

Document of
The World Bank

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Report No: 59384 - ECA

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED REGIONAL IDA CREDIT/GRANT
IN THE AMOUNT OF SDR 3.9 MILLION (US\$6.0 MILLION EQUIVALENT)
TO THE
KYRGYZ REPUBLIC

AND A REGIONAL IDA GRANT
IN THE AMOUNT OF SDR 3.9 MILLION (US\$6.0 MILLION EQUIVALENT)

AND A GRANT FROM THE PILOT PROGRAM ON CLIMATE RESILIENCE UNDER THE
STRATEGIC CLIMATE FUND (PPCR) IN THE AMOUNT OF US\$7 MILLION

TO THE
REPUBLIC OF TAJIKISTAN

AND A REGIONAL IDA GRANT
IN THE AMOUNT OF SDR 5.6 MILLION (US\$8.7 MILLION EQUIVALENT)
TO THE
EXECUTIVE COMMITTEE OF THE
INTERNATIONAL FUND FOR SAVING THE ARAL SEA

FOR THE

CENTRAL ASIA HYDROMETEOROLOGY MODERNIZATION PROJECT

May 2, 2011

Sustainable Development Department
Central Asia Country Unit
Europe and Central Asia Region

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CURRENCY EQUIVALENTS

(As of February 28, 2011)

Currency Unit = US\$

US\$ 1 = SDR 0.6357

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ASBP-3	Third Aral Sea Basin Program
CA	Central Asia
CAC DRMI	Central Asia and Caucasus Disaster Risk Management Initiative
CAHMP	Central Asia Hydrometeorology Modernization Project
CAREC	Central Asia Regional Economic Cooperation Program
CIS	Commonwealth of Independent States
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EC-IFAS	Executive Committee - International Fund for Saving the Aral Sea
FMI	Finnish Meteorological Institute
GFDRR	Global Facility for Disaster Reduction and Recovery
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
IDA	International Development Association
IFAS	International Fund for Saving the Aral Sea
IFI	International Financial Institution
NHMS	National Hydrometeorological Service
PPCR	Pilot Program for Climate Resilience
RCH	Regional Center of Hydrology
RCH-CC	Regional Center of Hydrology Coordination Council
SDC	Swiss Agency for Development and Cooperation
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-ISDR	United Nations-International Strategy for Disaster Reduction
USAID	United States Agency for International Development
WMO	World Meteorological Organization

Vice President:	Philippe H. Le Houerou
Regional Director:	Motoo Konishi
Sector Director:	Peter Thomson
Sector Manager:	Wael Zakout
Task Team Leader:	Salman Anees/Vladimir Tsirkunov

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PAD DATA SHEET

CENTRAL ASIA HYDROMETEOROLOGY MODERNIZATION PROJECT

PROJECT APPRAISAL DOCUMENT

*Europe and Central Asia Region
Sustainable Development Department
Urban, Water and Disaster Risk Management Unit*

Date: May 2, 2011 Regional Director: Motoo Konishi Sector Director: Peter Thomson Sector Manager: Wael Zakout Team Leader(s): Salman Anees / Vladimir Tsirkunov Project ID: P120788 Lending Instrument: SIL	Sector(s): Flood Protection (100%) Theme(s): Natural Disaster Management EA Category: C
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Project Financing Data:

Proposed terms:

[] Loan [X] Credit [X] Grant [] Guarantee [X] Other:

Source	Total Amount (US\$M)
Total Project Cost:	\$27.70 million
Other:	
Pilot Program for Climate Resilience (PPCR) for Tajikistan	\$7.0 million
Total Bank Financing:	\$20.70 million
IDA	\$20.70 million
Republic of Tajikistan	\$6.0 million
Kyrgyz Republic	\$6.0 million
Executive Committee of the International Fund for Saving the Aral Sea-(EC-IFAS)	\$8.7 million

Borrowers/Recipients:

