DOCUMENT OF THE EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT

Name of Project	**TAJIKISTAN: ENHANCING THE CLIMATE RESILIENCE OF THE ENERGY SECTOR**	
PPCR amount requested[1]	Grant Concessional finance (competitive reserve)[2]	USD 11,000,000 USD 10,000,000
Indicative co-financing	EBRD loan[3] EBRD technical cooperation (TC) grant **Total co-financing**	USD 46,600,000 USD 1,000,000 **USD 47,600,000**
Country targeted	Tajikistan	
Sector targeted	Power and Energy	
Summary of proposal	The request is for a project to enhance the climate resilience of Tajikistan's hydropower-dominated energy sector in Tajikistan through an integrated programme of activities designed to i) improve the enabling environment for climate-resilient energy security, ii) strengthen institutional capacities for climate-resilient hydropower operations, and iii) implement the first phase of a climate-resilient upgrade of a major hydropower plant hydropower plant as a ground-breaking demonstration project. This project adopts a highly innovative approach in which PPCR resources are used to have a catalytic and transformative effect on a larger volume of investment. It also provides a replicable investment model for climate-resilient upgrades of other hydropower plants in Tajikistan and which could also be transferred to other countries.	

PROJECT FIT WITH PPCR OBJECTIVES AND THE TAJIKISTAN SPCR

Tajikistan's Strategic Programme for Climate Resilience (SPCR) acknowledges the high vulnerability of Tajikistan's energy sector to climate change, and identifies this as a crucial dimension of the country's overall vulnerability to climate change, and as a critical threat to the economic well-being, livelihoods and energy security of the Tajik population. Tajikistan's hydropower plant and indeed its entire energy system are already vulnerable to extreme weather events, as made clear by the World Bank's recent Tajikistan Winter Energy Crisis study (2012). These vulnerabilities are being exacerbated by climate change. As detailed in Tajikistan's Second National Communication to the UNFCCC, Tajikistan's hydropower plants are highly vulnerable to the projected impacts of climate change as they depend upon river basins fed by glacial melt water and snowmelt. Most climate models predict significant changes in the dynamics of Tajik glaciers, snowmelt and precipitation as the climate warms. The International Commission on Large Dams (ICOLD) has already emphasized the urgent need to adapt older dams to cope with the impacts of climate change. At the same time, Tajikistan's Poverty Reduction Strategy emphasizes the importance of increasing the availability of affordable energy and using Tajikistan's abundant hydropower resources to promote economic growth and development. Hydropower provides around 98% of Tajikistan's electricity, while to date only about 10% of the total hydropower potential of 40 GW is being utilized. There is a significant

[1] Due to IMF conditions on MDB lending to Tajikistan, a relatively high grant-to-loan ratio is necessary for this project (see section 5.1. for details)
[2] Subject to the approval of the PPCR Subcommittee
[3] EUR 35,850,000

energy deficit, especially in winter, due to the unreliable electricity supply. In line with these challenges, Tajikistan's SPCR argues that in order to safeguard Tajikistan's development, there is an overwhelming case to improve the climate resilience of the hydropower sector by building the technical and institutional capacities of hydropower operators and investing in climate-resilient upgrades of hydropower facilities.

This project aims to enhance the climate resilience of Tajikistan's energy sector through a multi-layered approach, with a specific focus on Sugd province. This will facilitate targeted interventions that will generate lessons and experience that could subsequently be transferred elsewhere in Tajikistan and beyond. The project scope will go far beyond current practice in the Tajik energy sector by enabling climate change impacts on energy infrastructure and energy security to be better understood and managed. The intention is to help Tajikistan move towards current best available practices in such as those used in OECD countries where climate resilience is beginning to be mainstreamed into energy sector planning and investment, including hydropower operations. This approach is fully in line with the objectives of the SPCR and supports the Government of Tajikistan's strategic objectives of upgrading the country's energy infrastructure, especially hydropower facilities. It addresses some of the most significant barriers to improving the climate resilience of the energy sector by supporting improved policy making and investment planning, building capacity and expertise in key institutions, and introducing best-practice approaches. There is a need for demonstration and initial market transformation in order to ensure the uptake of best practice technology and practices and to raise the capacity of responsible institutions and the energy industry more broadly to be able to implement modern regulations. This Project will pursue this by combination of investment, technical assistance and policy dialogue, building on EBRD's existing engagement in energy sector upgrades and reforms and in close collaboration with other PPCR activities and IFI initiatives. The key partner in this project will be Barki Tojik, a Tajik electricity company that owns and manages most of Tajikistan's hydropower facilities.

This Project approach has been developed through an extensive programme of research, analysis and consultation over the period 2010-13. Extensive analytical work was carried out during PPCR Phase I as part of the *Project A4: Improving the Climate Resilience of Tajikistan's Hydropower Sector*[4], which was funded by PPCR Phase I and managed by EBRD. This resulted in in-depth analysis of the implications for climate change for Tajikistan's hydropower sector and detailed climate and hydrological modelling work that provided a fundamentally important basis for the subsequent development of project activities. A major stakeholder workshop was then held in March 2012 in Dushanbe, organised by the PPCR Secretariat and hosted by Barki Tojik, at which the findings of the PPCR Phase I energy sector work were analysed and discussed by a wide range of Tajik stakeholders, and where specific recommendations on PPCR Phase II activities in the energy sector were made[5]. Following this workshop, the analysis and recommendations from the PPCR Phase I study and the March 2012 workshop were fed into a major EBRD-managed Feasibility Study of the rehabilitation of Kairakkum hydropower plant, which enabled the Phase I research and analysis to have a significant transformative impact on the design of a major investment programme.

In order to achieve the full potential of increased climate resilience, supply-side investments need to be

[4] PPCR Phase I Project A4: Improving the Climate Resilience of Tajikistan's Hydropower Sector (http://www.ppcr.tj/IP/Phase1/Component4/ppcr_a4_-draft_final_report_13oct11%20(Final%20REport).pdf)
[5] See Annex I for the report of the PPCR Energy Sector Workshop, March 2012

accompanied by measures to reduce the strain on the system which is driven by increasing demand. Energy efficiency measures are achieving this goal in a quick and cost-effective manner. It is therefore planned that the proposed Project will be complemented by a parallel proposed PPCR/EBRD project for a '*Tajikistan Small Business Climate Resilience Financing Facility*' (SBCRFF), to be supported by the PPCR competitive set-aside, subject to PPCR Subcommittee approval. Whereas this project focuses on the climate resilience of energy generation (i.e. the supply side), the SBCRFF will address the demand side by financing energy efficiency improvements in the agricultural, SME and residential sectors, similar to an existing EBRD facility in Kyrgyzstan. As acknowledged during the PPCR Energy Sector Workshop in March 2012, and by numerous donor and MDB studies such as the World Bank's recent *Tajikistan's Winter Energy Crisis* study, reducing energy demand through supply-side efficiency improvements is of fundamental importance, and a cost-effective way of reducing strain on the energy system and making it more resilient to the effects of climatic variability on hydropower generation.

