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INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED RESTRUCTURING AND ADDITIONAL IDA CREDITS/GRANTS

TO THE

KYRGYZ REPUBLIC
IN THE AMOUNT OF SDR 3.6 MILLION
(US\$5.0 MILLION EQUIVALENT)

REPUBLIC OF TAJIKISTAN
IN THE AMOUNT OF SDR 2.2 MILLION
(US\$3.0 MILLION EQUIVALENT)

AND A REGIONAL IDA GRANT
IN THE AMOUNT OF SDR 2.5 MILLION
(US\$3.5 MILLION EQUIVALENT)

TO THE
EXECUTIVE COMMITTEE OF THE INTERNATIONAL FUND FOR SAVING THE ARAL SEA (EC-IFAS)

FOR THE

CENTRAL ASIA HYDROMETEROLOGY MODERNIZATION PROJECT (CAHMP)

July 10, 2018

Social, Urban, Rural And Resilience Global Practice
Europe And Central Asia Region

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CURRENCY EQUIVALENTS

For the Executive Committee of the International Fund for Saving the Aral Sea (EC-IFAS) and
the Kyrgyz Republic

(Exchange Rate Effective April 30, 2018)

Currency Unit = US\$

SDR 1 = US\$ 1.438

For the Republic of Tajikistan

(Exchange Rate Effective May 31, 2018)

Currency Unit = US\$

SDR 1 = US\$ 1.417

FISCAL YEAR

January 1 – December 31

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ABBREVIATIONS AND ACRONYMS

ADCP	Acoustic Doppler Current Profilers
AF	Additional Financing
CA	Central Asia
CAHMP	Central Asia Hydrometeorology Modernization Project
CAREC	Central Asia Regional Economic Cooperation
CARFFGS	Central Asia Regional Flash Flood Guidance System
CIF	Climate Investment Funds
COSMO-CA	Consortium for Small-Scale Modeling Central Asia
CPF	Country Partnership Framework
CPS	Country Partnership Strategy
DA	Designated Account
DFIL	Disbursement and Financial Information Letter
DFIRM	Development Finance IDA Resource Management (Bank unit)
DLS	Distance Learning System
DRM	Disaster Risk Management
ECA	Europe and Central Asia
EC-IFAS	Executive Committee of the International Fund for Saving the Aral Sea
EMP	Environmental Management Plan
ERIK	Enhancing Resilience in Kyrgyzstan (Bank project)
EWS	Early Warning System
FM	Financial Management
GCF	Green Climate Fund
GDP	Growth Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GRS	Grievance Redress Service
GTS	Global Telecommunication System
IA	Implementation Arrangements
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFAC	International Federation of Accountants
IFR	Interim Financial Report
IPSASB	International Public Sector Accounting Standards Board
IRI	Intermediate Results Indicator
ISA	International Standards on Auditing
KgHM	KyrgyzHydromet
MoES	Ministry of Emergency Situations (Kyrgyz Republic)
NFCS	National Framework for Climate Services

NMHS	National Meteorological and Hydrological Service
NPF	New Procurement Framework
NPV	Net Present Value
NWP	Numerical Weather Prediction
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PBA	Performance Based Allocation
PDO	Project Development Objective
PCU	Project Coordination Unit
PIU	Project Implementation Unit
PMU	Project Management Unit
PPCR	Pilot Program on Climate Resilience
PPSD	Project Procurement Strategy for Development
QMS	Quality Management System
RCH	Regional Center of Hydrology
SCF	Strategic Climate Fund
SOE	Statement of Expenses
SOP	Standard Operation Procedure
SWFDP-CA	Severe Weather Forecasting Demonstration Project in Central Asia
TjHM	TajikHydromet
TOR	Terms of Reference
WIS	WMO Information System
WMO	World Meteorological Organization
WMO RSMC	World Meteorological Organization Regional Specialized Meteorological Centre
WRF-ARW	Advanced Research Weather Research and Forecasting Model



BASIC INFORMATION – PARENT (Central Asia Hydrometeorology Modernization Project - P120788)

Country Central Asia	Product Line IBRD/IDA	Team Leader(s) Daniel Werner Kull		
Project ID P120788	Financing Instrument Investment Project Financing	Resp CC GSU09 (9350)	Req CC ECCCA (1608)	Practice Area (Lead) Social, Urban, Rural and Resilience Global Practice

Implementing Agency: Tajikhydromet, Kyrgyzhydromet

Is this a regionally tagged project?

No

Bank/IFC Collaboration

No

Approval Date

26-May-2011

Closing Date

31-Dec-2018

Original Environmental Assessment Category

Not Required (C)

Current EA Category

Not Required (C)

Situations of Urgent Need or Capacity Constraints

Financial Intermediaries (FI)

Series of Projects (SOP)

Project-Based Guarantees

Development Objective(s)

The objective of the Central Asia Hydrometeorology Modernization Project (CAHMP) is to improve the accuracy and timeliness of hydromet services in Central Asia, with particular focus on Kyrgyz Republic and Republic of Tajikistan.

Ratings (from Parent ISR)

	Implementation	Latest ISR
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	28-Jun-2016	22-Dec-2016	14-Jun-2017	15-Dec-2017	27-Dec-2017	12-Jun-2018
Progress towards achievement of PDO	MS	S	S	S	S	S
Overall Implementation Progress (IP)	MS	S	S	S	S	S
Overall Safeguards Rating						
Overall Risk	H	H	H	M	S	S

BASIC INFORMATION – ADDITIONAL FINANCING (Central Asia Hydrometeorology Modernization Project (CAHMP) Additional Financing - P164780)

Project ID	Project Name	Additional Financing Type	Urgent Need or Capacity Constraints
P164780	Central Asia Hydrometeorology Modernization Project (CAHMP) Additional Financing	Cost Overrun, Scale Up	No
Financing instrument	Product line	Approval Date	
Investment Project Financing	IBRD/IDA	01-Aug-2018	
Projected Date of Full Disbursement	Bank/IFC Collaboration		
31-Mar-2021	No		
Is this a regionally tagged project?			
No			
<input type="checkbox"/> Situations of Urgent Need or Capacity Constraints		<input type="checkbox"/> Financial Intermediaries (FI)	
<input type="checkbox"/> Series of Projects (SOP)		<input type="checkbox"/> Project-Based Guarantees	
<input type="checkbox"/> Disbursement-linked Indicators (DLIs)		<input type="checkbox"/> Contingent Emergency Response Component (CERC)	



[] Alternative Procurement Arrangements (APA)

Disbursement Summary (from Parent ISR)

Source of Funds	Net Commitments	Total Disbursed	Remaining Balance	Disbursed	
IBRD				<div style="width: 0%;"></div>	%
IDA	20.70	17.91	1.21	<div style="width: 94%;"></div>	94 %
Grants	7.00	6.85	0.15	<div style="width: 98%;"></div>	98 %

PROJECT FINANCING DATA – ADDITIONAL FINANCING (Central Asia Hydrometeorology Modernization Project (CAHMP) Additional Financing - P164780)

FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	11.50
Total Financing	11.50
of which IBRD/IDA	11.50
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	11.50
IDA Credit	2.50
IDA Grant	9.00

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?



Yes No

Does the project require any other Policy waiver(s)?

Yes No

INSTITUTIONAL DATA

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Contributing Practice Areas

Environment & Natural Resources
Water

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

No

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

No

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
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	Responsible)		
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Markus Zimmermann	Hydrology and DRM Expert		



CENTRAL ASIA

CENTRAL ASIA HYDROMETEOROLOGY MODERNIZATION PROJECT (CAHMP) ADDITIONAL FINANCING

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I. BACKGROUND AND RATIONALE FOR ADDITIONAL FINANCING

1. **This Project Paper seeks the approval of the Executive Directors to provide additional financing - through a combination of IDA Grants and Credits - of US\$11.5 million to the Central Asia Hydrometeorology Modernization Project (CAHMP, P120788).** The proposed additional financing would allow for: (i) completion of activities previously constrained by cost overruns; (ii) scaling up of activities, particularly procurement of hydrometeorological equipment; and (iii) implementation of new activities, enabling CAHMP to fully achieve the expected Project Development Objective (PDO) and enhance its impact. The recipients of the additional financing will be the Kyrgyz Republic (US\$5.0 million), the Republic of Tajikistan (US\$3.0 million) and the Executive Committee of the International Fund for Saving the Aral Sea (EC IFAS – US\$3.5 million), based on requests from the Government of Tajikistan (dated October 31, 2017), from the Government of the Kyrgyz Republic (dated January 19, 2018), and from EC-IFAS (dated December 26, 2017). An extension of the Project closing date from December 31, 2018, to March 31, 2021, to complete current and new activities under the project, is also sought. Closing dates of current grants and credits will be extended to the same date to facilitate completion of activities already under implementation (except for the PPCR grant for the Republic of Tajikistan). There are no changes to the PDO, components and project design, with minor changes to the implementation arrangements in one component.

2. **Regional Context. Reducing Central Asia’s vulnerability to extreme weather events and natural hazards continues to be a priority for the region’s economic development.** Central Asia is highly vulnerable to weather-related disasters including floods, landslides, mudflows, frosts, droughts, high winds, hailstorms, and avalanches - a situation which is exacerbated by the countries’ lack of adaptive capacity to anticipate or respond to frequent shocks.¹ Central Asian countries are among the most climate vulnerable countries in Europe and Central Asia (ECA), with Tajikistan ranking first and Kyrgyz Republic third out of the 24 countries in the region. While disaster impacts and in-country capacities to cope with catastrophes vary across Central Asia, vulnerabilities to natural hazards have increased throughout the region in the last few decades due to growing exposure of population and economic activities, rapid urbanization, aging infrastructure, lack of financial resources, and weak institutional capacities for implementing preventive measures and managing climate uncertainty.

3. **Improved services associated with weather, climate and water information are essential for sustainable and risk-informed socio-economic development.**² The cross-sectorial and cross-national character of weather-related hazards means that regional cooperation is integral to quality hydrometeorological service delivery. Moreover, climate change is increasing weather uncertainty which must be better understood and quantified to enhance the resilience and sustainability of investments. Analysis indicates that improved weather, water and climate information services deliver significant benefits by reducing disaster losses, and even greater ones through optimization of production in

¹ Vulnerability to climate change is a combination of: (i) exposure to hazards, measuring the strength of future climate change relative to today’s climate; (ii) sensitivity, indicating which economic sectors and ecosystem services are likely to be affected in view of climate change, e.g. renewable water resources, agriculture and hydropower production; and (iii) adaptive capacity to climate change, e.g. social, economic, and institutional settings to respond to weather shocks and variability.

² World Bank (2013). *Building Resilience: Integrating Climate and Disaster Risk into Development*. World Bank, Washington, D.C.



weather-sensitive sectors.³ Central Asia needs better quality weather, water, and climate information, especially to improve early warning, disaster risk reduction, emergency response and climate adaptation particularly in the agriculture, food security, transport, water resources management, energy and public health sectors.

4. **Sectoral Context. Many critical sectors are highly sensitive to weather and climate extremes and uncertainty, the optimization of which requires robust hydrometeorological services.** Central Asian countries are highly agrarian⁴, with 60% of the population living in rural areas and agriculture accounting for over 45% of total employment and nearly 25% of GDP, on average.⁵ Regional temperature and precipitation are highly variable, which when combined with projected reductions in surface water due to climate change, are likely to increase aridity, accelerate desertification and significantly raise weather-related risk to agricultural production. For instance, in some regions of Tajikistan, climate change projections indicate that by 2100 agricultural yields could drop by as much as 30 percent. The semi-arid climate of the region leads to the concentration of settlements and economic activities in more fertile but riskier areas, such as floodplains and alluvial fans. As both a domestic need and a resource for export, energy is critical to long-term economic development, with the mountainous regions of Central Asia rich in hydropower potential. When mixed with other energy sources, this offers an opportunity to meet electricity needs on a seasonal basis, taking advantage of abundant low-cost hydropower in the summer, and the reliability of thermal resources in winter. However, climate change is expected to further challenge the energy sector in Central Asia by reducing hydropower output (due to reduced water availability), increasing demand, and threatening existing infrastructure. To optimize such mixed energy production, robust short- and long-term weather and climate forecasts are needed.

5. **Institutional Context. National Meteorological and Hydrological Services (NMHSs) play a key role in disaster preparedness and hazard monitoring.** NMHSs provide Government agencies and the public with timely weather and river forecasts and early warnings to help prepare for severe weather events. However consistent underfunding of hydrometeorological services for over three decades, combined with growing demand for more reliable and sophisticated information services, means that even with the advances afforded by CAHMP and other partner investments, Central Asian NMHSs are challenged to fully satisfy societal needs. CAHMP and other Bank and partner operations have produced a range of lessons learned and good practices to modernize hydrometeorological services, which are reflected in the design of this proposed additional financing.

6. **To be effective, hydrometeorological services need to be nested in broader disaster risk management strategies, which are currently not fully institutionalized in Central Asia.** Governments across the region continue to focus on disaster response with the shift to a more proactive disaster management approach challenged by variable political will and statutory authority, as well as limited institutional resources and capacity.⁶ Coordination mechanisms between existing governmental agencies, both horizontal and vertical, are not fully developed. At a regional level, due to limited cross-border

³ Hallegatte, S. (2012). *A Cost-Effective Solution to Reduce Disaster Losses in Developing Countries: Hydro-Meteorological Services, Early Warning, and Evacuation*. Policy Research Working Paper; No. 6058. World Bank, Washington, DC.

⁴ Kazakhstan, with its strong energy sector, is less agrarian than the average Central Asian country, with agriculture accounting for only 8% of GDP (but still 33% of total employment).

⁵ S.C. Babu and S. Djalalov, eds. (2006), *Policy Reform and Agriculture Development in Central Asia*, Springer, New York

⁶ After the dissolution of the Soviet Union, many institutions involved in disaster risk management lack the required level of both human and financial resources to perform their activities.



cooperation, both extreme transboundary weather and regular events such as seasonal snowmelt often cause significant negative socioeconomic impacts. The agenda for strengthening weather and climate services at a regional level has and continues to gain traction, and the Bank can play a catalytic role in these efforts at the national and regional levels. Recognizing the risks posed by trans-boundary weather on key economic activities and people's lives and livelihoods, Central Asian countries engage and collaborate on regional climate risk management through multiple fora, including EC-IFAS and the Central Asia Regional Economic Cooperation (CAREC) Program.

7. **Central Asian mountains present significant challenges for weather and climate-related hazard monitoring, forecasting and early warning.** Rapid onset hazards such as storms, flash floods, mudflows, landslides and avalanches are widespread in the mountainous areas of Central Asia, while longer-term river flooding and droughts are common occurrences across the region.⁷ Monitoring stations in mountainous areas are particularly difficult to maintain, due to remote locations and extreme conditions. Operationalization of early warning and risk assessment of weather-related hazards, including translating observations and forecasts into actionable information products, needs to be highly efficient to respond to intense rapid-onset events. Better understanding of these hazards will contribute to climate change adaptation and reduce the region's vulnerability to weather-related hazards.

