Meeting of the Board
4 – 6 April 2017
Songdo, Incheon, Republic of Korea
Provisional agenda item 11(e)

GCF/B.16/07/Add.03

14 March 2017

Consideration of funding proposals – Addendum III

Funding proposal package for FP040

Summary

This addendum contains the following three parts:

a) A funding proposal titled "Tajikistan: Scaling-up Hydropower Sector Climate Resilience" submitted by EBRD;
b) A no-objection letter issued by the national designated authority or focal point; and
c) Environmental and social report(s) disclosure.

The documents are presented as submitted by the accredited entity, and national designated authority or focal point, respectively.

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Funding proposal submitted by the accredited entity

No-objection letter issued by the national designated authority or focal point

Environmental and social report(s) disclosure

GREEN CLIMATE FUND

Funding Proposal

Version 1.1

The Green Climate Fund (GCF) is seeking high-quality funding proposals.

Accredited entities are expected to develop their funding proposals, in close consultation with the relevant national designated authority, with due consideration of the GCF's Investment Framework and Results Management Framework. The funding proposals should demonstrate how the proposed projects or programmes will perform against the investment criteria and achieve part or all of the strategic impact results.

Project/Programme Title:	**Tajikistan: Scaling Up Hydropower Sector Climate Resilience**
Country/Region:	Tajikistan
Accredited Entity:	EBRD
Date of Submission:	31 July 2015

GREEN CLIMATE FUND

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Section H	**RESULTS MONITORING AND REPORTING**
Section I	**ANNEXES**

Note to accredited entities on the use of the funding proposal template

- Sections **A, B, D, E** and **H** of the funding proposal require detailed inputs from the accredited entity. For all other sections, including the Appraisal Summary in section F, accredited entities have discretion in how they wish to present the information. Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other project documents such as project appraisal document.
- The total number of pages for the funding proposal (excluding annexes) is expected not to exceed 50.

Please submit the completed form to:

fundingproposal@gcfund.org

Please use the following name convention for the file name:
"[FP]-[Agency Short Name]-[Date]-[Serial Number]"

A.1. Brief Project / Programme Information			
A.1.1. Project / programme title		**Tajikistan: Scaling Up Hydropower Sector Climate Resilience**	
A.1.2. Project or programme		Project	
A.1.3. Country (ies) / region		**Tajikistan**	
A.1.4. National designated authority (ies)		**Committee on Environmental Protection**	
A.1.5. Accredited entity		**EBRD**	
A.1.5.a. Access modality		☐ Direct ☒ International	
A.1.6. Executing entity / beneficiary		Republic of Tajikistan represented by the Ministry of Finance (**"Ministry of Finance"**)	
A.1.7. Project size category (Total investment, million USD)		☐ Micro (≤10) ☒ Medium (50<x≤250)	☐ Small (10<x≤50) ☐ Large (>250)
A.1.8. Mitigation / adaptation focus		☐ Mitigation ☐ Adaptation ☒ Cross-cutting	
A.1.9. Date of submission		31 July 2015	
A.1.10. Project contact details	Contact person, position	Craig Davies	
	Organization	European Bank for Reconstruction and Development	
	Email address	DaviesC@ebrd.com	
	Telephone number	+44 20 7338 6661	
	Mailing address	One Exchange Square, London EC2A 2JN, UK	

A.1.11. Results areas *(mark all that apply)*

Reduced emissions from:

- ☐ Energy access and power generation
  (E.g. on-grid, micro-grid or off-grid solar, wind, geothermal, etc.)
- ☐ Low emission transport
  (E.g. high-speed rail, rapid bus system, etc.)
- ☐ Buildings, cities and industries and appliances
  (E.g. new and retrofitted energy-efficient buildings, energy-efficient equipment for companies and supply chain management, etc.)
- ☐ Forestry and land use
  (E.g. forest conservation and management, agroforestry, agricultural irrigation, water treatment and management, etc.)

Increased resilience of:

- ☒ Most vulnerable people and communities
  (E.g. mitigation of operational risk associated with climate change – diversification of supply sources and supply chain management, relocation of manufacturing facilities and warehouses, etc.)
- ☒ Health and well-being, and food and water security
  (E.g. climate-resilient crops, efficient irrigation systems, etc.)
- ☒ Infrastructure and built environment
  (E.g. sea walls, resilient road networks, etc.)
- ☐ Ecosystem and ecosystem services
  (E.g. ecosystem conservation and management, ecotourism, etc.)

A.2. Project / Programme Executive Summary (max 300 words)

Tajikistan is the most vulnerable country to climate change in the Europe & Central Asia (ECA) region. Its energy system is dominated by hydropower and is therefore highly exposed to climate change risks. Hydropower is of fundamental importance for economic development and living standards in Tajikistan, and climate change is a hugely important risk amplifier in this already precarious and challenging context. Strengthened governance and institutions are necessary to improve the climate resilience of hydropower systems. Additionally, the climate vulnerability of Tajikistan's energy systems also has important social and gender dimensions.

In response to these severe challenges, the proposed Project aims to scale up the adoption of climate resilience practices and technologies in the Tajik hydropower sector. Enhanced institutional capacities, modern climate resilience technologies and adequate technical skills are urgently needed in Tajikistan to address the risks associated with climate change in the fragile and highly climate-vulnerable hydropower system. The proposed Project will support the transfer of knowledge and technologies for achieving these vital targets for Tajikistan's strategically important hydropower sector. This will be accomplished through a Project structure consisting of three closely inter-related components linked to three targeted Project Outputs. Project implementation is structured in two phases. The funds for Phase I have already been committed by EBRD and the CIF's Pilot Programme for Climate Resilience (PPCR), as set out in section B.2. This proposal is for further funding under Phase II. This arrangement will allow for a smoother, gradual implementation of the overall Project. The phases are intended to be staggered and to overlap each other in order to ensure smooth implementation and the effective coordination of project activities. Phase I has now reached a critical stage, with all the procurement arrangements and engineering services (covering both phases) now in place, and Phase I physical works about to commence. This means that it is now timely to plan ahead and secure the funding for Phase II so that the physical works of Phase II can begin smoothly and without interruption, taking into account the length of time needed to secure the funding and all necessary approvals.

The proposed Project will be delivered through a structured approach comprising of technical assistance, policy dialogue and facility upgrades in close partnership with the Tajik authorities.

The specific **objectives** of the Project are the following:

1. To increase the adoption of best international practices in the assessment and management of climate change risks to hydropower operations by Tajik hydropower operators and other associated agencies such as providers of hydromet services (Phase I+II);
2. To develop institutional capacities and structures needed to ensure effective transboundary management of hydropower cascades in order to promote the climate resilience of hydropower operations (Phase II); and
3. To scale up the integration of climate resilience approaches, technologies and design standards into a strategic hydropower facility with a powerful demonstration impact (Phase I + II).

Specific benefits will include:

- The modernisation of a major hydropower facility taking into account projected future climate conditions
- The population of Sughd region (approx. 2,400,000 people), in particular women, to benefit from a more secure and climate-resilient electricity supply.

A.3. Project/Programme Milestone

Expected approval from accredited entity's Board (if applicable)	2014 (Phase I) //2017 (Phase II)
Expected financial close (if applicable)	Not applicable
Estimated implementation start and end date	Start: 2017 End: 2023
Project lifespan	Investment Period Six Years from start. Project lifetime is 40 years.

	The design life of the asset is 60 years from completion.

B.1. Description of Financial Elements of the Project / Programme

Overview

The indicative total financing package is expected to amount to USD 208 million, of which USD 75 million have already been committed by the PPCR, EBRD, and EBRD's trust fund for Phase I[1]. Phase I has been approved by EBRD's Board and is in the initial stages of implementation. Loan and grant agreements have been put in place between EBRD and Barki Tojik (the state-owned vertically integrated power utility) and three major consultancy services contracts (implementation support) have been put in place: i) Support to the Project Implementation Unit (" the PIU"), ii) Basic Design and Engineering Services and iii) capacity building for climate resilience. The remaining USD 133 million for Phase II is envisaged to be made up of grant and concessional loan resources to be provided by the GCF, loans provided by EBRD and EIB (pending approval by EIB management), and grant resources provided by EBRD's trust fund.

Tajikistan adheres strictly to IMF restrictions on foreign borrowing and has enshrined this in law. These require that each funding package must consist of a grant element of at least 35%, calculated using the IMF methodology[2]. Therefore, while the use of some loan finance in these Programme elements is justified in order to e.g. incentivise improvements in approaches towards appropriate commercialisation, cost-recovery, and financial sustainability, it is necessary to reduce significantly the financing costs of such projects to the Tajik authorities, water companies and households. This can only be achieved by blending the loan finance with an appropriate amount of grant finance. EBRD's experience also confirms that an appropriate blend of loan and grant resources is needed due to Tajikistan's low-income status and the severe affordability constraints experienced by very many of Tajikistan's communities and households. Therefore, while the use of some loan finance in these Project elements is justified in order to incentivise improvements in appropriate commercialisation, cost-recovery and financial sustainability, for the above reasons, it is necessary to significantly reduce the financing costs to the Tajik authorities and Tajik households by blending the loan finance with an appropriate amount of grant finance.

Technical Assistance

It is anticipated that the technical assistance and policy dialogue elements of the Project will be funded using grant resources amounting to USD 11 million, which will be provided from the EBRD's Donor Trust Funds (of which USD 4 million have already been committed under Phase I of the project). These elements will cover skills transfer, capacity building and institutional development activities that will deliver important public goods in the form of an improved enabling environment for the integration of climate resilience into the management of hydropower operations. As these elements are not revenue generating, the use of grant resources is highly appropriate.

Investment including Grant Support

The elements of the Project that support the integration of climate resilience approaches, technologies and design standards into the pilot upgrade of a strategic hydropower facility (Qairokkum HPP) will be structured in manner that draws on important pilot work launched by EBRD, Barki Tojik and the PPCR. They will be financed using an appropriate blend of loan and grant finance amounting to a total of USD 197 million. This is anticipated to include grant resources of US 23 million from the GCF together with grant resources of USD 11 million from the PPCR (already committed), which will be used to finance the upgrade of urgently needed components essential for the hydropower plant's safety. These components are essential for the long-term climate resilience and safety of the facility, but as they do not generate revenues they would be extremely difficult to finance using non-grant resources, especially considering severe budget constraints in the sector caused by relatively low tariffs and affordability

[1] http://www.ebrd.com/cs/Satellite?c=Content&cid=1395244711494&pagename=EBRD%2FContent%2FDownloadDocument
[2] https://www.imf.org/external/pubs/ft/dsa/pdf/dsacr11130.pdf

constraints across the population.

The remainder of this part of the funding package is anticipated to consist of GCF concessional loan finance resources of USD 27 million, together with concessional loan finance of USD 10 million from the PPCR (already committed), EBRD loan finance of USD 88 million (of which $50 million have already been committed) and loan finance of USD 38 million contributed by EIB. These loan finance resources will be used for other climate resilience upgrade components such as improved turbines and generation facilities that will result in increased generation capacity and therefore have the potential to generate revenues. Due to low energy tariffs and affordability constraints, these additional revenues are however expected to be limited. Thus GCF's concessional terms are crucial in enabling the mobilisation of additional funding from IFI loans for the upgrade. Blending these (GCF concessional finance and IFI loans) can therefore guarantee the affordability of these components.

Phase I has covered the renewal of two turbines and two spillway gates plus associated hydro-mechanical and dam safety equipment, in addition to the initial phase of the technical cooperation on building capacity for climate risk management in hydropower operations. Phase II will cover the renewal of the remaining four turbines and spillway gates, as well as the subsequent phase of the technical cooperation on climate resilience capacity building, which will include improving transboundary cooperation on hydropower cascade management. The project has been phased in recognition of the significant affordability and absorption capacity challenges in Tajikistan. These two phases are intended to be staggered and to overlap each other in order to ensure smooth implementation and the effective coordination of project activities. Phase I has now reached a critical stage, with all the procurement arrangements and engineering services (covering both phases) now in place, and Phase I physical works about to commence. This means that it is now timely to plan ahead and secure the funding for Phase II so that the physical works of Phase II can begin smoothly and without interruption, taking into account the length of time needed to secure the funding and all.

Table 1: Indicative Financing breakdown for project phase I (in million US$)

Phase I						
	EBRD		**EBRD Trust Fund**		**PPCR**	
	Loan	**Grant**	**Loan**	**Grant**	**Loan**	**Grant**
Component linked to Output 1						
Capacity building with Barki Tojik				4		
SUB-TOTAL 1				4		
Component linked to Output 1						
Technical assistance on cross-border coordination						
SUB-TOTAL 2						
Component linked to Output 1						
Dam safety						4
Turbine upgrade	16				10	7

Generation upgrade	34					
SUB-TOTAL 3	50				10	11
TOTAL AMOUNT	50			4	10	11

Table 2: Indicative Financing breakdown for project phase II (in million US$)

Phase II

	GCF		EBRD		EBRD Trust Fund		EIB[3]	
	Loan	Grant	Loan	Grant	Loan	Grant	Loan	Grant
Component linked to Output 1								
Capacity building with Barki Tojik						2		
SUB-TOTAL 1						2		
Component linked to Output 2								
Technical assistance on cross-border coordination						3		
SUB-TOTAL 2						3		
Component linked to Output 3								
Project implementation related technical cooperation						2		
Dam safety	5	23						
Turbine and generation upgrade	22		38				38	
SUB-TOTAL 3	27	23	38			2	38	
TOTAL AMOUNT	27	23	38			7	38	

Table 3: Breakdown of Expenditure in USD million

Expenditure by type	Indicative cost estimates	Of which already Committed
1. Goods	148	53
2. Works	48	17
3. Services, including consultants	11	4
4. Travel	1	1

[3] Pending approval by EIB management

B.2. Project Financing Information

	Financial Instrument	Amount	Currency	Tenor	Pricing
(a) Total project financing *(Phase II only)*	**(a) = (b) + (c)**	133	million USD ($)		
(b) GCF financing to recipient	(i) Senior Loans (ii) Subordinated Loans (iii) Equity (iv) Guarantees (v) Reimbursable grants * (vi) Grants *	27 23	million USD ($) Options Options Options million USD ($)	40 yrs	0% [Service fee[4]: 0.25% Commitment fee: 0.5%]
	** Please provide economic and financial justification in section F.1 for the concessionality that GCF is expected to provide, particularly in the case of grants. Please specify difference in tenor and price between GCF financing and that of accredited entities. Please note that the level of concessionality should correspond to the level of the project/programme's expected performance against the investment criteria indicated in section E.*				
	Total requested (i+ii+iii+iv+v+vi)	50	million USD ($)		

	Financial Instrument	Amount	Currency	Name of Institution	Seniority
(c) Co-financing to recipient	Senior Loans Grant Senior Loans	38 7 38	million USD ($) million USD ($) million USD ($)	EBRD EBRD EIB[3]	senior Options senior
	Lead financing institution: European Bank for Reconstruction and Development				
	A letter of commitment is provided as part of this application. PPCR Approvals are appended				
(d) Financial terms between GCF and AE (if applicable)	The funding will be passed directly to the Ministry of Finance from the EBRD. Financial terms between GCF and EBRD will be governed by the Funded Activity Agreement based on the AMA. EBRD has carefully assessed the Executing Entity's financial capacities in terms of its internal control systems and processes for this project (and indeed previous EBRD projects) through detailed project-level due diligence including thorough credit analysis by EBRD's Credit team to ensure that the client and the project meet EBRD's strict sound banking criteria. These				

[4] GCF commitment fee on the undisbursed amount, becoming due following the signing of the Loan Agreement with the client

	findings are reviewed and approved by EBRD's Operations Committee and Board before Board approval of the project. GCF resources are expected to cover the following: 1) **A loan/loans** to the Ministry of Finance, to be comprised of an EBRD-financed tranche and a GCF-financed tranche, either on the same or on separate loan agreements. The GCF resources will be made available through the GCF loan sub-account of the EBRD GCF Special Fund. Loan tranches financed with GCF resources are expected to have maturities of up to 40 years with grace of up to 10 years. 2) **Grants** provided to the Ministry of Finance to cover non-revenue generating CAPEX components and/or technical assistance and capacity building necessary for the successful implementation of the project, and to ensure overall affordability. The GCF grant resources will be made available through the GCF grant sub-account of the EBRD GCF Special Fund. Grants will be non-repayable. The GCF Loan and the GCF Grant may be disbursed at the beginning of the implementation of the Project, before the EBRD Loan. 3) Fees requested by EBRD. The requested accredited entity fee is 5% of the requested GCF total financing. The fees are not included in the request outlined under Section B.2 above. They will amount to USD 2.5 million.

B.3. Financial Markets Overview (if applicable)

Not applicable

Please fill out applicable sub-sections and provide additional information if necessary, as these requirements may vary depending on the nature of the project / programme.

C.1. Strategic Context

As set out in Tajikistan's Poverty Reduction Strategy (2001), hydropower provides approximately 98% of Tajikistan's electricity, making it fundamentally important for the country's economy and development, and for the livelihoods and well-being of its population. Yet this critically important sector faces a number of challenges that are severely exacerbated by the threat of climate change. Demand for electricity varies considerably throughout the year – a phenomenon shared by most countries with extreme temperatures in summer and winter. However, Tajikistan's winter electricity demand is unusually high. Unlike most countries that are affected by extreme temperatures throughout the year, the Tajik population relies mainly on electricity for heating, rather than natural gas and coal which is why the residential sector accounts for such a large share of total electricity demand (44%) according to the World Bank's 2012 report 'Tajikistan's Winter Energy Crisis'. This is due to limited heating options and relatively low electricity prices. Unfortunately, the high electricity demand in winter coincides with the minimum availability of electricity generation from hydropower, due to hydrological conditions. River flows are lower in winter, reaching their minimum in March, and this reduces the output of all hydropower plants, in particular those without storage capacity. The situation of chronic electricity shortages has manifested itself further since 2009 when electricity imports though the Central Asian Power System (CAPS) came to a halt. The CAPS originated in the 1970s under the USSR. Covering five Central Asian countries, it was designed to meet the needs of the region and reduce the overall cost of supply, without taking national borders into account. Following the collapse of the USSR, the member states sought to achieve energy independence in terms of generation capacity and fuel supply. At the same time, the differences in the resource base for each country meant that the systems became unbalanced which caused dispute amongst member states.

In this context, climate change is a serious risk amplifier for the Tajik hydropower sector. Tajikistan's hydropower plants depend on river basins fed by glacial melt water and snowmelt. However, as the climate warms, most climate models predict significant changes in the dynamics of the Tajik precipitation patterns as well as alterations to the country's glaciers. Projections by the Intergovernmental Panel on Climate Change (IPCC) indicate that average temperatures in Tajikistan have increased by about 1.2°C since the 1950s, with most rapid warming occurring in winter. Higher winter temperatures mean that smaller fractions of the precipitation fall as snow. Rainfall has declined by approximately 20% since the 1950s. Changes across the country's glacier volumes are also significant. Tajik Hydromet suggests that since the mid-1960s, the Fedchenko glacier (northwest Pamir) shrank by 14 km2 or 6% and is now retreating by approximately 16 meters per year. Over the same period, glacier area reduced by more than 25-30% in the Vandj basin (western Pamir) and by 30-40% in the Murghab basin (eastern Pamir). Glacier retreat and thinning are also observed in the Garmo and Skogach (Obihingou basin), the GGP (Iskanderkul basin) and Diahandara (Karatag basin). These trends may lead to an increased water supply from enhanced glacier and snow melt in the near to medium future followed by a drastic reduction in water supplies as the mass of glacial ice and accumulated snow shrinks. These climatic impacts have serious implications for river hydrology and introduce additional uncertainty. Thus, the hydropower sector is in need of improved capacities to understand and forecast current and future hydrology and infrastructure is in urgent need of rehabilitation. Most of the country's hydropower plants were constructed during Soviet times and have seen limited rehabilitation ever since. Not surprisingly, many are not in a condition to adequately deal with the projected impacts of climate change especially with extreme weather events. The International Commission on Large Dams (ICOLD) has therefore emphasized the urgent need to adapt older dams, especially their spillway capacities, to cope with the new climate conditions, including an increase in severe floods. For many years, the Tajik power utility managed to keep its hydropower stations functioning under difficult conditions. However, increasing demand, aging equipment and the predicted impacts of climate change – which have the potential to change the rules under which Tajikistan's hydropower sector operates - are making Tajikistan's energy systems even more fragile. The extreme vulnerability of Tajikistan's energy sector to climate change impacts and the need for scaled-up investment in climate-resilience energy infrastructure upgrades are explicitly set out in Tajikistan's Third National Communication to the UNFCCC (2014) and its Independently Determined National Contribution (2015).