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

Responsible Agencies:**Tajikhydromet**

Contact Person: Mr. Makhmad Safarov
 Telephone No.: +992-372 215191
 Email: safarov_mt@list.ru

Kyrgyzhydromet

Contact Person: Mr. Zarylbek Itibaev
 Telephone No.: +996 312 316228/314745
 Email: meteo@meteo.ktnet.kg

EC-IFAS

Contact Person: Mr. Saghit Ibatullin
 Telephone No.: +7(727)3873431
 Email: mail@ec-ifas.org

Estimated Disbursements (Bank FY/US\$ m)

FY	2012	2013	2014	2015	2016	
Annual	1.5	4.5	5.0	8.0	1.70	
Cumulative	1.5	6.0	11.0	19.0	20.70	

Project Implementation Period: September 1, 2011 – August 31, 2016

Expected effectiveness date: September 1, 2011

Expected closing date: August 31, 2016

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

Yes No

If yes, please explain:

Does the project require any exceptions from Bank policies?
 Have these been approved/endorsed (as appropriate by Bank management?)

Yes No
 Yes No

Is approval for any policy exception sought from the Board?

Yes No

If yes, please explain:

Does the project meet the Regional criteria for readiness for implementation?

Yes No

If no, please explain:

Project Development Objective

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 description

The CAHMP proposes three components:

Component A: Strengthening regional coordination and information sharing: This component will ensure that each of the National Hydrometeorological Services (NHMSs) in the region can share, use, exchange and archive common hydromet data and information, and that each agency has a comparable level of expertise in the production of information and delivery of hydromet services.

Component B: Strengthening of Hydromet Services in Kyrgyz Republic: The component will help strengthen Kyrgyzhydromet to ensure that it has the infrastructure and capability to sustainably observe, forecast and deliver weather, water and climate services that meet the country's identified economic and societal needs.

Component C: Strengthening of Hydromet Services in Republic of Tajikistan: The component will help strengthen Tajikhydromet to ensure that it has the infrastructure and capability to sustainably observe, forecast and deliver weather, water and climate services that meet the country's identified economic and societal needs.

Safeguard policies triggered?	
Environmental Assessment (OP/BP 4.01)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Natural Habitats (OP/BP 4.04)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Forests (OP/BP 4.36)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Pest Management (OP 4.09)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Physical Cultural Resources (OP/BP 4.11)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Indigenous Peoples (OP/BP 4.10)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Involuntary Resettlement (OP/BP 4.12)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Safety of Dams (OP/BP 4.37)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Projects on International Waters (OP/BP 7.50)	<input type="radio"/> Yes <input checked="" type="radio"/> No
Projects in Disputed Areas (OP/BP 7.60)	<input type="radio"/> Yes <input checked="" type="radio"/> No

Conditions and Legal Covenants:

Financing Agreement Reference	Description of Condition/Covenant	Date Due
FA, Article V, 5.01 (a)	(For component A) The Project Operations Manual, satisfactory to the Association has been adopted by the Recipient.	Effectiveness
FA, Article V, 5.01 (b)	(For component A) The PMU shall have selected and engaged the services of a financial management specialist and a procurement specialist under terms of reference satisfactory to the Association.	Effectiveness
FA, Article V, 5.01 (c)	(For component A) The Project accounting system satisfactory to the Association is in place, with adequate in-built controls and capable of tracking Project resources and expenditures and generating financial reports, including interim financial reports (IFRs).	Effectiveness
FA, Article V, 5.02	(For component A) On behalf of the Republic of Kazakhstan, an opinion satisfactory to the Association of counsel satisfactory to the Association, or a certificate satisfactory to the Association of a competent official of the Republic of Kazakhstan showing, with respect to certain of the Recipient's Documents, that: <p style="margin-left: 40px;">(i) The IFAS and IFAS Entities Regulations, the EC-IFAS Regulations and the RCH Regulations are in full force and effect in the Republic of Kazakhstan; and</p> <p style="margin-left: 40px;">(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.</p>	Effectiveness