KEY INDICATORS, OUTCOMES AND RISKS

Key Indicators

In line with the overall PPCR Results Framework and the corresponding project-level Results Framework set out in Section 6, the key indicators of this Project will be:

Climate resilience

- Integration of climate change resilience features into the first phase of Kairakkum hydropower plant rehabilitation;
- Improved hydro-meteorological data and forecasts that take into account climate change projections to be used to inform hydropower facility operations (e.g. dam operating rules, flood response procedures);
- Kairakkum hydropower plant power generation to be more resilient to climatic variation and extreme climate events;
- Climate resilience issues integrated into energy sector policymaking and investment planning, and also fed into relevant government-wide polices and strategies.

Institutional capacity

- Replicable model for planning, developing and implementing climate-resilient upgrades of hydropower facilities developed and tested;
- Capacity developed within key institutions to build climate resilience into hydropower investment planning;
- Adoption of best practices as used by hydropower operators in OECD countries.

Development

- Households and businesses in Sugd Province experience 25% fewer power outages;
- PPCR grant to leverage additional finance for energy sector climate resilience improvements.

Climate resilience benefits

The Project will have the following specific climate resilience benefits:

- Support for the development of an evidence-based framework for energy sector policymaking and

investment planning to promote climate-resilient energy security, including at the household level;

- Strengthened institutional capacity in key energy sector institutions for the integration of an understanding of climate change impacts, the use of improved climatic and hydro-meteorological information, and the routine use of climate resilience measures and practices in the management and operations of hydropower facilities; and
- A climate-resilient upgrade of a major hydropower facility (Kairakkum) in order to optimise its productivity in the face of projected climatic and hydrological variability, including improvements to dam safety to strengthen the plant's capacity to cope with extreme climatic events, resulting in a more reliable and climate-resilient electricity supply for northern Tajikistan and provide a replicable investment model for climate-resilient hydropower upgrades that could be adopted in other locations and other countries.

Cost Effectiveness

This project will enable the PPCR to leverage a significant amount of co-financing, more than double the amount of the requested PPCR finance. The project preparation and design were enabled by a relatively modest amount of PPCR grant financing (including the USD 300,000 Phase I resources that were allocated towards the energy sector) to have a transformative impact on a large-scale investment programme by incorporating climate change considerations and corresponding climate resilience measures into the fundamental design of the investment. Consequently, USD 21,000,000 of PPCR finance (not counting PPCR Phase I) will leverage at least a further USD 47,600,000 additional co-financing from EBRD.

Demonstration Potential at Scale

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.

Development Impact

This Project will have a powerful development impact by supporting critical policy, management and infrastructure improvements in Tajikistan's fragile energy system, which is of critical importance for the country's economic development and poverty reduction. 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. This Project will help to alleviate this grave situation by contributing towards a more reliable and climate-resilient energy supply.

Environmental/Social Risk

This project focuses on 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 has therefore includes a full environmental and social analysis, in line with EBRD's Environmental and Social Policy, which is to be completed before the finalisation of the detailed project design and loan signing.

Gender Impact

This Project will fully integrate gender issues in its design and implementation. It has been developed with the active input of EBRD's Gender Team. Firstly, Activity I will include a strong gender perspective that will make a fundamental contribution to the design of the household-level surveys of energy security and climate vulnerability, which will in turn be used to inform the development of an improved framework for energy sector policymaking and investment planning. Furthermore, Activity III will involve the development of a Stakeholder Engagement Plan, which will set out how both men and women of the communities within the Project's zone of influence will be equally consulted and involved in project development. This will include a gender analysis to ensure that all community views are fed in to project implementation. The additional costs incurred by the inclusion of gender-focused activities will be met by the additional technical cooperation grants being leveraged by EBRD from its Early Transition Countries Fund.

DETAILED PROJECT DESCRIPTION

1. Project overview

1.1. Project structure

The Project will be structured as follows:

Activity I: Improved enabling environment for climate-resilient energy security
Main objective: to support the development of an improved framework for evidence-based policy-making and investment planning in the energy sector, taking into consideration climate change vulnerabilities and the energy security needs of households and businesses, including gender perspectives and the specific needs of vulnerable groups. This will help to establish a more favourable environment for investments and reforms that promote climate resilience and energy security.

Activity II: Improved institutional capacity for climate-resilient hydropower operations
Main objective: to build the capacities of responsible energy sector institutions (specifically, the Barki Tojik and the Ministry of Energy & Industry) to understand and manage the implications of climate change and climate variability on hydropower operations and move towards international best practice in climate resilient hydropower plant management and operations, in line with emerging best practice in OECD countries.

Activity III: Climate-resilient upgrade of a major hydropower plant
Main objective: to undertake the first phase of the rehabilitation of a full-scale hydropower plant so as to optimise its resilience to climate change in order to introduce international best practices and achieve a powerful demonstration impact that will enable the responsible Tajik institutions to replicate these approaches in other hydropower plants elsewhere in Tajikistan.

As detailed above, this proposed Project will be complemented by a parallel PPCR/EBRD project for a '*Tajikistan Small Business Climate Resilience Financing Facility*', which will address the demand side by financing energy efficiency improvements in the agricultural, SME and residential sectors. Reducing energy demand through supply-side efficiency improvements is of fundamental importance, and a cost-effective way of reducing strain on the energy system and making it more resilient to the effects of climatic variability on hydropower generation.

1.2. Project background

Tajikistan is one of the world's most vulnerable countries to climate change, which is directly affecting its hydropower capacities. As detailed in Tajikistan's Second National Communication to the UNFCCC, the country's hydropower plants are highly vulnerable to the projected impacts of climate change as they depend upon river basins fed by glacial melt water and snowmelt. Most climate models predict significant changes in the dynamics of

Tajik glaciers, snowmelt and precipitation as the climate warms. The International Commission on Large Dams (ICOLD) has already emphasized the urgent need to adapt older dams to cope with the new climate conditions.

As hydropower provides 98% of Tajikistan's electricity supply, the entire energy sector is highly sensitive to climatic variability and climate change (for further details see the energy sector section of the SPCR). 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 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 caused by burning wood and coal in homes, as well as the health impacts of inadequate winters heating, both of which are impacts with important gender considerations. Perversely, Tajikistan is one of the least energy-efficient countries in the world[6], which only exacerbates the severe strains on the country's energy infrastructure.

The proposed project will support the development priorities of the Government of Tajikistan (GoT), as well as potentially influencing them and helping to move beyond raising awareness into the implementation of concrete improvements. Addressing the investment needs and reviewing the policy framework for the energy sector is a top priority in the *Living Standards Improvement Strategy for Tajikistan 2013 – 2015* adopted by the Parliament in December 2012 (successor document to the Poverty Reduction Strategy) as well as in the *National Development Strategy up to 2015*. Furthermore, the reform of the energy sector was one of the flagship initiatives approved at the Development Forum in December 2012, which was chaired by President Rahmon and attended by all major IFIs and donor organisations active in Tajikistan. In August 2011, the Government issued a decree and approved a Restructuring Programme for Barki Tojik to be implemented in two Phases with the objective to increase the operational efficiency, transparency and financial sustainability of the company. Tajikistan's Strategic Programme for Climate Resilience (SPCR) acknowledges the seriousness of the situation and has prioritised the need to improve the climate resilience of the energy sector. This reinforces the GoT's wider objectives for the energy sector.