C.2. Project / Programme Objective against Baseline

Baseline

A comprehensive Feasibility Study was carried out by EBRD as part of the preparation of this project (see Annex II for the full report). This informed the assessment of the baseline against which the project was designed, as follows:

Ageing infrastructure

Tajikistan's hydropower plants were constructed during the Soviet era and have seen few upgrades since. Consequently, most of

these facilities have been in operation well beyond their useful economic life, and upgrades are urgently needed in order to avoid the risk of major technical failure that would jeopardize the supply of electricity to all customers and cause enormous damage to Tajikistan's economy. Tajikistan is one of the least energy-efficient countries in the world, which only exacerbates the severe strains on the country's energy infrastructure. This also applies to Qairokkum HPP (the proposed demonstration HPP covered by this proposal), where most of the electric and mechanical equipment has reached the end of its lifetime and a major rehabilitation including the replacement of the turbines is needed. The Feasibility Study found that the electric installations need to be renewed since they have reached the end of the lifetime. Specifically, new and improved turbines able to operate over a greater range of flows are needed in order for the facility to cope with the projected increases in hydrological variability that are expected as a result of climate change. Consequently, new generators are also needed so that the increased turbine capacity can translate into greater installed capacity. A new automatic control system will have to be installed and the monitoring and surveillance system, including an alarm system for the embankment dam, will be integrated. The power house and weir structure also need upgrading and repairs where the surface concrete is eroded and armour steel is exposed. The embankment dam requires rehabilitation and upgrading, specifically the construction of an impervious layer, in particular a concrete-slurry cut-off wall.

Impacts of climate change on hydrology

At the same time Tajikistan is among the countries that will be severely affected by climate change, with the hydropower sector especially vulnerable for the reasons set out in section C.1. As a result, many HPPs are poorly placed to cope with the projected impacts of climate change. Although they were able to be kept running under difficult conditions for many years, HPPs now need to be able to cope with new climatic conditions and increasing hydrological variability. Studies undertaken in the preparation of the Project (Annex XXI) indicated annual mean temperatures have risen by 1.2°C, and rainfall has fallen by ~20% since the 1950s. Most rapid warming has occurred in winter, in the north and east of the country. Winter rainfall is largely unchanged, but spring and autumn totals have fallen, especially in the Pamir. Observations suggest that, across Tajikistan as a whole, glacier volume has decreased by approximately one third since the 1930s. Climate models used by the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment suggest further warming of ~2.5°C by the 2050s, and ~4°C by the 2080s. The frequency of frost days are expected to decrease. There is much greater uncertainty about future changes in precipitation. The same group of models shows a mean annual increase of ~4% but has a range of -10% to +20% by the 2050s. On average, precipitation could increase by 17% in winter, and decrease by 11% in summer by the 2050s. The incidence of heavy rain days increases in all models. Climate model results for individual locations show very large biases. For example, some models are ~15°C too cold compared with observed temperatures in north Tajikistan. Models with larger temperature biases also tend to show greater warming in the future. Statistical downscaling can correct some of the gross biases in climate model output, so the additional effort of constructing local scenarios via this technique – as will be conducted for this assignment – is worthwhile, assuming that necessary calibration data can be procured for river basins of interest. Historic and projected trends in temperature, precipitation and extreme events imply:

• Higher winter and spring air temperatures mean that a smaller fraction of the precipitation total falls as snow;

• The altitude of the snowline increases, changing the local albedo (reflectivity) of the landscape, thereby amplifying regional warming;

• Long-term wastage and reduced mass balance of glaciers (assuming no change in winter precipitation);

• On average, less snow cover and snowpack storage at the end of winter, especially at lower elevations;

• Earlier thaw of permafrost and melting of snowpack and glacier ice;

• Earlier incidence of avalanches, landslides and flooding;

• Earlier (and potentially larger rain with snowmelt) peak inflows to reservoirs;

• Lower summer minimum inflows to reservoirs;

• More intense summer storms enhance soil erosion and conveyance of sediment.

(For more details on the analysis, please see Annex XXI.)

These observed and projected climatic trends have significant implications for hydrological conditions in Tajikistan, and are projected to result in increased hydrological variability. Some scenarios forecast increased surface runoff and snowmelt in the near to medium future, potentially followed by longer-term reductions in surface runoff as the mass of glacial ice and accumulated snow recedes. These climate change trends and the consequent increase in hydrological variability have serious implications for the hydropower sector. The overlapping effects of these multiple climatic factors introduce greater uncertainty to the hydrological system. This is why in the case of Qairokkum HPP, the detailed studies carried out by EBRD indicate that annual inflows into Qairokkum reservoir will be subject to increasing variability and may change significantly in the future. As part of the Feasibility Study, a range of hydro-climatic scenarios were used to explore options for the rehabilitation of Qairokkum HPP to ensure that the power plant can continue to operate efficiently and safely under the projected broadening range of possible hydrological conditions.

Management regimes and practices

Hydro-meteorological information services in Tajikistan are typically weak and poorly resourced, having suffered significant under-investment and neglect since the collapse of the Soviet Union. In addition, hydropower operators in Tajikistan still use dam operating rules and safety procedures that were developed during the Soviet era based on hydrological and meteorological observations dating from 1970s or even earlier. Now, rising demand, ageing equipment and projected climate change impacts and the related increased uncertainty in hydrology mean that the use of such static approaches is increasingly inappropriate. Models of extreme flood events and corresponding emergency response measures particularly need to be updated and better capabilities to understand climatic conditions and forecast their impact on river flows are crucially needed. This means taking into account the new hydrological and meteorological data as well as the projected climate change impact. Furthermore, Soviet-era structures and mechanisms for hydropower dam cascade management and coordination have deteriorated or disappeared since the collapse of the Soviet Union, with river systems such as the Syr Darya and Amu Darya being fragmented across the now independent countries of Central Asia. As a result, official systems for coordinating dam operations and sharing hydrological and meteorological information across borders are lacking, with informal, ad hoc practices taking their place in some cases. . In light of the growing challenges that climate change poses for hydropower operators, there is therefore an urgent case for improving transboundary coordination on dam and cascade management and building new mechanisms and structures for coordination and information sharing. These should build on existing and emerging initiatives such as the Central Asia Regional Economic Cooperation (CAREC) Strategy for Regional Cooperation in the Energy Sector, the Scientific-Information Centre of the Interstate Commission for Water Coordination of Central Asia (SIC-ICWC), and the World Bank-led Climate Adaptation and Mitigation Program for the Aral Sea Basin (CAMP4ASB).

Links to economic development and poverty reduction

Poor energy security, which is expected to be worsened as a result of climate change, has serious implications for economic activity, poverty and vulnerability. At present, approximately 70% of the Tajik population suffers from extensive electricity shortages during the winter. These are estimated at 2,700 GWh which is equivalent to a quarter of the winter electricity demand. With demand expected to rise and without major investments in the near future, shortages are projected at 4,500 GWH in 2016, which would be close to one third of the electricity demand in winter. Electricity shortages in winter impose economic losses of approximately USD200 million per year, or 3% of GDP. According to the World Bank's Business Economic Environment Survey, the frequent cut-offs and the poor quality of electricity is considered the main obstacle to doing business in Tajikistan. The social impacts associated with chronic electricity shortages in winter are severe and include indoor air pollution from burning coal and wood in homes, and health impacts from extreme winters.

Project Objectives

In response to the above challenges, the proposed Project *Tajikistan: Scaling Up Hydropower Climate Resilience* will improve the climate resilience of Tajikistan's strategically important but highly climate-vulnerable hydropower sector, which provides 98% of the country's electricity. This will support the scaling up of the transfer of improved climate resilience technologies, technical skills and institutional capacities that are urgently needed in order to build the capacities of Tajikistan's fragile and highly climate-vulnerable hydropower systems to cope with the risks associated with climate change and to build resilience to these impacts. This will be achieved through a Project structure consisting of three closely coordinated components. The specific objectives of

the Project are the following:

1. To increase the adoption of best international practices in the assessment and management of climate change risks to hydropower operations by Tajik hydropower operators and other associated agencies such as providers of hydromet services;
2. To develop institutional capacities and structures needed to ensure effective transboundary management of hydropower cascades in order to promote the climate resilience of hydropower operations; and
3. To scale up the integration of climate resilience approaches, technologies and design standards into a strategic hydropower facility (Qairokkum HPP) with a powerful demonstration impact across the sector.

C.3. Project / Programme Description

The proposed Project will have three complementary components with targeted project outputs as described below:

- **Output 1:** Increasing the adoption of international best practices in climate risk management in the hydropower sector
- **Output 2:** Develop institutional capacities and structures for effective transboundary management of hydropower cascades
- **Output 3:** Scale up the integration of climate resilience measures into a strategic hydropower facility (Qairokkum HPP) with high demonstration impact across the sector

Output 1: Increasing the adoption of international best practices in climate risk management in the hydropower sector

Climate change has serious implications for hydropower operations all over the world. Consequently, hydropower utilities from many different countries are developing approaches to help them understand the implications of climate change for their operations. Two of the most advanced countries in this respect are Australia (Hydro Tasmania, Snowy Hydro) and Canada (British Columbia Hydro, Hydro Quebec). A good example of the kinds of approaches being developed is provided by Hydro Quebec. Quebec, like Tajikistan, is heavily reliant on hydropower for its energy needs, and energy output is influenced by climatic conditions. Hydro Quebec has conducted analyses of hydrological regimes that have helped them to make forward projections of hydrological condition and to understand the potential direction of climate change over the coming decades. Analysis of this kind enables Hydro Quebec to determine appropriate non-structural measures, such as modifying dam operating rules in response to shifting hydrological conditions, and structural measures such as adjusting turbine and spillway capacity. Evaluations are made at the watershed level using simulation and optimization tools that take into account the existence of other structures throughout the watershed, global productivity objectives, as well as environmental, agricultural and other objectives and constraints. A key consideration is to ensure the adaptability of key assets and operations.

In order for Tajik hydropower operators such as Barki Tojik to align with these best international practices, there is a significant need for capacity building for energy sector institutions in order to enable them to integrate climate resilience into the operations of hydropower facilities. In particular, the regime of dam operating rules needs to be revisited in the light of updated information meteorological and hydrological conditions, including the about impacts of climate change. At the moment, hydropower dams in Tajikistan are still using operating rule regimes that were put in place during the Soviet period, and are based in hydro-meteorological observations from the 1980s or earlier. Linked to this, dam safety procedures including the modelling of extreme flood events and corresponding emergency response measures also need to be updated taking into account up-to-date hydro-meteorological data and the projected impacts of climate change.

In response to these priorities, for Output 1 the proposed Project covers the following activities:

- Strengthen national capabilities in climate risk assessment ensuring gender assessments are included when relevant and pertinent and adaptation in Barki Tojik through the development of partnerships, short-term co-location and two-way exchange of technical staff;
- Strengthen capabilities within Barki Tojik on data management and record keeping:
- Build long-term collaborative links with international partners in research, engineering and academia;
- Run technical workshops on climate diagnostics, climate risk assessment, and seasonal forecasting with accredited institutions to encourage professional development;
- Conduct study tours for Barki Tojik staff to visit hydropower facilities in an OECD country in order to gain first-hand experience of best practice in managing climate risks to hydropower operations;
- Build the capacity of Barki Tojik and hydropower plants to develop modifications to dam operating rules based on improved hydro-meteorological forecasts in order to optimise dam safety, maximise energy productivity, and minimise

spill (i.e. wasted water not used for energy generation);
- Build the capacity of Barki Tojik and relevant national authorities to understand and manage impacts of dam management regimes on downstream water users.
- Build the capacity of Barki Tojik and hydropower plants to improve flood emergency responses including modelling of peak maximum floods and response procedures, together with gender-sensitive disaster preparedness, response and contingency plans that respond to the specific needs and concerns of men and women (and ensure when pertinent that all data collected are sex disaggregated);
- Build the capacity of the Tajik national designated authority responsible for managing Tajikistan's engagement with the Green Climate Fund to monitor and disseminate information about project activities and outcomes.

The total cost of activities for Output 1 is US$ 6 million, which will be provided by EBRD's Donor Trust Funds.

Output 2: Develop institutional capacities and structures for effective transboundary management of hydropower cascades

As explained in section C.2 above, hydropower cascade management in Central Asia has deteriorated since the collapse of the Soviet Union. In response, this Output will focus on improving transboundary coordination of hydropower cascade management the Syr Darya. This work will take place strictly within the boundaries of the existing international agreements that govern the management of the Syr Darya basin. Every effort will be made to set this work in the context of transboundary cooperation, for example by exploring collaboration with the United Nations Economic Commission for Europe (UNECE), the Scientific-Information Centre of the Interstate Coordination Water Commission of the Central Asia (SIC ICWC), or other relevant transboundary bodies, while paying close attention to the political context and realities that influence transboundary issues in Central Asia. The activities under this Output will take the form of carefully structured technical assistance and policy dialogue activities that will address the following priorities:

- Policy and institutional review of existing structures and mechanisms for transboundary river management in Central Asia and the identification or establishment of an appropriate forum for transboundary co-operation where the benefits can be understood and shared between the riparian countries;
- Exploration and establishment of transboundary collaboration and data sharing opportunities, including the usage of public domain datasets. Targeted capacity building to the various national institutions involved in river basin management will aim to improve the operational systems, monitoring and knowledge sharing related to the transboundary coordination of hydropower facility management; and
- Supporting the professional development on technical climate risk management for young/mid-career professional from the hydropower operators and hydro-meteorological institutes in the riparian countries

Specifically, it is envisaged that this Output will provide targeted technical support, alongside and in coordination with existing regional cooperation initiatives, to enable hydropower operators and hydro-meteorological agencies to work together more effectively on cascade management, coordination of dam operations (e.g. operating rules), the sharing of relevant hydrological and meteorological information, and where possible common approaches in the use of climate information, forecasting and modelling. The assignment will leverage existing ties between EBRD and hydropower operators on the Syr Darya cascade (through existing investment projects in Kazakhstan, the Kyrgyz Republic and Tajikistan). It will also build on the fact that Tajikistan and the Kyrgyz Republic are both involved in the Pilot Programme for Climate Resilience (PPCR) and will explore opportunities to serve as a string framework for cooperation on climate resilience. While the primary focus of these activities will be on Tajik partners they will also reach out to relevant partners in other Central Asian countries, operating through existing networks established by CAREC, SIC-ICWC, PPCR, WB etc.

The total cost for activities under Output 2 is US$ 3 million, which will be provided by EBRD's Donor Trust Funds.

Output 3: Scale up of the integration of climate resilience measures into a strategic hydropower facility (Qairokkum HPP) with high demonstration impact across the sector

This Output covers the rehabilitation of Qairokkum hydropower plant in northern Tajikistan in order to integrate climate change analysis and climate resilience measures into the rehabilitation of a major hydropower facility that is sensitive to the impacts of climate change. This will build on existing pilot work launched by EBRD, Barki Tojik and the PPCR, and will have the following objectives:

- To demonstrate how climate change analysis can inform project design and investment decisions in the hydropower

sector to optimise climate resilience;

- To provide concrete benefits in the form of a more reliable, sustainable and climate-resilient power supply that will improve energy security in the face of a changing and more variable climate;
- To provide valuable lessons for subsequent investments in hydropower plant rehabilitation and construction that are expected to be financed in the coming years (and which may also provide useful lessons to other countries facing similar challenges); and
- To further develop the capacity of the Tajik authorities to incorporate climate change analysis into hydropower plant investment planning and operations.

Specifically, the activities under this Output will build upon detailed analytical work on the implications of climate change for hydropower operations in Tajikistan that has been carried out with the support of the PPCR. This included detailed climate change modelling and hydrological modelling that informed the Feasibility Study for Qairokkum hydropower plant rehabilitation, carried out by EBRD. The Feasibility Study was an extremely strong and innovative piece of work from a climate resilience perspective. It took the outputs of climate change and hydrological modelling studies conducted with PPCR support and used them to identify robust options for improving the safety of the dam in the face of anticipated hydrological variability driven by climate change. It involved a thorough economic analysis of a range of possible turbine refurbishment scenarios taking into account the uncertainties over future hydrological conditions, resulting in the identification of the optimal turbine scenario that will best be able to cope with the projected range of hydrological conditions. As climate resilience has been mainstreamed so thoroughly into the design of this investment, the entire Project is a 'climate resilience investment' in the sense that it will make the facility more resilient, productive and safe in the face of anticipated climatic change and variability. Specific project components that are especially relevant to the promotion of climate resilience include dam safety measures and equipment that will improve dam safety in the face of projected greater hydrological variability as a consequence of climate change, and turbine refurbishment using a scenario identified as the optimal option in the face of the projected range of climatic/hydrological scenarios. It is important to note during the refurbishment of the dam (including the replacement of turbines), no more than one turbine/spillway will be worked on at a time. This means that at least five remaining turbines/spillways will be fully operational at all times during the refit, which will allow the flow through the dam to be properly regulated and power generation only marginally affected during the refit.

The specific activities of Output 3 include the following:

i) The full rehabilitation of Qairokkum hydropower plant based on an upgrade scenario designed to optimise resilience to climate change and entailing a capacity increase from 126MW to 174MW, building on the initial upgrade measures (i.e. first two turbines, spillways and generators) undertaken under Phase I .

ii) The full rehabilitation of the power plant dam (again building on initial upgrade measures undertaken under Phase I) in order to raise safety levels to international standards and improve the resilience of the plant to extreme weather events, which are projected to increase in frequency and severity as a consequence of climate change. Improving dam safety is of paramount importance as dam failure could have devastating consequences on the downstream areas, including parts of Kazakhstan and Uzbekistan. As these project activities are non-revenue generating, there is a case for using grant resources to finance these essential upgrades.

iii) To install a comprehensive suite of modern monitoring and safety instrumentation, in order to improve dam safety in the face of the projected increased frequency and severity of extreme weather events as a consequence of climate change.

Output 3 will result in the full upgrade of Qairokkum HPP in order to improve its productivity in the face of projected climatic and hydrological variability. In addition, the rehabilitation will include priority works on improving the safety level of the embankment dam in order to strengthen the plant's capacity to cope with adverse impacts of climate change. The expected results will include additional electricity supply for northern Tajikistan, which is currently experiencing chronic electricity shortages, especially during the winter season, causing human hardship and economic losses.

The total cost of activities under Output 3 is US$ 199 million, which is funded by the GCF, the EBRD, the PPCR, EIB and EBRD's trust fund.

C.4. Background Information on Project / Programme Sponsor (Executing Entity)

The Executing Entity is the Ministry of Finance of the Republic of Tajikistan.

Under the Law on Sovereign and Sovereign Guaranteed Loan and Debt the role of the Ministry of Finance is to

(i) develop annual public investment programme based on long-term prognosis of economic development

(ii) make proposals to Government on the need for attracting loans, participates in loan negotiations, keeps records of sovereign loans

(iii) receive, use and return (pays back) sovereign loans under limits set by the Government, if applicable

(iv) manage state debt

Under this law no other institution in Tajikistan (except for the National Bank of Tajikistan) has the right for public borrowings.