8. **Project Background. CAHMP was approved by the World Bank's Board of Executive Directors on May 26, 2011.**⁸ The PDO is to improve the accuracy and timeliness of hydrometeorological services in Central Asia, with particular focus on Kyrgyz Republic and Republic of Tajikistan. The Project is comprised of three components that intend to strengthen (a) regional coordination and information sharing (supporting Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan); (b) hydrometeorological services in the Kyrgyz Republic; and (c) hydrometeorological services in the Republic of Tajikistan. The Project is financed by a mix of regional and national IDA credit and grant resources (US\$5.1 million credit, US\$15.6 million in grants), as well as a grant from the Pilot Program on Climate Resilience (PPCR) under the Strategic Climate Fund (SCF) of the Climate Investment Funds (CIF) for US\$7.0 million, bringing total Project financing to US\$27.7 million. Following the request of the Executive Committee of the International Fund for Saving the Aral Sea (EC-IFAS) for regional-level activities, and Ministries of Finance of the Kyrgyz Republic and the Republic of Tajikistan for country-level activities, the Project went through level two restructuring at the beginning of 2016 to revise the results framework to reflect project outcomes and achievements more accurately, and extend the original closing date from August 31, 2016 to June 30, 2018, to allow for completion of planned Project activities. The restructuring did not change the PDO, design and composition of components or institutional arrangements. A further request from the same entities resulted in a second level two restructuring in March 2018, extending the closing date to December 31, 2018, to allow for completion of ongoing Project activities.

9. **Implementation Status. The Project has made firm progress towards achievement of the PDO, with implementation consistently satisfactory since June 2016.** As of July 5, 2018, 94.79% (US\$24.76

⁷ For example, in the Kyrgyz Republic, 182 towns and villages are at risk of river flooding, while in Tajikistan an overall of 70 river floods occur every year. Landslides are also a common occurrence in the mountainous areas of Central Asia: while Kyrgyz Republic recorded 5,000 landslide sites, Tajikistan identified 50,000 landslide sites.

⁸ The original financing of US\$27.7 million under CAHMP is composed of: IDA H6770 (GRTD) of US\$8.70 million, effective 12-Jan-2012; IDA H6780 (GRTD) of US\$0.90 million and IDA 49340 (IDA) of US\$5.10 million, effective 03-May-2012; IDA H6790 (GRTD) of US\$6.00 million and TF 99848 (TF) of US\$7.00 million, effective 11-Nov-2011.



million) of the original credit/grant amount has been disbursed. The project has achieved all three PDO targets in the Kyrgyz Republic, namely improved timeliness of weather forecasts and increased accuracy of river and weather forecasting. Tajikistan has achieved the PDO target on improved timeliness of forecasts, and has significantly increased weather and river forecast accuracy over the past few years, although not yet fully achieving these PDO targets. The Project has achieved nine of eleven intermediate results targets, including establishing a platform for regional integration and improving regional access to mid-resolution numerical weather prediction (NWP). At the national level, KyrgyzHydromet and TajikHydromet have been strengthened and made more sustainable, while also digitally archiving large volumes of historical data, which is critical for climate assessment. KyrgyzHydromet has fully and TajikHydromet partially improved their hydrometeorological observation networks as per the original CAHMP targets, while both are transmitting satisfactory volumes of data to the Global Telecommunication System (GTS), although KyrgyzHydromet has not yet fully reached its target. The remaining intermediate results targets are expected to be fully met under the proposed additional financing.

10. **CAHMP has played a key role in enhancing collaboration, information sharing and capacity building among four NMHSs in Central Asia.** The project has made substantial progress in strengthening regional collaboration and institutional capacity of the four involved NMHSs. Through joint capacity building such as forecaster training, NMHS technical staff have developed operational relationships for collaboration, mutual support and recognition of the regional and national benefits of data sharing. The Project has also provided a management-level platform for Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan to closely collaborate, build consensus on forward-looking enhancements and agree the aspects of weather/climate and hydrological information services that need to be managed with a regional dimension. For example, the four countries are collaborating on operational regional numerical weather prediction, using global and regional resources and expertise to improve national weather forecasting under the Severe Weather Forecasting Demonstration Project in Central Asia (SWFDP-CA).

11. **KyrgyzHydromet and TajikHydromet are improving their services and therefore their utility for government ministries, partners and the public.** Within KyrgyzHydromet and TajikHydromet, mindsets and perceptions have gradually shifted from a traditional government scientific agency approach focusing on technical activities, to a more user-oriented service provider approach, increasingly focusing on understanding and meeting user information needs. Promoting this cultural shift, the Project has supported activities such as preparation and subsequent approval of business development plans for KyrgyzHydromet and TajikHydromet, which have further improved the potential for sustainability. In both cases, the statuses and budgets of these agencies have increased during project implementation, indicating improved recognition by government, in response to improved performance. In addition, KyrgyzHydromet and TajikHydromet are now able to contribute more information and expertise to regional efforts, for example leading the identification of regional capacity building needs for certain themes under the Bank's Strengthening Early Warning of Mountain Hazards in Central Asia (P158373) technical assistance project.

12. **While Project implementation is progressing well, cost overruns caused by losses due to currency fluctuations threaten achievement of the expected objectives.** CAHMP currently runs the risk of not being able to implement all activities planned under the initial financing, specifically operationalization of high resolution regional numerical weather prediction and modernization of national observation networks, primarily due to losses caused by fluctuation of the exchange rate



between US\$ and SDR (losses of approximately US\$1.78 million: US\$780,000 for Component A, US\$480,000 for Component B, and US\$520,000 for Component C). Completion of these activities is critical to achieving the planned improvements in weather and river forecasting quality and delivery. The proposed additional financing and Project extension also provide an opportunity to scale-up successful activities and introduce new activities to increase Project impact. All original IDA grants and credits will be extended, while the PPCR grant for the Republic of Tajikistan will close as currently scheduled on December 31, 2018. The practice of the SCF, of which the PPCR is a program, is not to extend grant closing dates after full disbursement.

13. **Rationale. Additional financing will ensure that the expected objectives of the Project are fully achieved, impacts are broadened, and results are more sustainable.** The proposed additional financing will offset cost overruns due to SDR/US\$ exchange rate fluctuations, scale up several project activities, and add new activities that have emerged as critical for broader Project impact. Activities supported under additional financing will continue to (1) strengthen regional-level coordination, information-sharing and collaborative services that support Central Asian NMHSs; (2) facilitate procurement and installation of modern hydrometeorological infrastructure; and (3) strengthen national capacity in monitoring, forecasting, service delivery (for example production of user-centric early warnings) and institutional management of the NMHSs. The proposed measures will enable Central Asian NMHSs to make the best use of the new technologies and instruments, and capacity to utilize them, which will ultimately lead to better protection of people and property. Considering increased domestic commitments for operational budget for both KyrgyzHydromet and TajikHydromet, the additional financing aims to solidify the foundation for continued national ownership and sustainability.

14. **Alternative financing opportunities are limited.** Alternatives to the proposed additional financing were discussed with the involved NMHS and Government counterparts, including potential allocation of counterpart funding and processing of a larger follow-up lending operation. For the present situation, additional financing is considered the most appropriate mechanism because: (i) the Governments of Kyrgyz Republic and Tajikistan are fiscally constrained, (ii) counterpart funding of capital investments to support regional activities faces significant obstacles, and (iii) momentum could be lost during preparation of a new operation, particularly for regional initiatives. Additional financing however does not preclude a potential second phase of CAHMP in the future, as indicated in the Aide Memoire from the June-July 2017 implementation support mission. The team also explored alternative sources of funding for additional financing, including the PPCR and Green Climate Fund (GCF), all of which are currently constrained, for various reasons. The counterparts welcome continued Bank engagement in hydrometeorological service modernization across Central Asia, valuing the Bank's significant global expertise in hydrometeorological modernization⁹ and strong collaboration with the WMO and leading NMHSs, facilitated by GFDRR. Finally, the Bank is providing assistance for increasing Central Asia's resilience in key sectors and is strengthening the region's disaster risk management system, particularly in Tajikistan and the Kyrgyz Republic.

15. **Building disaster and climate resilience is essential to supporting the World Bank's twin goals of ending extreme poverty and promoting shared prosperity.** Central Asia's recent development gains

⁹ For example: Rogers, D.P. & Tsirkunov, V.V. (2013). *Weather and Climate Resilience: Effective Preparedness through National Meteorological and Hydrological Services*. Directions in Development--Environment and Sustainable Development, World Bank, Washington, DC.



could be undermined by unanticipated weather-related shocks. Given that natural disasters disrupt livelihoods and trap vulnerable communities in poverty, early warning systems that protect well-being and asset resilience support poverty reduction and socio-economic development.¹⁰ Institutional capacity to collect, generate and analyze hydrometeorological and climate-related data is an essential starting point for risk-informed decision making, focusing on the most vulnerable sectors and building long term resilience. The scale-up of existing activities and the introduction of new activities through the proposed additional financing are therefore aligned with the World Bank Group goals of ending poverty and promoting shared prosperity, and will generate regional and national climate change and disaster risk management co-benefits. The proposed additional financing is also in line with the Bank's corporate agenda, within which disaster risk management (DRM) was adopted as a priority item during the 2012 Annual Meetings. As part of the World Bank Group Climate Change Action Plan 2016-2020, the Bank has committed to help bring access to high-quality hydrometeorological information and early warning systems to developing countries, working to build institutions, observation systems, decision-making process and service-delivery focus.¹¹

16. **The proposed additional financing is aligned with the priorities of the involved countries.** For example, under the World Bank Group's Country Partnership Strategy (CPS) for Tajikistan (FY15-18), it will contribute to DRM under Pillar 2 (social inclusion) and constitutes a significant contribution towards the CPS' cross-cutting theme of climate change. The additional financing will further contribute to reducing commercial and technical losses (energy, water, transport under CPS Pillar 1) and is aligned with CPS' Pillar 3 (regional connectivity). At a regional level, by supporting improved weather, water and climate information services and disaster-related early warning systems (EWS), the project contributes to the CPF's priority focus on strengthening disaster and climate resilience (Tajikistan for example) and supports the Bank's broader efforts to promote regional cross-border cooperation on resilience.

II. DESCRIPTION OF ADDITIONAL FINANCING

17. **Project development objectives and the design of the project will not change.** While PDO targets on forecast accuracy have been partially achieved and in the case of KyrgyzHydromet exceeded, it is critical for forecast accuracy to be sustained across years to account for more turbulent seasonal weather conditions which are more complex to forecast. The proposed additional financing will continue and complement the original Project design, consisting of three components: (A) regional, (B) national in Kyrgyz Republic and (C) national in Tajikistan. There will be changes under Component A. The regional component will continue to support Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan, and will also include Turkmenistan.

18. **Project implementation arrangements will not change significantly.** EC-IFAS, through its Almaty-based Regional Center of Hydrology (RCH), will continue to implement Component A, with a dedicated Project Management Unit (PMU) already in place. EC-IFAS will be the recipient of IDA regional grant funds, consistent with the six eligibility criteria established for regional institutions under the IDA Regional Grant

¹⁰ Hallegatte, S., Vogt-Schilb, A., Bangalore, M. & Rozenberg, J. (2017). *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters*. Climate Change and Development, World Bank, Washington, DC.

¹¹ World Bank, IFC, and MIGA. 2016. "World Bank Group Climate Change Action Plan 2016–2020." World Bank, Washington DC.



Pilot.¹² While EC-IFAS members include IBRD borrowers, EC-IFAS was identified as the only venue able to provide the regional level of coordination for the Project to have its intended impact, and the involved IBRD borrowers will not directly benefit from IDA financing, but will rather continue to host regional functions from which they indirectly benefit. The proposed regional activities constitute an essential part of regional and national institutional development and capacity building and are indispensable for the operation of integrated regional networks. In the Kyrgyz Republic (Component B), the previous PCU at Kyrgyzhydromet has been elevated to a PIU at the Ministry of Emergency Situations (MoES), also supporting the Bank project Enhancing Resilience in Kyrgyzstan (ERIK, P162635). The PCU at TajikHydromet will continue to implement Component C. The Component B PIU and Component C PCU will continue to work under the overall guidance of the Project Management Committees (PMC) established in the Republic of Tajikistan and the Kyrgyz Republic. The project operation manuals (one for each component) will be updated to align with the Bank's New Procurement Framework and Regulations for Projects (effective 1 July, 2016) and changes to safeguard requirements, Project dates, financing and activity details.

19. **Additional financing in the form of an US\$3.5 million grant from the IDA Regional Grant Pilot program is sought for Component A: Strengthening regional coordination and information sharing and services.** The IDA Pilot was created to build capacity of regional institutions to facilitate regional integration more effectively and efficiently. Component A focuses on building institutional capacity of three closely linked institutions and the systems they operate: EC-IFAS RCH (Almaty), UzHydromet (in its functions as host of the World Meteorological Organization Regional Specialized Meteorological Centre - WMO RSMC – continuing to support regional numerical weather prediction and satellite/global data access) and KazHydromet (in its functions as the Central Asia Regional Flash Flood Guidance System Regional Centre - CARFFGS RC).

20. **Component A's existing sub-components will continue.** These include: *Sub-Component A.1 – Improve the technical and organizational capacity of the EC-IFAS and the RCH to coordinate the work of the National Hydrometeorological Services and to promote information receiving, storage and exchange among the National Hydrometeorological Services (US\$740,000); Sub-Component A.2 – Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate (US\$300,000); Sub-Component A.3 - Improve the provision of hydrometeorological services by the National Hydrometeorological Services through: (i) improved early warning systems for extreme events, including support to the CARFFGS; and (ii) improved weather and river flow forecasting and climate change assessment systems with access to, and use of, global and regional numerical weather prediction products (US\$1.99 million); and Sub-Component A.4 – Support implementation of Component A of the Project and ensure full coordination of activities under Components A, B, and C of the Project*

¹² Eligibility Criteria for Access to IDA Grants by Regional Institutions:

1. Recipient is a bona fide regional organization that has the legal status and fiduciary capacity to receive grant funding and the legal authority to carry out the activities financed.
2. Recipient does not meet eligibility requirements to take on an IDA credit.
3. The costs and benefits of the activity to be financed with an IDA grant are not easily allocated to national programs.
4. The activities to be financed with an IDA grant are related to regional infrastructure development, institutional cooperation for economic integration, and coordinated interventions to provide regional public goods.
5. Grant co-financing for the activity is not readily available from other development partners
6. The regional entity is associated with an IDA-funded regional operation or otherwise supports the strategic objectives of IDA on regional integration.



(US\$470,000).