1.3. Project objectives

This project aims to enhance the climate resilience of Tajikistan's energy sector through a multi-layered approach, with a specific focus on Sugd province. This will facilitate targeted interventions that will generate lessons and experience that can subsequently be transferred

[6] International Energy Agency Energy Balances data set; World Bank Development Indicators Database

elsewhere in Tajikistan. The project scope will go far beyond current practice in the Tajik energy sector by enabling climate change impacts on energy infrastructure and energy security to be better understood and managed. The intention is to help Tajikistan move towards current best available practices in such as those used in OECD countries where climate resilience is beginning to be mainstreamed into energy sector planning and investment, including hydropower. This approach is entirely in line with the objectives of the SPCR and supports the Government of Tajikistan's strategic objectives of upgrading the country's energy infrastructure, especially hydropower facilities. It addresses some of the most significant barriers to improving the climate resilience of the energy sector by supporting improved policy making and investment planning, building capacity and expertise in key institutions, and introducing best-practice approaches. There is a need for demonstration and initial market transformation in order to ensure the uptake of best practice technology and practices and to raise the capacity of responsible institutions and the energy industry more broadly to be able to implement modern regulations. The proposed Project will pursue this by combining investment, technical assistance and policy dialogue, building on EBRD's existing engagement in energy sector upgrades and reforms.

1.4. Indicative project financing structure

It is envisaged that the Project will be financed by a USD 46,600,000[7] loan from the EBRD, USD 11,000,000 grant finance from the PPCR and USD 10,000,000 concessional finance from the PPCR competitive set-aside[8], and a further USD 1 million grant from EBRD's Early Transition Countries Fund. The origins and uses of the proposed funding are set out in more detail in the below table. In this way, the PPCR finance is leveraging a further USD 47,600,000 of co-financing for this project. The project preparation and design have enabled a relatively modest amount of PPCR grant financing (including the USD 300,000 Phase I resources that were allocated towards the energy sector) to have a transformative impact on a large-scale investment programme by incorporating climate change considerations and corresponding climate resilience measures into the fundamental design of the investment. Fuller details of the project financing structure are given in section 3.

Anticipated funding source	**Amount (USD)**	**Purpose**
EBRD ETC Fund (grant)	1,000,000	Activity I and Activity II (technical cooperation)
EBRD (loan)[9]	46,600,000[10]	Activity III (investment)
PPCR (grant)	11,000,000	
PPCR (concessional finance)[11]	10,000,000	
TOTAL	68,600,000	

Table 1: Origin and uses of funding (indicative amounts only)

[7] EUR 35,850,000
[8] Subject to PPCR Subcommittee approval
[9] Subject to EBRD Board approval
[10] EUR 35,850,000
[11] From PPCR competitive reserve (subject to approval)

2. Detailed project structure

2.1. Activity I: Improved enabling environment for climate-resilient energy security

2.1.1. Activity I background

The climate-energy-poverty nexus plays an extremely important role in influencing vulnerability to climate change in Tajikistan. 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 of women and men (including impacts on gender equality, education, health etc.). There are important differences in energy access and use, and in climate vulnerability, between social groups (e.g. men, women, older people, urban/rural etc.). It is therefore important to consider energy security at the community level, and to understand how this may be influenced by climate change. Gender is an important dimension: 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. The high occurrence of female-headed households (due to male migrant workers departing for Russia) needs special consideration, as they may further influence the gender dimension of energy security/climate vulnerability. Furthermore, female headed-household may be poorer, more overburdened and with less access to information and opportunities. Inclusive measures may be needed to ensure their full participation. On the other hand improved access to energy has the potential for multiple social and economic benefits for women as well as men. Increasing energy generation and distribution capacity is an important way of addressing energy vulnerability at the community-level. These issues have begun to be brought to light by UNDP's Mainstreaming Human Development in Tajikistan project. As part of this, UNDP Tajikistan has initiated the preparation of a National Report on Human Development 2012 "Tajikistan: Poverty in the Context of Climate Change". Consultations with stakeholders during the preparation of the project revealed a gap in current understanding of how energy insecurity and climate variability affect households in Tajikistan. Analysis is needed to understand the important climate-energy-poverty nexus in Tajikistan. This is essential for community-level, social and gender dimensions of climate change risks to energy security to be reflected in energy sector policymaking and investment planning.

2.1.2. Activity I scope and objectives

In response, Activity I of this project will entail a programme of household and business surveys of energy use and climate vulnerability (incorporating a gender perspective) in order to fill this knowledge gap and better understand the different uses, needs and priorities for energy consumption at the community and household level, as well as taking into account SMEs. This activity will focus on in the Sugd Province of Northern Tajikistan, where it will directly complement the rehabilitation of Kairakkum hydropower plant (see Activity III) as

well as the EBRD project "Sugd Energy Loss Reduction Project". Sugd Province is the second largest region in Tajikistan by population and was formerly a major hub for light manufacturing and agri-processing (e.g. cotton ginning, fruit processing), being partially located in the fertile Ferghana Valley and directly connected by rail to the rest of the former Soviet Union. Since the collapse of the Soviet Union and the subsequent under-investment and deterioration of Tajikistan's energy infrastructure, the poor and unreliable energy supply has greatly eroded Sugd's light manufacturing base, with negative knock-on consequences for economic output, employment and markets for agricultural produce, which has further negative impacts on farmers. Better analysis of energy use and climate vulnerability is needed to inform energy sector planning and operations, in order to promote benefit in terms of poverty reduction, and economic and social inclusion.

The proposed household and business surveys will analyse the energy consumption behaviour of local residents and the way they cope with and respond to climate variability. The activity will have two components; the first with a focus on the household level, and the second on SMEs. The scope will cover socio-economic data collection from Sugd Province, climate change and energy insecurity impact assessment, organisational and institutional review and a technical assessment that will look at service characteristics and infrastructure evaluation. This baseline study will help to inform financial analyses and affordability studies. This work will give a clear view on energy consumption at the micro-level, namely depicting how households and SMEs use energy and for what purposes. It will also pick out gender differences as well as special needs of boys and girls and people living with disabilities. Many studies report that women are more likely to use power for household activities, while men use it for economic production, and children use electricity to read and study. Inequalities in terms of climate vulnerability and energy security will be assessed in order to address the needs of the most vulnerable sections of the population. This will shape development of policy and planning responses to seasonal imbalances in energy supply including the influence of climatic variability.

In addition, this component will include a public awareness campaign to raise awareness of the link between climate resilience and energy security, including the need for demand-side measures and shifts in consumer behaviour. This will be coordinated with and mutually supported by related activities to be undertaken as part of the related proposed PPCR/EBRD project *Tajikistan Small Business Climate Resilience Financing Facility*.

2.1.3. Activity I indicative budget

It is anticipated that Activity I will require USD 140,000 in grant finance, which will be provided by EBRD's multi-donor Early Transition Countries Fund.

Use of finance	**Indicative budget (USD)**
Surveys of energy access & climate vulnerability	
Household surveys	*50,000*
SME surveys	*50,000*

Subtotal a	***100,000***
Analysis and development of policy recommendations b	20,000
Awareness raising activities c	20,000
TOTAL (a+b+c)	**140,000**

Table 2: Indicative budget for Activity I

2.2. Activity II: Improved institutional capacity for climate-resilient hydropower operations

2.2.1. Activity II background

The PPCR Phase I study and the PPCR Energy Sector Stakeholder Workshop in March 2012 recognised the crucial importance of non-structural climate resilience measures, alongside structural ones. This corresponds with emerging best practice on the importance of adaptive management of infrastructure and fixed assets, and is also consistent with approaches being developed by hydropower operators in OECD countries. 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, who also contributed to the March 2012 stakeholder workshop. 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.