The Ministry of Finance will pass on the funds for project implementation under subsidiary financing agreements to Barki Tojik. It is a state-owned vertically integrated power utility, responsible for generation, transmission and distribution of electricity in the entire country except for the remote Gorno- Badakhshan region where Pamir Energy supplies less than one per cent of total country's demand. Barki Tojik is currently managed by a Chairman and six deputy chairmen who hold portfolios of generation, distribution, transmission, sales, finance, and other activities. These portfolios have a geographical focus rather than a focus based on business segments. The Chairman is appointed by the President of Tajikistan and reports to the President's Office, with a Supervisory Board consisting of senior government ministers and chaired by the Prime Minister. The Supervisory Board represents the Government as the sole shareholder. Barki Tojik employs approximately 13,328 staff. As part of the ongoing corporate restructuring, the Government approved a new organizational structure based on which BT is being reorganized into four business units, i.e., generation, transmission, distribution and corporate services. BT is aware of the potential impacts of climate change on its generation assets and is committed to incorporate climate resilience measures as part of its operations and future developments.

Barki Tojik has operational responsibility for the great majority of Tajikistan's hydropower facilities and is therefore fully equipped to work alongside EBRD in the implementation of large-scale upgrades of energy infrastructure. BT staff have comprehensive and extensive operational, engineering, financial and strategic planning expertise that EBRD and other MDBs such as the Asian Development Bank have has worked with successfully on past large-scale investments such as Sughd Loss Reduction Project (EBRD) and Nurek Switchyard (ADB). BT has prioritised as a key part of its strategic and operational planning the rehabilitation of existing generating capacity in the Tajik system as vital to meeting demand. Most of Tajikistan's hydropower plants have been in operation for an average of 45-50 years without major investments in upgrade or rehabilitation. This compares with the industry norms of economic lives of 25 years for hydropower equipment and 50 years for civil works. Ageing plants require rehabilitation or replacement of turbines, generators, transformers and other key electromechanical equipment. In line with the strategy to rehabilitate existing hydropower plants, the Government of Tajikistan has prioritized the rehabilitation of three large hydropower plants: Qairokkum (126MW), Nurek (3,000MW), and Golovnaya (240MW). BT owns and operates 4,377MW of generating capacity comprising eight large and a few small hydropower plants, and two fossil-fuel combined heat and power plants (318MW). Barki Tojik generated on average 14.8TWh/year in the last five years out of which Nurek hydropower plant with capacity of 3,000MW contributes approximately 70% of the annual output. The amount of electricity generation has decreased as the available capacity has reduced each year over the last several years (from 70% in 2006 to 57% in 2012). This indicates the critical need for rehabilitation of generating equipment as BT's plants are ageing and are in need of substantial investments to ensure their safe and reliable operation. BT also owns and operates 55,096 km of transmission and distribution power lines and sells electricity to approximately one million customers in Tajikistan.

C.5. Market Overview (if applicable)

The energy intensity of Tajikistan remains high, about 2.5 times greater than the EU-28 average. The main energy resource in the country is hydropower, from which more than 90 per cent of the country's electricity supply is derived. Tajikistan is considered one of the most vulnerable countries to climate change in the EBRD region, with its principal economic sectors such as energy and agriculture/agribusiness dependent on water resources and therefore exposed to climatic variability. Over 70 per cent of the Tajik people suffer from shortages of electricity during the winter and women seem to suffer disproportionately as a result of their primary responsibility for household chores, including firewood collection, heating preparation, cooking, childcare, washing and cleaning (UNDP, 2012). These tasks become considerably more onerous without access to reliable electricity and significantly increase women's time burden. Therefore, the country faces challenges that will require increased energy efficiency, climate resilience actions and support for energy security. Volatility of water flows as a result of climate change is likely to significantly impact the country's hydro based energy system, and putting in place plans to address this volatility remains a key priority over

the next years. Heat supply is another major issue for the country as the availability of natural gas, oil and diesel fuel is no longer sufficient meet the rising demand of the country. In particular, natural gas is no longer supplied from Uzbekistan and the Tajik power system was disconnected from the Unified Central Asian Power Grid in the end of 2009. As the high dependency on such resources is essential for the provision of centralised heating, in order to heat their homes and energy inefficient buildings, many people had to shift to electricity instead.

The limited capacity and obsolete condition of existing energy infrastructure is an increasing problem, especially as the demand of the end user sector is continuously growing. Energy efficiency improvements across sectors are needed in order to keep up with the population's increasing demand for electricity and to support sustainable economic development. However, electricity tariffs are very low in Tajikistan and tariff increases, while necessary, need to be implemented in a way that is sensitive to the severe affordability constraints faced by the population. Although hydropower currently provides around 98% of Tajikistan's electricity, at present only about 10% of the country's total hydropower potential of 40 GW is being utilized. In addition to expanding hydropower exploitation, there is also potential to explore solar as well as other energy sources such as wind. However, the inefficient use of energy and water resources is a major challenge and a priority for policy dialogue. These issues are expected to be prioritised in the National Climate Change Adaptation Strategy that the Tajik authorities are currently preparing with the support of international development partners.

Tajikistan's power system has an installed capacity of c. 5.2GW, consisting of eight large and a few small HPPs (4.9GW), and two fossil fuel CHPs in Dushanbe (0.3GW). The largest hydropower plants in the country are Nurek (3,000MW), Sangtuda-1 (670MW), Baipaza (600MW), Golovnaya (240MW), Sangtuda-2 (220MW) and Qairokkum (126MW). In 2015, the country's net power generation amounted to c. 15,758GWh with domestic consumption of c. 12,016GWh. Hydropower generation accounts for over 96% of the total output.

Barki Tojik is currently responsible for most of the power generation, transmission and distribution in Tajikistan, except for the Gorno Badakshan region, where a private company, Pamir Energy, operates majority of the power infrastructure under a concession agreement. In addition, two recently constructed IPPs, Sangtuda-1 HPP (670MW) and Sangtuda-2 HPP (220MW), sell electricity to Barki Tojik, and Barki Tojik, in turn, transmits and distributes this electricity. In the domestic market, electricity is sold at regulated tariffs established by the Government; the latest c. 16.5% tariff increase for most consumer groups became effective on 1 November 2016. The largest consumer groups refer to the population, TALCO, pumping stations and other consumers. From the consumer perspective, the demand for electricity is high in Tajikistan because of limited alternative options for heating, especially in urban areas. Electricity use by the agricultural sector is largely restricted to the summer months.

The Government's strategy and objectives in the sector are informed by the following constraints and barriers to development:

- Seasonal mismatch between electricity supply and demand - Tajikistan has excess capacity in the summer and electricity deficit with power shortages in winter, which impose large economic losses;
- Disconnection of Tajikistan from the Central Asian Power System since late 2009, which exacerbates winter deficit issue in the Tajik power system;
- High consumer demand for electricity in Tajikistan, because of limited alternative options for heating, especially in urban areas;
- Obsolete power sector infrastructure;
- Commercial and financial viability of the country's power utility;
- The power sector is subsidized, and consequently tariffs for electricity in Tajikistan are low.

The sector objectives pursued by the Government refer to improving domestic energy supply to satisfy the needs of households and industries, improving sector performance tackling regulatory, operational, commercial and other issues; and developing export markets to realize the significant potential of hydropower exports. The actions being implemented by the Government refer to:

a) New investment in generation and infrastructure capacity, to balance seasonal mismatch, increase thermal and hydro power generation, increase safety and ensure reliable and uninterrupted service of the existing hydro power facilities
   - Construction and launch of thermal generation - 100 MW Dushanbe 2 CHP was commissioned in 2014, the next phase under construction shall increase the capacity to 400 MW;
   - Construction and launch of new hydro power generation facilities – Sangtuda-1 HPP (670MW) was launched in 2008

and Sangtuda-2 HPP (220MW) was launched in 2011-2014. The country also pursues a large Rogun hydro power project;

- Rehabilitation of existing hydro power generation facilities – on-going rehabilitation of Qairokkum HPP (126 MW) and Golovnaya HPP (240 MW) as well as target rehabilitation of Nurek HPP (3,000 MW) with a support of the IFI/donor community;

b) New investment into transmission and distribution with a support of the IFI/donor community, with supply and installation of new electricity meters, meter reading systems and billing systems to increase revenue collections and introduce commercial business practices whereby addressing energy efficiency and increasing the reliability of power supply

- On-going energy loss reduction project in Sughd region financed by EBRD, EIB and the European Commission IFCA (about 100,000 meters to be installed along with a billing system);
- On-going wholesale metering and transmission reinforcement project (installation of 2,700 wholesale meters and billing system and 90 km of new 220kV transmission line interconnecting the Panjakent and Ayni regions), financed by the Asian Development Bank (ADB).

c) Leveraging the available hydro power potential to sell available summer electricity

- As a result of the CASA-1000 project in implementation (financed by EBRD, EIB, the World Bank and IsDB) Tajikistan and the Kyrgyz Republic shall benefit from the currently limited opportunity to sell available summer electricity surplus while Afghanistan and Pakistan shall access the much needed sources of reliable electricity supplies.

d) Reform and restructuring in the sector

- Barki Tojik, the national power utility, undergoes the corporate restructuring programme with regards to the separation of the generation, distribution and transmission functions.
- Corporate Solutions has been engaged by ADB to assist the Ministry of Energy with defining and planning future steps beyond the commercialisation of Barki Tajik, including unbundling, by defining and agreeing a sector reform plan that addresses key issues of future sector structure, tariff structure and legal and regulatory framework.
- EBRD has launched a comprehensive regulatory technical cooperation program.

Under the current challenging macro-economic conditions, the energy sector is facing financial difficulties. Despite the latest tariff increases, domestic tariffs do not suffice to cover the full operating cost of the sector. The repayment capacity of the Barki Tojik is constrained by low revenue collection rates and high leverage. The implementation of financial and operational recovery measures and cost-reflective tariffs are key for improving the financial sustainability of the sector. Currently, the repayment capacity strongly depends on the support of the Tajik government.

The Government has expressed support and commitment to restructuring of Barki Tojik and necessary sector reforms as described above, which should result in improving the standing of Barki Tojik. Further to the reform agenda, tariff was increased by 15% in 2014 and by c. 16.5% on average for several consumer groups in 2016; revaluation of Barki Tojik's fixed assets and accounts receivable was completed and Barki Tojik demonstrated progress with IFRS implementation; Barki Tojik's restructuring plan (unbundling into generation, transmission and distribution) was approved by Barki Tojik's Supervisory Board and its implementation is under way. A new tariff methodology is being developed. Other financial and operational recovery measures being discussed with Barki Tojik include reduction in technical and commercial losses through rehabilitation of transmission and distribution grid, as well as investments in metering and billing systems; improvement in payment discipline of Barki Tojik's clients; debt restructuring program.

EBRD is acutely aware of the need to ensure that improvements in the electricity supply benefit all sections of the population, including the poorest and most vulnerable. As one in every five households is now headed by a woman and the number of female-headed households is on the rise in Tajikistan due to the high levels of male out-migration, women in particular are expected to benefit from reliable electricity supply. This is why EBRD has conducted affordability and tariff analysis, so that the policy dialogue on electricity tariff reform that is being carried out by EBRD and other MDBs takes into account the income levels of the Tajik population and the consequent implications for the affordability of any electricity tariff increases, including an analysis of gender differences in terms of affordability. It is important to be aware that at present in Tajikistan, most of electricity generation and almost all transmission and distribution are carried out by Barki Tojik, vertically integrated, with a Supervisory Board which includes the representatives of a number of ministries. This means that energy generation and transmission/distribution are coordinated under the same structure, and also that decisions that affect the population's access to electricity are sensitive to political and social concerns. At present, there are three categories of electricity tariffs in Tajikistan: i)

residential tariffs at around USD 0.02/kWh, ii) private industry at around USD 0.05 kWh, and iii) tariffs for public (government) enterprises which are typically lower than the other two categories. This illustrates that the situation is not as simple as might be assumed, and it is not safe to assume that supplying electricity to industry is always more profitable than supplying residential areas. This picture is further complicated by low payment collection rates, especially in the public/government sectors, and system losses. In any case, EBRD and other development partners are already supporting Barki Tojik and the Tajik authorities in developing a new tariff policy in line with the international practice, and to adopt measures such as improved metering and an automated billing system, which will enable improvements in payment collection. Gender differences in the use of services will be taken into consideration with a view to increasing customer satisfaction from the services provided by Barki Tojik.

EBRD is also very aware of the need for an evidence-based system for ensuring that decisions on the distribution of electricity take into account the energy security and climate resilience needs of the population, and dedicated technical work on this precise topic is included in this Output 1 of the Project. At present, electricity demand often outstrips generation outputs in many parts of Tajikistan (including Sughd province), which means that 'load-shedding' or partial disconnection of localised parts of the distribution grid has to be carried out. Systems for managing 'load-shedding' in order to ensure the optimal distribution of electricity to consumers are relatively weak. Regional distribution grids typically include 'red lines' which connect generation facilities with essential facilities such as hospitals and schools, as well as many state-owned industrial facilities. The intention of the red line is to ensure that these users are prioritised and that they do not suffer power cuts. Urban populations (especially larger cities such as Khujand) are given higher priority but are still not immune from severe power cuts. However, more peripheral parts of the grid such as small towns and rural areas are much more likely to experience more frequent power cuts. This is expected to disproportionately affect women and their ability to benefit from reliable electricity supply, as one in every five households is now headed by a woman due to the high levels of male out-migration. Private businesses also report that they are often not prioritised and as a result suffer frequent power cuts that require them to adopt alternative options such as the use of diesel generators. Another important consideration is the timing of load shedding – for example, residential areas have a great need of electricity during the evening and in the morning, whereas industrial consumers have a great needed during the daytime. In response to these needs, this Project includes dedicated technical support to Barki Tojik to support the development of an evidence-based framework for energy sector policymaking that will help to optimise the distribution of electricity to consumers in a way that addresses their different needs and contributes towards improved energy security and climate resilience. This is especially important to ensure that the additional power generation capacity that will be created as a result of Qairokkum modernisation will benefit as wide a cross-section of the population of Sughd province as possible, paying particular attention to women's needs and preferences. This evidence-based framework will be developed through a programme of household and business surveys, which will target households and the business sector separately, in coordination with Barki Tojik. The survey will aim to gain understanding of energy use and the impacts of climate vulnerability on energy availability at both business and household levels. It will also explore gender differences in energy use and climate vulnerability, as these differ between men and women within businesses as well as households. Rural and urban areas will be explored and analysed separately as the quality of electricity service is very different. The survey will be conducted with pre-formulated questions developed after conducting research. The topics to be covered in the questionnaires will include:

- The level of awareness of energy security, both among households and businesses, testing differences between men and women
- Behaviour of energy use
- Gendered patterns of household energy use (intra-household decision-making, who uses energy for what purposes, where, when, and what type of energy) and energy consumption by businesses.
- Impacts of climate vulnerability for businesses and households (gender differentiated).
- The most effective communication tools in use (TV, posters, brochures, billboards, newspapers, leaflets, magazines, events, meetings, announcements etc.).

As part of the survey, a detailled gender assessment will be undertaken to identify key gender issues, risks, constraints and opportunities in relation to energy security, use, consumption and climate vulnerability. In addition to the survey results, the gender assessment will include a desk review and analysis of available data. Additional sources of publicly available information that are useful for the gender assessment and should be taken into consideration include:

- The regulatory environment, namely energy policies and other policies impacting energy sector activities, budgets, as well as energy sector responsibilities and mechanisms for decision-making; whether women are involved in decision-making and how these policies influence women and men's access to and use of energy

- Policies and laws outside the energy sector but impacting the energy sector initiatives (such as in the ares of labour, industry, land ownerhsip, entrepreneurship, finance etc.)
- Mapping of stakeholders involved in the Project and an assessment of the institutional capacity of institutions that are relevant for gender-related decision-making and implementation

Other ongoing programs and initiatives in this area

Based on the research carried out, the survey will be conducted in a number of towns and rural areas of Sughd Province. In selecting the towns, climate zones and the socio-economic development levels of the towns will be taken into consideration.

This Project has been carefully designed to ensure coordination and synergies with other projects being implemented by EBRD and other development partners in Tajikistan, such as the Sughd Loss Reduction Project (EBRD/EIB/EC IFCA), support for Barki Tojik corporate restructuring (ADB), etc. as well as the "Scaling up private sector climate finance through local financial institutions (GCF-EBRD SEFF co-financing Programme)". The PPCR programme in Tajikistan provides a strong framework for multi-agency coordination on climate resilience activities, led by the PPCR Secretariat located inside the PM's Office, which will greatly benefit this project. In particular, the coordination with the above GCF-SEFF programme will build upon the strong synergies that have already been established between this Project and the existing EBRD/PPCR project "Small Business Climate Resilience Financing Facility", which has already resulted in the establishment of the Tajikistan Climate Resilience Financing Facility "CLIMADAPT". CLIMADAPT is supporting the climate resilience of Tajik businesses, farmers and households through promoting the uptake of energy efficiency technologies (as well as water efficiency and sustainable land management technologies) in the agricultural, manufacturing and residential sectors. As acknowledged by the World Bank's 2012 report on "Tajikistan's Winter Energy Crisis", reducing energy demand through supply-side efficiency improvements is fundamentally important for reducing strain on the energy system and making it more resilient to the effects of climatic variability on hydropower generation. Subject to the successful disbursement of the existing resources under CLIMADAPT, it is anticipated that the above GCF-SEFF programme will make available resources for a larger extension of CLIMADAPT that could potentially make available large amounts of affordable finance for businesses, households and farmers to adopt energy efficiency (plus water efficiency and sustainable land management) technologies, addressing the energy demand side directly and increasing its efficiency. At the same time, this Project will make a significant contribution towards the climate resilience of energy supplies, this ensuring that energy supply and energy demand are supported in a coherent and complementary fashion. This means that the two projects have a great potential to re-enforce each other's impact and lead to a more reliable and resilient energy supply for a wider share of the population and an overall more climate resilient economy.

C.6. Regulation, Taxation and Insurance (if applicable)

EBRD need not obtain any additional licenses or permits to carry out the proposed activities in this Programme. For more information, please refer to the Agreement establishing the EBRD. The Bank is an international financial institution established and acting on the basis of an international agreement known as the Agreement Establishing the European Bank for Reconstruction and Development dated 29 May 1990, as amended (the "EBRD Agreement"). Members of the Bank are parties to the EBRD Agreement and are bound by the terms of the EBRD Agreement. As an international organisation, the Bank is established and governed on the basis of public international law and, therefore, the Bank is not incorporated under the laws of any country and has no company registration in any country.

Pursuant to the provisions of the EBRD Agreement, the Bank enjoys certain exemption from taxation in the territories of the Bank's member countries. In particular, Article 53(1) of the EBRD Agreement provides that "within the scope of its official activities the Bank, its assets, property, and income shall be exempt from all direct taxes." Accordingly, the Bank's income arising from the Bank's official activities in the Bank's member countries is exempt from any direct taxation in the member countries.

Further, according to Article 53(2) of the EBRD Agreement "when purchases or services of substantial value and necessary for the exercise of the official activities of the Bank are made or used by the Bank and when the price of such purchases or services includes taxes or duties, the member that has levied the taxes or duties shall, if they are identifiable, take appropriate measures to grant exemption from such taxes or duties or to provide for their reimbursement". Therefore, pursuant to Article 53(2) of the EBRD Agreement, the Bank is exempt from payment of VAT or any other tax in its member countries on purchases or services made or used by the Bank in connection with its official activities in the member countries.

Further, according to Article 21.2 of the EBRD Agreement, Members shall not impose any restrictions on the receipt, holding, use or transfer by the Bank of currencies obtained by the Bank by borrowing and currencies and other resources administered by the

Bank as contributions to the Special Funds and currencies received by the Bank in payment on account of principal interest, dividends or other charges in respect of loans or investments, or the proceeds of disposal of such investments made out of any of the currencies obtained by the Bank by borrowing, or in payment of commission, fees or other charges.

The EBRD provides finance, but does not implement projects per se. As such it need not obtain insurance for any goods or services, but rather it verifies that its clients have all the insurance necessary through its regular due diligence process.

We can confirm that proceeds from the GCF loan and grant will be tax-exempt and no direct or indirect taxes will be imposed by the Republic of Tajikistan on goods or services procured by the Executing Entity in relation to the Project financed by the GCF and EBRD.