21. **A new activity under Component A will contribute to Sub-Component A.3.** Operationalization of data exchange and regional numerical weather prediction constitutes the additional financing for cost overruns under Sub-Components A.1 and A.3 (US\$440,000). Activities to scale up will reinforce regional technical capacities under Sub-Components A.1, A.2 and A.4 (US\$1.26 million). A new activity under Sub-Component A.3 will introduce modules for landslide/mudflow assessment, riverine routing and seasonal river forecasting into the existing operational CARFFGS (US\$1.80 million), thereby improving early warning systems for extreme events and improving river flow forecasting. This activity was requested by KazHydromet (CARFFGS Regional Center) on behalf of all participating countries on 7 October, 2016, accompanied by supporting letters from the Central Asian NMHSs. As a new CAHMP country, Turkmenistan is already participating in CARFFGS, but may need to formally agree engagement in other regional activities supported by CAHMP but led by the WMO RSMC.¹³ Details of the planned activities are included in Annex 1.

22. **Additional financing of US\$5.0 million from IDA is sought for Component B: Strengthening of Hydromet Services in Kyrgyz Republic.** Additional financing in the form of an US\$2.5 million IDA credit and US\$2.5 million IDA grant is being sought. The existing sub-components will continue: *Sub-Component B.1 – Strengthen the institutional capacity of Kyrgyzhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Kyrgyzhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Kyrgyz Republic; (iii) revising the scientific methodological basis of the Kyrgyzhydromet operations to WMO standards; and (iv) preparation of a feasibility study for country-wide modernization of hydrometeorological services, including integration and strengthening of existing systems for monitoring and forecasting at KyrgyzHydromet and other relevant public bodies of the Kyrgyz Republic (US\$700,000); Sub-Component B.2 – Improve the hydrometeorological observation networks to provide more timely extreme and hazardous weather warnings and a more efficient national water resources management system through: (i) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (ii) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; (iii) development of forecasting systems; (iv) creation of an automatic monitoring system on high risk high-mountain lakes; (v) creation of a mobile expeditionary subdivision for monitoring high risk breakthrough lakes, glaciers and mudflow hazard sites (US\$3.03 million); Sub-Component B.3 – Enhance the service delivery system of Kyrgyzhydromet through: (i) development of improved services provided by Kyrgyzhydromet including expanded user access to informational products; and (ii) specialized training to staff involved in service delivery (US\$1.17 million); and Sub-Component B.4 – Support implementation of Component B of the Project (US\$100,000).*

23. **New activities under Component B will contribute to existing Sub-Components.** Completion of the originally planned modernization of the national observation network constitutes the additional financing for cost overruns under Sub-Component B.2 (US\$450,000). Activities to scale up include strengthening of national institutional capacities and service delivery, and expansion of the modernized

¹³ For example, to join the WMO SWFDP-CA, the Turkmenistan Permanent Representative to the WMO would need to send a formal letter to the WMO Secretary General, with copy to the President of the WMO Regional Association II (Asia), requesting the addition of Turkmenistan as participating country.



observation networks under all Sub-Components (US\$2.87 million). New activities build on previous CAHMP investments, including (US\$1.63 million): feasibility study for country-wide modernization of hydrometeorological services (under Sub-Component B.1), monitoring of dangerous high altitude breakthrough lakes to minimize outburst flood risk (under Sub-Component B.2), creation of a mobile expeditionary subdivision for monitoring breakthrough dangerous lakes, glaciers and mudflow hazards site (under Sub-Component B.2), and modernization of the system for producing weather forecasts on hazardous weather conditions (under Sub-Component B.3). Details of the planned activities are included in Annex 1.

24. Additional financing of US\$3.0 million from IDA is sought for Component C: Strengthening of Hydromet Services in Republic of Tajikistan. Additional financing in the form of an US\$3.0 million IDA grant is being sought. The existing sub-components will continue: *Sub-Component C.1 – Strengthen the institutional capacity of Tajikhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Tajikhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Republic of Tajikistan; and (iii) revising the scientific methodological basis of the Tajikhydromet operations to WMO standards (US\$500,000); Sub-Component C.2 – Improve the hydrometeorological observation networks to provide: (i) more timely extreme and hazardous weather warnings; and (ii) a more efficient national water resources management system through: (A) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (B) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; and (C) development of forecasting systems (US\$2.07 million); Sub-Component C.3 – Enhance the service delivery system of Tajikhydromet through: (i) development of improved services provided by Tajikhydromet including expanded user access to informational products; (ii) development of a national framework for climate services, in line with the Global Framework for Climate Services; and (iii) specialized training to staff involved in service delivery (US\$210,000); and Sub-Component C.4 – Support implementation of Component C of the Project (US\$218,900).*

25. New activities under Component C will contribute to existing Sub-Components. Completion of the originally planned modernization of the national observation network constitutes the additional financing for cost overruns under Sub-Component C.2 (US\$500,000). Activities to scale up include strengthening of national institutional capacities and service delivery, and expansion of the modernized observation networks under Sub-Components C.1, C.2 and C.4 (US\$2.04 million). New activities build on previous CAHMP investments, including (US\$460,000): upgrading of snow surveying equipment (under Sub-Component C.2), development of a service delivery strategy and a national framework for climate services (under Sub-Component C.3), and strengthening publication facilities (under Sub-Component C.3). Details of the planned activities are included in Annex 1.

26. A significant proportion of national investments/activities will deliver regional impacts. By continuing to improve monitoring and forecasting at the national level, the two national components will also continue to generate significant regional spillover benefits. Improvements in hydrometeorological observation networks, ICT systems and their management will allow KyrgyzHydromet and TajikHydromet to share increased volumes of higher quality and more timely data with the WMO RSMC and CARFFGS,



and globally through the WMO Information System (WIS).¹⁴ For example, sharing of more and higher quality real-time meteorological observations will improve global and regional numerical weather prediction throughout the region. Enhanced national forecasting and early warning capacities will enable stronger engagement in related regional initiatives, as well as delivery of cross-border warning advisories, for example for floods on transboundary rivers.

27. **Regional IDA will therefore finance half (50%) of the national components.** About 72% of proposed additional financing for Component B (Kyrgyz Republic) and 83% for Component C (Tajikistan) are for activities that deliver regional benefits. In recognition of this, the two national components will be 50% financed by IDA Regional funds and 50% financed by IDA national performance-based allocations (PBA), aligned with the IDA financing scheme committed to the original Project. This amounts to US\$2.5 million of Regional IDA for Component B (Kyrgyz Republic), and US\$1.5 million of Regional IDA for Component C (Tajikistan). As per IDA rules, Regional IDA will be on the same terms as national IDA. Identification and descriptions of the national activities delivering regional benefits are provided in Annex 1 (specifically Tables 1.2 and 1.3). A summary of proposed IDA additional financing commitments is provided in the table below, confirmed by DFIRM during the Decision Meeting, December 11, 2017.

Component	National IDA (US\$ Mil.)			Regional IDA (US\$ Mil.)			Total IDA (US\$ Mil.)		
	Credit	Grant	Total	Credit	Grant	Total	Credit	Grant	Total
A. Regional	0.00	0.00	0.00	0.00	3.50	3.50	0.00	3.50	3.50
B. Kyrgyz Republic	1.25	1.25	2.50	1.25	1.25	2.50	2.50	2.50	5.00
C. Tajikistan	0.00	1.50	1.50	0.00	1.50	1.50	0.00	3.00	3.00
Total	1.25	2.75	4.00	1.25	6.25	7.50	2.50	9.00	11.50

28. **The results framework will be revised.** The proposed additional financing and extension of the project closing date will require revision of the results framework indicators to reflect changes in end targets, both in terms of timing and expected impacts, and to monitor the outcomes of new activities. In addition, the PDO indicator related to timeliness of weather forecasts in Kyrgyz Republic and Tajikistan will be revised to monitor user satisfaction with hydrometeorological services in these countries. This continues to capture progress in the timeliness of forecasts and adds information about overall improvements in hydrometeorological services, while also aligning the indicator with what is already being monitored and reported.

29. **Summary of original and additional financing allocations.** A summary of the allocations under the original Project and the additional financing for each sub-component is presented in the table below.

Component	Original (US\$)	Additional Financing (US\$)				Total (US\$)
		Overrun	Scale-up	New	Total	
Component A: Strengthening regional coordination and information sharing and services						
A.1 Improve the technical and organizational capacity of the EC-IFAS and the RCH	1,680,000	250,000	490,000	0	740,000	2,420,000

¹⁴ The WMO Information System (WIS) is enhancing WMO's existing Global Telecommunication System (GTS), which serves as the backbone of global hydrometeorological data sharing.



to coordinate the work of the National Hydrometeorological Services and to promote information receiving, storage and exchange among the National Hydrometeorological Services						
A.2 Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate	1,530,000	0	300,000	0	300,000	1,830,000
A.3 Improve the provision of hydrometeorological services by the National Hydrometeorological Services through: (i) improved early warning systems for extreme events, including support to the CARFFGS; and (ii) improved weather and river flow forecasting and climate change assessment systems with access to, and use of, global and regional numerical weather prediction products	1,640,000	190,000	0	1,800,000	1,990,000	3,630,000
A.4 Support implementation of Component A of the Project and ensure full coordination of activities under Components A, B, and C of the Project	3,850,000	0	470,000	0	470,000	4,320,000
<i>Component A Sub-Total</i>	<i>8,700,000</i>	<i>440,000</i>	<i>1,260,000</i>	<i>1,800,000</i>	<i>3,500,000</i>	<i>12,200,000</i>
Component B: Strengthening of Hydromet Services in Kyrgyz Republic						
B.1 Strengthen the institutional capacity of Kyrgyzhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Kyrgyzhydromet staff; (ii)	845,000	0	450,000	200,000	700,000	1,495,000



<p>development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Kyrgyz Republic; (iii) revising the scientific methodological basis of the Kyrgyzhydromet operations to WMO standards; and (iv) preparation of a feasibility study for country-wide modernization of hydrometeorological services, including integration and strengthening of existing systems for monitoring and forecasting at KyrgyzHydromet and other relevant public bodies of the Kyrgyz Republic</p>						
<p>B.2 Improve the hydrometeorological observation networks to provide more timely extreme and hazardous weather warnings and a more efficient national water resources management system through: (i) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (ii) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; (iii) development of forecasting systems, (iv) creation of an automatic monitoring system on high</p>	3,800,000	450,000	1,980,000	600,000	3,030,000	6,830,000



risk high-mountain lakes; (v) creation of a mobile expeditionary subdivision for monitoring high risk breakthrough lakes, glaciers and mudflow hazard sites						
B.3 Enhance the service delivery system of Kyrgyzhydromet through: (i) development of improved services provided by Kyrgyzhydromet including expanded user access to informational products; and (ii) specialized training to staff involved in service delivery	880,000	0	340,000	830,000	1,170,000	2,050,000
B.4 Support implementation of Component B of the Project	475,000	0	150,000	0	150,000	625,000
<i>Component B Sub-total</i>	<i>6,000,000</i>	<i>450,000</i>	<i>2,870,000</i>	<i>1,680,000</i>	<i>5,000,000</i>	<i>11,000,000</i>
Component C: Strengthening of Hydromet Services in Tajikistan						
C.1 Strengthen the institutional capacity of Tajikhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Tajikhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Republic of Tajikistan; and (iii) revising the scientific methodological basis of the Tajikhydromet operations to WMO standards	1,335,000	0	500,000	0	500,000	1,835,000
C.2 Improve the hydrometeorological observation networks to provide: (i) more timely extreme and hazardous	8,860,000	500,000	1,321,100	250,000	2,071,100	10,931,100



weather warnings; and (ii) a more efficient national water resources management system through: (A) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (B) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; and (C) development of forecasting systems						
C.3 Enhance the service delivery system of Tajikhydromet through: (i) development of improved services provided by Tajikhydromet including expanded user access to informational products; (ii) development of a national framework for climate services, in line with the Global Framework for Climate Services; and (iii) specialized training to staff involved in service delivery	2,255,000	0	0	210,000	210,000	2,465,000
C.4 Support implementation of Component C of the Project	550,000	0	218,900	0	218,900	768,900
<i>Component C Sub-total</i>	<i>13,000,000</i>	<i>500,000</i>	<i>2,040,000</i>	<i>460,000</i>	<i>3,000,000</i>	<i>16,000,000</i>
Total	27,700,000	1,390,000	6,170,000	3,940,000	11,500,000	39,200,000

III. KEY RISKS

30. **Overall risk rating is substantial, reflecting an improvement in institutional capacity.** During project implementation EC-IFAS RCH, KyrgyzHydromet and TajikHydromet have strengthened their institutional capacities for implementation, and the respective project implementation units have acquired adequate financial management and procurement capacities. The Governments of the Kyrgyz Republic and Tajikistan have doubled the annual budgets of their respective NMHSs, contributing to



sustainability. While still complex, the technical design of the project has proven effective. The risk ratings for Project technical design and institutional capacity for implementation and sustainability have therefore been reduced to substantial. As implementation and sustainable operation and management of highly technical hydrometeorological systems continues to be a challenge in a context of limited human and financial resources, the Project will continue to engage international expertise to help ensure solid technical design, procurement and implementation of activities, further mitigating Project risks. Sector Strategies and Policies, as well as Stakeholders, continue to exhibit substantial project risk due in particular to TajikHydromet’s limited autonomy and visibility within the government, and improved but still limited interaction by the NMHSs with their primary users. These risks are being mitigated through regional technical assistance focused on improving NMHS outreach and recognition.

31. **Regional and national stakeholder engagement is critical for success.** Technical cooperation between the NMHSs is well established, however regional geopolitics can affect interactions. Regional systems are therefore designed to function, although not as effectively, even when for example regional data-sharing is challenged. At the national level, the relationships between KyrgyzHydromet and TajikHydromet and their primary users and ministries are in some cases superficial, which could undermine impact and sustainability. The Project emphasizes strengthening these relationships through enhanced mechanisms for service delivery and ensuring demand-responsiveness. Combined with business development plans that consider the benefits and costs of both public and fee-based services, stronger stakeholder engagement is being pursued to contribute to sustainable and effective service delivery.

IV. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

32. As in the original appraisal of the Project, only the benefits to the two national components are assessed, while the costs for the full Project are considered, pursuing a conservative approach to the economic analysis (details are provided in Annex 3). At a minimum, the proposed additional financing will increase the annual benefits of CAHMP from US\$3.6 million to US\$8.0 million in Kyrgyz Republic and from US\$7.0 million to US\$10.4 million in Tajikistan (in 2017 values). Minimum expected performance of the proposed additional financing indicates economic efficiency:

Metric	Kyrgyz Republic	Tajikistan	Overall
Annual benefits (US\$, 2017 value)	4.4 million	3.5 million	7.9 million
Net present value (US\$, NPV)	45 million	39 million	79 million ¹⁵
Benefit/cost ratio	4.2	5.2	3.9

33. As projected climate change-driven increases in variability of weather extremes are realized, the net present value and benefit/cost ratio of CAHMP and the proposed additional financing will also increase. This is because benefits from hydrometeorological services and early warning are not threshold

¹⁵ Overall NPV does not equal the sum of NPV in Kyrgyz Republic and Tajikistan because it also incorporates the full cost of Component A (regional).



constrained, meaning relative performance does not decrease with increased hazard intensity, as is the case for example with flood protection levees, which fail once they are over-topped. Financial analysis is not applicable to this project because it is not a revenue generating project.