2.2.2. Activity II scope and objectives

The PPCR Phase I study included a detailed analysis of the types of non-structural measures and practices that need to be adopted by the operators of hydropower facilities in Tajikistan in order to improve the climate resilience of the facilities and of the hydropower sector more broadly. This analysis led directly to the identification of capacity building needs of the energy sector (e.g. Barki Tojik and the Ministry of Energy & Industry), as well as Tajik Hydromet which has a key role in providing the essential meteorological and hydrological data services on which the hydropower industry depends. These capacity building priorities were then developed further in consultation with stakeholders, including during the consultative workshop held in Dushanbe in March 2012.

Through this process, two main capacity-building priorities were identified:

i) Undertaking further hydro-meteorological analytical work & monitoring
ii) Capacity building and training for introducing climate resilience into the operational management of hydropower facilities

At the March 2012 workshop it was recognised that the World Bank managed PPCR project 'Strengthening Hydromet' and the ADB managed PPCR project 'Climate Science and Modelling Programme' are providing comprehensive support to Tajik Hydromet to help build their capacities for improved hydro-meteorological data collection and analysis. Therefore stakeholders concluded that there is no need for the energy sector project to duplicate this support but rather complement it by supporting key energy sector actors (i.e. Barki Tojik, hydropower plant operators) to make effective use of improved hydro-meteorological data services and apply them in hydropower operations. This would also optimise coordination and complementarity between PPCR activities.

The PPCR Phase I study and the stakeholder workshop identified 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. 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.

These priorities will be implemented under Activity II and cover the following activities:

- Strengthen national capabilities in climate risk assessment 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 around specific PPCR tasks;

- Run technical workshops on climate diagnostics, climate risk assessment, and seasonal forecasting with accredited institutions to encourage professional development;
- Conduct a study tour 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[12] 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.

2.2.3. Activity II indicative budget

It is anticipated that Activity II will require USD 860,000 in grant finance, which will be provided by EBRD's multi-donor Early Transition Countries Fund.

Use of finance	**Indicative budget (USD)**
Analysis and development of improved dam operating rule regimes	230,000
Analysis and development of improved flood safety procedures and responses	230,000
Partnership development (inc. study tour to OECD country)	250,000
Training and roll-out programme	150,000
TOTAL	**860,000**

Table 3: Indicative budget for Activity II

2.3. Activity III: Climate-resilient upgrade of a major hydropower plant

2.3.1. Activity III overview

The PPCR Phase I study, and the subsequent stakeholder workshop, also identified the need for a demonstration investment project, in which the integration of both structural and non-structural climate resilience measures can be integrated into the rehabilitation of a major hydropower facility in Tajikistan. This would provide an extremely powerful demonstration impact that would 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

[12] Within the limits of the international agreements that govern the management of the Syr Darya cascade.

upgrades in Tajikistan (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.

This Activity entails the first phase of the rehabilitation of Kairakkum 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 includes the following objectives:

i) To demonstrate how climate change analysis can inform project design and investment decisions in the hydropower sector to optimise climate resilience;
ii) 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;
iii) To pilot a replicable approach that can 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
iv) To build the capacity of the Tajik authorities to incorporate climate change analysis into hydropower plant investment planning and operations.

Specifically, this project builds upon detailed analytical work on the implications of climate change for hydropower operations in Tajikistan that was carried out under Phase I of the PPCR. This included detailed climate change modelling and hydrological modelling that was fed into the Feasibility Study for Kairakkum 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 (climate change and hydrological modelling) of the Phase I PPCR study 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.

2.3.2. Activity III background

Kairakkum hydropower plant was built on the Syr-Darya River, about 10 km east of the city of Khujand in 1959. It consists of a hydroelectric plant, dam, spillway and reservoir for seasonal regulation of the Syr Darya River for irrigation as well as for electricity generation. This plant is the only electricity generating facility in northern Tajikistan, but its capacity is insufficient to meet electricity needs, especially during the winter season and during extreme climatic conditions. The following map (Figure 1) presents the location of the plant in northern part of the country.

Figure 1: Map of the upper Syr Darya basin (source: Interstate Commission for Water Coordination of Central Asia)

Most of the electric and mechanical equipment at Kairakkum plant has reached the end of its lifetime and the likelihood of a major failure is increasing. A major rehabilitation including the replacement of the turbines is urgently needed. This will eventually result in the total rated capacity of the plant increasing to 174MW, while total generation will increase to 850-900GWh per year representing an increase of 28% from current average annual generation. Turbine refurbishment is also needed in order to enable the plant to optimise energy generation in the face of the greater hydrological variability that is expected as a consequence of climate change.

The rehabilitation of Kairakkum hydropower plant, and the associated technical assistance, comprises an integral part of the Government overall energy sector strategy. The immediate focus of the energy development in Tajikistan is to eliminate current winter energy deficit. Estimated at about 24% of winter demand, it results in both social and economic hardship. Winter energy shortages were estimated at 2,700 GWh in 2012 and could exceed 6,800 GWh by 2020. In this context, Activity III will have a significant developmental impact by contributing towards the eventual total upgrade of Kairakkum hydropower plant. At the regional level, Activity III will help to meet winter shortages in northern Tajikistan where Kairakkum plant is located. The rehabilitation of Kairakkum hydropower plant offers a valuable opportunity to serve as a pilot for the integration of climate change analysis and

climate resilience measures into investment planning in the hydropower sector, with potential transferable lessons for the rehabilitation of other hydropower plants in Tajikistan (for example, rehabilitation of the existing 3,000MW Nurek hydropower power station) and beyond.

2.3.3. Climate change analysis and incorporation into investment design

Building on the work carried out during PPCR Phase I, climate change scenarios were used to inform hydrological modelling and the determine the most appropriate specifications of the upgrade of the hydropower plant facility, including the selection technologies such as turbine capacity. The IPPC suite of global climate change models, together with and three representative GHG emissions scenarios (A1B, A2, B1) were used to generate nine hydrological scenarios for the Syr Darya river basin in which Kairakkum hydropower plant is located (see Figure 2).