C.7. Institutional / Implementation Arrangements

The Project will be implemented under the FAA that is to be agreed between the GCF and EBRD. The following agreements will be put in place under the proposed financing structure:

(i) Grant Agreement between EBRD and the Government of Tajikistan
(ii) Loan Agreement between EBRD and the Government of Tajikistan for the proceeds of the EBRD loan
(iii) Loan Agreement between EBRD and the Government of Tajikistan for the proceeds of the GCF loan

These agreements will specify precisely how the funds will be used for project implementation.

In addition, as set out in Table 2 and in section C.3, the Project will also include a number of Technical Cooperation assignments to be funded with grant resources from EBRD Trust Funds.

For Output 1: Capacity building with Barki Tojik

- Technical cooperation consultancy contract issued by EBRD

For Output 2: Technical assistance on cross-border coordination

- Technical cooperation consultancy contract issued by EBRD

For Output 3: Project implementation related technical cooperation

- Grant Agreement between EBRD and Barki Tojik with consultancy contracts to be issued by Barki Tojik

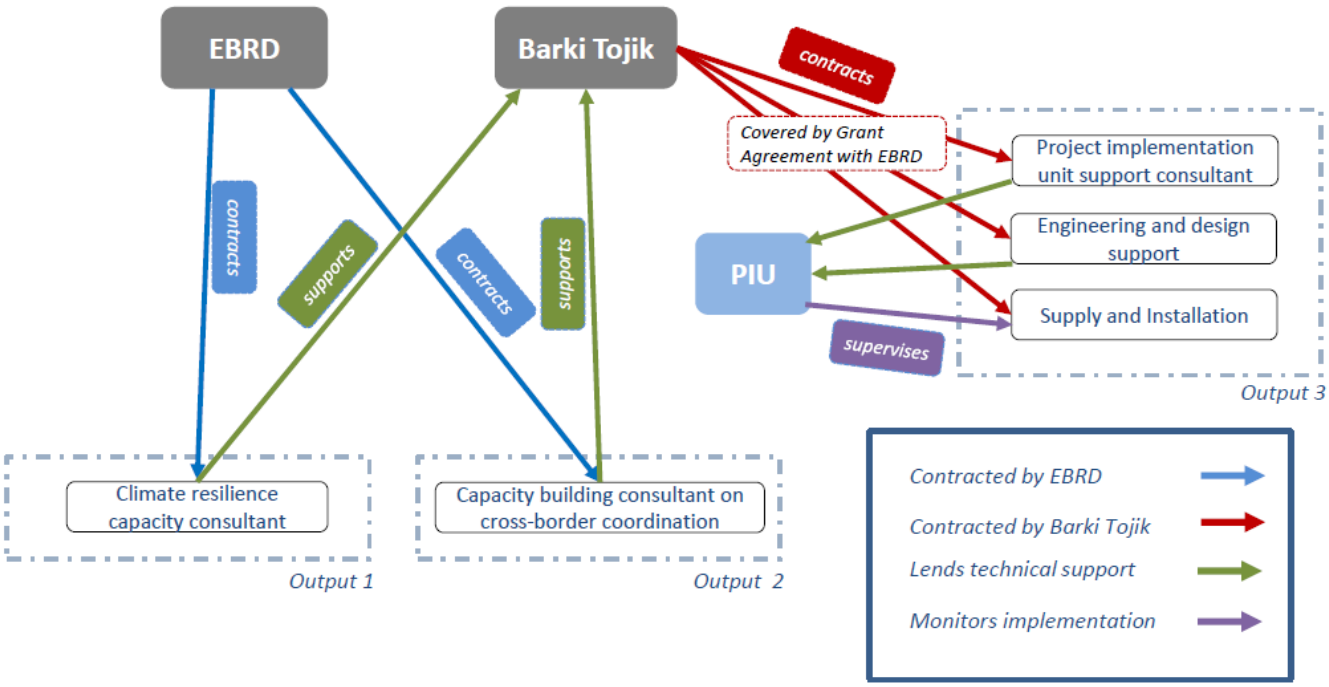
In order to accommodate GCF grant and loan resources (including reflows from repayment), EBRD will establish a Special Fund (with a sub-account for this project). EBRD establishes this structure to channel co-financing to the beneficiary, with Special Funds legally being treated as resources of the Bank and guaranteeing the same privileges and immunities, and preferred creditor status. In lending operations the EBRD becomes the Lender of Records of the co-financed resources (similar in structure to 'Trust Funds').

The funds will be passed on by the Ministry of Finance to Barki Tojik for project implementation. Physical works of the project will be managed by the PIU, which has a specific mandate to support the implementation of donor/MDB funded investments in Barki Tojik's infrastructure and assets. The PIU has local staff with expertise in procurement, technical support, finances, site management supervision, monitoring and evaluation. The PIU is supported by technical assistance for engineering and supervision by a team of independent, international consultants, embedded in the PIU. This programme of support to the PIU has been designed based on a detailed assessment of the capacity development needs of Barki Tojik and the PIU that was carried out by EBRD as part of the preparation of EBRD's Sughd Loss Reduction project in 2011. Specifically, this support to the PIU will cover the development of PIU operating procedures, support and oversight of procurement processes, support for evaluation processes, and support for contract finalisation, as well as assistance with site supervision, monitoring and reporting, testing, commissioning and operational acceptance, monitoring and reporting on the implementation of the Environmental and Social Action Plan, and knowledge transfer to Barki Tojik.

Financial resources for this support have already been confirmed under Phase I and are included under the USD 4 million (grant) allocation for consultancy services set out in section B.1. In addition to this support to the PIU, dedicated technical assistance will also be provided to project implementation to improve the enabling environment for climate-resilient

energy security and to understand and manage the implications of climate change and climate variability on hydropower operations and move towards international best practice used in OECD countries. During the refurbishment of the dam (including the replacement of turbines), no more than one turbine/spillway will be worked on at a time. This means that at least five remaining turbines/spillways will be fully operational at all times during the refit, which will allow the flow through the dam to be properly regulated. In the same way, power generation will by only marginally affected during the refit (there will be at least five turbines in operation at any given time) and the total operating capacity will increase as soon as the first new turbine is installed. Please see Figure 1 below for a presentation of the organisation structure of the implementation process.

Figure 1: Project Implementation – Organigram



Under Phase I, the following project progress has been made as of October 2016. Naturally, full project implementation cannot commence until Phase II resources have been approved.

Output 1 – Capacity building with Barki Tojik: this activity has commenced under Phase I and a dedicated team of international and local experts was appointed in December 2015. This team has established a permanent presence in Tajikistan and has conducted a number of initial field missions and consultations with Barki Tojik, Tajik Hydromet, the Ministry of Energy and water Resources and other Tajik stakeholders. This has resulted in the development (in May 2016) of a details implementation plan for the delivery of a comprehensive programme of support for building the climate resilience of the Tajik hydropower sector. This entails three workstreams: i) training on climate and hydrological data collection and management, ii) training on climate-resilient reservoir operations and iii) analysis and policy support on strategy, governance and institutional arrangements. Under workstream (i) the first package of technical training workshops was delivered in Dushanbe in August 2016. Under workstream (ii) a study tour to Quebec (Canada) has taken place in September 2016 as a key component of twinning Tajik hydropower operators with their counterparts in Canada, a country that is a global leader on hydropower climate risk management. Under workstream (iii) a comprehensive programme of household and business surveys is currently being carried out in Sughd province in order to develop an evidence base for energy sector planning that improves the climate resilience and energy security of the Tajik population including vulnerable groups and gender perspectives. Regular newsletters are being sent to all stakeholders, the first of which was produced in August 2016. It is envisaged that this activity will continue throughout Phase I and Phase II in order to

progressively build capacity for climate risk management across the hydropower sector.

Output 2 – Technical assistance on cross-border coordination: This activity has not commenced under Phase I and is instead envisaged to commence under Phase II once the resources have been approved. However it is intended that this work will build upon Output 1 as detailed above, and use the lessons learned and networks developed within Tajikistan to roll out technical support and capacity development activities on a transboundary level.

Output 3 – Project implementation & related technical cooperation (dam safety, turbine upgrade & generation upgrade): To date, two major and comprehensive procurement exercises have been completed under this Output. Firstly, a dedicated and well-resourced team tasked with providing Support to the PIU for Qairokkum HPP modernisation has been assembled and mobilised. This support will ensure that Barki Tajik has the technical and engineering capacities necessary for implementing this major infrastructure upgrade. Secondly, another dedicated and well-resourced team has been mobilised to provide Engineering Design Services. This team is also in place and is already working on the detailed engineering design which will provide the fine blueprint for Qairokkum HPP modernisation, building on the Feasibility Study, due diligence work and climate change impacts analysis. This detailed design is expected to be completed during Q3 2016. Once this has been done, and Phase II resources secured, physical works will then be able to commence.

C.8. Timetable of Project/Programme Implementation

TASK	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	...	Q30
Output 1																											
Output 2																											
Output 3																											
Evaluation																											

D.1. Value Added for GCF Involvement

This proposed project sets out a major opportunity for a transformative intervention that will have a huge impact on improving the climate resilience of the Tajik energy sector and, more widely, in promoting climate-resilient and sustainable development in Tajikistan through improving the access to clean energy of thousands of household and businesses. However, this impact can only be achieved through the mobilisation of significant amounts of finance of which an appropriate proportion must be concessional (e.g. grant) in order to address the severe affordability and debt sustainability constraints experienced in Tajikistan (a low-income country) and to off-set the additional costs associated with the introduction of necessary climate resilience measures. Phase I has begun this process (with financing from EBRD and the PPCR) but due to the limited ability of Tajik partners to access and absorb international finance (taking into consideration Tajikistan's level of debt) it has been necessary to structure the project in two coordinated phases. Additional funding from the GCF is needed to address the additional costs associated with climate resilience measures that are needed in the face of the severe climate change threats facing the Tajik energy sector. Without this, the project would run the risk of being a 'business as usual' investment that would not factor in projected future climate conditions and variability into the design and ongoing management of the facility. Specifically, this translates into a need for grant finance for specific equipment upgrades needed in order to cope with projected future climate conditions, such as dam safety, and higher capacity turbines. Given the scale of the finance required (especially for the larger Phase II of the project), the GCF is the only climate finance mechanism that is able to mobilise the scale of funding that is needed for a major climate-resilient infrastructure upgrade of this kind. There are no other financing mechanisms accessible to Tajikistan that could achieve this.

More general reasons for the need for GCF involvement in the project include the following.

(i) **Additionality**: The rehabilitation of aging hydropower facilities is crucial for Tajikistan's economy. The challenges of a changing climate puts additional burden onto the country. A long-term perspective needs to be taken to address these challenges. The GCF involvement guarantees that this long-term investment can be done in a climate-resilient way.

(ii) **Scale**: After initial pilot projects to include climate resilience in infrastructure, investments need to be scaled up to address the critical challenges that climate change poses. The GCF is the only fund able to address these at the scale needed to significantly contribute to the climate resilience of the Tajik energy system and thus the country's economy.

(iii) **Importance of sector**: The centrality of the hydropower sector for the economy of Tajikistan in this case and other countries more generally make the involvement of the GCF even more important. This Project can show how an integrative approach combining capacity building and infrastructure upgrades can further the climate resilience in the sector and in the whole community. Stronger climate resilience translates into higher economic well-being and more sustainable societies.

With the GCF's involvement the Project can demonstrate a successful implementation and can aid in scaling up climate resilience in the hydropower sector in Tajikistan and beyond.

D.2. Exit Strategy

The long-term sustainability of energy sector infrastructure and indeed the Tajik energy sector overall is a core consideration in the design and implementation of this proposed project. The specific investments are being designed for a 60 year lifespan, and ongoing operations and maintenance considerations have been factored into project design and associated technical support and dialogue with the Governmnet of Tajikistan and Barki Tojik. EBRD is acutely aware of the need for progressive energy tariff reforms over the years ahead in order to ensure the sustainability of such investments. EBRD (in close coordination with the World Bank, Asian Development bank and other international partners) is therefore heavily involved in policy dialogue on energy sector tariff reform with the Tajik authorities. Specifically, EBRD has agreed with the Tajik authorities an initial tariff reform programme entailing tariff increases of at least 30% by 2017. These increases are already in place and have been implemented by the end of 2016. They will be adjusted thereafter in accordance with new tariff methodology to be adopted by the Tajik authorities in 2017. These reform efforts, which are being monitored closely by EBRD together with WB, ADB and other international partners, are envisioned to contribute significantly to the financial sustainability of Barki Tojik. Furthermore, upgrades and improvements of existing hydropower capacities increase its ability to generate revenues by improving its reliability and increasing its generation capacities. In combination with tariff reform, this will help to make Barki Tojik financially more sustainable and allow for better maintenance and further investments. The inclusion of long-term planning and climate change considerations guarantee the resilience and efficiency of the plant in the long run. Furthermore, the capacity building

components will further strengthen Barki Tojik in managing the effects of climate change and coordinating with other operators along the river. GCF financial exit will be achieved through the repayment of the loan, as described in the termsheet.

In this section, the accredited entity is expected to provide a brief description of the expected performance of the proposed project/programme against each of the Fund's six investment criteria. Activity-specific sub-criteria and indicative assessment factors, which can be found in the Fund's Investment Framework, should be addressed where relevant and applicable. This section should tie into any request for concessionality made in section B.2.

E.1. Impact Potential

Potential of the project/programme to contribute to the achievement of the Fund's objectives and result areas

E.1.1. Mitigation / adaptation impact potential

The impact of the Project is potentially large due to following reasons:

- Tajikistan is highly vulnerable to the impacts of climate change; increasing hydrological variability and more frequent and severe extreme events are predicted to affect the already ailing hydropower sector in the future;
- The hydropower sector as the country's main source of energy is central to the functioning of Tajikistan's economy and the livelihoods of its people (women and men). Increasing the energy supply is a priority in improving the livelihoods of people, including particularly vulnerable rural and low-income households. Female-headed households are also more likely to be poor than male-headed households and this disparity appears to be increasing over time (UNDP, 2012).
- Tajikistan's hydropower sector with its aged infrastructure has huge investment needs. With a constrained budget the most urgent upgrades would be implemented without taking climate change into account, locking in long-lived assets highly vulnerable to climate change.
- Additionally, hydropower is a source of clean and sustainable energy for Tajikistan and instrumental in avoiding investments in carbon-intense generation assets. It further has the potential to create opportunities to export energy to neighbouring countries in the long run, reducing CO2 emissions in the region and benefiting the development of the Tajik economy.

Implementing the Project with the support of the GCF can guarantee the development of the Tajik energy sector in order to strengthen the country's economic development in a climate resilient and sustainable way. The project creates additional urgently needed generation capacity and demonstrates that the impact of climate change in the long-term can be integrated and how management practices and infrastructure investments can be well adapted to projected future conditions, creating a strong enabling environment and a good example for replication.

E.1.2. Key impact potential indicator

	• *Expected total number of direct and indirect beneficiaries, disaggregated by gender (reduced vulnerability or increased resilience);* • *Number of beneficiaries relative to total population, disaggregated by gender (adaptation only)*	*Total*	The entire population of Sughd region, 2,400,000 will directly benefit from more secure and reliable electricity supply. This is based on the fact that Qairokkum HPP is the only major electricity generation asset in the northern Sughd region and thus responsible for secure and reliable supply to all households in the region. Through the dedicated capacity building of climate risk management in the country and with the upgrade of a major generation source in the

			national grid, the project further increases the reliability of the regional and national power supply, which will indirectly benefit circa 8,6 million. The latest UN ESA census estimates the share of women in the Tajik population to be 49.3%. It can thus be assumed that roughly 1.18 million women benefit directly and 4.2 million indirectly from the project.
		Percentage (%)	Approximately 30% of Tajikistan's population benefit directly from the power supplied by the plant. The effect on the national grid will indirectly benefit 100% of the population.
Other relevant indicators	• *Expected increase in the number of households in the Sughd region with access to climate resilient, sustainable energy* • *Expected increase in the number of SMEs in the Sughd region with access to climate resilient, sustainable energy* • *Expected increase in generation and use of climate information in decision-making*	• *Reduction of households relying on alternative (coal, wood) fuel sources by 50 %* • *Increase by 10%* • *Agreement between Barki Tojik and Tajik Hydromet on protocol on using climatological and hydro-meteorological information in hydropower operations*	

E.2. Paradigm Shift Potential

Degree to which the proposed activity can catalyse impact beyond a one-off project/programme investment

E.2.1. Potential for scaling up and replication (Provide a numerical multiple and supporting rationale)

The potential for **scalability** of this project is significant. The development of lasting technical capacity within Barki Tojik for assessing and managing climate change risks to hydropower operations, through the integration of best practices and skills, will open the way for the application of these approaches in the management of other hydropower facilities across Tajikistan and beyond. Given the enormous importance of hydropower to the Tajik economy, this will have a strong demonstration effect of how investments in climate resilience benefit the Tajik energy sector and the population more broadly. For example, these approaches will benefit the management of the **seven** other large HPPs that are owned and operated by Barki Tojik.

The project has significant potential for **replicability** as it is piloting a highly innovative approach to integrating climate resilience considerations into energy sector investment planning. This will have an extremely powerful demonstration impact that will illustrate how climate resilience can be optimised in a practical manner that delivers direct benefits to the Tajik energy sector and to

the population more broadly. It would also set a powerful example that could be repeated in subsequent hydropower upgrades in Tajikistan (e.g. the 3,000MW Nurek hydropower plant) and elsewhere, thus creating a replicable investment model for climate-resilient hydropower upgrades and significantly building the capacity of Tajik institutions to plan, organise and finance climate-resilient upgrades of hydropower plants. In Tajikistan and the neighbouring Kyrgyz Republic alone, the potential for replicating this approach could be as high as eightfold (in terms of annual generation) over the next ten years alone[5]. The other countries in Central Asia utilising hydropower offer at least the same amount for the application of a similar approach. The approach can be more widely applied. Within the EBRD's region of operations alone, the potential for further replication of climate resilient hydropower development is estimated to be twentyfold over the next ten years (across countries like Georgia, Armenia, Turkey and Morocco).

E.2.2. Potential for knowledge and learning

This project has the potential to effect a significant paradigm shift in climate resilience financing in Tajikistan and beyond. It will demonstrate how climate resilience – and the use of climate finance – can have a transformative impact on the design and management of critical infrastructure assets and introducing meaningful and practical climate resilience measures into the management of the energy sector more broadly. It will also demonstrate how an emerging economy such as Tajikistan can benefit from and adapt for its own needs cutting-edge climate resilience practices that are emerging from advanced OECD economies such as Canada and Australia.

The Project also offers a large potential for learning in several dimensions. The capacity building under Output 1 of the Project brings best international practice to the Tajik electricity sector, by twinning Barki Tojik with a leading hydropower operator from the OECD. This presents a substantial opportunity for the Tajik institutions to learn from and integrate leading international practices concerning climate change adaptation and to build capacity internally. The activities under the seconded Output address transboundary coordination of cascading hydropower plants. This has huge potential to improve operations in several countries and encourages cross-border and joint learning, coordinating operations, sharing information and data and developing capacities in climate risk management along the river system. Implementing the infrastructure upgrade offers further significant learning potential to all institutions involved. It will provide Barki Tojik with experience and capacity to manage a big infrastructure upgrade, which will certainly prove invaluable for replication projects in Tajikistan.

The Project will be guiding Barki Tojik in scaling up climate resilience measures in the hydropower sector in the future. This can also serve as an example for other countries, demonstrating the success of an integrated approach. The learning and knowledge creation process will be monitored and evaluated to ensure the success and better transferability of the approach. See Annex VII for an indicative monitoring and evaluation plan to oversee the process.

E.2.3. Contribution to the creation of an enabling environment

Building on on-going work the Project will help Tajikistan move towards current best available practices as those used in OECD countries where climate resilience is being mainstreamed into energy sector planning and investment, including hydropower operations. The transfer of skills and best practices will further build capacity and expertise in Barki Tojik and other key institutions in Tajikistan, embedding climate resilience in policy making, sector investment planning and the operations of Tajikistan's hydropower plants.