B. Technical

34. The technical assessment carried out at appraisal of the original Project remains valid for additional financing. Technical design is based on improvements of critical elements of weather, climate and hydrological information systems such as observation infrastructure, communication networks, data management/visualization facilities, and service delivery channels. Intrinsic to overall project design is capacity building, institutional strengthening and service improvement for the participating NMHSs. Regional activities emphasize data sharing and coordination among participating countries, as well as leveraging the latest hydrometeorological technology, methodologies and data services available at global level. This approach and the main Project activities have been agreed upon with all participating NMHSs. The Project design was vetted by reputable international experts and integrates lessons learned from past Project implementation as well as those globally collated by the Bank's Global Facility for Disaster Reduction and Recovery (GFDRR) Hydromet Team.¹⁶

C. Financial Management

35. The Implementation Arrangements for the original Project will continue to be applied, except in the Kyrgyz Republic where the PCU at KyrgyzHydromet is now a PIU at MoES. The following Implementing Agencies (IAs) will be responsible for financial management arrangements: Regional Component – EC-IFAS through the PMU at the Regional Center for Hydrology, Kyrgyz Republic Component – MoES, and Tajikistan Component – TajikHydromet supported by the respective Project Implementation and Coordination Units. The financial management function (FM) function for the Additional Financing, including planning and budgeting, accounting, financial reporting, external auditing, funds flow, and internal controls will rely on the existing systems. The FM assessment of the implementing agencies (IA) for the additional financing confirmed that there are overall adequate FM arrangements in place. In particular, the FM assessment notes that: (i) the FM staff of the Implementing Agencies have significant experience in implementing Bank-financed projects; (ii) there is adequate accounting software utilized by all IAs; (iii) annual independent audits of all three components under the parent project revealed no major issues, and (iv) interim financial reports (IFRs) on the projects by components were received on time and found to be acceptable to the Bank. No major weaknesses were identified at the implementing agencies (IAs) for the additional financing implementation. No additional actions are recommended.

D. Procurement

36. The World Bank's Procurement Regulations for IPF Borrowers (July 2016, revised November 2017), require to have in place an integrated Project Procurement Strategy for Development (PPSD). Each component will ensure their specific needs are integrated into the PPSD prior to project appraisal/additional financing negotiations with the Bank. It was determined that the proposed Additional

¹⁶ For example: Rogers, D.P. & Tsirkunov, V.V. (2013). *Weather and Climate Resilience: Effective Preparedness through National Meteorological and Hydrological Services*. Directions in Development--Environment and Sustainable Development, World Bank, Washington, DC.



Financing does not include complex procurements, so the simplified PPSD Short Form is applicable. The PPSD will include the following key deliverables: (i) Summary of which packages are to be put to market; (ii) Summary of risks and opportunities to be managed; (iii) Pre-market engagement strategy (e.g. supplier briefings, probity, expressions of interest); (iv) Options for contracting approaches and (v) Procurement Plan. The task team has prepared Terms of Reference for preparation of the PPSD, which have been agreed with the Borrowers. As such, the task team is assisting the Borrowers in preparation of PPSD.

E. Social (including Safeguards)

37. The additional financing will not lead to any changes to safeguards policies. The Project will not trigger Involuntary Resettlement as there will be no involuntary land acquisition or negative impact on assets. It has therefore been assigned a low social risk rating. The Project will provide positive social benefits by increasing the volume and quality of hydrometeorological information and early warning services available to the public.

38. Aligned with the *Strategic Framework for Mainstreaming Citizen Engagement in World Bank Group Operations*, the revised PDO indicator on “Increased user satisfaction with hydrometeorological services” will be monitored through biennial surveys. These will support two-way engagement between both the public and critical economic sectors with hydrometeorological service providers. Survey results will be made publicly available, and the counterparts maintain points of contact for public engagement. Survey results will be gender disaggregated.

F. Environment (including Safeguards)

39. The Project will continue to be classified as environmental category C, since no adverse environmental impact is anticipated. The Project will not finance any civil works that would require triggering the OP 4.01 Environmental Assessment. The Project will not finance any equipment whose operation, breakage or malfunction would cause adverse impact on environment or human health. It has therefore been assigned a low environmental risk rating. The Project will provide positive environmental benefits by contributing to the mitigation of natural hazard risks and supporting climate change adaptation.

40. The Operational Manuals for the three components will have a section to address minor environmental issues arising from placement of monitoring equipment and disposal/installation of equipment or implementation of civil works mentioned above. The Borrowers will use an Environmental Management Plan (EMP) Checklist, a standard template developed by the World Bank Environmental and Social safeguards specialists specifically for minor construction/renovation works, as a primary measure to monitor and account for associated risks. The World Bank team will monitor EMP checklists regularly during the supervision missions.

G. Other Safeguard Policies (if applicable)

V. WORLD BANK GRIEVANCE REDRESS



Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org

**VI. SUMMARY TABLE OF CHANGES**

	Changed	Not Changed
Change in Implementing Agency	✓	
Change in Results Framework	✓	
Change in Components and Cost	✓	
Change in Loan Closing Date(s)	✓	
Change in Procurement	✓	
Change in Project's Development Objectives		✓
Cancellations Proposed		✓
Reallocation between Disbursement Categories		✓
Change in Disbursements Arrangements		✓
Change in Safeguard Policies Triggered		✓
Change of EA category		✓
Change in Legal Covenants		✓
Change in Institutional Arrangements		✓
Change in Financial Management		✓
Change in APA Reliance		✓
Other Change(s)		✓

VII. DETAILED CHANGE(S)**IMPLEMENTING AGENCY**

Implementing Agency Name	Type	Action
Tajikhydromet	Line Ministry/Ministerial Department	No Change
Kyrgyzhydromet	Line Ministry/Ministerial	Marked for Deletion



	Department	
EC-IFAS Regional Center of Hydrology (RCH)	Bilateral/Multilateral Agency	New
Ministry of Emergency Situations	Line Ministry/Ministerial Department	New

RESULTS FRAMEWORK

Project Development Objective Indicators

Increased accuracy of river flow forecasts Unit of Measure: Text Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	KgHM 62% TjHM 64%	KgHM: 83% TjHM: 75%	KgHM: 85% TjHM: 80%	Revised
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	
Increased accuracy and timeliness of basic weather forecasts Unit of Measure: Text Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	76% for KgHM and 66% for TjHM	KgHM: 94.7% TjHM: 85%	KgHM: 85% TjHM: 85%	Revised
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	
Increased user satisfaction with hydrometeorological services Unit of Measure: Text Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	KgHM: 2.80 TjHM: 2.90	KgHM: 3.81 TjHM: 4.26	KgHM: 4.3 TjHM: 4.3	Revised
Date	17-Jun-2016	01-Dec-2017	31-Mar-2021	



Intermediate Indicators

(Comp B: Kyrgyz Republic, IRI 4) Increased institutional strength and sustainability of Kyrgyzhydromet

Unit of Measure: Text

Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	Existing legal structure, operating procedures and staffing are inadequate to meet KgHM mission#s needs. Investment and O&M needs far exceed KgHM budgets.	KgHM prepared a list of operational guidelines necessary for operations in light of modernized infrastructure; the terms of reference to draft these is being developed. "Fee-for-service" arrangements have been piloted in few sectors, resulting in a 7% increase in the special account funds. The Marketing Department has initiated regular quality survey assessments of users, and is implementing simplification of the payment system for KgHM services. KgHM budget is now sufficient to cover O&M needs of regular operations.	New regulations developed. New standard operating procedures developed. New business plan developed. Budget significantly increased.	Revised
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	

(Comp C: Tajikistan, IRI 3) Increased sustainability and strengthened performance of Tajikhydromet operations

Unit of Measure: Text

Indicator Type: Custom



	Baseline	Actual (Current)	End Target	Action
Value	<p>Existing legal structure, operating procedures and staffing are inadequate to meet TjHM mission needs.</p> <p>Investment and O&M needs far exceed TjHM budgets.</p>	<p>New regulations and operational guidelines developed in line with new concept, modernized observation infrastructure and technologies are fully functioning.</p> <p>“Fee-for-service” arrangement piloted in few sectors, in particular energy, agriculture, housing and transportation. For 10 months of 2017, 9 contracts were signed for about US\$5000.</p> <p>In April 2017 TjHM requested the Environmental Protection Committee to submit the draft budget of Tajikhydromet to the Finance Ministry of taking into account the allocation of additional funds for the O&M of the upgraded observation network. Currently, no additional funds for O & M are needed.</p>	<p>New regulations developed.</p> <p>New standard operating procedures developed.</p> <p>New business plan developed.</p> <p>Budget significantly increased.</p>	Revised
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	
<p>(Comp B: Kyrgyz Republic, IRI 1) Improved status of hydrometeorological observation networks Unit of Measure: Text Indicator Type: Custom</p>				
	Baseline	Actual (Current)	End Target	Action



	13% of meteostations gauging main meteo parameters	100% of meteostations gauging main meteo parameters.	100% of meteostations gauging main meteo parameters	
Value	44% of stream gauges reporting operational data	100% of stream gauges reporting operational data.	93% of stream gauges reporting operational data	Revised
	70% stream gauges measuring discharges	95% stream gauges measuring discharges.	87% stream gauges measuring discharges	
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	
(Comp B: Kyrgyz Republic, IRI 2) Better transmission of data to global telecommunication system (GTS)				
Unit of Measure: Text				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	86.00	0.85	100.00	Revised
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	
(Comp C: Tajikistan, IRI 1) Improved status of hydrometeorological observation networks				
Unit of Measure: Text				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
	19% of meteostations gauging main meteo parameters	100% of meteostations gauging main meteo parameters	90% of meteostations gauging main meteo parameters	
Value	16% of stream gauges reporting operational data	50% of stream gauges reporting operational data	50% of stream gauges reporting operational data	Revised
	49% stream gauges measuring discharges	60% stream gauges measuring discharges	71% stream gauges measuring discharges	
Date	31-Aug-2011	01-Dec-2017	31-Mar-2021	
(Comp C: Tajikistan, IRI 2) Better transmission of data to global telecommunication system (GTS)				
Unit of Measure: Percentage				
Indicator Type: Custom				
	Baseline	Actual (Current)	End Target	Action
Value	70.00	95.00	100.00	Revised



Date	31-Aug-2011	01-Dec-2017	31-Mar-2021
(Comp A: EC-IFAS, IRI 1): Improved access to national and regional numeric weather prediction products to all CA countries Unit of Measure: Text Indicator Type: Custom			
	Baseline	Actual (Current)	End Target
Value	100x250 km transmitted every 12 hours	<p>13 x 13 km every 6 hours</p> <p>The calculation results based on ftp are being transmitted for the regional grid of resolution 13.2x13.2 km using the adapted COSMO technology in Uzhydromet and other NHMS CAs.</p> <p>The system of local calculations for COSMO-CentralAsia-2 with a resolution of 2x2 km is organized.</p> <p>The COSMO-CA-2 technology software was developed for further installation at Uzhydromet. Installation of dedicated high powered computing facilities is currently under way at UzHydromet.</p>	<p>7x7 km every 6 hours for all of Central Asia</p> <p>2x2 km every 6 hours for the mountainous region of Central Asia</p>
			Revised
Date	10-Dec-2015	01-Dec-2017	31-Mar-2021
(Comp A: EC-IFAS, IRI 3): Improved access to landslide, mudflow and snowmelt guidance for all CA countries Unit of Measure: Text Indicator Type: Custom			
	Baseline	Actual (Current)	End Target
			Action



Value	CARFFGS provides only flash flood guidance products across the region	same as baseline	CARFFGS provides flash flood, landslide, riverine routing and snowmelt guidance products across the region	New
Date	02-Mar-2018		31-Mar-2021	

COMPONENTS

Current Component Name	Current Cost (US\$, millions)	Action	Proposed Component Name	Proposed Cost (US\$, millions)
Component A: Strengthening regional coordination and information sharing.	8.70	Revised	Component A: Strengthening regional coordination and information sharing and services	12.20
Component B: Strengthening of Hydromet Services in Kyrgyz Republic.	6.00	Revised	Component B: Strengthening of Hydromet Services in Kyrgyz Republic	11.00
Component C: Strengthening of Hydromet Services in Republic of Tajikistan.	13.00	Revised	Component C: Strengthening of Hydromet Services in Republic of Tajikistan	16.00
TOTAL	27.70			39.20

LOAN CLOSING DATE(S)

Ln/Cr/Tf	Status	Original Closing	Current Closing(s)	Proposed Closing	Proposed Deadline for Withdrawal Applications
IDA-49340	Effective	31-Aug-2016	31-Dec-2018	31-Mar-2021	31-Jul-2021
IDA-H6770	Effective	31-Aug-2016	31-Dec-2018	31-Mar-2021	31-Jul-2021
IDA-H6780	Effective	31-Aug-2016	31-Dec-2018	31-Mar-2021	31-Jul-2021
IDA-H6790	Effective	31-Aug-2016	31-Dec-2018	31-Mar-2021	31-Jul-2021
TF-99848	Effective	31-Aug-2016	31-Dec-2018	31-Dec-2018	30-Apr-2019



Expected Disbursements (in US\$)

Fiscal Year	Annual	Cumulative
2011	0.00	0.00
2012	500,000.00	500,000.00
2013	1,172,838.01	1,672,838.01
2014	1,767,065.54	3,439,903.55
2015	2,863,771.23	6,303,674.78
2016	5,957,160.29	12,260,835.07
2017	2,905,592.40	15,166,427.47
2018	3,100,000.00	18,266,427.47
2019	3,000,000.00	21,266,427.47
2020	4,600,000.00	25,866,427.47
2021	4,200,000.00	30,066,427.47

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Latest ISR Rating	Current Rating
Political and Governance	● Moderate	● Moderate
Macroeconomic	● Moderate	● Moderate
Sector Strategies and Policies	● Substantial	● Substantial
Technical Design of Project or Program	● Substantial	● Substantial
Institutional Capacity for Implementation and Sustainability	● Substantial	● Substantial
Fiduciary	● Moderate	● Moderate
Environment and Social	● Low	● Low
Stakeholders	● Substantial	● Substantial
Other		
Overall	● Substantial	● Substantial



LEGAL COVENANTS – Central Asia Hydrometeorology Modernization Project (CAHMP) Additional Financing (P164780)

Sections and Description

Component C (Tajikistan): The Recipient, through Tajikhydromet, shall: (i) not later than one (1) month after the Effective Date, employ or contract the services of the key PCU staff, including executive director, procurement and financial management specialists under terms of reference and with qualifications and experience satisfactory to the Association; and (ii) maintain the PCU within Tajikhydromet throughout the duration of the Project with organization, resources, staffing and terms of reference at all times satisfactory to the Association and as further described in the POM.

