policies. More specifically, the project is fully aligned with the Nationally Determined Contribution (NDC) of the Government of Bangladesh and its ten key areas. For adaptation, the project is aligned with key area 1 food security, livelihood, and health protection (including water security) since it will promote drought-adaptive crop varieties, which will increase the availability of food production. Also, on the same key area, the project will promote a Managed Aquifer Recharge so that the poor communities will have access to safe drinking water and irrigation water, thus ensuring water security for communities vulnerable to droughts. With its focus on enhancing institutional capacities the project is also aligned with key area 10 policy and institutional capacity building. Indeed, the project will enhance the capacities of the BMDA in the design and implementation of climate change adaptation projects of implementing entities and of the Ministry of Water Resources. In addition, the NDC has identified 14 adaptation priorities for Bangladesh. This project is directly linked with three priorities that are, stress-tolerant variety improvement and cultivation, adaptation on local level perspective, and capacity building at the individual and institutional level.

The project will contribute to the implementation of the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) and its six pillars.

The project will also contribute to the implementation of the Bangladesh National Adaptation Programme of Action, which was prepared by the Ministry of Environment and Forest (MOEF) as a response to the decision of the Seventh Session of the Conference of the Parties (COP-7) of the United Nations Framework Convention on Climate Change (UNFCCC).

The Government of Bangladesh (GoB), adopted the 'Vision 2021'. The associated Perspective 2010-2021 Plan has set solid development targets for Bangladesh. This project will also contribute to Vision 2021 since the Vision intends to take effective measures to protect Bangladesh from the adverse effects of climate change.

PKSF is well-positioned to implement the project. PKSF was established by the Government of Bangladesh in 1990 as a "not for profit" organisation with the vision of "A Bangladesh where poverty has been eradicated; the ruling development and governance paradigm is inclusive, people-centred, equitable and sustainable; and all citizens live healthy, appropriately educated and empowered and humanly dignified life". PKSF provides a wide range of development services including financial, health, educational, capacity development, technology transfer, and business development services to disadvantaged segments of the society through appropriate pro-poor institutions. PKSF has a significant pro-poor strategy that looks at poverty alleviation in a holistic way. The programmes PKSF implements include the provision of financial services, people centred holistic development programmes, enterprise development, social protection, capacity building, advocacy and knowledge management, research and development (R&D), and environment and climate change. More specifically, PKSF has established an Environment and Climate Change Unit to address climate change issues in Bangladesh. In this regard, the Community Climate Change Project (CCCP, implemented by PKSF) is well-known and highly appreciated by participating donors, the World Bank, GoB, and the

civil society. Indeed, this project scales up previous interventions conducted by CCCP. During CCCP, several consultations were organised at the community level (October 2012 to December 2016). The purpose of these consultations was to monitor project progress, implementation quality and quantity, effectiveness, and other project level indicators. The mid-term and final evaluations provided useful insights to design the ECCCP-Drought and represented additional opportunities for consultations.

In order to refine the rationale and activities proposed, PKSF organized one stakeholder consultation meeting on the draft project document of ECCCP-Drought, involving experts from the government and from NGOs. PKSF has been mobilizing micro-credit financing through its partner NGOs throughout the country, particularly in the Barind areas where poor farmers and women groups receive micro-scale finance to overcome adversities posed by drought. PKSf has made initial contacts with BMDA, which is a the legal entity to work with poor people in the Barind area. Several of the water-saving technologies developed and tested by BMDA will be implemented under the project, while the government agency has key mandate to promote such adaptive technologies in view of high vulnerability of poor people living in the Barind area.

Finally, PKSF presented the ECCCP-Drought project proposal to the Advisory Committee of the NDA, which provided a 'No Objection Letter'. The committee provided feedbacks which are incorporated in the proposal.

D.6. Efficiency and effectiveness

D.6.1. Estimated cost per t CO_2 eq, defined as total investment cost / expected lifetime emission reductions (Mitigation and Cross-cutting)	(a) Total project financing	US$ 29,989,450
	(b) Requested GCF amount	US$ 24,985,450
	(c) Expected lifetime emission reductions	_____ tCO_2eq
	(d) Estimated cost per tCO_2eq (d = a / c)	US$_____ / tCO_2eq
	(e) Estimated GCF cost per tCO_2eq removed (e = b / c)	US$_____ / tCO_2eq
D.6.2. Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund's financing, disaggregated by public and private sources (Mitigation and Cross-cutting)	(f) Total finance leveraged	US$ 29,989,450
	(g) Public source finance leveraged	US$ 29,989,450
	(h) Private source finance leveraged	US$ 0
	(i) Total Leverage ratio (i = f / b)	**1.20**
	(j) Public source leverage ratio (j = g / b)	**1.20**
	(k) Private source leverage ratio (k = h / b)	**N/A**

D.6.3. Describe how the financial structure is adequate and reasonable in order to achieve the proposal's objective(s), including addressing existing bottlenecks and/or barriers; providing the minimum concessionality; and without crowding out private and other public investment. (max. 500 words)

The project will create 'public goods', with a major need for public resources. Since the nature of the financial need is to create public goods and subsequent services, there is no chance of mobilizing private financing in these sectors/sub-sectors. The current financing will not crowd out any other source of financing. Moreover, none of the sub-component leaves room for locking-in financing, as designed, in increasing financial risks. Rather, all the financing needs by sub-component, will ensure that long-term sustainability of adaptation is achieved.