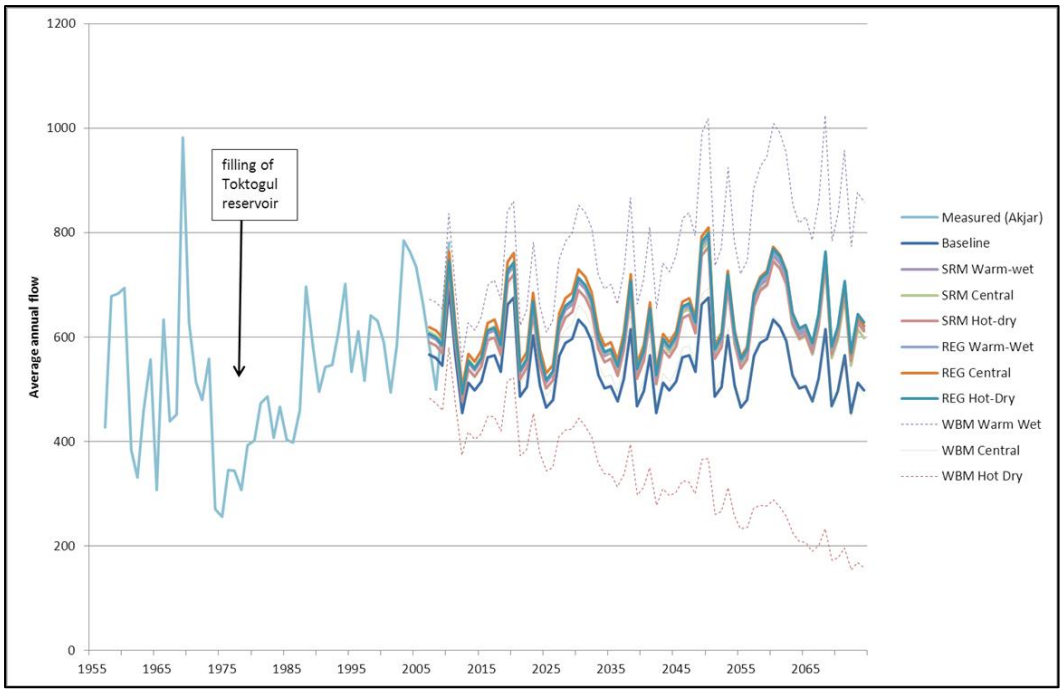

Figure 2: Measured and modelled inflows into Kairakkum reservoir under a range of climate change/hydrological scenarios (1957 to 2074)

These climatic/hydrological scenarios were then used to model energy production across a range of turbine upgrade scenarios (see Figure 3). Based on this analysis, the turbine upgrade showing the optimal performance over the range of projected climate/hydrological conditions was selected for incorporation into the design of the rehabilitation investment using the Max/Min Regret Analysis methodology developed by the Swiss Department of Energy. The climatic/hydrological scenarios were also used to inform modelling of the probable maximum flood (PMF) in Kairakkum reservoir, leading to the identification and specification of dam safety measures.

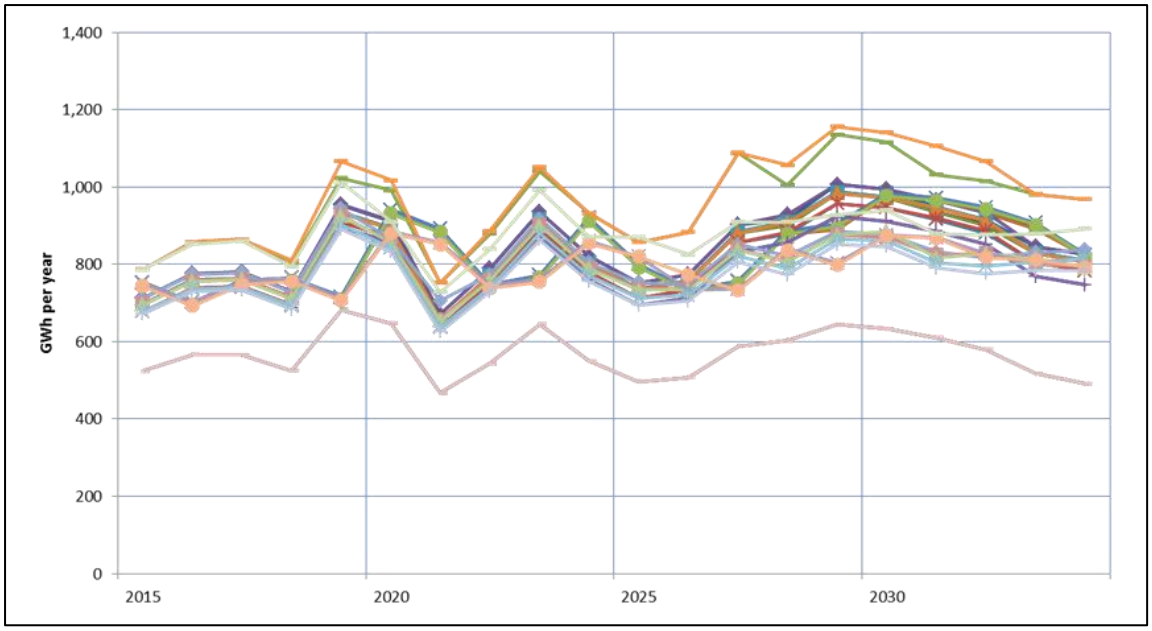

Figure 3: Modelled energy generation (GWh per year) at Kairakkum hydropower plant under a range of climate change/hydrological scenarios

2.3.4. Activity III objectives

The principal objective of Activity III is to undertake the first phase of the rehabilitation of Kairakkum hydropower plant in order to improve it productivity and safety in the face of the projected impacts of climate change. The eventual full rehabilitation of Kairakkum hydropower plant will extend its economic useful life by at least 20 years and eliminate the risk of major technical failure of the aging plant. It will increase the plant's efficiency by up to 7% and electricity generation by 28% and improve the reliability of electricity supply in northern Tajikistan, especially during winter season when severe electricity shortages take place.

Due to affordability constraints, the overall rehabilitation of Kairakkum hydropower plant will be phased, as upgrading the entire hydropower plant in a single transaction would exceed Barki Tojik's ability to borrow. The initial phase, which will be covered by Activity III, will entail dam refurbishment and safety improvements and the replacement of two of a total of six turbine units, in line with the climate resilient dam upgrade scenario developed through the PPCR Phase I and the subsequent Feasibility Study. The remaining turbines will then be replaced under a subsequent transaction, beyond the scope of this project. This raises the prospect of an even more positive leveraging ratio in due course, as the PPCR's transformational impact on the design of the investment programme will also be applied to the subsequent phase of the upgrade. In this way, Activity III will make a major contribution towards the climate resilience of the entire energy system in Northern Tajikistan, together with the institutional improvements that will be achieved through Activities I and II.

Specific objectives of Activity III include the following:

i) To complete the initial phase of the rehabilitation of Kairakkum hydropower plant based on an upgrade scenario designed to optimise resilience to climate change and which will lead to an eventual capacity increase from current 126MW to 174MW. Activity III will support the first phase only of this turbine upgrade, i.e. the first two out of the eventual total of six new turbines. As the investment needs of the turbine upgrade have turned out to be greater than was originally envisaged at SPCR stage, there is a case for seeking additional PPCR resources. However, as the new turbines will be revenue generating and will increase the output of Kairakkum hydropower plant, it is appropriate for them to be financed using concessional finance from the PPCR competitive set-aside, and the revenue stream will enable Barki Tojik to repay the loan element of the concessional finance.
ii) To rehabilitate the embankment dam of the power plant 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 to Barki Tojik, there is a case for using PPCR grant resources to finance these essential upgrades.
iii) To install new 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. As these project activities are non-revenue-generating and were not originally foreseen at SPCR stage, there is a case for using additional PPCR grant resources to finance the installation of this essential equipment.

2.3.5. Activity III expected result

Activity III will result in the completion of the initial phase of the upgrade of Kairakkum hydropower plant 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.