Conditions

Type	Description
Effectiveness	Component A, FA reference Article V, 5.01.a: The Project Operations Manual has been updated by the Recipient in a manner satisfactory to the Association
Effectiveness	Component A, FA reference Article V, 5.01.b: On behalf of the Recipient, the delivery to the Association of an opinion of counsel satisfactory to the Association showing, with respect to certain of the Recipient’s Documents, that: (i) The IFAS and IFAS Entities Regulations, the EC-IFAS Regulations and the RCH Regulations are in full force and effect in Turkmenistan and the Republic of Kazakhstan; and (ii) The Recipient and the RCH, as well as their staff, enjoy the privileges and immunities awarded to organizations of IFAS under the IFAS Status Agreement.
Effectiveness	Component C, FA reference Article IV, 4.01: The Recipient, through Tajikhydromet, has updated the Project Operations Manual in a manner satisfactory to the Association.
Effectiveness	Component B, FA reference Article IV, 4.01: The Recipient has updated the Project Operations Manual in a manner satisfactory to the Association.



VIII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY : Central Asia

Central Asia Hydrometeorology Modernization Project (CAHMP) Additional Financing

Project Development Objectives

The objective of the Central Asia Hydrometeorology Modernization Project (CAHMP) is to improve the accuracy and timeliness of hydromet services in Central Asia, with particular focus on Kyrgyz Republic and Republic of Tajikistan.

Project Development Objective Indicators

Action	Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Revised	Name: Increased accuracy of river flow forecasts		Text	KgHM 62% TjHM 64%	KgHM: 85% TjHM: 80%	Annual	Internal verification reports of the NMHSs	PMU, PCU and PIU
Description: Accuracy (%) of seasonal river flow forecasts (for vegetation period)--Seasonal river forecast accuracy needed for credible water management decisions								
Revised	Name: Increased accuracy and timeliness of basic weather forecasts		Text	76% for KgHM and 66% for	KgHM: 85% TjHM: 85%	Annual	Based on internal verification reports of the NMHSs	PMU, PIU and PCU



				TjHM				
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Description: Accuracy (%) of weather forecasts of 72 hours lead time--Accuracy of weather forecasts and warnings must be sufficient to achieve credibility with users

Revised	Name: Increased user satisfaction with hydrometeorological services		Text	KgHM: 2.80 TjHM: 2.90	KgHM: 4.3 TjHM: 4.3	Biennial (every 2 years)	User satisfaction surveys performed by NMHSs	PMU, PIU and PCU
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Description:

Intermediate Results Indicators

Action	Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Revised	Name: (Comp B: Kyrgyz Republic, IRI 4) Increased institutional strength and sustainability of Kyrgyzhydromet		Text	Existing legal structure, operating procedures and staffing are inadequate to meet KgHM	New regulations developed. New standard operating procedures developed.	KgHM	Government decree or resolution, KgHM reports	Annual



				mission#s needs. Investment and O&M needs far exceed KgHM budgets.	New business plan developed. Budget significantly increased.			
Description: New legal and regulatory documents ; updated operational procedures ; Better match between budget needs and available resources								
Revised	Name: (Comp C: Tajikistan, IRI 3) Increased sustainability and strengthened performance of Tajikhydromet operations		Text	Existing legal structure, operating procedures and staffing are inadequate to meet TjHM mission needs. Investment and O&M needs far exceed TjHM budgets.	New regulations developed. New standard operating procedures developed. New business plan developed. Budget significantly	TjHM	Government Decree or resolution TjHM reports	Annual report of PIU



					increased.			
<p>Description: New legal and regulatory documents Updated operational procedures Better match between budget needs and available resources</p>								
No Change	Name: (Comp C: Tajikistan, IRI 5) Increased reliability of climate data		Text	Information on climate limited and of inadequate quality	Ability to downscale to local scales for at least 90% of the country	TjHM	Report of TjHM	Annual
<p>Description: Current capacity to understand climate change is limited by lack of key meteo observations. Restoration of network will improve reliability of long-range climate outlooks</p>								
Revised	Name: (Comp B: Kyrgyz Republic, IRI 1) Improved status of hydrometeorological observation networks		Text	13% of meteostations gauging main meteo parameters 44% of stream gauges reporting operational data 70%	100% of meteostations gauging main meteo parameters 93% of stream gauges reporting operational data 87% stream gauges measuring	KgHM	Based on internal reports of Kyrgyzhydromet (KgHM)	Annual Report of PIU



				stream gauges measuring discharges	discharges			
<p>Description: Meteorological instruments are installed, staff trained to use them ; Stream gages are repaired and telemetry installed to send data to central site ; Stream gauges are equipped to measure discharges</p>								
Revised	Name: (Comp B: Kyrgyz Republic, IRI 2) Better transmission of data to global telecommunication system (GTS)		Text	86.00	100.00	KgHM	Based on internal reports KgHM	Annual
<p>Description: The regional data contribution responsibility of KgHM is not being met. WMO will provide statistics showing improved contribution of NHMS.</p>								
Revised	Name: (Comp C: Tajikistan, IRI 1) Improved status of hydrometeorological observation networks		Text	19% of meteostations gauging main meteo parameters 16% of stream gauges reporting operational data	90% of meteostations gauging main meteo parameters 50% of stream gauges reporting operational data 71% stream gauges	TjHM	Based on internal reports of Tajikhydromet (TjHM)	Annual



				49% stream gauges measuring discharges	measuring discharges			
<p>Description: Meteorological instruments are installed, staff trained to use them. Stream gages are repaired and telemetry installed to send datato central site. Stream gauges are equipped to measure discharges</p>								
Revised	Name: (Comp C: Tajikistan, IRI 2) Better transmission of data to global telecommunication system (GTS)		Percentage	70.00	100.00	TjHM	Internal reports of NHMS	Annual
<p>Description: The regional data contribution responsibility of TjHM is not being met. WMO will provide statistics showing improved contribution of NHMS.</p>								
Revised	Name: (Comp A: EC-IFAS, IRI 1): Improved access to national and regional numeric weather prediction products to all CA countries		Text	100x250 km transmitte d every 12 hours	7x7 km every 6 hours for all of Central Asia 2x2 km every 6 hours for the mountaino us region of Central Asia			



Description:

No Change	Name: (Comp A: EC-IFAS, IRI 2): Established platform for integration of four NHMSs in CA		Text	Lack of agreed regional approaches on knowledge exchange and emergency procedures	Regional approach adopted in hydromet forecasting and decision-making mechanism for regional issues formalized among the four NHMSs in CA			
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Description:

No Change	Name: (Component B: Kyrgyz Republic, IRI 3) Historical data archiving		Text	0.00	800,000.00			
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Description:

No Change	Name: (Component C Tajikistan, IRI 4): Historical data archiving		Text	0.00	800,000.00			
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Description:

New	Name: (Comp A: EC-IFAS, IRI 3): Improved		Text	CARFFGS provides	CARFFGS provides			
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	access to landslide, mudflow and snowmelt guidance for all CA countries			only flash flood guidance products across the region	flash flood, landslide, riverine routing and snowmelt guidance products across the region			
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Description:



Target Values

Project Development Objective Indicators

Action	Indicator Name	Baseline	End Target
Revised	Increased accuracy of river flow forecasts	KgHM 62% TjHM 64%	KgHM: 85% TjHM: 80%
Revised	Increased accuracy and timeliness of basic weather forecasts	76% for KgHM and 66% for TjHM	KgHM: 85% TjHM: 85%
Revised	Increased user satisfaction with hydrometeorological services	KgHM: 2.80 TjHM: 2.90	KgHM: 4.3 TjHM: 4.3

Intermediate Results Indicators

Action	Indicator Name	Baseline	End Target
Revised	(Comp B: Kyrgyz Republic, IRI 4) Increased institutional strength and sustainability of Kyrgyzhydromet	Existing legal structure, operating procedures and staffing are inadequate to meet KgHM mission#s needs. Investment and O&M	New regulations developed. New standard operating procedures developed. New business plan



		needs far exceed KgHM budgets.	developed. Budget significantly increased.
Revised	(Comp C: Tajikistan, IRI 3) Increased sustainability and strengthened performance of Tajikhydromet operations	Existing legal structure, operating procedures and staffing are inadequate to meet TjHM mission needs. Investment and O&M needs far exceed TjHM budgets.	New regulations developed. New standard operating procedures developed. New business plan developed. Budget significantly increased.
No Change	(Comp C: Tajikistan, IRI 5) Increased reliability of climate data	Information on climate limited and of inadequate quality	Ability to downscale to local scales for at least 90% of the country
Revised	(Comp B: Kyrgyz Republic, IRI 1) Improved status of hydrometeorological observation networks	13% of meteostations gauging main meteo parameters 44% of stream gauges reporting operational data 70% stream gauges measuring discharges	100% of meteostations gauging main meteo parameters 93% of stream gauges reporting operational data 87% stream gauges measuring discharges



Revised	(Comp B: Kyrgyz Republic, IRI 2) Better transmission of data to global telecommunication system (GTS)	86.00	100.00
Revised	(Comp C: Tajikistan, IRI 1) Improved status of hydrometeorological observation networks	19% of meteostations gauging main meteo parameters 16% of stream gauges reporting operational data 49% stream gauges measuring discharges	90% of meteostations gauging main meteo parameters 50% of stream gauges reporting operational data 71% stream gauges measuring discharges
Revised	(Comp C: Tajikistan, IRI 2) Better transmission of data to global telecommunication system (GTS)	70.00	100.00
Revised	(Comp A: EC-IFAS, IRI 1): Improved access to national and regional numeric weather prediction products to all CA countries	100x250 km transmitted every 12 hours	7x7 km every 6 hours for all of Central Asia 2x2 km every 6 hours for the mountainous region of Central Asia
No Change	(Comp A: EC-IFAS, IRI 2): Established platform for integration of four NHMSs in CA	Lack of agreed regional approaches on knowledge exchange and emergency procedures	Regional approach adopted in hydromet forecasting and decision-making mechanism for regional issues formalized among the four NHMSs in CA
No Change	(Component B: Kyrgyz Republic, IRI 3) Historical data archiving	0.00	800,000.00



No Change	(Component C Tajikistan, IRI 4): Historical data archiving	0.00	800,000.00
New	(Comp A: EC-IFAS, IRI 3): Improved access to landslide, mudflow and snowmelt guidance for all CA countries	CARFFGS provides only flash flood guidance products across the region	CARFFGS provides flash flood, landslide, riverine routing and snowmelt guidance products across the region



Annex 1: Detailed Additional Financing Activity Description

1. **Component A Strengthening regional coordination and information sharing and services (US\$3.5 million):** The objectives of this component are to ensure that EC-IFAS/RCH maintains and increases its capacity to promote collaboration between NMHSs in the region, that the World Meteorological Organization Regional Specialized Meteorological Center (WMO RSMC), hosted by UzHydromet in Tashkent, is capacitated to fulfill its technical regional responsibilities, and that the Central Asian NMHSs work at a comparable level of expertise in the production of information and delivery of hydromet services. This is particularly important for production of consistent forecasts and warnings of extreme weather events and climate information relevant to the entire region. The proposed additional financing will support operationalization of regional numerical weather prediction at the WMO RSMC, reinforce regional technical capacities of EC-IFAS RCH and WMO RSMC, and introduce modules for landslide/mudflow assessment, riverine routing and seasonal river forecasting into the existing operational CARFFGS. Activities and their estimated costs are summarized in Table 1.1. While composition of sub-components remains unchanged, some sub-component titles have been shortened for more efficient reading and reporting.

2. **Sub-Component A.1 – Improve the technical and organizational capacity of the EC-IFAS and the RCH to coordinate the work of the National Hydrometeorological Services and to promote information receiving, storage and exchange among the National Hydrometeorological Services (US\$740,000):** The WMO RSMC will be supported to improve data exchange between the Central Asian NMHSs through the strengthening of integrated information and telecommunications hub services.

- a. *Activity 1.1 (US\$250,000):* Improve the WMO RSMC's capacity to facilitate data exchange between the communication centers of Central Asian National Hydrometeorological Services NMHSs, including creation of an integrated information and telecommunications hub at UzHydromet through supply of hardware and software, as well as ICT staff capacity building.
- b. *Activity 1.2 (US\$100,000):* Supply and installation of hardware and software at the WMO RSMC to introduce a long-range weather forecasting system for automated production of monthly forecasts, as well as automation of processing and visualization of the average monthly and daily hydrometeorological data at 2.5° resolution for the period 1880 to present. This activity will allow for optimization of staff required in the RSMC forecasting division, reduce the time for issuing forecasts, as well as substantially expanding the scope and volume of processed information delivered by the RSMC.
- c. *Activity 1.3 (US\$390,000):* Expand the functionality of the regional system for accessing online information products created from satellite information, including supply and installation of hardware and software. This will focus on agrometeorological services, allowing for continuous monitoring of the condition and use of agricultural land including accurate data on field boundaries, cropping areas, state of crops, and rapid identification of the impacts of adverse natural disasters such as drought, pests and diseases, as well as to provide



information support to crop yield forecasting.

3. **Sub-Component A.2 – Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate (US\$300,000):** E-learning training courses to be delivered through the Distance Learning System (DLS) established under the Project will be developed for several hydrometeorological topics.

- a. *Activity 2.1 (US\$300,000):* Development and potential acquisition of learning aids to study technical characteristics and operations and maintenance of modern hardware, including finalization of a studio for the development of distance learning courses at WMO RSMC. While DLS installation has been completed, electronic training courses need to be developed, as well as supply of study equipment (hydrometeorological infrastructure, sensors, etc.) to support professional development of observation departments across the region.

4. **Sub-Component A.3 – Improve the provision of hydrometeorological services by the National Hydrometeorological Services through: (i) improved early warning systems for extreme events, including support to the CARFFGS; and (ii) improved weather and river flow forecasting and climate change assessment systems with access to, and use of, global and regional numerical weather prediction products (US\$1,990,000):** Strengthening of regional Numerical Weather Prediction (NWP) services provided by the WMO RSMC and expansion of regional geomorphologic information services provided through the Central Asia Regional Flash Flood Guidance System (CARFFGS). This will include capacity building of the Central Asian NMHSs to optimally utilize these tools to bolster national services.

- a. *Activity 3.1 (US\$90,000):* Advanced training of IT specialists and forecasters in the technologies of decoding, archiving, visualization as well as application of calculation results of the installed mesoscale NWP modeling system, and organization of automated information processing using COSMO-CA (Consortium for Small-Scale Modeling – Central Asia) technology.
- b. *Activity 3.2 (US\$100,000):* Methodological and technical assistance for commissioning the computer cluster at the WMO RSMC and installation of the COSMO-CA system.
- c. *Activity 3.3 (US\$1,800,000):* Introduction of modules for landslide/mudflow assessment, riverine routing and seasonal forecasting of river flow into the existing operational Central Asia Regional Flash Flood Guidance System (CARFFGS). Currently CARFFGS is providing flash flood early warning guidance using satellite monitoring and NWP weather forecasts. It will be expanded to provide similar guidance for landslides, mudflows, larger-scale river floods, and long-term seasonal melt runoff. CARFFGS is being implemented regionally by KazHydromet in Astana.