E.2.4. Contribution to regulatory framework and policies

[5] Estimations based on the assumption that 25 % of active hydropower assets require rehabilitation over the next decade.

The engagement of EBRD and other international financial institutions (IFIs) such as the World Bank and Asian Development Bank in the Tajik power sector is conditional on a set of milestones including adjustment of tariffs and the restructuring of Barki Tojik.These milestones include the following:

Implementation of new tariff methodology for Barki Tojik which eliminates cross subsidies among consumer categories (2017)

- Electricty tariffs increased by a minimum of 30% (Q4 2017)
- Tariffs reach cost recovery (2018)

Adjusted tariffs set incentives for more efficient energy consumption, reducing the demand load for the electricity sector and increasing its resilience. Tariff reform and restructuring also increase the financial sustainability of Barki Tojik's operations. More sustainable operations allow for improved long-term planning. This is a crucial building block enabling Barki Tojik and other Tajik institutions to fully take advantage of the knowledge and skill transfer and implement long-term, climate-responsive planning and operations of the energy sector.

E.3. Sustainable Development Potential

Wider benefits and priorities

E.3.1. Environmental, social and economic co-benefits, including gender-sensitive development impact

The project is rated 'B' under the EBRD's Environmental and Social Policy[6]. The project improves the reliability and quality of the electricity supply in Tajikistan and has the potential for multiple social and economic benefits for women as well as men well described in literature[7]. It also has wide-ranging environmental, co-benefits.

By addressing the safety of the dam, the Project will reduce the likelihood of environmental impacts such as flooding and land erosion. Furthermore, the following benchmarks are provided under the implementation of the Environmental and Social Action Plan (ESAP; see Annex V), improving environmental safety, reducing the impact on local aquatic life, which include several endangered species amongst which the Syr Darya Shovelnose is endemic, increasing health benefits to local inhabitants by reducing reliance on traditional fuels, and improving the overall approach to management of the plant.

Benchmarks included in the project are:

1. Development and implementation of environmental and social management system in line with ISO 14001 to improve company operational approaches
2. Installation of oil-free Kaplan turbines (only water used for turbine control to minimise environmental risk downstream)
3. Installation of low fish mortality turbine design to protect aquatic life
4. Real-time disclosure of flow and hydrological information in place to enable more integrated management of the resource through the cascade
5. Reduction of number of households in the Sughd region relying on coal and wood by 50 %

Regional integration is furthered by the project through planned disclosure of real-time flow and hydro-metrological data from the hydropower plant. This makes the operations of the hydropower plant more transparent for the public and can be beneficial for coordinating downstream plants and other activities.

[6] http://www.ebrd.com/who-we-are/our-values/environmental-and-social-policy.html

[7] Lipscomb, Molly, A. Mushfiq Mobarak, and Tania Barham. 2013. "Development Effects of Electrification: Evidence from the Topographic Placement of Hydropower Plants in Brazil." *American Economic Journal: Applied Economics*, 5(2): 200-231
Dinkelman, Taryn. 2011. "The Effects of Rural Electrification on Employment: New Evidence from South Africa." *American Economic Review*, 101(7): 3078-3108.

In addition to these environmental benefits, the project will also deliver wider social and economic co-benefits, including gender-sensitive development impacts. More reliable and climate-resilient access to electricity will provide strong co-benefits for gender-sensitive development and may contribute to better living conditions. Poor energy security, which is expected to be worsened as a result of climate change, has serious implications for economic activity, poverty and vulnerability. At present, approximately 70% of the Tajik population suffers from extensive electricity shortages during the winter. These are estimated at 2,700 GWh which is equivalent to a quarter of winter electricity demand. With demand expected to rise and without major investments in the near future, shortages are projected at 4,500 GWh in 2016, which would be close to one third of the electricity demand in winter. Electricity shortages in winter impose economic losses of approximately USD200 million per year, or 3% of GDP. According to the World Bank's Business Economic Environment Survey, the frequent cut-offs and the poor quality of electricity is considered the main obstacle to doing business in Tajikistan. The social impacts associated with chronic electricity shortages in winter are severe and include indoor air pollution from burning coal and wood in homes and health impacts from extreme winters – which is an impact that disproportionately affects women. Children are also often affected by a lack of night-time lighting, which can impair educational activities. The project will make a direct contribution towards addressing these needs.

E.4. Needs of the Recipient

Vulnerability and financing needs of the beneficiary country and population

E.4.1. Vulnerability of country and beneficiary groups (Adaptation only)

Energy insecurity is a persistent problem that hinders economic development and social inclusion. Closely linked with climate vulnerability, it poses a huge burden on the Tajik population and hinders the realisation of the economic and social potential. Increasing energy generation and distribution capacity is an important way of addressing energy vulnerability at the community-level. It further creates more economic opportunities in rural areas and benefits existing businesses through increased reliability, enabling better planning and more efficient production[8]. This is especially relevant since roughly 35 percent of the population in the Project area live below the poverty level (according to WB data for 2013) and are particularly economically vulnerable. Gender equality is an important dimension as well: energy vulnerability may have specific impacts on women, such as the increased use of low-grade fuels for cooking and heating which leads to health impacts, increased time having to spent on the collection of firewood, leading to opportunity costs, and fewer education/income generation opportunities due to lack of indoor lighting (UNDP 2012). According to EBRD's Life in Transition survey (a representative household survey), more than 3 in 10 households in Tajikistan are headed by women, further emphasising the importance of including the gender angle and considering the benefits for vulnerable parts of society. According to multiple studies[9], improved and more reliable access to electricity will have strong co-benefits for gender-sensitive development and contributes to better living conditions for vulnerable rural populations.

The vulnerability of Tajikistan's energy system to climate change is compounded by prolonged underinvestment, over-reliance on aging hydropower assets, policy failures and weak corporate governance. This situation has grave economic and social consequences. Most power generation facilities have been in operation well beyond their useful economic life. Upgrades are needed urgently to avoid the risk of major technical failure that would jeopardize the supply of electricity to all customers and cause enormous damage to Tajikistan's economy. Large parts of the population and the economy are already suffering from an unreliable power supply and from severe power outages during the winter season. The Tajik people suffer the social costs as well, including indoor air pollution from burning wood and coal in homes and health impacts from extreme winters, impacts with important gender considerations. According to the World Bank study[10] conducted in 2012 *household burning of solid fuels is a major health risk factor in Tajikistan and particularly affects women and children*. This project will help to alleviate this grave situation by contributing towards a more reliable and climate-resilient energy supply.

[8] Lipscomb, Molly, A. Mushfiq Mobarak, and Tania Barham. 2013. "Development Effects of Electrification: Evidence from the Topographic Placement of Hydropower Plants in Brazil." *American Economic Journal: Applied Economics*, 5(2): 200-231

[9] Dinkelman, Taryn. 2011. "The Effects of Rural Electrification on Employment: New Evidence from South Africa." *American Economic Review*, 101(7): 3078-3108.

[10] World Bank's Tajikistan Winter Energy Crisis study (2012)

Tajikistan is among the poorest countries in the world with some 40% of its population living below the poverty threshold. Tajikistan's abundant hydropower potential is essentially the only major natural resources that the country possesses, yet the poor state of its energy infrastructure, the high investment needs and the serious additional threats to energy security posed by climate change mean that Tajikistan's high energy potential is not being translated into improvements in living standards and poverty reduction for the population. The quality of energy supply is poor with frequent unplanned outages and high system losses.

About 70 per cent of the population currently suffers from blackouts during the winter, imposing direct costs in terms of (1) foregone revenue from economic activity; (2) additional costs due to damage to equipment and interruption of business processes; and (3) costs from household equipment damage. In addition to the economic burdens of an electricity system in crisis, there are difficult consequences for Tajikistan's households as well. The Tajik population experiences frequent and severe electricity shortages, especially in winter, when power supply falls short of demand. This has severe social and welfare implications taking into consideration cold and harsh winters. In rural areas this means that much of the population has very limited access to electricity supply at all, sometimes only one or two hours a day, especially in winter. Urban areas are affected differentially, as although the supply is less unreliable, the population does not have access to alternative energy sources such as firewood (as in rural areas) and most urban residential heating relies on electricity. This means that the urban poor suffer greatly during winter blackouts.

The situation creates grave social costs for the Tajik population, including indoor air pollution from being forced to burn low-grade fuels inside their homes during winter. Households (especially rural) often have no option but to warm their homes by burning solid fuels (wood and coal predominantly). As a result, the incidence of carbon monoxide poisoning due to indoor air pollution is high. The World Health Organization lists Tajikistan among the 20 worst affected countries for diseases resulting from indoor air pollution. Household burning of solid fuels is a major health risk factor in Tajikistan and particularly affects women and children. Staying warm becomes a preoccupation for families and overrides the risks of fire and poor indoor air quality. Gender is an important dimension as well, as energy vulnerability has specific impacts on women, such as the increased use of low-grade fuels for cooking and heating which leads to health impacts, increased time having to spent on the collection of firewood, leading to opportunity costs, and fewer education/income generation opportunities due to lack of indoor lighting at night. Furthermore, the increased use of firewood in rural areas as a result of the poor electricity supply contributes directly to deforestation, which in turn worsens soil erosion and leads to reduced agricultural productivity and sedimentation in rivers which increases flooding risks.

In response, the proposed Project will help to alleviate this grave situation by contributing towards a more reliable and climate-resilient energy supply. This will be achieved through increasing the generation capacity of Qairokkum HPP (the only major power generation facility in the Northern Sughd province) to 174 MW, which will address the problems caused by demand exceeding supply, as well as enabling the dam operators to anticipate and manage climatic and hydrological variability thus ensuring a more reliable energy supply, and developing an evidence-based framework for managing and delivery energy supplies to the population of Sughd province in a way that takes account of household and business needs. The improved and more reliable access to electricity will have strong co-benefits for gender-sensitive development. The development of the above evidence-based framework will include a gender component to ensure that women are enabled to equally benefit from the Project and that their specific needs and constraints are taken into consideration, along with those of other community views and are then fed in to the analysis.

Qairokkum HPP is the only large electricity generation facility in Sughd province, and is responsible for maintaining the power baseload in the Sughd sub-grid. As a result, the entire population and economy of Sughd province relies to a significant extent on the Qairokkum HPP for their electricity supply. Power imports from neighbouring Uzbekistan ended some years ago when the former Central Asia grid ceased to operate. Although a transmission line has now been built to connect Sughd to the southern districts of Tajikistan, this connection is intermittent and is especially unreliable during harsh winter weather as it runs through inhospitable, high-altitude terrain. Therefore, the improvements in the reliability, resilience and power generation capacity that will be achieved at Qairokkum HPP as a result of this Project will directly benefit the entire population of Sughd province. As stated above, all sections of the population are currently affected by power cuts (with the exception of essential public facilities on the priority 'red line' of the grid), especially during extreme weather events such as droughts and harsh winter conditions.

At the same time, the Project is aware of the need to enable Barki Tojik to understand better the energy security and climate

resilience needs of different segments of the population (including low-income and vulnerable groups) so that electricity access can be better delivered in a way that balances the needs of different groups of consumers, e.g. residential areas, industry etc. For that reason, Output 1 of the Project includes support for developing an evidence-based framework for energy sector policy-making and service provision, through a detailed assessment of energy usage in the Sughd province. The will consist of household and business surveys of energy use and climate vulnerability. These surveys will analyse the energy consumption behaviour of local residents and businesses and the way they cope with the impacts of climatic variability on energy availability and use. The results will inform a climate change and energy insecurity impact assessment, and will be complemented by an institutional review and technical assessment that will assess service characteristics and infrastructure provision. Inequalities in terms of climate vulnerability and energy security will be assessed in order to identify differentiate gender differences and address the needs of the most vulnerable sections of the population. The surveys will also be designed in a way that allows intra-household gender analysis of energy use and vulnerability as well as differentiated analysis of energy use by male- and female-led businesses). This work will provide an evidence base to shape the development of operational and planning responses to the impacts of seasonal/climatic variability on energy use and availability. There will also be public awareness campaign based on the findings of this work, in order to raise awareness of the link between climate resilience and energy security, including the need for demand-side measures and shifts in consumer behaviour. A better understanding of the impacts of climatic variability and energy availability on energy usage of vulnerable sections of the population can then build a basis for targeted responses.

As stated above, EBRD has conducted affordability and tariff analysis, so that the policy dialogue on electricity tariff reform that is being carried out by EBRD and other MDBs takes into account the income levels of the Tajik population and the consequent implications for the affordability of any electricity tariff increases. EBRD and other development partners are already supporting Barki Tojik and the Tajik authorities in developing a new tariff policy in line with the international practice, and to adopt measures such as improved metering and an automated billing system, which will enable improvements in payment collection and reduce losses.

During the Soviet era, the electricity and heating infrastructure of the then Tajik SSR was well maintained and funded by large subsidies as well as dependent on the Central Asian Power Grid. As a result, almost the entire population of the Sughd province enjoyed reliable electricity access, including the rural population. Since the collapse of the Soviet Union, Tajikistan's energy and heating infrastructure has deteriorated significantly. Rural communities endure poor and unreliable electricity supplies, sometimes limited to a few hours a day, and even urban settlements also suffer frequent power cuts, especially during harsh weather conditions. In winter times, staying warm becomes a priority for many low-income families. Not being able to rely on electric heating (or other sources of modern energy sources), forces low-income households to rely on basic and inefficient energy sources (e.g. wood, raw coal and traditional low-grade fuels such as dried cow dung briquettes). This affects both rural and urban communities. In rural areas, the reliance on traditional low-grade fuels such as firewood and cow dung briquettes contributes directly towards deforestation and soil erosion (i.e. manure being burned instead of being used to maintain soil fertility and structure). The use of such low-grade fuels for indoor heating and cooking also have severe human health implications due to indoor air pollution, which has an important gender dimension as women and girls and disproportionately affected. In urban areas, winter power cuts cause considerable distress to the entire population, who do not have access to rural coping strategies such as the use of firewood. The strengthening of the energy supply into the grid will improve the reliability of electricity provision and make electric heating a cleaner, healthier and cheaper alternative for heating. Therefore, one of the intended outcomes of the Project is to achieve a 50% reduction in the number of affected households using low-grade solid fuels through the provision of a more reliable and resilient electricity supply, as was the case during the Soviet era. This benchmark will be monitored through the programme of household and business surveys that is to be carried out under Output 1 of the Project.

As explained above, the entire population of Sughd province is currently affected by the unreliable electricity supply, and therefore the entire population of Sughd province will benefit from the modernisation of Qairokkum HPP and the more reliable and climate-resilient electricity supply that this will result in. Therefore, the entire population of the Sughd province (i.e. 2.4 million people or 30% of the total population of Tajikistan) will benefit from the Project's positive impact on the supply of electricity in the Sughd sub-grid directly. Furthermore, the capacity building in managing the climate risk to the Tajik hydropower sector under Output 1 and strengthened transboundary coordination under Output 2 of the Project are expected to improve the reliability of the electricity supply in the entire country. This will indirectly benefit the whole population of Tajikistan.

In addition, as stated above, one of the intended outcomes of the Project is to achieve a gradual reduction in the number of affected households using low-grade solid fuels through the provision of a more reliable and resilient electricity supply (the benchmarks are set at 30% and 50% throughout the project's lifespan), as was the case during the Soviet era. This benchmark will be monitored through the programme of household and business surveys that is to be carried out under Output 1 of the Project.

E.4.2. Financial, economic, social and institutional needs

Tajikistan is among the poorest countries in the world with some 40% of its population living below the poverty threshold. The energy sector plays a vital role in the economy with 98% of power produced by hydropower plants. The vulnerability of Tajikistan's energy system to climate has grave economic and social consequences. Large parts of the population and the economy already suffer from an unreliable power supply and from severe power outages during the winter season. This leads to further social costs (such as the health impacts of indoor air pollution by burning coal or wood, particularly affecting women and children). A reliable energy supply will help rural communities as well as relief local businesses of supply constraints. The financial sustainability of the Tajik energy sector is limited due to low tariffs and operational efficiency. The contribution of the GCF would help to mobilise additional loans to cover the full investment at affordable cost. In the context of broader energy sector reform, the Government of Tajikistan has requested the assistance of IFIs and donors to help with investments, formulation and implementation of policies and institutional reforms. This will improve the sector's financial sustainability, while also enabling the critical climate vulnerability of its operations to be addressed. The Project's capacity building component will further help Barki Tojik to improve the efficiency of its operations and to take long-term planning better into account. In the realm of the technical assistance Barki Tojik will receive further assistance in improving its operations and planning as well as project implementation capacities.

E.5. Country Ownership

Beneficiary country (ies) ownership of, and capacity to implement, a funded project or programme

E.5.1. Existence of a national climate strategy and coherence with existing plans and policies, including NAMAs, NAPAs and NAPs

Tajikistan has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 2008. It is a low-income country and is widely recognised as being highly vulnerable to climate change. The proposed Project is country-driven and supports the Government of Tajikistan's goal of ensuring that the population has access to safe, reliable and sustainable water supplies. It is consistent with the priorities of the National Development Strategy, the National Environment Action Plan, the National Action Plan on Climate Change Mitigation, the Intended Nationally Determined Contribution to the UNFCC and the Poverty Reduction Strategies. Furthermore, this activity complements the PPCR and the NPD in Tajikistan.

The Project will also make an important contribution towards improving Tajikistan's preparedness for climate change and disaster risk reduction, and is therefore focused on preventing adverse impacts on the population, rather than reaction. As well as making a direct contribution to improvements in the physical infrastructure that Tajikistan needs to become more resilient to climate change, it will also help to build the institutional capacity needed for this infrastructure to be managed and maintained in a sustainable manner, including financial sustainability.

E.5.2. Capacity of accredited entities and executing entities to deliver

The European Bank for Reconstruction and Development (EBRD) was established in 1991 to nurture a new private sector in a democratic environment. EBRD provides project financing for banks, industries, and businesses, both new ventures and investments in existing companies. It also works with publicly owned companies, to support privatization, restructuring state-owned firms and improvement of municipal services. The Bank uses its close relationship with governments in the region to promote policies that will

support the business environment. The Bank also has a strong environmental mandate and is committed to financing projects that are environmentally sound and sustainable. [11] [12]

The comparative advantage of the EBRD for the GCF lies in the Bank's experience and track record in market creation and transformation, and ensuring sustainability through private sector and municipal environmental infrastructure projects at the country and regional level in the countries of eastern and central Europe and central Asia. The EBRD recognized from the start the strategic importance of municipalities in the transition and in the financing of projects with significant environmental benefits in the district heating, water, and waste sectors. Over recent years EBRD has developed considerable expertise in the area of climate change mitigation and energy efficiency, for example through its Sustainable Energy Initiative. EBRD has also become active in the field of climate change adaptation and is interested in forming new partnerships with other agencies to address the challenges of climate change adaptation in the EBRD region. Finally, the EBRD recognises civil society as a key stakeholder and partner in achieving its mandate and has extensive experience in engaging with local and international CSOs[13].

The Bank has a strong, well-established presence in the ECA region and is therefore uniquely well placed to contribute to the challenge of climate change adaptation in the region. It has a network of around 200 professional staff located across the region to support project development, implementation and monitoring, together with sustained policy dialogue and business relationships with governments, local institutions, industry, banks, utilities and investors.

The EBRD currently operates in 37 countries and has at least one resident office within each of these. Some larger countries, such as Kazakhstan and Turkey, also have sub-regional offices to bring EBRD staff closer to the business needs. Regional offices are typically staffed by a mixture of international and national staff and provide an in-depth knowledge of the social, economic, and political conditions within the country and help to generate and implement new projects as well as monitor existing operations, and facilitate dialogue and business relationships with governments, local institutions, industry, banks, utilities, and investors.