FA, Schedule 2, Section I, A.6	(For component A) The Recipient shall maintain the RCH and the PMU throughout the life of the Project in a form and with functions, staffing, resources, terms of reference and qualifications satisfactory to the Association. In addition, the PMU shall be located and maintained in the city of Almaty, Republic of Kazakhstan, for the life of the Project.	Life of project
FA, Article IV, 4.01 (a)	(For component B) The Project Operations Manual, satisfactory to the Association has been adopted by the Recipient.	Effectiveness
FA, Article IV, 4.01 (b)	(For component B) The PCU shall have selected and engaged the services of a procurement specialist under terms of reference satisfactory to the Association.	Effectiveness
FA, Article IV, 4.01 (c)	(For component B) The Project accounting system satisfactory to the Association is in place, with adequate in-built controls and capable of tracking Project resources and expenditures and generating financial reports, including interim financial reports (IFRs).	Effectiveness
FA, Article V, 5.01 (a)	(For component C) The Project Operations Manual, satisfactory to the Association has been adopted by the Recipient.	Effectiveness
FA, Article V, 5.01 (b)	(For component C) The PCU shall have selected and engaged the services of a financial management and a procurement specialist under terms of reference satisfactory to the Association.	Effectiveness
FA, Article V, 5.01 (c)	(For component C) The Project accounting system satisfactory to the Association is in place, with adequate in-built controls and capable of tracking Project resources and expenditures and generating financial reports, including interim financial reports (IFRs).	Effectiveness
FA, Article V, 5.01 (d)	(For component C). The Co-financing Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled.	Effectiveness
GA, Article V, 5.01 (a)	(For component C) The Project Operations Manual, satisfactory to the World Bank has been adopted by the Recipient.	Effectiveness
GA, Article V, 5.01 (b)	(For component C) The PCU shall have selected and engaged the services of a financial management and a procurement specialist under terms of reference satisfactory to the World Bank.	Effectiveness

GA, Article V, 5.01 (c)	(For component C) The Project accounting system satisfactory to the World Bank is in place, with adequate in-built controls and capable of tracking Project resources and expenditures and generating financial reports, including interim financial reports (IFRs).	Effectiveness
GA, Article V, 5.01 (d)	(For component C) The Co-financing Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled.	Effectiveness

I. Strategic Context

A. Regional and Country Context¹

1. The Central Asia (CA) region comprises five former Soviet republics: the Republic of Kazakhstan, Kyrgyz Republic, the Republic of Uzbekistan, Turkmenistan, and the Republic of Tajikistan. Central Asia stretches from the Caspian Sea in the west to China in the east, and from central Siberia in the north to Afghanistan and Iran in the south. Although Central Asia covers an area nearly the size of Western Europe, it has only 57 million inhabitants, or about one-seventh of Western Europe's population. In 2008, Central Asian countries had 14 percent of the Europe and Central Asia (ECA) Region's population and contributed only 5.0 percent of the ECA's gross domestic product (GDP). Throughout Central Asia, per capita gross national income (GNI) varies considerably: in Kazakhstan it is US\$6,160, which is average for ECA countries; Kyrgyz Republic is US\$780; Republic of Tajikistan, US\$600; and Turkmenistan, US\$2,840. Almost half the population of Central Asia lives in Uzbekistan, where the GNI is US\$910.

2. Central Asia has geographic features that include impassable mountain ranges and vast expanses of grasslands and deserts. All five countries are landlocked and far from major industrial and population centers of Europe, the Middle East, and the Far East. The five countries share historical, cultural, and ethnic ties and a rich tradition of trade along the ancient Silk Road. The economy of Central Asia was once flourishing but is now modest amidst more powerful states. Each country is pursuing an independent development trajectory, often through policies that encourage self-sufficiency.