5. **Sub-Component A.4 – Support implementation of Component A of the Project and ensure full coordination of activities under Components A, B, and C of the Project (US\$470,000):** Continuation of regional integration, both technical and political, for example through the annual meeting of NMHS



Directors. This sub-component further supports regional events and provision of expertise, as well as project management unit costs of EC-IFAS/RCH.

Table 1.1 Component A: Scope and estimated cost of activities

#	Sub-components/Activities	Cost (US\$)	Additional Financing Need		
			Overrun	Scale-up	New
A.1	Improve the technical and organizational capacity of the EC-IFAS and the RCH to coordinate the work of the National Hydrometeorological Services and to promote information receiving, storage and exchange among the National Hydrometeorological Services	740,000			
1.1	Improve the WMO RSMC's capacity to facilitate data exchange	250,000	X		
1.2	Scaling up regional long-range forecasting services	100,000		X	
1.3	Expanding regional access to information products created from satellite data	390,000		X	
A.2	Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate	300,000			
2.1	Development of learning aids and e-learning courses	300,000		X	
A.3	Improve the provision of hydrometeorological services by the National Hydrometeorological Services through: (i) improved early warning systems for extreme events, including support to the CARFFGS; and (ii) improved weather and river flow forecasting and climate change assessment systems with access to, and use of, global and regional numerical weather prediction products	1,990,000			
3.1	Advanced training of IT specialists and forecasters in use of COSMO-CA	90,000	X		
3.2	Commissioning the computer cluster and installation of COSMO-CA at the WMO RSMC	100,000	X		
3.3	Additional modules for the Central Asia Regional Flash Flood Guidance System (CARFFGS)	1,800,000			X
A.4	Support implementation of Component A of the Project and ensure full coordination of activities under Components A, B, and C of the Project	470,000		X	
	TOTAL:	3,500,000	440,000	1,260,000	1,800,000



6. **Component B: Strengthening of Hydromet Services in Kyrgyz Republic:** This component aims to continue to strengthen KyrgyzHydromet's capacity, infrastructure and service delivery for sustainable observation, forecasting, and delivery of weather, water and climate services to meet national economic and social needs. The proposed additional financing will support completion and expansion of the modernization of the national observation network, strengthening of institutional and human capacity in hydrometeorology and operation of modern hydrometeorological systems, and expansion of user-targeted capacity in service delivery with a focus on operational forecasting, early warning and information dissemination. Activities and their estimated costs are summarized in Table 1.2. While composition of sub-components remains unchanged, some sub-component titles have been shortened for more efficient reading and reporting.

7. **Sub-Component B.1 - Strengthen the institutional capacity of Kyrgyzhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Kyrgyzhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Kyrgyz Republic; (iii) revising the scientific methodological basis of the Kyrgyzhydromet operations to WMO standards, and (iv) preparation of a feasibility study for country-wide modernization of hydrometeorological services, including integration and strengthening of existing systems for monitoring and forecasting at KyrgyzHydromet and other relevant public bodies of the Kyrgyz Republic (US\$700,000):** For sustainable operation of the creating systems, constant training of the KyrgyzHydromet specialists by modern methods of forecasting (hydrology, meteorology and agrometeorology), limnological and glaciological observations and researches, GIS (Geographic Information System) technologies, IT technologies is necessary. Also, incorporate mathematical modeling of hydrometeorological processes into the practice of forecasting units.

- a. *Activity 1.1 (US\$200,000):* Capacity building of the human resources of the KyrgyzHydromet through staff training in the fields of meteorology, agrometeorology, hydrology, glaciology, limnology, avalanche monitoring and forecasting, metrology, and information technologies with a focus on GIS-technologies. Trainers from specialized domestic and foreign education institutions will be engaged.
- b. *Activity 1.2 (US\$100,000):* Expert support and on-the-job staff training for the development of technical specifications for procurement of hydrometeorological equipment.
- c. *Activity 1.3 (US\$150,000):* Acquisition/development of electronic training courses in the production of meteorological, agrometeorological, hydrological, snow-avalanche, glaciological, limnological observations. Such courses will be used for training of station observers in the Training Center and DLS, and will lead to an improvement in the quality of observations.
- d. *Activity 1.4 (US\$200,000):* Feasibility study for country-wide modernization of hydrometeorological services, including integration and strengthening of existing systems for monitoring and forecasting at KyrgyzHydromet and other relevant public bodies, for



example the Ministries of Water Resources, Agriculture and Energy. The study shall produce a costed design and implementation plan for integration into a seamless national system of systems, also taking into consideration financial and technical capacity needs (for example to operate and maintain weather radars), and outline a service delivery strategy particularly for KyrgyzHydromet. International expertise will be needed to support this activity.

8. **Sub-Component B.2 - Improve the hydrometeorological observation networks to provide more timely extreme and hazardous weather warnings and a more efficient national water resources management system through: (i) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (ii) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; (iii) development of forecasting systems, (iv) creation of an automatic monitoring system on high risk high-mountain lakes; (v) creation of a mobile expeditionary subdivision for monitoring high risk breakthrough lakes, glaciers and mudflow hazard sites (US\$3,030,000):** This subcomponent will be focused on creation and development of a modern in equipment and sufficient in quantity automated meteorological, hydrological and limnological monitoring system (with emphasis on breakout dangerous lakes) and monitoring of glaciers, which will allow obtaining information on hydrometeorological components of the natural environment in real time regime. Development of a collecting system, processing hydrometeorological information, forecasting, such as on the basis of modeling the development of meteorological, hydrological, agrometeorological, snow avalanche processes, the state of breakout dangerous lakes with the usage of modern GIS technologies.

- a. *Activity 2.1 (US\$800,000):* Restore key sites for hydrological observation network and installation of hydrological equipment. At the moment, 50% of manual hydrological posts have been modernized in KyrgyzHydromet.
- b. *Activity 2.2 (US\$450,000):* Introduction of a mobile hydrological monitoring station for observations on rivers on which there are no stationary hydrological posts. The station will enable monitoring of mudflows and expand the provision of hydrological information to the water and energy sectors.
- c. *Activity 2.3 (US\$1,100,000):* Procurement of automatic weather stations to strengthen hydrological, road, urban and glacier monitoring networks. This will increase the density of the meteorological observation network in accordance with WMO recommendations and provide better real-time information on weather conditions. This in turn will help improve the quality of snow avalanche and road condition forecasting, as well as urban and rural forecasting, including in high-altitude areas.
- d. *Activity 2.4 (US\$500,000):* Creation of an automatic monitoring system on previously identified and assessed high risk high-mountain lakes (with potential for floods due to breakthroughs). Installation of automatic monitoring of lake levels and meteorological parameters, providing real-time online information on the state of risky lakes, helping to predict potential breakthrough floods. This would be linked to preventive measures for



the evacuation of the population in the lower territories. Real-time monitoring data will be accessible by both KyrgyzHydromet and the Ministry of Emergency Situations, the latter being responsible for preparedness and response activities should risk increase.

- e. *Activity 2.5 (US\$100,000):* Creation of a mobile expeditionary subdivision for monitoring high risk breakthrough lakes, glaciers and mudflow hazard sites. Purchase of laptops, climbing equipment, photo and video cameras, binoculars, GPS-navigators, portable weather stations, steam ice drills, communication tools (radio stations, satellite phones), theodolites, tents, sleeping bags, camp utensils, special clothes and other life support equipment. Staff training will also be conducted. Such a subdivision will allow for rapid assessment of dangerous situations, resulting in decision-support for immediate preventive measures to reduce the threat.
- f. *Activity 2.6. (US\$80,000):* Installation of a monitoring system for server equipment, which will trigger timely preventive measures to avoid service interruptions of hardware and software complexes installed in KyrgyzHydromet to support operations. The system will reduce ITC downtime and shorten the reaction time to equipment failure or lack of communication channels.

9. **Sub-Component B.3 - Enhance the service delivery system of Kyrgyzhydromet through: (i) development of improved services provided by Kyrgyzhydromet including expanded user access to informational products; and (ii) specialized training to staff involved in service delivery (US\$1,170,000):** Development of a system for providing hydrometeorological services required for users of hydrometeorological information and economy sectors which are sensitive to weather and climate events.

- a. *Activity 3.1 (US\$50,000):* Survey of key users of hydrometeorological information services from different sectors of the economy to determine the demand, form and volumes of needed hydrometeorological information delivery.
- b. *Activity 3.2 (US\$120,000):* Creation of a high-speed local computer network in KyrgyzHydromet. It will improve internal processing and help reduce preparation and distribution times for hydrometeorological information products to the end users.
- c. *Activity 3.3 (US\$830,000):* Modernization of the system for producing weather forecasts on hazardous weather conditions using the WRF-ARW (Weather Research and Forecasting Advanced Research) numerical weather prediction model. KyrgyzHydromet has been using the WRF-ARW model since 2014, and starting 2016 also the COSMO-CA model. By using multiple model outputs as a “poor man’s ensemble”, the accuracy of forecasts and warnings across different weather conditions will be increased. A high-speed computer cluster will increase the speed of calculations and forecasts lead time up to 7 days. An international expert will be required to perform the parameterization and adaptation of the model for the territory of the Kyrgyz Republic.



- d. *Activity 3.4 (US\$150,000)*: Creation of a studio for preparation of video and audio clips for dissemination of weather forecasts to the mass media. Procurement of equipment for preparation of audio/visual segments, development of a television studio, and specialists will be trained. International consultants will be needed to prepare technical specifications, develop procedures for the provision of video and audio clips for the mass media, and train staff for the preparation of such clips. This activity will be pursued in collaboration with the national television company.
- e. *Activity 3.5 (US\$20,000)*: Establishment of a system for the operational provision of hydrometeorological information to the population. There is a highly vulnerable portion of the population that does not know how to use SMS messaging (primarily elderly people), and they often call different departments of KyrgyzHydromet for updated information. This diverts specialists from their operational work; on bad weather days, there can be up to 100 calls. Multichannel auto responders will therefore be installed in Bishkek and Osh, providing recorded information in both Kyrgyz and Russian.

10. **Sub-Component B.4 - Support implementation of Component B of the Project (US\$150,000)**: Project implementation unit costs, hosted by KyrgyzHydromet. This sub-component will continue to support implementation of country specific activities of this component and contribute to sustainability of country based investments.

Table 1.2 Component B: Scope and estimated cost of activities

#	Sub-components/Activities	Cost (US\$)	Additional Financing Need			Regional Benefit
			Overrun	Scale-up	New	
B.1	Strengthen the institutional capacity of Kyrgyzhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Kyrgyzhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Kyrgyz Republic; (iii) revising the scientific methodological basis of the Kyrgyzhydromet operations to WMO standards, and (iv) preparation of a feasibility study for country-wide modernization of hydrometeorological services, including integration and strengthening of existing systems for monitoring and forecasting at	650,000				



#	Sub-components/Activities	Cost (US\$)	Additional Financing Need			Regional Benefit
			Overrun	Scale-up	New	
	KyrgyzHydromet and other relevant public bodies of the Kyrgyz Republic					
1.1	Capacity building of the human recourses of the KyrgyzHydromet through the staff training.	200,000		X		X
1.2	Expert support in the development of technical specifications for hydrometeorological equipment to be procured	100,000		X		X
1.3	Acquisition/development of electronic training courses	150,000		X		X
1.4	Feasibility study for country-wide modernization of hydrometeorological services	200,000			X	
B.2	Improve the hydrometeorological observation networks to provide more timely extreme and hazardous weather warnings and a more efficient national water resources management system through: (i) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (ii) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; (iii) development of forecasting systems; (iv) creation of an automatic monitoring system on high risk high-mountain lakes; (v) creation of a mobile expeditionary subdivision for monitoring high risk breakthrough lakes, glaciers and mudflow hazard sites	3,030,000				
2.1	Restore key sites for hydrological observation network and installation of hydrological equipment.	800,000		X		X
2.2	Introduction of a mobile hydrological laboratory for river observations without stationary hydrological posts	450,000	X			X
2.3	Equipping hydrological observation networks, roads and large cities, glaciers with automatic meteorological stations	1,100,000		X		X



#	Sub-components/Activities	Cost (US\$)	Additional Financing Need			Regional Benefit
			Overrun	Scale-up	New	
2.4	Creation of an automatic monitoring system on high-mountainous breakthrough dangerous lakes.	500,000			X	X
2.5	Creation of a mobile expeditionary subdivision for monitoring breakthrough dangerous lakes, glaciers and mudflow hazards site.	100,000			X	X
2.6	Creation of a monitoring system for server equipment.	80,000		X		X
B.3	Enhance the service delivery system of Kyrgyzhydromet through: (i) development of improved services provided by Kyrgyzhydromet including expanded user access to informational products; and (ii) specialized training to staff involved in service delivery	1,170,000				
3.1	Survey of key users of the hydrometeorological information products	50,000		X		
3.2	Creation of a high-speed local computer network of KyrgyzHydromet.	120,000		X		X
3.3	Modernization of the system for producing weather forecasts on hazardous weather conditions using the WRF-ARW model	830,000			X	
3.4	Creation of a studio for the preparation of video and audio clips with release of the weather forecasts for mass media.	150,000		X		
3.5	Establishment of a system for the operational provision of the population with hydrometeorological information	20,000		X		
B.4	Support implementation of Component B of the Project	150,000				
4.1	PCU costs (staff, equipment, audit)	150,000		X		
	TOTAL:	5,000,000	450,000	2,870,000	1,630,000	3,600,000

11. **Component C: Strengthening of Hydromet Services in Republic of Tajikistan (US\$3,000,000):** This component aims to continue to strengthen TajikHydromet’s capacity, infrastructure and service delivery for sustainable observation, forecasting, and delivery of weather, water and climate services to meet national economic and social needs. The proposed additional financing will support completion of the



modernization of the national observation network, strengthening of institutional and human capacity in hydrometeorology and operation of modern hydrometeorological systems, and expansion of user-targeted capacity in service delivery with a focus on operational forecasting, early warning and information dissemination. Activities and their estimated costs are summarized in Table 1.3. While composition of sub-components remains unchanged, some sub-component titles have been shortened for more efficient reading and reporting.

12. **Sub-Component C.1 - Strengthen the institutional capacity of Tajikhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Tajikhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Republic of Tajikistan; and (iii) revising the scientific methodological basis of the Tajikhydromet operations to WMO standards (US\$500,000):** This subcomponent will continue to provide technical support and training to TajikHydromet staff to enable them to engage effectively in and leverage the modernization program. This will help develop the necessary strategy and human capacity to sustain the modernization effort beyond its initial implementation, with a long-term focus on strengthening service delivery.