2.3.6. Activity III indicative budget

It is anticipated that Activity III will require a total of USD 68,600,000 in financing, which is expected to be provided by a combination of loan finance from the EBRD, together with grant finance and concessional finance from the PPCR. The proposed PPCR grant resources will be used to finance dam and spillway refurbishment and safety measures, as these are critical for climate resilience and yet non-revenue generating, which creates a stronger case for grant financing. The proposed PPCR concessional finance (subject to PPCR

Subcommittee approval) will be used to support the upgrade of two turbine units, which will help to increase the productivity of the hydropower plant in the face of projected climate change impacts. A full breakdown is provided in section 3.

Use of finance	**USD million**
Concrete dam refurbishment	
· Adaptation of turbine bays	2.60
· Detailed safety and geotechnical analysis	0.67
Sub-total a	*3.27*
Spillway refurbishment	
· New spillway gates	5.20
· Refurbishment of gantry gates	1.53
Sub-total b	*6.73*
Surveillance and safety measures	
· Installation of additional surveillance equipment and stability analysis	1.00
Sub-total c	*1,00*
Turbine refurbishment	
· New turbines and controllers	10.00
Sub-total d	*10.00*
Electro-mechanical equipment	
· New 30 MW generators	21.05
· New turbine control system	5.20
· New 110 kV switchgear equipment	6.50
· Electrical equipment (balance-of-plant units)	7.80
Sub-total e	*35.10*
Engineering & supervision f	6.05
TOTAL (a+b+c+d+e+f)	**67.60**

Table 4: Indicative budget for Activity III

3. Financing structure

3.1. Breakdown of indicative project financing

Use of finance	Indicative budget (USD)	Anticipated funding source
ACTIVITY I: Improved enabling environment for climate-resilient energy security		
Surveys of energy access & climate vulnerability	100,000	EBRD Early Transition Countries Fund
Household surveys	*50,000*	
SME surveys	*50,000*	
Analysis and development of policy recommendations	20,000	
Awareness raising activities	20,000	
Activity I sub-total a	**140,000**	
ACTIVITY II: Improved institutional capacity for climate-resilient hydropower operations		
Analysis and development of improved dam operating rule regimes	230,000	EBRD Early Transition Countries Fund
Analysis and development of improved flood safety procedures and responses	230,000	
Partnership development (inc. study tour to OECD country)	250,000	
Training and roll-out programme	150,000	
Activity II sub-total b	**860,000**	
ACTIVITY III: Climate-resilient upgrade of a major hydropower plant facility (Kairakkum)		
Concrete dam refurbishment		PPCR grant
Adaptation of turbine bays	2,600,000	
Detailed safety and geotechnical analysis	670,000	
Spillway refurbishment		
New spillway gates	5,200,000	
Refurbishment of gantry gates	1,530,000	
Sub-total	*10,000,000*	
Surveillance and safety measures		Additional PPCR grant
Installation of additional surveillance equipment and stability analysis	1,000,000	
Sub-total	*1,000,000*	
Turbine refurbishment		PPCR concessional finance
Two new turbines and controllers	10,000,000	
Sub-total	*10,000,000*	
Electro-mechanical equipment		EBRD loan
New 30 MW generators	21,050,000	
New turbine control system	5,200,000	
New 110 kV switchgear equipment	6,500,000	
Electrical equipment (balance-of-plant units)	7,800,000	
Engineering & supervision	6,050,000	

Sub-total	*46,600,000*	
Activity III sub-total c	**67,600,000**	
GRAND TOTAL (a+b+c)	**68,600,000**	

Table 5: Breakdown of proposed uses of finance

3.2. Breakdown of funding sources (indicative)

Anticipated funding source	**Purpose**	**Amount (USD)**
EBRD ETC Fund (grant)	Activity I and Activity II (technical cooperation)	1,000,000
EBRD (loan)[13]	Activity III (investment)	46,600,000[14]
PPCR (grant)		11,000,000
PPCR concessional finance (from competitive reserve)[15]		10,000,000
TOTAL		**68,600,000**

Table 6: Breakdown of proposed sources of finance

EBRD loan finance has been approved in principal by EBRD management (concept approval), and Board approval will follow PPCR Subcommittee approval of the PPCR financing. EBRD will mobilise further grant resources from its Early Transition Countries Fund**.** Due to Tajikistan being a low-income country with an IMF programme, the country has a limit on external debt and external borrowing related to investment projects; such borrowing must be concessional with a minimum grant element of 35%. The PPCR finance will therefore help to meet the concessionality requirement required by the IMF.

4. Project management

4.1. Implementation arrangements

Project implementation will be the responsibility of Barki Tojik. Activity III will be managed by the embedded Project Implementation Unit (PIU) that has already been established within Barki Tojik. Technical assistance for Activity III engineering and supervision will be provided in the form of international consultancy support to the embedded PIU. Further technical assistance will also be provided to Barki Tojik to improve the enabling environment for climate-resilient energy security (Activity I) 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 (Activity II). It is important to note that the implementation of Activity III will not entail significant impacts on downstream users (including transboundary impacts). During the refurbishment of the dam (including the

[13] Subject to EBRD Board approval
[14] EUR 35,850,000
[15] Subject to PPCR Subcommittee approval

replacement of turbines and spillways), 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. Whereas Activity I and Activity II will be able to proceed towards implementation as soon as the grant resources are approved, Activity III will require a minimum of 1-2 years of planning and proper preparation before rehabilitation works can start. Total duration of the rehabilitation would therefore be 7 to 8 years.

4.2. Procurement arrangements

All procurement will be carried out in line with EBRD's 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.

4.3. Project monitoring, evaluation and audit

In addition to active monitoring staff in its headquarters in London, EBRD has a regional office in Dushanbe 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 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, as part of the overall PPCR programme in Tajikistan this project will also be subject to monitoring and evaluation under the framework of the PPCR Results Framework. This will be carried out in partnership between EBRD, the PPCR Secretariat and the CIF Admin Unit. See section 6 for the project-level Results Framework that will be used.

4.4. Project sustainability

The project will include key conditionalities in line with proposed Reform Plan for Barki Tojik, which will ensure long-term operation of the power sector. The financial sustainability of the electricity sector and Barki Tojik in particular is expected improve as a result of the implementation of the Reform Plan for Barki Tojik, which is supported by major donors and IFIs. Further sustainability will be ensured by the capacity building and knowledge

transferred to Barki Tojik that will occur through the Project Implementation Unit, as well as through the IFI-led sector policy dialogue with the Tajik authorities.