E.5.3. Engagement with NDAs, civil society organizations and other relevant stakeholders

The process of engaging Tajik hydropower stakeholders began in 2009 in the realm of the development of Tajikistan's Strategic Programme for Climate Resilience, in which hydropower was identified as one of the priority areas of the country. In 2012 a workshop on climate resilience in the energy sector followed, bringing together over 40 national and international experts and decision makers. Barki Tojik and the Ministry of Energy & Water, together with a large number of other government agencies and civil society organisations were well represented and stressed the importance of the topic for the future of Tajikistan's energy sector. The workshop identified the needs and priorities of the energy sector with particular reference to climate resilience. This informed and helped shape the preparations for this project. The NDA has been personally highly committed in this area of work and has contributed to a shared vision across national authorities and EBRD of the significance of the topic and the potential of project-based interventions. The NDA fully supports this proposal to the GCF.

EBRD has also been closely collaborating with the PPCR Secretariat in Tajikistan, which engages a wide-reaching CSO network on questions of climate resilience. This has facilitated a continuous dialogue about the development of this project with a wide range of CSOs. Based on this extensive consultation process in preparation for the Project, also including the Environmental and Social Analysis, a Stakeholder Engagement Plan was developed, which set out how communities and other stakeholders within the projects' zone of influence will be consulted and involved in the development of the project. This will include a gender component to ensure that women are enabled to equally benefit from the Project and that their specific needs and constraints are taken into consideration, along with those of other community views and are then fed in to the analysis. Building on this, a workshop for continuous stakeholder consultation is to be held in January 2016 in Dushanbe. This will be a further opportunity to consult with CSO actors and include their input in the project and to inform a wider stakeholder base about the project's aims and broader climate resilience issues in the country.

[11] http://www.ebrd.com/strategic-gender-initiative.html
[12] http://www.ebrd.com/what-we-do/projects-and-sectors/economic-inclusion.html
[13] http://www.ebrd.com/who-we-are/civil-society-overview.html

These Stakeholder engagement activities will ensure that the views of local communities are adequately reflected and that the objectives and results of the project are communicated effectively to ensure local buy-in. Gender-sensitive disaster risk reduction, risk preparedness, risk response and contingency plans that respond to the specific needs and concerns of men and women, will be promoted; the adaptive capacities of local stakeholders will be developed. This will ensure that the Tajik hydropower sector will continue to benefit from sophisticated practices in dealing with dam safety and the growing challenges of climate change.

Transboundary context

Qairokkum HPP is located in the highly transboundary Syr Darya river basin, which is shared between four states, Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan. This situation is further complicated by the fact that these state have sometimes competing priorities for water use, for example the Kyrgyz Republic and Tajikistan prioritise energy generation whereas Kazakhstan and Uzbekistan especially prioritise irrigation. Central Asia's water and energy infrastructure was developed as an integrated system by the Soviet Union, with a coordinated approach to managing water and energy resources, and balancing priorities. For example, under this system the water-rich upstream countries (Kyrgyz Republic and Tajikistan) stored water during the winter in return for receiving winter energy imports from the downstream, fossil fuel-rich countries of Uzbekistan and Kazakhstan, and the upstream countries released water during the summer for irrigation in the downstream countries. This system broke down after the collapse of the Soviet Union, eventually leading to the disintegration of the Central Asian energy grid. Nevertheless, political and institutional efforts to maintain transboundary cooperation have persisted during this period despite certain political tensions, for example through the efforts the United Nations Economic Commission for Europe (UNECE), and the Scientific-Information Centre of the Interstate Coordination Water Commission of the Central Asia (SIC ICWC) based in Tashkent with branch offices in other Central Asian countries.

In the hydropower sector, transboundary cooperation between hydropower operators exists on a mainly working-level and sometimes informal basis. The dam operators on transboundary cascades (e.g. Syr Darya) all know each other from university times (they almost all trained together at the former technical university in Tashkent) and they share information about dam management and river flows with each other on an informal basis, often using mobile phones etc. At the same time, there are new emerging opportunities to strengthen the institutional basis for transboundary cooperation in the longer term. For example, both the Kyrgyz Republic and Tajikistan are now covered by the CIF's Pilot Programme for Climate Resilience (PPCR) and EBRD is actively working to coordinate these countries' respective Strategic Programmes for Climate Resilience (SPCRs) to facilitate transboundary coordination.

The Project will take a very practical and working level approach to strengthening transboundary cooperation in the hydropower sector that will complement and support longer-term improvements at the institutional and political levels. This will entail developing fora and mechanisms for encouraging improved transboundary cooperation on hydropower cascade management and climate risk management. It will strengthen assessments and exchange on climate risk management in hydropower operations between Tajikistan and neighbouring Central Asia countries, and to develop operational links on climate information exchange between hydropower operators on the Syr Darya cascade (e.g. Toktogul HPP (Kyrgyz Republic) and Shadara HPP (Kazakhstan). This will involve providing training activities to operators Tajikistan and its neighbouring countries, taking advantage of the fact that EBRD is investing in numerous hydropower facilities on the Syr Darya (e.g. Qairokkum HPP, Shardara HPP) and the fact that both Tajikistan and the Kyrgyz Republic are included under the PPCR, which will provide a strong framework for cooperation on climate resilience. In this way, this activity will aim to put in place a protocol for sharing relevant climate and hydro-meteorological data between Central Asian countries. The specific activities will include the following:

- The identification or establishment of an appropriate forum for transboundary co-operation where the benefits can be understood and shared by both upstream and downstream countries. This will involve setting out:
- Fora/mechanisms that are already in place (e.g. SIC/ICWC, CAMP4ASB);
- Benefits for upstream & downstream countries of working in collaboration on cascade management; and
- Existing models of successful coordination elsewhere in the world.

- Exploring transboundary collaboration opportunities through the use of public domain datasets. Where sharing of data across countries are problematic, public domain datasets can be an effective way of overcoming such barriers. The more public datasets can be used, the less friction there is, as everyone is drawing from a common source and doesn't have to rely on each other.
- Professional development on technical climate risk management issues for young/mid-career professionals from Barki Tojik, Tajik Hydromet and their equivalents in neighbouring Central Asian countries. This would take the form of specially developed training activities (e.g. summer schools etc.), potentially in coordination with local technical and/or academic institutions, such as the University of Central Asia (under consideration).

Downstream Irrigation for Agriculture

Hydropower dams in Central Asia are almost always built for the dual purposes of energy generation and irrigation, and this is also true of the dams on the Syr Darya river including Qairokkum. For this reason, these dams operate under two seasonal regimes: i) a winter regime that optimises power generation while storing enough water for irrigation during the following spring/summer, and ii) a summer regime that prioritises the release of water for downstream irrigation. The severe electricity supply and climate resilience challenges described above are primarily a problem under the winter regime, and it is the winter season that poses the greatest difficulties concerning the energy security and climate resilience of the population. During the summer season, the electricity demand of the population is much lower as there is no demand for electricity for heating (which is very high in winter) and less demand for electricity for lighting. In summer the water is spilled instead of being used to generate power due to limited market opportunities to export electricity and as the reservoir capacity in the system is inadequate to allow storage of the spilled water for later use during critical winter months. This means that, during the summer, water can be released though the dam for downstream irrigation without compromising the energy security of the population.

Furthermore, there are no reported deficits of water during the spring/summer irrigation season and therefore no consequent risks to agricultural production. Agriculture is a vital part of the Tajik economy and agricultural irrigation has always been the main water consumer in the region. In the coordination between competing water usages, agriculture has thus priority. It is expected that the Project will deliver further improvements in the optimisation and balancing of competing water uses in the face of a changing and more variable climate. Changing precipitation patterns and increased hydrological variability are making planning and coordination more difficult. Hence, among the main aims of the project is to build a better evidence base, built on observed and forecasted data, for managing river flows and operating hydropower plants. Improved understanding of the river hydrology, expected inflows and seasonal and short-term forecasts, will enable dam operators to better manage water releases for irrigation and coordinate more efficiently between irrigation needs and power generation.

At the same time, EBRD recognises that the most significant threat to agricultural irrigation is the extremely inefficient use of water in downstream irrigation systems, both in Tajikistan itself and in other downstream countries such as Uzbekistan. Although this topic is beyond the scope of this Project, EBRD is making significant efforts to improve this situation by promoting the uptake of more efficient irrigation techniques (e.g. drip and sprinkler irrigation) through the CLIMADAPT Tajikistan Climate Resilience Financing Facility, which is being financed by EBRD and the PPCR. It is anticipated that a larger extension of CLIMADAPT could in due course be launched with the support of the GCF EBRD SEFF programme (approved by the GCF Board in October 2016), which could support further improvements in irrigation water use efficiency.

E.6. Efficiency and Effectiveness

Economic and, if appropriate, financial soundness of the project/programme

E.6.1. Cost-effectiveness and efficiency

Due to prolonged underinvestment, aging infrastructure and the severe impact of climate change, the Tajik energy sector has large investment needs. The grant portion of the GCF contribution will allow important dam safety components to be financed that are critical in dealing with the increased frequency and magnitude of extreme weather events due to climate change. The concessional loan provided by the GCF mobilises two IFI loans and ensures the affordability of the upgrade for the budget constrained Tajik energy operator. The blended loans provide the volume necessary for addressing climate resilience at a sizable scale. They remain affordable for the country and at the same time provide incentive to improve the sector's financial sustainability through tariff reform.

E.6.2. Co-financing, leveraging and mobilized long-term investments

The Project will enable the GCF to leverage a significant amount of co-financing, approximately 160% of the amount of the requested GCF finance in Phase II of the project only. The volume of funds of the entire project adds approximately 300% to the GCF's contribution. The ratio of GCF finance to co-financing is 1:1.6 for Phase 2 alone, and 1:3.12 for the project overall. The impact of the GCF's contribution has goes beyond supporting crucial infrastructure investment needs and mobilises technical assistance programmes with a transformative impact on the Tajik energy sector, integrating climate resilience measures in operations as well as investment planning and design. Consequently, USD 50 million of GCF finance leverages at least a further USD 81 million additional co-financing from EBRD and EIB in Phase II of the project.

This Project will elaborate a highly innovative approach to integrating climate resilience considerations into energy sector investment planning. This will have an extremely powerful demonstration impact that will illustrate how climate resilience can be optimised in a practical manner that delivers direct benefits to the Tajik energy sector and to the population more broadly. It would also set a powerful example that could be repeated in subsequent hydropower upgrades in Tajikistan (e.g. the 3,000MW Nurek hydropower plant) and elsewhere, thus creating a replicable investment model for climate-resilient hydropower upgrades and significantly building the capacity of Tajik institutions to plan, organise and finance climate-resilient upgrades of hydropower plants.

Furthermore, Tajik businesses rely heavily upon electricity for their manufacturing operations, including the processing of cotton and other agricultural produce. The commercial sector is also highly dependent on electricity for heat and lighting, as well as industrial processes. However, the quality of supply is poor with frequent unplanned outages. About 70% of the population currently suffers from blackouts during the winter, imposing direct costs in terms of foregone revenue from economic activity, and additional costs due to damage to equipment and interruption of business processes. These shortages, estimated at about 2,700 GWh, about a quarter of winter electricity demand, impose economic losses estimated at over USD 200 million or 3% of GDP. The unreliable electricity supply has a negative impact on the development of business opportunities. For example, the World Bank's Business Economic Environment Survey of 2008 reported that 80% of firms cited power supply reliability as a major obstacle to doing business in Tajikistan. A reliable power supply is critical for Tajikistan's economy and development. Without reliable, affordable electricity throughout the year, Tajikistan's businesses cannot invest, operate and create jobs. Therefore, the proposed project will have a significant impact on the ability of Tajik businesses to grow and generate jobs, livelihoods and revenues, while using clean, sustainable energy that is resilient to the projected impacts of climate change.

E.6.3. Financial viability

Economic and financial rate of return

Through the analysis of different design proposals the economically most beneficial option was identified (taking into account climatic projections for the lifespan of the asset). The Economic Internal Rate of Return (EIRR) was calculated as 21.71% and the Financial Internal Rate of Return (FIRR) as 6.88% in the feasibility study (the full financial and economic analysis is included in chapter 15 the feasibility study in Annex II).

Despite the clear financial and economic benefits of the project, affordability constraints hinder the realisation of the project, while debt sustainability constraints reduce the ability of the Government to support Barki Tojik in carrying out this important project. Furthermore, Barki Tojik is at present faced with huge investment needs across the network of aging infrastructure. Electricity tariffs are very low in Tajikistan and tariff increases, while necessary, need to be implemented in a way that is sensitive to the severe affordability constraints faced by the population, and thus may not allow for a much needed rehabilitation. GCF grant resources are therefore essential making the Project affordable to Barki Tojik and the Republic of Tajikistan, especially in light of the IMF recommendations with regards to debt sustainability observed by the Government.

The proposed financial structure for the project provides the least concessionality needed to make the proposal viable. The level of concessionality in this project needs to be very carefully balanced in order to allow the project to be affordable to the Government of Tajikistan and Barki Tojik (and the Tajik population through their electricity bills) taking into consideration income/poverty levels, and to allow it to introduce innovative climate resilience features that incur additional costs, while providing appropriate incentives for Barki Tojik to continue gradually increasing tariffs (as explained in section D2) in order to ensure the long-term financial sustainability of the investment and indeed the entire energy sector.

Financial viability in the long run beyond the Fund intervention

In the scope of EBRD's involvement in the Tajik energy sector, the Bank is also involved in policy dialogue with the Tajik government supporting energy tariff reform. Tariff reform is envisioned to contribute significantly to the financial sustainability of the Tajik energy sector. Upgrades and improvements of existing hydropower capacities increase its ability to generate revenues by improving its reliability and increasing its generation capacities. In combination with tariff reform, this will help to make Barki Tojik financially more sustainable and allow for better maintenance and further investments. The inclusion of long-term planning and climate change considerations shall ensure the resilience and efficiency in the long run. Furthermore, the capacity building components will strengthen Barki Tojik's operations and efficiency.

Application of IMF guidance on sovereign debt sustainability

The IMF is not involved in review or approval of individual projects. Under Article IV of the IMF's Articles of Agreement, the IMF has a mandate to exercise surveillance over the economic, financial and exchange rate policies of its members in order to ensure the effective operation of international monetary system. The IMF's appraisal of such policies involves a comprehensive analysis of the general economic situation and policy strategy of each member country. The IMF holds bilateral discussions with members, usually every year. A staff team visits the country, collects economic and financial information, and discusses with officials the country's economic developments and policies. On return to headquarters, IMF staff prepares a report, which forms the basis for discussion by the Executive Board. At the conclusion of the discussion, the Managing Director, as Chairman of the Board, summarizes the views of Executive Directors, and this summary is transmitted to the country's authorities. According to the recent IMF briefing, IMF and Tajikistan are working to come to closure on an IMF-supported program in Tajikistan, as soon as the policy framework can be defined that would help to address the challenges that Tajikistan faces.

The Government observes IMF recommendations including the ones on the debt sustainability. The indicative 40 per cent threshold has been introduced with regards to the external public debt to GDP ratio (35.9 per cent actual in July 2016). Financing has been targeted on highly concessional terms with a minimum 35 per cent "grant element" as per IMF recommendations (where the "grant element" accounts for pure grant funding as well as the level of lending concessionality).

The proposed financial structure of the project addresses both the criteria of the concessionality of financing and of the impact on

the external public debt to GDP as described in the paragraph above. The proposed financial structure is in line with the debt sustainability requirements adhered to by the Republic of Tajikistan as (i) it provides for the "grant element" as per the IMF calculator above the minimum required 35 per cent and (ii) in view of the GCF finance, it offers the least possible impact on the level of the already high external public debt to GDP.

Debt sustainability constraints faced by Barki Tojik

Qairokkum HPP is not a separate legal entity, but one of the power plants owned and operated by Barki Tojik. Barki Tojik is a vertically integrated power utility, responsible for generation, transmission and distribution of electricity. Qairokkum HPP does not have a separate tariff; the final end-user tariff, on top of the generation related costs, needs to also account for transmission and distribution as well as dispatch cost.

Under the current challenging macro-economic conditions (and affordability considerations that constrain tariff increases), Barki Tojik is facing financial and commercial difficulties with domestic tariffs not sufficient to cover full operating costs and set-aside financing costs, and is highly leveraged. Barki Tojik also faces significant investment needs related to required rehabilitation across the network of the aging infrastructure, and heavily relies on the Government support.

This Project will entail the implementation of a capacity increase from 126 MW to 174 MW which will result in an additional revenue stream and contribute positively to the operations of both Qairokkum HPP and Barki Tojik. However, this capacity increase alone would not allow Barki Tojik to reach break- even, advocating the need for a highly concessional financing. Other policy actions implemented and under consideration shall result in better operational and financing standing of Barki Tojik and the entire sector in longer term as explained in section C5.

Barki Tojik's debt is mostly foreign currency denominated (while revenue is mostly TJS denominated), exposing Barki Tojik to the foreign exchange risk. The debt burden and the foreign exchange risk passed on to Barki Tojik call for a significant share of the grant and concessional loan financing in hydropower rehabilitation projects to make such investments affordable to Barki Tojik and the Government, as the current repayment capacity of Barki Tojik is heavily relied on the Government support. The proposed financing structure addresses significant debt sustainability constraints faced by Barki Tojik via the sovereign loan and the level of concessionality offered.

Affordability constraints

The latest electricity tariff for population in Tajikistan was set at c. TJS 0.1465 per kWh from November 2016. Even the latest increased tariff (TJS 0.1465 per kWh vs TJS 0.1262 per kWh) would not allow full operating cost recovery, set aside financing of required rehabilitation.

An average income household throughout the year is expected to allocate between 7.9% and 9% of its disposable income on electricity services throughout the period considered (2016-2019). For the households belonging to the lowest income decile, on average their share of income spent on electricity is expected to be close to the 10% affordability threshold through the period considered and slightly above in 2016 at 10.5%. If there is no grant co-financing and the full rehabilitation costs for the hydro power plants are passed on to the consumers, there would be further increases in tariffs which could cause affordability concerns for poorest households. Summing up, the analysis indicates that the affordability ratio for the lowest income households is close to the threshold. If the capital costs of the project are fully passed on to the consumers, the affordability concerns for the lowest income households are likely to increase. Therefore, though the importance of the project is highly recognised by all stakeholders involved, the project could have been rejected.

The tariff for water supply pumps and pumping stations is currently heavily subsidised with the current tariff for water companies at TJS 0.03 per kWh during the summer season. According to the World Bank analysis[14], if Tajik electricity prices were increased to

[14] Tajikistan's Winter Energy Crisis:Electricity Supply and Demand Alternatives November, 2012

cover the cost of new supply, however gradually, they would impose huge strains on the budgets of Tajik households and other electricity users, who would in turn react by decreasing their use of electricity at considerable economic and social costs.

The proposed financial structure for the project has been developed to account for affordability constraints outlined and offers an appropriate level of concessionality while providing appropriate incentives to continue gradually increasing tariffs in order to ensure the long-term financial sustainability of the investment and indeed the entire energy sector. The work on the new tariff policy is on-going, with the first priority being the need to address operating cost recovery. The savings of the added concessionality will thus diminish the burden of the required tariff increase and will thus be effectively passed on to the users.

E.6.4. Application of best practices

The Project will bring best international practices as well as well-adjusted technologies to the Tajik energy sector. Building on the experience of a leading international hydropower operator, Barki Tojik will benefit from skills and knowledge transfer regarding the management and operations of hydropower plants in the light of predicted changing climatic conditions. This includes site-specific and gender-sensitive assessments of climate risks, corresponding dam safety measures, improved utilisation of climate and hydrological data and special staff trainings. The physical upgrade of the hydropower plant was developed through an extensive programme of research, data gathering and in-depth analysis, building on climate projections and selecting the best suitable and economically feasible technological option.

E.6.5. Key efficiency and effectiveness indicators	
	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 only)
	The GCF's contribution will leverage an additional US$ 81,000,000 (160%) for Phase II of the project. The GCF's funding enables with this the completion of the two-phased project, leveraging in total US$ 158,000,000 (or 300% of its own resources). The project is funded entirely with public resources.