- a. *Activity 1.1 (US\$10,000):* Development of regulations for information service provision in the field of hydrometeorology and monitoring of environmental pollution. The lack of such regulations means there is no government-approved list of Public Hydrometeorology Information Types that dictates which information TajikHydromet should provide for free and which specialized information should be provided through fee-based services, contributing towards NMHS cost recovery.
- b. *Activity 1.2 (US\$30,000):* Development of standard operating procedures (SOPs) and provision of staff training in these SOPs for: management of meteorological and hydrological stations, management of agrometeorological stations, operation of the modernized hydrometeorological and agrometeorological networks including data quality control and management, metrological service and technical support service (repair) of the observation network and associated hydrometeorological equipment.
- c. *Activity 1.3 (US\$70,000):* Initialize development of a Quality Management System (QMS) for TajikHydromet. The QMS will define the organizational structure, procedures, processes and resources needed to ensure the delivery of quality products and services, and is an effective internal tool for institutional management for sustaining and improving service delivery. Initial activities will include conducting a gap analysis to identify which clauses of ISO 9001 are currently not being fully applied (or not applied at all) and develop remedial actions, as well as staff training.
- d. *Activity 1.4 (US\$10,000):* Surveying of key end-users by sector of the economy to determine end-users' demand and develop analytical reviews. The assistance of an international expert will be needed to prepare questionnaires for various sectors of the economy and a national consultant to assist in rolling out the survey and assessing the results.



- e. *Activity 1.5 (US\$300,000)*: Technical staff capacity building on operational meteorology and hydrology, glaciology, agrometeorology, glaciology, metrology, public weather services and information technologies. This activity will be embedded, as far as possible, into complementary capacity building activities such as those under sub-component C.2.
- f. *Activity 1.6 (US\$80,000)*: Expert support for development of technical design and specifications of hydrometeorological equipment to be procured under sub-component C.2. The experts will also be expected to train TajikHydromet staff in hydrometeorological system design and drafting of technical specifications.

13. **Sub-Component C.2 - Improve the hydrometeorological observation networks to provide: (i) more timely extreme and hazardous weather warnings; and (ii) a more efficient national water resources management system through: (A) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (B) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; and (C) development of forecasting systems (US\$2,071,100)**: This sub-component will continue to restore meteorological and hydrological observational networks, and ensure efficient and timely transmission of observational results. Continued implementation of these activities will help to meet the needs of the national economy and users for reliable hydrometeorological data, and fulfill the national and international obligations on the exchange of information on current hydrometeorological conditions within the country. These data are essential for the assessment and management of water resources and disaster risk management.

- a. *Activity 2.1 (US\$250,000)*: To continue the modernization of the national hydrological monitoring network, the equipping of hydrological stations with measuring instruments for measuring water discharge will be continued. The Project so far achieved about 60% of hydrological stations being able to measure discharge, continued investment will achieve the target of 71%.
- b. *Activity 2.2 (US\$250,000)*: Supply of Acoustic Doppler Current Profilers (ADCP) for regional hydrometeorological centers and cluster hydrological stations, allowing for enhanced automation of water discharge measurement and resumption of occasional hydrological observations at the request of end-users (for construction of various hydroengineering facilities, including small and medium-sized water hydropower plants).
- c. *Activity 2.3 (US\$100,000)*: Optimization and automation of hydrometeorological production to most effectively and efficiently leverage the capabilities of the modernized network to meet user demand, including automation of production of hydrometeorological forecasts and bulletins, forecast verification, warning services, data management and publication.
- d. *Activity 2.4 (US\$200,000)*: Technical upgrade of the agrometeorological network through procurement of instruments and equipment for agrometeorological stations including



soil drills, soil moisture meters, crypedometers for various depths, various thermometers, drying cabinets and bicycles for observers.

- e. *Activity 2.5 (US\$200,000)*: Improvement of metrological and technical support of the observation network, including supply of equipment for the stationary calibration and repair laboratory.
- f. *Activity 2.6 (US\$250,000)*: To strengthen the monitoring of glaciers and snow conditions, supply of an electronic tachymeter, portable GPS, GPS-enabled monitoring camera, laptops for field work, winter expedition equipment (skis, poles, snowshoes and related equipment), and office equipment for the Glaciology Center including personal computers and a color printer.
- g. *Activity 2.7 (\$821,100)*: Strengthening of the meteorological observation network, including supply of heated precipitation sensors to enable measurement of snow water equivalent, spare parts for the upgraded network (including data loggers, batteries, GPRS modems and laptops for field work), masts for installation of protective containers for data loggers and other equipment, protective containers for batteries, winter-summer type air conditioners for mobile observation huts, PCs for observers, and solar to provide power to remote stations.

14. **Sub-Component C3 - Enhance the service delivery system of Tajikhydromet through: (i) development of improved services provided by Tajikhydromet including expanded user access to informational products; (ii) development of a national framework for climate services, in line with the Global Framework for Climate Services; and (iii) specialized training to staff involved in service delivery (US\$210,000)**: Service delivery is an extremely important element of modern hydrometeorological services, with specific emphasis on the needs of customers and users to ensure maximum social and economic benefit. This sub-component will continue to support TajikHydromet to be able to communicate effectively with those clients, resulting in a more collaborative approach to service delivery. Unless this active engagement occurs, users are often unable to optimally utilize hydro meteorological information effectively and though important, it is often discounted as a factor in decision making.

- a. *Activity 3.1 (US\$60,000)*: Development of a Service Deliver Strategy and Implementation Plan, as guided by the WMO Strategy for Service Delivery. Development of this strategy and investment plan will help TajikHydromet raise its standards of service delivery in the provision of products and services to users and customers, and engage more closely with users and customers to ensure its services meet demand in a useful, high quality and sustainable manner.
- b. *Activity 3.2 (US\$100,000)*: Strengthening of the TajikHydromet publishing facilities through procurement of equipment for high-speed large-scale printing, offset printing, and document production. This will improve the speed and quality of printed materials for end-users.



- c. *Activity 3.3 (US\$50,000)*: Development of a National Framework for Climate Services (NFCS) in-line with the Global Framework for Climate Services (GFCS). The NFCS shall establish regular multi-sectoral exchange between climate services producers and users to discuss needs and opportunities, monitoring the number and frequency of different actors’ engagement and subsequent increases in number and/or resolution of information services agreed.

15. **Sub-Component C4 – Support implementation of Component C of the Project (US\$218,900)**: Project implementation unit costs, hosted by TajikHydromet. This sub-component will continue to support implementation of country specific activities of this component and contribute to sustainability of country based investments.

Table 1.3 Component C: Scope and estimated cost of activities

#	Sub-components/Activities	Cost (US\$)	Additional Financing Need			Regional Benefit
			Overrun	Scale-up	New	
C.1	Strengthen the institutional capacity of Tajikhydromet, including improvement of its human resources and its financial sustainability model through: (i) technical support and training of Tajikhydromet staff; (ii) development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Republic of Tajikistan; and (iii) revising the scientific methodological basis of the Tajikhydromet operations to WMO standards	500,000				
1.1	Development of regulations for information service provision	10,000		X		
1.2	Development of standard operating procedures (SOPs) and training for management and operations of the observation system	30,000		X		X
1.3	Initialize development of a Quality Management System (QMS)	70,000		X		
1.4	Survey of key end-users	10,000		X		
1.5	Technical staff capacity building	300,000		X		X
1.6	Support for technical design and specifications	80,000		X		X
C.2	Improve the hydrometeorological observation networks to provide: (i) more timely extreme and hazardous weather warnings; and (ii) a more	2,071,100				



#	Sub-components/Activities	Cost (US\$)	Additional Financing Need			Regional Benefit
			Overrun	Scale-up	New	
	efficient national water resources management system through: (A) equipment restoration and improvement for hydrological, agrometeorological and snow-avalanche observation; (B) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; and (C) development of forecasting systems					
2.1	Upgrading the hydrological observation network	250,000	X			X
2.2	Upgrading velocity profiling capacity	250,000	X			X
2.3	Automation and optimization of hydrometeorological production	100,000		X		X
2.4	Upgrading the agrometeorological network	200,000		X		X
2.5	Improvement of technical maintenance of observation networks	200,000		X		X
2.6	Upgrading of snow surveying equipment	250,000			X	X
2.7	Strengthening of the meteorological network	821,100		X		X
C.3	Enhance the service delivery system of Tajikhydromet through: (i) development of improved services provided by Tajikhydromet including expanded user access to informational products; (ii) development of a national framework for climate services, in line with the Global Framework for Climate Services; and (iii) specialized training to staff involved in service delivery	210,000				
3.1	Development of a Service Deliver Strategy and Implementation Plan	60,000			X	
3.2	Strengthening of publication facilities	100,000			X	
3.3	Development of a National Framework for Climate Services (NFCS)	50,000			X	
C.4	Support implementation of Component C of the Project	218,900				
4.1	PCU costs (staff, equipment, audit)	218,900		X		



#	Sub-components/Activities	Cost (US\$)	Additional Financing Need			Regional Benefit
			Overrun	Scale-up	New	
	TOTAL:	3,000,000	500,000	2,040,000	460,000	2,481,100



Annex 2: Implementation Arrangements

Fiduciary - Financial Management

1. The AF will continue to employ the Implementation Arrangements established under the original CAHMP, except in the Kyrgyz Republic where the PCU at KyrgyzHydromet is now a PIU at MoES. The following Implementing Agencies (IAs) will be responsible for financial management arrangements: Regional Component – EC-IFAS through the PMU at the Regional Center for Hydrology, Kyrgyz Component – MoES and Tajik Component – TajikHydromet supported by the respective Project Implementation and Coordination Units. The financial management function (FM) function for the Additional Financing, including planning and budgeting, accounting, financial reporting, external auditing, funds flow, and internal controls will rely on the existing systems. The FM assessment of the implementing agencies (IA) for the additional financing confirmed that there are overall adequate FM arrangements in place. In particular, (i) the FM staff of the Implementing Agencies have significant experience in implementing Bank-financed projects; (ii) there is adequate accounting software utilized by all IAs; (iii) annual independent audits of all three components under the parent project revealed no major issues, and (iv) IFRs on the projects by components were received on time and found to be acceptable to the Bank.
2. No major weaknesses were identified at the implementing agencies (IAs) for the additional financing implementation. No additional actions are recommended.
3. All three IAs have acceptable budgeting and planning capacity in place for the additional financing implementation. Cash basis will be applied for the Project accounting, and IPSAS “Financial Reporting Under the Cash Basis of Accounting” issued by the International Public Sector Accounting Standards Board (the IPSASB) of the International Federation of Accountants (IFAC) will be used for the Project financial reporting. The current chart of account used for the parent project will be amended to reflect the specific activities under the additional financing.
4. The internal control system in place at the IAs was assessed to be overall adequate and capable of providing timely information and reporting on the additional financing, as well as safeguarding of the Project’s assets.
5. Project management-oriented Interim Un-audited Financial Reports (IFRs) will be used for the Additional Financing monitoring and supervision. The format of the IFRs will be similar to that used by the parent Project and will include: (i) Project Sources and Uses of Funds, (ii) Uses of Funds by Project Activity, (iii) Designated Account Statements, and (iv) SOE Withdrawal Schedule. IAs will be producing IFRs every calendar quarter throughout the life of the project. These financial reports will be submitted to the Bank within 45 days of the end of each calendar quarter. The first set of IFRs will be submitted after the end of the first full quarter following the initial disbursement. Separate sets of IFRs will be prepared and submitted for the parent project and additional financing.
6. There are overall adequate auditing arrangements in place, with no pending audits for the active project. The auditors issued unmodified (clean) opinions on the financial statements of the project for all



three components, with no critical recommendations in the management letters.

7. The audit of the Project annual financial statements, consolidated for the parent project and the Additional Financing split by components, will be conducted (i) by independent private auditors acceptable to the Bank, on terms of reference (TOR) acceptable to the Bank and procured by the respective Implementing Agency, and (ii) according to the International Standards on Auditing (ISA) issued by the International Auditing and Assurance Standards Board of the International Federation of Accountants (IFAC). The annual audits of the Project financial statements will be provided to the Bank within six months since the end of each fiscal year, also at the Project closing. The cost of the Project audit will be financed from the proceeds of the Project.

8. The Recipients have agreed to disclose the audit reports for the Project within one month of their receipt from the auditors and acceptance by the Bank by posting the reports on the web-sites of IAs or other official websites of the Recipients. Following the Bank's formal receipt of these reports from the Recipient, the Bank will make them publicly available per World Bank Policy on Access to Information.

9. The overall FM risk for the Project is assessed as Moderate, with the Substantial Inherent Risk and Moderate Control Risk. The combined overall Fiduciary risk rating is Substantial given the substantial procurement risk rating.

10. In the environment of project implementation, corruption is perceived as an important issue; therefore adequate mitigation measures have been established and will be closely monitored to ensure that the residual project risk remains acceptable, including: (a) formal internal control framework is described in the Project's Operations Manuals; (b) flow of funds mechanism via a commercial bank acceptable to the Bank; (c) project financial statements to be audited by independent auditors and on terms of reference acceptable to the Bank; and (d) regular FM implementation support and supervision, and procurement prior and post reviews will be conducted to monitor and assess the corruption risk.

Disbursements

11. Three separate Designated Accounts (DAs) will be opened for the additional financing by each Implementing Agency for Regional, Tajik and Kyrgyz Components: The DAs will be opened in US\$, in commercial banks acceptable for the Bank. The SOE based disbursement method will be applied for the additional financing.

12. Project funds will flow from the Bank, either: (i) via the DA, which will be replenished based on SOEs; or (ii) based on direct payment withdrawal applications and/or special commitments, received from the implementing entities. Withdrawal applications documenting funds utilized from the DAs will be sent to the Bank at least every three months.

13. The following disbursement methods may be used under the Project: Reimbursement, Advance, Direct payment and Special Commitment. The DAs' ceilings for each component and the detailed instructions on withdrawal of additional financing proceeds will be provided in the Disbursement and Financial Information Letter (DFIL).



Procurement

14. Under the World Bank's New Procurement Framework (NPF), the Additional Financing is required to complete a Project Procurement Strategy for Development (PPSD). The PPCSD will be prepared prior to project appraisal/additional financing negotiations with the Bank. The PPCSD will include the following key deliverables: (i) Summary of which packages are to be put to market; (ii) Summary of risks and opportunities to be managed; (iii) Pre-market engagement strategy (e.g. supplier briefings, probity, expressions of interest); (iv) Options for contracting approaches and (v) Procurement Plan. The task team has prepared the Terms of References for preparation of PPCSD which will be discussed/agreed with the Borrowers. The task team will assist the Borrowers in preparation of PPCSD.