The financial structure of the project responds to the minimum needs to ensure successful public goods, ground water recharge, improved access to water, enhanced capacities of public and grassroots level institutions to adapt to climate change and improved knowledge of farmers to farm in a drought-prone environment.

The proposed project is the extension of the earlier Community Climate Change Project (CCCP) implemented by PKSF from 2012 to 2016. The cost of the ECCCP-Drought project activities was estimated using CCCP project as a reference and adjusted for inflation. It is expected that the estimated budget will be adequate to successfully implement the project activities in achieving the project goal. But the exchange rate and inflation may affect the costs of the activities. Average inflation rate is around 6% in Bangladesh. At the same time, dollar rate generally increases against BDT. As the project will pay local expenditure in BDT, the 6% inflation should be adjusted. So, there is very limited chance to decrease number of beneficiaries. However, in case of BDT. gain due to increase of dollar rate, the project may require increase number of beneficiaries. In such case, PKSF will communicate with the GCF to get approval of increasing the number of beneficiaries. The probability of this risk is also low.

As the project will promote drought-adaptive agriculture and water management and consumption technologies and practices, it will be mainly grant-based. The grant will be used for promoting climate-resilient technologies which include drought-adaptive cropping patterns, facilitating access to water, and recharging the underground aquifer. The grant will also be used to build capacities and to provide training. Since the benefits intended will primarily be for the poor people living in Barind area, such grant financing towards reducing vulnerability of poor in an LDC is fully justified.

The expected benefits of the project clearly outweigh the grant cost. The BBS conducted a study[59] estimating the impacts of droughts in Bangladesh for the 2009-2014 period. The results included in the study make it possible to compare the total economic value of losses for agricultural crops in the Rajshahi division (to which the target districts belong) caused by droughts with the number of households who experienced losses caused by droughts in the same period and in the same area. The comparison shows that the average annual loss of crops per household due to drought is BDT 3,257 (or US $ 38.78). It is expected that the project interventions will protect this loss and increase productions in the drought affected areas.

Changes in the cropping patterns that the project will propose under Component 3 will increase farming profitability. The following table includes a comparative analysis of the cropping patterns proposed by the project with those traditionally planted in the target area. As shown in the following table, cropping patterns proposed by the project strongly increase the profitability per hectare (a more detailed analysis is included in the pre-feasibility study).

Table 3: Comparison of profitability of traditional vs project proposed cropping patterns

Traditional cropping pattern	Profit (BDT) per hectare
Aus-Aman-Boro	32,684
Project proposed cropping patterns	
Aman-Wheat-Mung	67,597
Aman-Mustard-Mung	51,987

The technological advancements as proposed have been tested in the SWR, therefore these technologies present industry best practices. A mix of surface and ground water will enhance opportunities towards achieving integrated water management, while the potential for recharge of GWT will increase sustainability of the resource base in the longer run. Such solutions are ideally suited for the causes of vulnerabilities posed by climate change in Barind area.

[59] BBS (2015) Bangladesh Disaster-Related Statistics: climate change and natural disaster perspectives. *Impact of Climate Change on Human Life (ICCHL) Programme*

E. ANNEXES

E.1. Mandatory annexes

☒	Annex 1	NDA No-objection Letter(s) (Template)
☒	Annex 2	Pre-feasibility (or feasibility) study (Guidance)
☒	Annex 2a	Logical Framework (Template)
☒	Annex 2b	Timetable (Template)
☒	Annex 3	Budget plan that provides breakdown by type of expense (Template)
☒	Annex 4	Gender assessment and action plan (Template)
☒	Annex 5	Co-financing commitment letter
☒	Annex 6	Term sheet and evidence of internal approval
☒	Annex 7	Risk assessment and management (Template)
☒	Annex 8	Procurement plan model (Template)
☒	Annex 9a	Legal Due Diligence (regulation, taxation and insurance) (Template)
☒	Annex 9b	Legal Opinion/Certificate of Internal Approvals (Template)

E.2. Other annexes to be submitted when applicable/requested

☐	Annex 10	Economic and/or financial analysis (Guidance) (mandatory for private-sector proposals)
☐	Annex 11	Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project
☒	Annex 12	Environmental and Social Action Plan (ESAP) (Template)
☐	Annex 22	Assessment of GHG emission reductions and their monitoring and reporting (for mitigation and cross cutting-projects)[60]
☒	Annex 23	Map of the proposed project area
☒	Annex 24	IRMF ECCCP Drought
☒	Annex 25	FGD report
☒	Annex 26	Methodology for map preparation
☒	Annex 27	Tentative envisioned list of NGOs

***** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents. *****

[60] Annex 22 is mandatory for mitigation and cross-cutting projects.