F.1. Economic and Financial Analysis

Economic and Financial Analysis of the Project

Considering the socioeconomic benefits of the Project, the economic analysis of the rehabilitation project gave positive results for all scenarios and technical options, expressed in an Economic Net Present Values of USD112.8 million for selected option and an Economic Internal Rate of Return (EIRR) of 21.71%. The financial analysis resulted in a Financial Internal Rate of Return (FIRR) of 6.88% and a Net Present Value of USD 11.6 million for the selected design.

Despite the clear financial and economic benefits of the project, affordability constraints hinder the realisation of the project, while the debt sustainability constraints reduce the ability of the Government to support Barki Tojik in carrying out this important project. Furthermore, Barki Tojik is at present faced with huge investment needs across the network of aging infrastructure. Electricity tariffs are very low in Tajikistan and tariff increases, while necessary, need to be implemented in a way that is sensitive to the severe affordability constraints faced by the population, and thus may not allow for a much needed rehabilitation. The GCF's concessional loan will ensure improved debt sustainability and the affordability of essential investment in revenue generating components. Grant resources are also essential for the implementation of non-revenue generating components with significant public good externalities, such as ensuring dam safety in the face long-term climate change impacts.

The financial analysis is based on the following assumptions:

Revenues: The average volume of production output to be achieved after the implementation has been estimated based on the technological parameters selected for the project. Simulations have been developed considering hydrological scenarios for the next decades (see benefits described in part 1). Out of the number of simulated production values for each individual year of the projection period an average value of production output was calculated for both the project case and the Baseline Scenario. The average annual production volume to be achieved after full implementation of the investment measures is calculated at the average value of 856 GWh. The cash flows resulting from this average production level must be considered average values as well. Actual values will fluctuate according to hydrological levels, examples of which are provided in the hydrological scenarios. For the projections of the refurbishment project, the production volume is linearly increased from the estimated present level of output to be still achieved by the plant in its present form at 700 GWh, up until the 6th new turbine is installed. In the Baseline Scenario the estimated present day value of 700 GWh is assumed to gradually reduce to zero in the sequence of turbines taken out of service. The electricity production is sold at a multitude of tariffs to the various categories of consumers. The presently applicable power tariffs are officially decreed in a tariff structure (according to „Price List No. 09-01-2012"). In order to arrive at a realistic projection of prices for the output of Qairokkum, the average of the total revenues billed by Barki Tojik in the Sughd Region for the electricity supplied in the area in 2012 were assessed. The result of this analysis is a value of 9.65 Dirham/kWh. After application of inflation the starting value in 2015 for the analysis results as 11.76 Dirhams/kWh In the projections this value is subsequently increased at the projected CPI.

Cost: Based on the data received for the various cost categories and production figures in the respective years, variable cost have been determined after consideration of inflation for basic materials and spare parts 0.85 TJS/kWh (including metal parts, oils and other supplies), operating maintenance of fixed assets and equipment 2.48 TJS/kWh. These rates for variable cost have been increased at the projected inflation rates and multiplied with the annual electricity production. For outsourced services an initial value of 1.87 Mio. TJS has been estimated, which is also subsequently increased at the projected CPI. The own energy consumption of the power plant is estimated at 1% and has been valued at the specific production cost of the plant. In recent years the total staff has been kept at almost 120 employees. For the future operation this number is estimated to be 112. The average salary per employee is topped up by a number of additional items including: Bonus for success indicators (50 % monthly salary), payment for work on holidays and weekends, vacation payments, payment for overtime hours, working in more than one position, increased working scope, increased servicing area, for harmful working conditions, work during night

shift, for none fixed working hours of drivers, for high professional skills, for skill level and personal allowances. This amount is increased at the projected rates of domestic wage growth. In addition to the salaries and allowances, social charges are paid at a rate of 25% of direct payments. Administrative costs are estimated at an initial value of 4.4 Mio. TJS and includes royalties, drinking water, travel and transport expenses, communication costs, bank and insurance services, taxes (on transport, property and land),other public charges (State Committee for standardization and Metrology, State Technical Supervision), fire protection and guard services, health and environmental measures. For the calculation of the long term Levelized Unit Costs (LUC) the direct costs (materials, staff and energy), sales, general and administration costs, interest expenses as well as investment costs have been considered arriving at LUC 1.34 EUR-cent/kWh.

All given assumptions and estimates have been applied in the elaboration of projected financial statements for the HPP in Qairokkum considering the refurbishment project. The projections have been carried for a period of 20 years, i.e. a project horizon up to the year 2034 has been used for the calculation of investment indicators. However, for the purpose of a presentable format the following Tables only show the period up to 2030, thus including the period of the EBRD loan. The following assumptions have also been applied in the projections of the financial statements: Corporate tax rate 15.0%, current assets on sales 35.0%, current liabilities on sales 45.0%.

For the economic analysis, the following factors were additionally included:

Starting from the cash flow analysis of the financial evaluation, the socio economic analysis is to appraise the project's contribution to the economic welfare of the country. It thus takes the perspective of the society as a whole rather than only for the owner of the project. The performance of the investment as measured through financial project IRR is extended through the definition of a number of correction factors, which are to cover the project's impact on the national economy.

The corrective measures undertaken to record adaptations to the quantitative framework of the analysis are organized in two phases. In a first phase financial cash flows are corrected for fiscal transfer payments, which are to be applied differently from a national perspective. A further adaptation towards a socio-economic perspective is implemented in a second phase dealing with externalities (external costs and benefits) resulting from the project. This approach follows standard practices for economic project evaluation in the format of Cost Benefit Analyses.

Fiscal corrections: This measure aims at adapting inflows and outflows (prices and costs) for tax effects, as these represent transfer payments and hence would represent a distortion of the effect to the national economy. The time series of FCFs used for the calculation of the incremental (Financial)IRR are thus corrected for corporate tax.

Externalities: Benefits from personnel employed for the implementation: This measure is to compensate for outflows which do not occur in a socio-economic sense, i.e. which are actually to the benefit of some part of the national society. Such an external benefit is found with the project in question in employment during construction, which represents value flows which are earned by households in the country and thus remain with the society. These amounts are hence considered in the socio-economic evaluation as external benefits.

Willingness To Pay (WTP): As electricity tariffs are kept low in Tajikistan, while load shedding is common feature suppressing demand especially during winter, an approach was chosen to compare the above regulated tariff to a market value, which people are willing to pay for electricity. The Willingness to pay (WTP) in this context is defined as the maximum amount consumers are willing to pay for electricity. An indicative analysis in this regard has been carried out for a study of the World Bank. The study provides an estimate of the value of unserved demand as well as various electricity supply expansion programs in Tajikistan. The development of electricity tariffs is one of the key economic variables having an impact on the evaluation of project variants. The World Bank study arrives at a weighted average value of Tajik WTP of 7 cents/kWh, which is proposed to be gradually reached by 2025 from the present less than 3 cents/kWh. WTP levels surpassing the assumed tariffs have been added as additional benefits to be gained by the project scenarios. Benefits resulting from Willingness To Pay considerations

have been applied accordingly in the detailed analysis of the selected project option.

Additionally benefits in terms of CO2 emission reduction have been assessed: Descriptions and an assessment of CO2 emission reductions are provided in the full study and have been applied in the economic analysis.

Both fiscal corrections and externalities corrections are entered into a comprehensive analysis of the aspects described, so as to arrive at indicators measuring the long term effect of the project in a socio-economic perspective, the Economic Internal Rate of Return (EIRR) and the Economic Net Present Value (ENPV).

For the detailed economic and financial analysis see chapters 15 in Annex II.

Barki Tojik

Qairokkum HPP is not a separate legal entity, but one of the power plants owned and operated by Barki Tojik. Barki Tojik is a vertically integrated power utility, responsible for generation, transmission and distribution of electricity. Qairokkum HPP does not have a separate tariff; the final end-user tariff, on top of the generation related costs, needs to also account for transmission and distribution as well as dispatch cost.

Under the current challenging macro-economic conditions, Barki Tojik is facing financial and commercial difficulties. Despite the latest tariff increases, domestic tariffs do not suffice to cover full operating cost. Barki Tojik also faces significant investment needs related to required rehabilitation across the network of the aging infrastructure, and heavily relies on the Government support.

The Qairokkum HPP rehabilitation project envisions implementation of a capacity increase from 126 MW to 174 MW which would result in an additional revenue stream and contribute positively to the operations of both Qairokkum HPP and Barki Tojik. However, this capacity increase alone would not allow Barki Tojik to reach break-even without other policy actions, advocating the need for a highly concessional financing. Other policy actions implemented and under consideration shall result in better operational and financing standing of Barki Tojik in longer term as explained in section C5.

Barki Tojik's debt is mostly foreign currency denominated (while revenue is mostly TJS denominated), exposing Barki Tojik to the foreign exchange risk. Tajik Somoni depreciated by c. 60% in recent years (calculated as TJS/USD 7.86 current exchange rate vs. 4.9 TJS/USD 2014 average). The debt burden and the foreign exchange risk passed on to Barki Tojik call for a high share of the grant financing in the hydro power rehabilitation projects to make these projects the most affordable to the Government. The proposed financing structure addresses significant debt sustainability constraints via the sovereign loan and the level of concessionality offered.

Affordability analysis of residential electricity tariffs

The below analysis presents projections on the affordability of electricity services in Tajikistan according to an affordability model developed by the Bank.

The key variables and assumptions are summarised below:

- The household income figures are based on "Tajikistan Food Security and Poverty Survey", No 3, 2015 and "Social and Economic Conditions of Tajikistan during January-December 2015". The source of the data is the Agency on Statistics under President of the Republic of Tajikistan. The household income projections are derived from the consumer prices and real GDP growth rates as provided in the EBRD's forecast of macroeconomic indicators.
- The latest electricity tariff for population in Tajikistan was set at c. TJS 0.1465 per kWh from November 2016. Even the latest increased tariff (TJS 0.1465 per kWh vs TJS 0.1262 per kWh) does not allow full operating cost recovery (set aside financing of required rehabilitation). The tariffs are assumed to grow further, at least by inflation, in 2017-2018, which,

accompanied by higher margin existing export sales, should allow Barki Tojik to reach operating cost recovery level in 2018.

- Household average electricity consumption is estimated at 625kWh per household per month and 500kWh per household for the lower income households.
- An affordability limit of 10% of household expenditure on electricity services is considered.

Results: affordability of electricity annual average (in TJS), in per cent of household income

	2016	2017	2018	2019
average household	9.0%	8.4%	8.1%	7.9%
1st decile (lowest)	10.5%	9.8%	9.5%	9.2%

According to the model, an average income household on average throughout the year is expected to allocate between 7.9% and 9% of its disposable income on electricity services throughout the period considered.

For the households belonging to the lowest income decile, on average their share of income spent on electricity is expected to be close to the 10% affordability threshold through the period considered and slightly above in 2016 at 10.5 per cent.

If there is no grant co-financing and the full rehabilitation costs for the hydro power plants are passed on to the consumers, there would be further increases in tariffs which could cause affordability concerns for poorest households.

Summing up, the analysis indicates that electricity services remain affordable for an average household in Tajikistan based on the tariff structure projected. However, the affordability ratio for the lowest income households is close to the threshold. If the capital costs of the project are fully passed on to the consumers, the affordability concerns for the lowest income households are likely to increase.

F.2. Technical Evaluation

The structure and outputs of this proposed Project have been carefully developed based on detailed technical studies and extensive consultations with stakeholders in Tajikistan. The technical assistance and policy dialogue activities set out in Output 1 and Output 2 were designed based on the findings of a major stakeholder workshop on climate resilience in the energy sector that was organised by EBRD and Barki Tojik in March 2012.

Output 3 was developed based on comprehensive analysis of nine detailed climate scenarios that were used to identify the most suitable and appropriate solution regarding the type and number of turbines for the rehabilitation of the hydropower plant. Three different technical scenarios have been developed and studied during the pre-feasibility stage. One is the replacement of all six turbines with new ones of the same type but an increased total rated capacity of 170 MW. The second scenario additionally considers the construction of a second power house with a seventh horizontal Kaplan turbine. The third scenario would only replace four or five out of six turbines and run the remaining ones as long as they last without replacing them once they are finished. The numerical simulations of all hydrologic scenarios in combination with all three technical scenarios where run over a period of 60 years, starting in 2015. The reservoir operation has remained unchanged which means that the reservoir is kept at its full level until the end of May followed by an irrigation regime until the middle of September before refilling the reservoir until the end of the year. The mean annual energy generation over the entire simulation period is between 450 and 1100 GWh per year, depending on the combination of climatic-hydrological and technical scenario. Based on those results, including a comparative financial analysis and following the discussions with the client it was decided to further pursue the option of 6 new vertical Kaplan turbines to be custom fit into the existing power house. This requires only minor

adaptations of the structure.

The technical evaluation included an in-depth assessment of hydrology and climate change impacts:

The hydrological and climate change part of this study focused on four key aspects: The simulation of future inflows, the estimation of a Probable Maximum Flood (PMF), an assessment of reservoir sedimentation, and finally a review of the assumptions regarding climate change factors by a climate change specialist. For the projection of future water availability for power generation the Consultant could build on the work done under PPCR project A4 "Improving the Climate Resilience of Tajikistan's Hydropower Sector" (Wilby et al., 2012). The simulations were based on 9 combinations of 3 climate scenarios and 3 different hydrological models. One of the models (WBM) produces outlier results for the "hot-dry" and "warm-wet" climate scenarios, which are rather extreme in their assumptions regarding temperature and precipitation changes. These outlier series were included in the power generation simulations but are considered to be very unlikely, and should be given little weight in decision making regarding technical choices and economic viability. All other scenario simulations produce results within a narrow range of ±3%. The predicted average flows for 2015-2074 would be close to the average inflow of the period 1992 and 2010, with aslight increasing trend (simulated flows for 2045-2074 are 6.5% higher, on average, than for the period 2015-2044). The flood simulations indicate that the currently existing discharge capacity and spillway structures are not adequate to safely cope with a Probable Maximum Flood (PMF). Several PMF scenarios were studied with different assumptions regarding the relative contribution of catchment areas upstream and downstream of Toktogul reservoir. Estimated peak flows were combined with the hydrograph shape of a historical flood (1966) and a hydraulic model was developed to transfer the upstream flood hydrographs to Qairokkum, including the simulation of the effect of Qairokkum reservoir itself. The resulting flood waves had a duration of more than 6 weeks and a peak inflow into Qairokkum reservoir between 6400 and 8800 m^3/s, resulting in maximum water levels between 349.5 and 351.3 m (with all spillway gates opened), clearly beyond the maximum flood level of 348.35 m. The attenuating effect of the upstream reservoirs, Toktogul ad Andizhan, is smaller than expected, mainly because the critical PMF is caused by an extreme snowmelt event with a duration of several weeks. Assuming that Qairokkum and the upstream reservoirs are at full supply level at the beginning of the flood, the available retention volume is quite limited and quickly fills up if the considered flood has a large volume. Flood volume is therefore a very critical assumption, and further studies (requiring additional data from Kyrgyzstan) would be desirable to enhance the reliability of the assumptions made. However, in any case it is strongly recommended to further investigate the need for additional spillway capacities based on an analysis including not only Toktogul but also the Naryn Cascade and its spilling capacities. This is justified not only by the above simulation results, but also by the vulnerability of the current system of gated spillways to operational problems as well as by the additional uncertainty introduced by climate change. The impact of climate change on extreme floods is difficult to quantify but according to the results of a recent ADB Project extreme floods are expected to increase. Sedimentation is not a significant problem for the future operation of Qairokkum reservoir. From construction to the most recent bathymetric survey (in 2009) Qairokkum reservoir has lost about 25% of its original volume due to sedimentation, but most of this loss occurred prior to the construction of Toktogul reservoir. Today, due to the trapping effect of the upstream reservoirs, the annual sedimentation rate is about 10 million m^3/year, i.e. about 0.3% per year of the remaining storage volume. The climate change part of the study confirmed that the scenarios used for the hydrological simulations are generally in agreement with other climate modelling scenarios, even though the "hot-dry" and "warm-wet" scenarios are rather extreme as they capture the outer "envelope" of predicted temperature and precipitation changes. A review of 50 precipitation and 20 temperature time series indicates that during the past 50 years precipitation shows no clear trend whereas a significant warming by about 2°C has already been observed. Finally the relative role of glacier melting was studied. Runoff from glaciated areas is rather limited in the Syr Darya catchment and accounts for only about 6% of the total runoff. Drastic changes in annual water availability as a result of glacier melting are therefore unlikely.

The technical evaluation of the project entailed the following components:

Qairokkum Embankment Dam: The embankment dam at Qairokkum is a sand fill dam without an impervious core or surface

layer. Such types of dams are highly sensitive against over topping, internal erosion through piping and surface erosion. Additionally there is a risk for liquefaction under seismic loading. Any of these events could lead to a fast destruction of the dam through breaching in case of overtopping and internal erosion in the dam body or the foundation.

Qairokkum Weir: It can be summarized that the safety factor against sliding of one powerhouse block under normal loads and flood conditions is above the internationally required minimum safety factor for angles of internal frictions in the foundation of at least 35 °. According to Melentev (1988) the angle of friction in the foundation should be at least 36 °. For the PGA earthquake load (calculation done with pseudo-static method) an angle of internal friction in the foundation of at least 42 ° is necessary for a safety factor higher than 1. Further investigation for the final assessment of the foundation condition and possible internal angles of friction under earthquake load should be done in the next phase of the assessment. Concrete structure and foundation: In the inception report the state of the power house was documented with extensive repair needs at the concrete surfaces and some specific components such as crane rail girders or gate niches, but no visible problems regarding the structural integrity of the building. Basically the entire portion above the reservoir water level needs a detailed inspection and repair plan. The repairs of the damaged surfaces where the armour steel is lying openly will have to be done in conjunction with the adaptation and partial automation of the spillway gates, turbine intake stop logs, trash racks, the new cleaning machine etc. There will also be changes to the transformers now installed at the top of the power house which will be replaced and equipped with better safety equipment such as oil containments and fire protection systems. In addition to the surface renewal and repair needs there is a need for additional monitoring and safety instrumentation, such as pressure gauges and flow meters, to be integrated into the new monitoring and surveillance system of the scheme. Many of the piezometers which had been installed as open pipes in the original structure are dysfunctional by now. It will either be necessary to restore the functionality of these systems and install automatic metering devices connected to the plant's monitoring system, or to replace them with new technologies, such as automatic pressure meters and flow meters. The overall stability of the structure will be evaluated in more detail in the feasibility report when more data from the existing and still functioning monitoring devices (piezometers and manual flow measurements) have been analysed. There should also be an earthquake monitoring and warning system in the building that takes the necessary steps should a serious seismic event occur. Apart from that the civil structures appear to be in a reasonably good condition. No damages due to seismic events in the past or any other signs of structural damages could be detected. It was found from the data collected during the second visit following the presentation of the Pre FS that some of the piezometer readings underneath the concrete section of the dam are strongly fluctuating and reach very high values. This is raising concerns about the overall stability of the structure. It is therefore necessary to install additional monitoring equipment to evaluate the overall stability and possibly the need for stabilizing measures by reducing the uplift pressure. Reasons could be that the pressure relief drains have become dysfunctional and/or the sheet pile underneath the concrete structure has lost its functionality as impervious layer. A second thorough inspection of the entire structure has resulted in the conclusion that no earthquake damage of any structural significance could be detected or identified. The inspection tunnels below the turbine intakes were also accessed and inspected for the first time. They were found in excellent condition with no visible seepage flow into and through the concrete structure. It is intended to keep these tunnels permanently drained and accessible in the future.

Hydro-mechanical equipment: Several scenarios for the rehabilitation of the power plant have been studied during the pre-feasibility phase, including uncertainty regarding climate change effects and including financial feasibility. As a result and following the discussions during the prefeasibility study workshop held on 21 May 2013 in Dushanbe it was decided to implement the scenario based on the replacement of all 6 generating units by new ones with the same runner diameter. No additional turbines will be installed. The goal of the project is to improve the hydro power plants reliability, durability and to increase the electricity generation by using the existing civil structure. The turbine output shall be increased to the maximum, which is possible without cavitation and with minor adaptations only for the concrete weir and power house. All gates will be rehabilitated and the turbine intake gates will be equipped with automatic drives. To enhance safety under flood conditions it is additionally recommended to install automatic drives at two out of the six spillway gates. New trash racks and a new trash rack

cleaning machine are recommended.