Annex 3: Economic and Financial Analyses

1. The original Project Appraisal Document (PAD) reported an economic analysis of CAHMP investments in the Kyrgyz Republic and Tajikistan. Based on a detailed 2009 study¹⁷, the analysis considered potential reductions in hydrometeorological losses achieved through project implementation, following a conservative sector-specific approach. The following cost-benefit analysis results were reported, indicating the economic viability of the project:

Project Metric	Kyrgyz Republic	Tajikistan	Overall
Average annual benefits	US\$7.4 million	US\$7.2 million	US\$14.6 million
Economic rate of return	53.4%	23.7%	22.1%
Net present value	US\$10.3 million	US\$4.6 million	US\$8.3 million
Benefit/cost ratio	3.3	1.5	1.4

2. The assessment of CAHMP additional financing applies refined loss reduction, sector-specific and benchmarking approaches to estimate project economic benefits. There are described in the authoritative guidance document *Valuing Weather and Climate: Economic Assessment of Meteorological and Hydrological Services*¹⁸, which also reviewed the previous assessments in Central Asia. Cost-benefit analysis for disaster and climate risk management in developing country contexts is generally challenged by lack of robust data and information. Further, there are several complexities and uncertainties inherent in quantifying disaster risk management that are compounded by climate change, and cost-benefit analysis is also challenged in handling intangibles and discounting of future impacts, which is particularly important for extreme events¹⁹.

3. The two national components are assessed (Component B: Kyrgyz Republic and Component C: Tajikistan) assuming 25% of the regional component costs are also incurred in these countries. Overall project performance is assessed based on the combined benefits accrued in Kyrgyz Republic and Tajikistan, but incorporating full costs of the project. It can be assumed, based on a recent global assessment²⁰, that the four CAHMP countries will benefit by at least a 35% increase in forecasting quality.

4. To build the robustness and confidence in the results of the cost-benefit analysis, a transparent and conservative approach is therefore warranted²¹. All assumptions and their supporting analysis are here reported. Where a range of potential analysis inputs is generated, the most “conservative” values

¹⁷ Rogers, D., Smetanina, M.I., and Tsirkunov, V.V. (2009). *Improving weather, climate, and hydrological services delivery in Central Asia (Kyrgyz Republic, Republic of Tajikistan, and Turkmenistan)*. World Bank, Washington, D.C.

¹⁸ WMO, World Bank, GFDRL, USAID (2015). *Valuing Weather and Climate: Economic Assessment of Meteorological and Hydrological Services*. WMO-No. 1153, World Meteorological Organization, Geneva, Switzerland.

¹⁹ IPCC (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK, and New York, NY, USA.

²⁰ Kull, D.W., Graessle, C.; & Aryan, B. (2016). *Strengthening National Hydrometeorological Services through Cascading Forecasting: Investing for Sustainability and Impact across Global, Regional, and National Centers*. Policy Research Working Paper, no. WPS 7609, World Bank Group, Washington, D.C.

²¹ Kull, D., Mechler, R. & Hochrainer-Stigler, S. (2013). “Probabilistic cost-benefit analysis of disaster risk management in a development context”. *Disasters*, 37: 374–400. doi:10.1111/disa.12002.



are taken, meaning that for a range of potential benefits, the lowest value is used. This results in the analyzed net present values and benefit/cost ratios representing the lowest threshold of expected economic effectiveness; most likely the truly realized economic efficiency will be greater than what is here reported.

- 5. From the outset two key conservative assumptions must be noted:
 - a) Only reductions in the short-term direct impacts of weather and climate-related disasters are considered; long-term indirect impacts (such as health) are not included.
 - b) Disaster risk is based on past loss experience and therefore not adjusted for potential climate change impacts.

These assumptions contribute to a conservative estimate of CAHMP additional financing economic performance.

6. **Benefits from Reduced Disaster Losses.** Considering the stochastic nature of disasters, standard practice for cost-benefit analysis of disaster risk management-related investments utilizes the average annual losses to consolidated risk across event magnitudes and frequencies. This represents the averaging of all potential losses over time to quantify the expected economic burden per year.

7. Annualized loss assessments are only readily available for floods²² for both countries and for landslides in the Kyrgyz Republic²³. During preparation of the World Bank Strengthening Critical Infrastructure Against Natural Hazards Project (P158298), the Committee of Emergency Situations of Tajikistan made available loss data for 1997-2006. The recorded losses appear to underestimate the true economic impacts, based on the recent flood risk assessments. Recorded losses in Tajikistan for other hydrometeorological disasters were therefore pro-rated using floods as the baseline. The same pro-rating factors were also used for the Kyrgyz Republic, considering similarities in topography and climate between the two countries. The following annualized losses are used in the risk-based analysis, reported in 2017 values (past loss experience and risk assessments have been transformed to 2017 values based on inflation and economic growth):

Hydrometeorological Hazard	Average Annual Losses (US\$, 2017 value)	
	Kyrgyz Republic	Tajikistan
Floods & mudflows	75.9 million	103.7 million
Landslides & avalanches	2.7 million	6.1 million
Wind, snow, hail & cold	36.8 million	50.2 million
Droughts	29.6 million	40.4 million
TOTAL	145.0 million	200.3 million

- 8. Subbiah et al (2009)²⁴ provides some insight into the levels of damage reduction for different

²² World Bank, GFDRR (2017). *Europe and Central Asia: Country Risk Profiles for Floods and Earthquakes*. World Bank Group, Washington, DC.

²³ World Bank (2017). *Climate and Disaster Risk Screening Report for General Project in Kyrgyzstan: Enhancing Resilience in Kyrgyzstan (ERIK) Project*. World Bank Group, Washington, D.C.

²⁴ Subbiah, A.R., Bildan, L., Narasimhan, R. (2009). *Background Paper on Assessment of the Economics of Early Warning Systems*



sectors that can be achieved through early warning, with global experience indicating a conservative overall range of 5-8% (compared to for example 8.5% in Russia²⁵ and 10% for floods in southeastern Europe²⁶). In line with the conservative approach set out for this analysis, the lower end of the range of global experience (5%) is applied, which is more conservative than what was used for the Project’s original economic assessment (7.5% for the Kyrgyz Republic and 5.8% for Tajikistan). For landslides, avalanches and droughts the loss reduction is further reduced to 2%, considering the inability to rapidly move infrastructure out of harm’s way and the limited irrigation schemes present in the region.

9. Recognizing that CAHMP additional financing represents a partial contribution to ongoing full modernization of KyrgyzHydromet and TajikHydromet, the full potential benefits of loss reduction cannot be attributed to the additional financing. Rather, a portion of the potential benefits based on improvements in surveyed user satisfaction during CAHMP implementation is considered²⁷. The increase in user satisfaction (based on a 5-point scale) is quantified into a percentage increase of potential full satisfaction (using the pre-CAHMP satisfaction as the baseline and a perfect score of 5 as the target). The remaining (currently unachieved) percentage to full satisfaction is then applied to the potential full benefits of modernization to represent the contribution of additional financing. For the Kyrgyz Republic 55%, and for Tajikistan 33%, of full potential benefits are therefore assumed to be delivered by the additional financing.

10. Considering the limited data availability forcing the adoption of a host of assumptions to quantify the benefits from reduced disaster damages, the benchmarking methodology utilized in 2009 is employed to verify the results. The table below summarizes the total estimated annual benefits due to improved hydrometeorological services. The benchmarking approach validates the order of magnitude of the more detailed risk-based approach.

Hydrometeorological Hazard	Loss Reduction	Reduction in Annual Losses (US\$, 2017 value)	
		Kyrgyz Republic	Tajikistan
Floods & mudflows	5%	2.1 million	1.7 million
Landslides & avalanches	2%	0.03 million	0.04 million
Wind, snow, hail & cold	5%	1.0 million	0.8 million
Droughts	2%	0.3 million	0.3 million
TOTAL		3.5 million	2.9 million
Benchmarking Approach		2.8-3.6 million	1.4-2.0 million

11. **Benefits from Increased Production.** In addition to diminishing disaster losses, modernized hydrometeorological services can significantly enhance economic productivity of weather-sensitive sectors. Due to lack of information, a benchmarking approach is herein used to estimate potential benefits

for Disaster Risk Reduction. World Bank-UN Project on the Economics of Disaster Risk Reduction, GFDRR, Washington.

²⁵ World Bank (2005). *Russian Federation Hydromet Modernization Project*. Project Appraisal Document, Report No. 3 1465-RU, Washington, D.C.

²⁶ World Bank, UNISDR, WMO & FMI (2008). *Strengthening the Hydrometeorological Services in South Eastern Europe*. South Eastern Europe Disaster Risk Mitigation and Adaptation Program.

²⁷ Improvements in user satisfaction are reported in the CAHMP Implementation Status Report (ISR) Seq. No. 10.



to economic productivity from modernized hydrometeorological services in the Kyrgyz Republic and Tajikistan.

12. Hallegatte (2012)²⁸ finds that about 25% of world GDP is generated in weather-sensitive sectors, i.e., agriculture, mining and energy, water resources, construction and transport. Modernized hydrometeorological and warning systems can benefit these sectors in many ways – from immediate warnings, to seasonal advisories, to infrastructure design and spatial planning. A conservative global benchmark is that modern forecasts add value of 0.1% to 1% in weather-sensitive sectors, which would translate into gains of approximately 0.025% to 0.25% of global GDP.

13. Currently agriculture contributes about 15% of GDP in the Kyrgyz Republic and 25% of GDP in Tajikistan²⁹, but data on other weather sensitive sectors is not readily available. The 25% global estimate found by Hallegatte is therefore used, which is considered a conservative estimate, particularly of the total Tajik GDP that is weather-sensitive. Consistent with a conservative approach, applying the lower end of Hallegatte’s 0.1-1% estimate for increased production results in annual benefits in production of US\$1.7 million for the Kyrgyz Republic and US\$1.8 million for Tajikistan. In the cost-benefit analysis, the same assumptions on benefits attributable to additional financing as used for the benefits from loss reduction are applied to these potential increases in productivity.

14. **Cost-Benefit Analysis.** By comparing the costs and benefits of the project over time an understanding of the relative value of the planned investments can be generated. While cost-benefit analysis provides a useful process and resultant metrics to help steer investment decision-making, it should however not be the only factor considered. It must be noted that the cost-benefit analysis assumes that broader DRM systems needed for successful early warning and early action are functioning.

15. While the implementation period of the project is 3 years, for this analysis it is assumed that the project lifespan/impact is 15 years. Project disbursement is spread evenly over the 3 years of implementation, while operations and maintenance (O&M) costs are assumed at 15% of investments. O&M costs increase linearly over the first 3 years as cumulative project investments are made, reaching a constant 15% of total capital costs during years 4-15. Benefits in terms of reduced disaster damages and increased production are assumed to increase linearly starting to be realized from year 2 and reaching 100% after completion in year 4.

16. Cost-benefit analysis utilizes a discount rate to represent societal preference for consuming in the present as opposed to saving and consuming in the future. A discount rate of 0% indicates no preference between now and in the future, while a discount rate of 10% represents a higher preference for spending now. In this analysis, a discount rate of 5% is applied, representing an understanding that future costs and benefits are relatively important in comparison to the current situation – concurrent with concerns regarding climate change. However, 0%, 5%, 10% and 15% discount rates are also applied for sensitivity analysis. The resulting cost-benefit metrics are summarized in the following table:

- *Annualized benefits (2017 value):* the total annual benefits expected to be produced by CAHMP

²⁸ Hallegatte, S. (2012). *A Cost-Effective Solution to Reduce Disaster Losses in Developing Countries: Hydro-Meteorological Services, Early Warning and Evacuation*. World Bank Policy Research Paper #6058, Washington.

²⁹ www.worldbank.org/data



additional financing reported in 2017 values, including both loss reduction and sectoral productivity optimization.

- *Net present value (NPV)*: present benefits minus present costs (if the NPV is greater than 0 then the investment is considered economically effective).
- *Benefit/cost ratio*: present benefits divided by present costs (if the benefit/cost ratio is greater than 1.0 then the investment is considered economically effective)

Metric	Discount Rate			
	0%	5%	10%	15%
Kyrgyz Republic				
Annual benefits (US\$, 2017 value)	4.4 million			
Net present value (US\$, NPV)	71.5 million	44.6 million	29.1 million	19.7 million
Benefit/cost ratio	4.9	4.2	3.6	3.1
Tajikistan				
Annual benefits (US\$, 2017 value)	3.5 million			
Net present value (US\$, NPV)	61.4 million	38.7 million	25.6 million	17.6 million
Benefit/cost ratio	6.1	5.2	4.4	3.8
Overall				
Annual benefits (US\$, 2017 value)	7.9 million			
Net present value (US\$, NPV)	127.5 million	79.2 million	51.4 million	34.5 million
Benefit/cost ratio	4.6	3.9	3.3	2.8

17. To further check the robustness of the analysis, a worst-case scenario is assessed, utilizing the following most conservative assumptions:

- Lowest estimated value of loss reduction benefits from the benchmarking approach.
- Omission of benefits from sectoral production optimization.
- Discount rate of 15%.
- Under this worst-case scenario, the following results are obtained:

Metric	Kyrgyz Republic	Tajikistan	Overall
Annual benefits (US\$, 2017 value)	2.8 million	1.4 million	4.2 million
Net present value (US\$, NPV)	9.1 million	3.1 million	9.3 million
Benefit/cost ratio	2.0	1.5	1.5

18. Even in the worst-cases scenario, the individual components and overall project are economically viable. Further, as weather and climate impacts increase due to the projected increased variability of extremes caused by climate change, the net present value and benefit/cost ratio of this investment will also increase. This is because early warning provides benefits that are not limited by thresholds; whether a flood is a 25-year or a 50-year event, early warning still reduces impacts similarly (as opposed for example to levees, whose design thresholds are at some point exceeded).

19. **Economic analysis conclusions.** The following conclusions can be drawn from the economic analysis:



- Floods have the highest economic impacts in Central Asia, such that investments in early warning for disaster reduction should concentrate on this hazard.
- At a minimum, the proposed additional financing will increase the annual benefits of CAHMP from US\$3.6 million to US\$8.0 million in the Kyrgyz Republic and from US\$7.0 million to US\$10.4 million in Tajikistan (in 2017 values).
- The proposed additional financing is a cost-effective investment, exhibiting potential benefit/cost ratios of at least 1.5 across all components, with a more optimistic but realistic estimate of at least 4.2 in the Kyrgyz Republic, at least 5.2 in Tajikistan, and at least 3.9 for the overall project.
- This reflects net present values of over US\$40 million in the Kyrgyz Republic, over US\$35 million in Tajikistan, and over US\$75 million for the two components combined.
- Projected climate change indicates increased negative impacts of weather and climate in the future. Investments like this project are needed to manage these risks.

20. **Financial Analysis.** Financial analysis is not applicable to this project because it is not a revenue generating project.



MAP

CENTRAL ASIA
HYDROMET REGIONAL PROJECT