4.5. Risk assessment and mitigating actions

Risk	Mitigating actions
Financial sustainability of Barki Tojik. The financial situation of Barki Tojik is precarious constraining its possibilities to address the energy sector challenges from its own means. Low tariffs, poor collection rates and weak corporate governance and financial management have brought Barki Tojik to a point where it has a negative cash-flow and is forced to borrow short-term for working capital purposes. Scope for tariff increases, although essential, is constrained by low affordability and the absence of a social safety net.	Following extensive policy dialogue, the Government is fully aware of the action required to turn around Barki Tojik, and has adopted policy decisions to start the process. Comprehensive support from the IFIs and international donors will help the Government design and implement the reform agenda, and jointly agreed upfront conditionalities will ensure demonstration of political commitment and address the most critical points. • Prior increase of the average tariff from 2.25 USD cents in June 2013 to 3.5 USD cents before the first disbursement, plus agreement with the Government of Tajikistan to continue tariff adjustments to full cost recovery. • Presentation of unqualified audit report as an essential step to increase the transparency of Barki Tojik. • Approval by the Government of Tajikistan of the Reform Plan for Barki Tojik. The Reform Plan contains a set of measurable benchmarks for a phased restructuring based on the work of the ADB consultant. • The weak corporate governance will be addressed through a series of technical assistance (ADB financed restructuring of Barki Tojik, EBRD financed support to modernise energy regulation and institutional strengthening) and extensive policy dialogue. The World Bank is considering providing support to improve the social safety net. The IFCA grant co-financing is essential to keep the need for tariff increases within affordability levels.
Implementation risk Risks include cost overruns, delays in procurement and failure to achieve expected technical outcomes.	EBRD has experience in other early transition countries similar to Tajikistan and have put in place close supervision of implementation by international consulting firms. Barki Tojik will assign a dedicated embedded Project Implementation Unit (PIU) within its own structures to manage the physical investment under EBRD's procurement rules. This PIU will be assisted by the international consultant, which is included in the overall budget.

Progress with policy reform Turning around the energy sector is dependent on a series of policy decisions to be taken by the government. This includes a differentiated tariff policy, relations to TALCO and the Ministry of Water Resources (irrigation), policy of government agencies towards paying utility fees, sector regulation and public information and consultations.	Several fora exist for high-level policy dialogue between the Government and the IFIs and international donors, initial progress has been achieved. These include the Development Coordination Council (DCC) and its working groups, which conducts regular discussions with the Government on a wide array of issues, the energy sector being one of the most important. Specifically for the reform of the energy sector, the Government has established an inter-ministerial working group and a Steering Committee under the First Deputy Prime Minister. The Government's international commitments through WTO require reform of state utilities. Lastly, the IFIs and international donors will continue to provide technical assistance and set conditionalities as appropriate.
Environmental and social risks 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.	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.

Table 7: Analysis of risks and mitigating actions

5. Project context and coordination issues

5.1. Macroeconomic issues and poverty analysis

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. In terms of macroeconomic conditions, Tajikistan's real GDP grew at 7.5% in 2012 helped by strong growth in remittances. Annual inflation kept pace with global food and fuel prices and remained in single digits. Growth is projected to ease below 7% in 2013 because of slower growth in Russia and weaker aluminium exports, while inflation pressures are expected to remain low. The fiscal accounts strengthened in

2012 on improved revenue collection and expenditure rationalization, with budgeted social spending fully implemented. External debt remains moderate at just above 30 per cent of GDP. Due to Tajikistan being a low-income country with an IMF programme, the country has a limit on external debt and external borrowing related to investment projects; such borrowing must be concessional with a minimum grant element of 35%. The PPCR finance will therefore help to meet IMF concessionality requirements.

5.2. Coordination with other initiatives and programmes

5.2.1. Coordination with other PPCR activities

This project will be coordinated closely with a number of other complementary PPCR activities, managed by the ADB and World Bank under the overall coordination of the PPCR Secretariat.

Tajikistan Small Business Climate Resilience Financing Facility (EBRD): this project, which has not yet been approved by the PPCR Subcommittee, will promote the climate resilience of the energy sector by focusing demand side and financing energy efficiency improvements in the agricultural, SME and residential sectors. As acknowledged during PPCR Energy Sector Workshop in March 2012, and by numerous donor and MDB studies such as the World Bank's recent *Tajikistan's Winter Energy Crisis* study 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.

Improvement of Weather, Climate and Hydrological Service Delivery (World Bank): this project aims to support Tajik Hydromet through hydrometeorology modernization activities. These include rebuilding infrastructure and human capacity to reduce disaster risks, manage the consequences of climate variability and underpin the economic development of the agricultural, water resources, energy and transportation sectors. The project will help hydromet services in Tajikistan improve physical infrastructure required to observe and forecast changes in the environment; increase the capacity and capabilities of the workforce; and develop new business practices to sustain these services. In line with the conclusions and recommendations of the PPCR Energy Sector Workshop held in March 2012, Activity II will be coordinated closely with this project in order to build effective linkages and collaborative practices between Tajik Hydromet and the hydropower sector.

Building Capacity for Climate Resilience Project (ADB): this project aims to strengthen climate risk management practices and awareness of climate change amongst a variety of stakeholders including government, civil society, the media and highly vulnerable groups such as women and the poor; and to institutionalize the existing PPCR Secretariat to ensure effective implementation of climate change projects beyond the duration of the PPCR. Cooperation with this project will be especially important to ensure outreach to wider stakeholders and will be especially relevant to the implementation of Activity III.

Climate Science and Modelling Programme (ADB): this project aims to increase resilience to climate change by strengthening the capacities of Tajik Hydromet and PPCR stakeholders to produce, and analyse and apply climate science and downscaled climate impact projections toward formulation of sector-based climate science for investment resilience. In line with the conclusions and recommendations of the PPCR Energy Sector Workshop held in March 2012, Activity II will be coordinated closely with this project in order to build effective linkages and collaborative practices between Tajik Hydromet and the hydropower sector.

5.2.2. Coordination with other EBRD activities

Sugd Loss Reduction Project (EBRD): this project focuses on demand side management by financing the installation of modern electricity meters, meter reading systems and design and installation of an automated billing system in northern Sugd region of Tajikistan. The project will reduce existing level of electricity losses in the network, increase bill collection levels and improve quality of electricity supply. As Kairakkum hydropower plant is the only generating facility in Sugd Province, this project is highly complementary to Activity III and is also highly relevant to Activity I. This project will allow for transparent accounting of electricity generated mainly by the Kairakkum plant. The new, improved billing system in Sugd region will in turn produce accurate bills, process payments and provide the necessary information to allow unpaid accounts to be targeted.

2.2.3. Coordination with other IFI activities

In the context or 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. To this end, a multi-donor initiative is underway involving the ADB, World Bank, EU, EBRD and some bilateral donors. The work of the development partners is coordinated under the auspices of the Development Coordination Council to ensure consistency, leverage and efficiency.

Central Asia Energy-Water Development Program – CAEWDP (World Bank): this is a four-year program, which aims to improve diagnostics and analytical tools to support the countries of the region in well-informed decision-making to manage their water and energy resources, strengthen regional institutions, and stimulate investments. The following specific project activities are taking place under the framework of the CAEWDP

Tajikistan's Winter Energy Crisis study (World Bank): this work entails a four pronged strategy to reduce the winter energy shortages: i) demand side management including energy efficiency and fuel switching; ii) increase of supply through rehabilitation of existing hydropower assets, construction of thermal plants and renewables; iii) increase in energy trade; and iv) comprehensive policy review, including tariff adjustments, development of a social safety net, and strengthening of regulations. This study was strongly welcomed by donors and MDBs as it provides a clear framework for coordinated efforts in the energy

sector. It should be noted that the Government increased tariffs during 2006 - 2011 by 250% and followed by another 12% to reach an average of 2.25 US cents/kWh in 2012 (although still very low by average standards). An appropriate tariff policy will require an accompanying program of demand side management measures at the customer level to reduce demand for electricity and moderate the impact of increasing tariffs on total household energy bills. This study places strong emphasis on the need for the rehabilitation of energy infrastructure in order to stabilise the energy system and increase domestic supply. This is a strong endorsement of the approach proposed in this new project. The study estimated that the total energy infrastructure rehabilitation investment needs amount to around USD 1 billion.