Description of the new turbines: The existing Kaplan turbines will be replaced by new ones. The runner design will be state of the art, vertical axis and tailored to the existing powerhouse and to the actual key parameters. The runner diameter and the getting of the turbines shall remain unchanged, in order to avoid extensive civil work. The centreline of the runner remains unchanged at elevation 324.20m .a.s.l.. The six (6) new Kaplan turbines to be implemented will have an operating range as follows: Head [m] 14.60 19.00 21.50; Discharge [m^3/s] 140 177 150; Operating speed [rpm] 125 125 125; Turbine output [MW] 18 30 29; Runaway speed off-cam 375 rpm; A discharge larger than 177 m^3/s per single unit is not recommended, as such could cause cavitation pitting and destroy the runner blades. With efficiencies around 97% for the generators, 99% at the transformers and considering 1% internal consumption, a plant capacity of at least 170 MW is to be expected.

Electro-technical equipment: The installation of new turbines with increased rated power makes it mandatory to install new generators as well. Apart from that most of the electro-technical equipment has reached the end of its lifetime and is outdated. Based on the findings of the consultant on site, the age of the equipment, the requirement for a safe and stable operation as well as the possibility to increase the generation, we considered the replacement of all components by new and modern equipment. Great importance should be given to a reliable operation of the HPP since the grid in Tajikistan is practically isolated from the neighbouring countries. The new layout is based on a 110/10.5 kV three phase unit transformer for each generator which will be connected to two new step-up transformers with a capacity of 125 MVA each. A new automatic control system will have to be installed and the monitoring and surveillance system, including an alarm system for the embankment dam, will be integrated.

(For the full detailed technical evaluation see chapter 4-9 in Annex II.)

F.3. Environmental, Social Assessment, including Gender Considerations

The physical component of the Project focuses on the extension of the rehabilitation of existing hydropower facilities, and not the construction of new ones. This means that environmental and social risks are readily identifiable and assessable, and for that reason it has been categorised by EBRD's Environment & Sustainability Department as a Category B project under EBRD's Environmental & Social Policy. The development of this Project therefore includes a full environmental, social and gender analysis, in line with the EBRD's Environmental and Social Policy, and the EBRD's Strategy for the Promotion of Gender Equality (2016-2020)The EBRD recognises equality of economic opportunity, as a fundamental aspect of a modern, sustainable and well-functioning market economy. The Project is also aligned with GCF's Gender Policy and Gender Action Plan, which aim to ensure programmes funded by the Fund benefit men and women equally.

In line with the EBRD's Strategy for the Promotion of Gender Equality (2016-2020), this project will aim to enhance women's access to electricity through identifying gender gaps, as well as gender differentiated needs, preferences and priorities, in access to electricity especially in rural areas, to ensure both men and women can equally benefit from the services provided by Barki Tojik, as well as to contribute to achieving long-term sustainability goals, including poverty reduction.

F.4. Financial Management and Procurement

All procurement will be carried out in line with EBRD's public procurement policies and rules and will use the EBRD's standard tender documents. All contracts are subject to the prior review by the EBRD. A draft procurement plan specifying the contract type and procurement method for each contract will be prepared by the EBRD procurement specialist and amended by Barki Tojik prior to commencement of procurement. Any amendments will be subject to the EBRD prior review and approval.

The following project components/scope of work have been envisaged for the rehabilitation of Qairokkum hydro power plant, Phase II: (i) Environmental Mitigation; (ii) Preliminary Works; (iii) Power House and Concrete Dam; (iv) Embankment Dam Rehabilitation; (v) Building Systems and Technologies; (vi) Hydraulic Steel Structures; (vii) Hydromechnical Equipment; (viii)

Basic Engineering and Design Services; (ix) Procurement, and Implementation Supervision. The procurement plan foresees two Contracts to be procured under the Project: (i) Power House and Concrete Dam Rehabilitation and (ii) Supply and Installation of Hydraulic Steel Components, Turbines and Electromechanical Equipment. These Contracts will be procured as open tenders in accordance with EBRD's Procurement Policies and Rules under which all interested suppliers or contractors are given an equal opportunity to submit a tender. The Bank's standard tender documents shall be used. The Consulting Services under the Project include (i) support to the PIU, (ii) Design Services Consultant to produce Basic Engineering Design for the Plant, and (iii) Consultant for Capacity building to manage Climate Change Risks.

The project is being implemented by the Project Implementation Unit (PIU). A PIU consultant has been engaged for provision of organizational and technical assistance to Barki Tojik to ensure the successful completion of the project in accordance with the Project Implementation Plan (PIP) and with all Bank's requirements stipulated in the Loan Agreement. EBRD's procurement procedures as per EBRD's Procurement Policies and Rules (PP&R) (http://www.ebrd.com/documents/procurement/procurement-policies-and-rules-2014.pdf) as referred to in the Loan Agreement between EBRD and BT will be followed and EBRD will closely monitor the procurement process. The requested drawdowns must be for eligible expenditures as detailed in the Loan Agreement. Progress reports review and monitoring visits will be carried out. Further details may be found in the Disbursement Handbook for Public Sector Loans (http://www.ebrd.com/downloads/research/guides/disburse.pdf).

EBRD will monitor the environmental and social performance of the Project throughout the investment cycle. This will involve a combination of client reporting, regular site visits by EBRD's staff and independent audits. As part of the monitoring, EBRD requires clients to provide a report, at least annually, on their environmental and social performance and the implementation of applicable Environmental and Social Action Plans (ESAPs).

G.1. Risk Assessment Summary

The Project is exposed to several risks that can have a considerable impact on its success. The identified two main risks are climate variability and project implementation. Both aspects are directly recognized and targeted by technical assistance support. Extensive climate modelling and the integration of best international practices will mitigate the climate risk. The EBRD's experience in the country further mitigates risks related to the implementation. The occurrence of environmental and social risks is covered and mitigated by the application of EBRD's rigorous environmental and social standards as set out in its 2014 Environmental and Social Policy[15].

G.2. Risk Factors and Mitigation Measures

Please describe financial, technical and operational, social and environmental and other risks that might prevent the project/programme objectives from being achieved. Also describe the proposed risk mitigation measures.

Selected Risk Factor 1

Description	Risk category	Level of impact	Probability of risk occurring
Climate variability risk – Risk that the occurrence of extreme weather events and worst-case precipitation scenarios threaten the success and limit the positive impact of the Project.	Technical and operational	Medium (5.1-20% of project value)	Low

Mitigation Measure(s)

The planning and design of the Project takes into account a wide range of climate scenarios mitigating the risk of underestimating the impact of climate change. It further improves the Tajik hydrological and meteorological monitoring capabilities, enabling better management of extreme weather events. Enhancing the coordination among cascading hydropower plants along the Syr Darya (including across borders) boosts the system's capacity to manage extreme events.

Selected Risk Factor 2

Description	Risk category	Level of impact	Probability of risk occurring
Implementation risk - Risks include cost overruns, delays in procurement and failure to achieve expected technical outcomes.	Financial	Medium (5.1-20% of project value)	Low

Mitigation Measure(s)

EBRD has experience in other early transition countries similar to Tajikistan and has put in place close supervision of implementation by international consulting firms. The PIU is responsible for managing the physical investment under EBRD's procurement rules. This PIU will be assisted by the international consultant, which is included in the overall budget.

[15] http://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html

Selected Risk Factor 3			
Description	Risk category	Level of impact	Probability of risk occurring
Environmental and social risk - This Project has been categorised by EBRD's Environment & Sustainability Department as Category B as defined by EBRD's Environmental & Social Policy, which means that the Project entails some environmental and social risks, but that these are readily assessed and managed. As the Project is limited to the rehabilitation of existing hydropower facilities (not the construction of new ones) environmental and social impacts will be limited and location-specific.	Social and environmental	Low (<5% of project value)	Low
Mitigation Measure(s)			
The Project includes a full environmental and social analysis, in line with EBRD's Environmental and Social Policy, which will be carried out before loan signing and before the detailed project design is finalised. This entails the development of a Stakeholder Engagement Plan, which will set out how communities and other stakeholders within the Projects' zone of influence will be consulted and involved in project development. This will include a gender component to ensure that women are enabled to equally benefit from the Project and that their specific needs and constraints are taken into consideration along with those of other community views and are then fed in to the analysis. Specific attention will be taken to guarantee the finalisation of gender sensitive disaster (floods) risk reduction, risk preparedness, risk response and contingency plans.			

** Please expand this sub-section when needed to address all potential material and relevant risks.*

H.1. Logic Framework.

Please specify the logic framework in accordance with the GCF's Performance Measurement Framework under the Results Management Framework.

H.1.1. Paradigm Shift Objectives and Impacts at the Fund level[16]						
Paradigm shift objectives						
Increased climate-resilient sustainable development	The adaptation paradigm shift impact is derived from the transformative impact of this project in building the climate resilience of a critical but climate-vulnerable sector (hydropower) and in introducing best international practices on climate risk management in hydropower operations.					
Expected Result	**Indicator**	**Means of Verification (MoV)**	**Baseline**	**Target**		**Assumptions**
				Mid-term (if applicable)	Final	
Fund-level impacts						
A3.0 Increased resilience of intrastructure and the built environment to climate change	Number and value of physical assets made more resilient to climate variability and change, considering human benefits	EBRD board documents	0 units rehabilitated	hydro-mechanical and electro-mechanical equipment of two units (out of six) rehabilitated	all six units of hydro-mechanical and electro-mechanical equipment rehabilitated	The reliability and quality of the electricity supply is proportional to the value of the physical asset made climate resilient.

[16] Information on the Fund's expected results and indicators can be found in its Performance Measurement Frameworks available at the following link (Please note that some indicators are under refinement): http://www.gcfund.org/fileadmin/00_customer/documents/Operations/5.3_Initial_PMF.pdf

H.1.2. Outcomes, Outputs, Activities and Inputs at Project/Programme level

Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term (if applicable)	Final	
Project/programme Outcomes	**Outcomes that contribute to Fund-level impacts**					
A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development	Institutional and regulatory systems that improve incentives for climate resilience and their effective implementation	EBRD project monitoring reports	Energy sector policymaking and investment planning do currently not take into account climate change or measures to improve climate resilience	One major hydropower facility modernised talking into account projected future climate conditions	Projected future climate conditions taken into account in the planning of upgrades to at least one other hydropower plant	Macroeconomic conditions remain sufficiently stable for scaled up investment in the hydropower sector
A6.0 Increased generation and use of climate information in decision-making	Use of climate information products/ services in decision-making in climate sensitive sectors	Consultant reports	Dam management regimes do not take into account climate change projections	Up to three training workshops on climate risk assessment conducted with with Barki Tojik and Tajik Hydromet	Protocol on using climatological and hydro-meteorological information in hydropower operations agreed between Barki Tojik and Tajik Hydromet	Assumes good receptiveness and engagement by staff of Barki Tojik and Tajik Hydromet
A7.0 Strengthened adaptive capacity and reduced exposure to climate risks	Use by vulnerable households, communities, businesses and public-sector services of Fund-supported tools, instruments, strategies and activities to respond to climate change and variability	Consultant reports	Rural communities often have problem accessing electric power due to bad conditions of the system, instability of voltage, and high losses (reduction of reliance on coal and wood 0 % at	Reduction of households in the Sughd region relying on coal and wood by 20 %	Reduction of households in the Sughd region relying on coal and wood by 50 %	Assumes that electricity tariffs remain affordable for the majority of the population

			start)			
Project outputs	**Outputs that contribute to outcomes**					
1. Increased adoption of international best practices in climate risk management in the hydropower sector	Updated operating rules and risk planning	Consultant reports	None	Launch of collaboration with OECD hydropower operator	Updated operational procedures in place	Assumes good receptiveness and engagement by staff of Barki Tojik and Tajik Hydromet
2. Institutional capacities and structures for effective transboundary management of hydropower cascades developed	Existence of institutionalised transboundary collaboration between hydropower operators	Consultant reports	Non-existent	Negotiations launched	Establishment of protocol for sharing relevant climate and hydro-meteorological data between riparian countries	Assumes that the political situation enables transboundary cooperation to take place
3. Scaling-up of the integration of climate resilience measures into a strategic hydropower plant and big demonstration effect achieved	Replacement of six turbines and enforcement of dam safety	Site visits	All turbines dilapidated and in need of replacement - 0 turbines replaced	Two turbines replaced	Six turbines replaced and safety measures in place	Macroeconomic conditions remain sufficiently stable for scaled up investment in the hydropower sector
Activities	**Description**		**Inputs**		**Description**	
1.1. Technical capacity building support for Barki Tojik and other hydropower stakeholders	Twinning of Barki Tojik with leading OECD hydropower operator Training and skills transfer for integrating climate change projections into operations and planning The activities will contribute to (output 1.) the increased adoption of international best practices in climate risk management within Barki Tojik and the wider Tajik hydropower sector. Promotion of equal opportunities policies and practices within Barki Tojik's workforce		Technical assistance and skills transfer package for Barki Tojik and other hydropower stakeholders		Targeted expert support provided by consultants and international hydropower experts Technical training workshops Staff exchanges and study tour These inputs will facilitate the adoption of international best practices concerning climate change risk management in the hydropower sector (output 1).	
2.1 Support for improved transboundary cooperation in	Establishing official communication channels and fostering data and information sharing between national		Technical assistance and skills transfer package for hydropower stakeholders in		Targeted expert support provided by consultants and international	

hydropower management	hydropower operators and hydromet agencies in Tajikistan and neighbouring countries as appropriate These activities aim to help create and strengthen institutional capacities and structures for more effective transboundary management of hydropower cascades (output 2.)	Tajikistan and neighbouring countries as appropriate	hydropower experts Technical training workshops Staff exchanges and study tours The inputs facilitate the creation and strengthening of institutional capacities for better transboundary coordination in the hydropower sector (output 2)
3.1 Physical investment in the modernisation of Qairokkum HPP to improve climate resilience, productivity and safety	Comprehensive programme of upgrades covering dam safety measures, turbines and power generation equipment. These activities are instrumental in scaling-up and demonstrating the integration of climate resilience measures into strategic hydropower plant (output 3.)	Finance and technical engineering services to implement enhanced dam safety measures, turbine replacement and generation capacity upgrades	Provision of detailed engineering services, extensive technical support for Barki Tojik's Project Implementation Unit, and a comprehensive financing package for physical works. These inputs contribute to demonstrating how climate resilience measures are integrated and scaled up in a strategic hydropower plant (output 3.)

H.2. Arrangements for Monitoring, Reporting and Evaluation

In addition to active monitoring staff in its headquarters in London, EBRD has regional offices in Dushanbe and Khujand with local staff who manage the implementation and monitoring of projects on a day-to-day basis. There is also a semi-annual formal monitoring review of all projects that are subject to internal review by relevant staff at EBRD (Credit Team, Environment & Sustainability Department, etc.). The monitoring review covers the financial standing of the Client, project implementation, environmental, social, , civil society and gender issues, and improvements, implementation of technical assistance, as well as progress in corporate development and policy dialogue. Moreover, all projects are subject to a formal evaluation process upon completion. Furthermore, the logic framework in section H of this document will be used to evaluate the outcome of this Project. In addition, the project monitoring, reporting and evaluation arrangements will be fully compliant with the GCF monitoring and accountability policy requirement and AMA. This will include the submission of an annual performance report to the GCF, as well as a mid-term review/evaluation for any needed corrective actions. Both this and the final evaluation will be carried out by EBRD's independent Evaluation Department. Information on the post-implementation monitoring system can be found in Annex VII.

I. Supporting Documents for Funding Proposal

☒ NDA No-objection Letter

Attached

☒ Feasibility Study

Attached

☒ Integrated Financial Model that provides sensitivity analysis of critical elements (xls format, if applicable)

Shared through secure dataroom

☒ Confirmation letter or letter of commitment for co-financing commitment (If applicable)

Attached

☒ Project/Programme Confirmation/Term Sheet (including cost/budget breakdown, disbursement schedule, etc.)

Attached

☒ Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (If applicable)

Attached and published on EBRD website

☒ Appraisal Report or Due Diligence Report with recommendations (If applicable)

Attached

☐ Evaluation Report of the baseline project (If applicable)

NOT APPLICABLE – original project has not undergone evaluation yet.

☒ Map indicating the location of the project/programme

Attached

☒ Timetable of project/programme implementation

See Section C.8 and attached

☒ Monitoring and Evaluation Plan for learning and knowledge creation

Attached

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

No-objection letter issued by the national designated authority

КУМИТАИ
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COMMITET OF ENVIRONMENTAL PROTECTION
UNDER THE GOVERNMENT OF THE REPUBLIC OF TAJIKISTAN
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№ 1/28-03-86 аз «09» 16. 01 соли 2017
Ба № _____ аз «___» _____ соли 2016

To: The Green Climate Fund ("GCF")

Dushanbe, 14.01.2017

Re: Funding proposal for the GCF by the European Bank for Reconstruction and Development ("EBRD") regarding Scaling Up Hydropower Sector Climate Resilience

Dear Madam, Sir,

We refer to the project Scaling Up Hydropower Sector Climate Resilience in Tajikistan as included in the funding proposal submitted by European Bank for Reconstruction and Development ("EBRD") to us on 12. January 2017.

The undersigned is the duly authorized representative of the Committee on Environmental Protection, the National Designated Authority/focal point of Tajikistan.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the project as included in the funding proposal.

By communicating our no-objection, it is implied that:

(a) The government of Tajikistan has no-objection to the project as included in the funding proposal;
(b) The project as included in the funding proposal is in conformity with Tajikistan's national priorities, strategies and plans;
(c) In accordance with the GCF's environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

Name: Mr. Khayrullo Ibodzoda
Title: Chairman of the Committee on Environmental Protection
under the Government of the Republic of Tajikistan

Environmental and social report(s) disclosure

Basic project/programme information	
Project/programme title	Tajikistan: Scaling Up Hydropower Sector Climate Resilience
Accredited entity	EBRD
Environmental and social safeguards (ESS) category	Category B

Environmental and Social Impact Assessment (ESIA) (if applicable)	
Date of disclosure on the accredited entity's website	2016-09-08
Language(s) of disclosure	Russian and English
Link to disclosure	http://www.ebrd.com/cs/Satellite?c=Content&cid=1395252412582&d=&pagename=EBRD%2FContent%2FDownloadDocument [English] http://www.ebrd.com/cs/Satellite?c=Content&cid=1395252412618&d=&pagename=EBRD%2FContent%2FDownloadDocument [Russian] The ESAAP below contains an impact assessment (ESIA) consistent with the requirements of PS1 for a category B project.
Environmental and Social Management Plan (ESMP) (if applicable)	
Date of disclosure on the accredited entity's website	2016-09-08
Language(s) of disclosure	Russian and English
Link to disclosure	http://www.ebrd.com/cs/Satellite?c=Content&cid=1395252412582&d=&pagename=EBRD%2FContent%2FDownloadDocument [English] http://www.ebrd.com/cs/Satellite?c=Content&cid=1395252412618&d=&pagename=EBRD%2FContent%2FDownloadDocument [Russian] The ESAAP below contains a management plan (ESMP) consistent with the requirements of PS1 for a category B project.
Resettlement Action Plan (RAP) (if applicable)	
Date of disclosure	n/a
Any other relevant ESS reports and/or disclosures (if applicable)	
Description of report/disclosure	**Environmental and Social Appraisal and Action Plan**: As the project has been classed as Category B in line with EBRD's Environmental and Social Policy (2104), the ESS document was prepared for GCF and is aimed at providing GCF and the public with relevant information regarding (i) the environmental and social assessment carried out by EBRD and (ii) the resulting environmental and social action plan agreed with Barki Tojik in the frame of the Scaling Up Hydropower Sector Climate Resilience Project in Tajikistan.
Other link(s)	http://www.ebrd.com/what-we-do/get/knowledge-hub.html [webpage showing all EBRD/GCF ESS disclosure documents]