Ferghana Valley Water Resources Management Project (World Bank): this project aims to improve the capacity for increased irrigated agriculture productivity in the Ferghana Valley by improving land and water management, and to improve safety and regulation of the Kairakkum Dam and Reservoir, thereby contributing to enhanced water management security and efficiency at the basin level. It will also entail strengthening the early warning system of the Kairakkum dam as well as in carrying out a geotechnical study. Although this project focuses on water resources management and not energy security and climate resilience, there are clear opportunities for cooperation and complementarity that will be explored with the World Bank.

Power Sector Efficiency Improvement Project (ADB): this project includes, in addition to investment financing, a major Technical Assistance to help the Government implement the Restructuring Programme of Barki Tojik. The TA assignment commenced in June 2012 and an international consultant (Corporate Solutions) has completed its diagnostic phase presenting a comprehensive set of recommendations and a phased Reform Plan of Barki Tojik for the Government's approval. The Government has assigned an Inter-Ministerial Working Group, and above it a Steering Committee chaired by the First Deputy Prime Minister to oversee and guide the restructuring of Barki Tojik. It is expected that the Steering Committee will approve the Reform Plan for Barki Tojik during summer 2013.

5.2.4. Transboundary issues

The Kairakkum dam and reservoir are located in a river basin shared by four states, Kyrgyzstan, Uzbekistan, Kazakhstan and Tajikistan. Kyrgyzstan and Uzbekistan are upstream stakeholders and Kazakhstan and Uzbekistan are downstream stakeholders. The rehabilitation will allow for more effective use of available water resources by eliminating spill overs while additional spillway capacity will allow for better regulation and control of flooding in the downstream areas. The rehabilitation will also improve the environmental safety of the hydroelectric units by installing non-polluting turbine, which will have a positive impact in the downstream area. As a result the Project will promote regional cooperation among riparian states that share the same river basin. It is important to note that the implementation of Activity III will not entail significant impacts on downstream users (including transboundary impacts). During the refurbishment of the dam (including the

replacement of turbines and spillways), 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. It is also important to note that the proposed work on dam operating rules under Activity II 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.

6. Results framework

The below project-specific results framework will be used to monitor and evaluate the project, through collaboration between EBRD, the PPCR Secretariat, and the CIF Admin Unit. This framework forms part of Tajikistan's overall PPCR M&E workplan.

Results	**Indicators**	**Target**	**Baseline**	**Related project activities**	**Responsible entity(ies)**
TRANSFORMATIONAL IMPACT					
A1. Increased resilience of households, communities, businesses, sectors and society to climate variability and climate change	A1.3 (core): Numbers of people supported by the PPCR to cope with effects of climate change	Households and businesses in Sugd Province experience 25% fewer power outages as a result of extreme weather	Households and businesses in Sugd Province currently suffers frequent power outages (especially during extreme weather)	Improvements in energy sector policymaking, planning and infrastructure to achieve a more climate-resilient power supply	Barki Tojik
A2. Strengthened climate responsive development planning	A2.1 (core): Degree of integration of climate change in national, including sector planning - e.g., national communications to UNFCCC, national strategies, PRSPs, core sector strategies, annual development plans and budgets, and NAPs	Climate resilience issues integrated into energy sector policymaking and investment planning, and also fed into relevant government-wide polices and strategies	Energy sector policymaking and investment planning does not take into account climate change nor measures to improve climate resilience	Support for capacity building in Barki Tojik and relevant government institutions to boost their ability to assess climate change implications for the energy sector and integrate climate resilience measures into sector policies and planning	PPCR Secretariat
PROJECT OUTCOMES					

B1. Strengthened adaptive capacities	B1 (core): Extent to which vulnerable households, communities, businesses and public sector services use improved PPCR supported tools, instruments, strategies, activities to respond to Climate Variability and Climate Change.	Kairakkum hydropower plant power generation to be resilient to climatic variation and extreme climate events	Generation has declined in recent years due to operational difficulties on and a lack of resources for repairs and rehabilitation; limited ability to cope with extreme climatic events such as floods as several of the spillway gates are not functional	Generation capacity able to be maintained at optimal levels across a wider range of climate variability than at present	Barki Tojik
				Dam able to manage and regulate extreme flows/surges including extreme climatic events and ensure the safety of downstream communities and avoid environmental damage	
B2. Improved institutional framework in place	B2 (core): Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience	Institutional capacity at Kairakkum hydropower plant to manage climate risks	No capacity currently exists to manage climate risks other than basic hydrological monitoring	Development of institutional capacity to monitor changes in key climatic/hydrological parameters and adjust plant management accordingly	Barki Tojik PPCR Secretariat
		Capacity developed within Barki Tojik and Tajikhydromet to build climate resilience into hydropower investment planning and management	No capacity currently exists to consider climate change as part of investment planning	Development of capacity to conduct climate change risk analysis and integrate climate resilience measures as part of investment planning in the hydropower sector	Barki Tojik PPCR Secretariat
B3. Use of climate information in decision making	B3 (optional): Evidence showing that climate information	Improved hydro-meteorological data and forecasts that take into	Dam management regimes do not take into account climate	Support for building the capacity of Barki Tojik and hydropower dam operators to update dam management	Barki Tojik

routinely applied	products/services are used in decision making in climate sensitive sectors	account climate change projections to be used to inform hydropower facility operations (e.g. dam operator rules, flood response procedures)	change projections. Operating rule regimes are based on old datasets that do not take into account projected future hydrological conditions.	regimes (operating rules, flood management procedures) using improved hydro-meteorological data and climate change projections.	
B4. Climate responsive investment approaches identified and implemented	B4 (optional): Leverage of PPCR funding against public and private investments in climate sensitive sectors	PPCR grant to leverage additional finance for energy sector climate resilience improvements	PPCR finance has not yet leveraged any additional finance for the energy sector	Significant amounts of finance for climate resilience improvements in the energy sector to be sought from EBRD, EIB and EU IFCA	PPCR Secretariat EBRD
B5. Climate responsive investment approaches identified and implemented	B5 (core): Quality of and extent to which climate responsive instruments/ investment models are developed and tested	Integration of climate change resilience features into Kairakkum hydropower plant rehabilitation	Climate change resilience measures are not considered during the design of hydropower investments	Identification of practical and achievable climate resilience features that form an integral part of the detailed technical design of the rehabilitation of Kairakkum hydropower plant and are affordable within the available financing structure	Barki Tojik EBRD
		Replicable model for planning, developing and implementing climate-resilient upgrades of hydropower facilities developed and tested	No institutional experience on how to integrate climate resilience into hydropower infrastructure upgrades currently exists in Tajikistan	Generation of replicable lessons on the integration of climate risk analysis and climate resilience measures into hydropower investments that can be applied in other investments in the sector	Barki Tojik EBRD
		Adoption of best practices	There is little or no	Exposure of Barki Tojik staff and from	Barki Tojik

		as used by hydropower operators in OECD countries by Barki Tojik and other relevant Tajik institutions	awareness of emerging international best practice on hydropower and climate resilience	relevant government agencies officials to international best practice on hydropower and climate resilience in OECD countries (training, exchanges, study tour)	

Table 8: Proposed results framework