3. Some twenty years after the breakup of the Soviet Union, these five Central Asia countries still struggle to find suitable arrangements for regional cooperation despite their multitude of common problems and shared resources that require coordinating policies and programs. The need to cooperate is pronounced and urgent in the water, energy, trade, and transport sectors, and there is much to learn from one another as each faces the challenges that accompany modernization. Sustained rates of economic growth and poverty reduction are likely to become a reality in Central Asia only after notable progress occurs in regional cooperation.

4. Regional cooperation efforts stall on the issue of trust. Cooperative schemes have proven unstable even when they focus on public goods or resources that must be shared due to geography (e.g., the Amu Darya and Syr Darya rivers) or the Soviet infrastructure legacy of regional power grids, pipelines, canals, highways, and railroads. Despite some efforts, regional cooperation remains problematic, in part because each country falls at different locations along the continuum of cultural and political dimensions of nation building, isolationist policies, pace of transition, economic prospects, and natural resource endowments.

5. In this context, the World Bank recognizes the necessity of striking a balance between a genuine *need* for regional cooperation in Central Asia and the perpetual difficulty of achieving it. Over the last decade, the Bank has recognized that tangible results of regional cooperation will require a long-term effort and commitment from a broad range of stakeholders. Therefore, the

¹ The notes on regional context were adapted from the Central Asia Regional Framework Paper prepared by the Central Asia Country Unit, Europe and Central Asia (ECA) Region, 2004.

Bank has focused on areas of less political sensitivity, such as natural disaster management. Since Central Asia is vulnerable to extreme weather events such as floods and droughts, which affect neighboring countries, a shared approach to disaster management—weather forecasting, hydrometeorological monitoring, public awareness, disaster mitigation, and reconstruction—would reduce the human and economic costs of these events and reap benefits for each country.

6. Improved services associated with weather, climate, and water throughout Central Asia are essential for stable social and economic development.² All Central Asian countries are vulnerable to weather-related disasters including floods and mudflows, droughts, frosts, avalanches, hailstorms, and high-velocity winds, which constitute the major part of all economic losses associated with natural hazards. In the Republic of Tajikistan and Kyrgyz Republic, for example, estimated losses average or exceed 1.0 percent of annual GDP.³ Climate change is a major source of uncertainty. Throughout the region, better quality weather, water, and climate information is needed, in particular for early warning systems, disaster reduction strategy support, improved disaster operations, and climate adaptation strategies in agriculture and food security, transport, water resources management, hydropower generation and public health.

7. Central Asian mountains present significant forecasting challenges. Air masses from the Atlantic and other seas to the west often appear to have exhausted their supply of moisture in traversing Central Asia from the Caspian to the east. However, air masses that rise to flow across the eastern mountains cool rapidly and unleash more precipitation—resulting in heavy rains and flash flooding in the Kyrgyz Republic, Tajikistan, and to some extent in Kazakhstan and Uzbekistan. Monitoring stations in these mountainous areas are no longer open, increasing vulnerability to rapidly changing events among all key weather-dependent sectors.

B. Sectoral and Institutional Context

8. Since the mid-1980s, the Central Asia National Hydrometeorological Services (NHMSs) capacity has been in decline due to overall spending reductions for public services.⁴ Similar problems exist in each country and prevent the NHMSs from providing adequate weather, water and climate services—obsolete and broken equipment, poor telecommunications, inadequate training, and problems retaining qualified staff. Lack of access to timely and accurate weather, climate, and water information impedes civil society and economic performance. Among key sectors, economic assessments reveal potential for a measurable gains with even a modest investment in improving NHMS capacity.⁵

9. The Kyrgyz Republic is at the center of the largest Eurasian continent, away from significant water bodies and close to the deserts that define the country's drought-prone continental climate. The country experiences an average of 3-4 extreme meteorological events per year including frosts, heavy precipitation, 7-10 high-impact mudflows and avalanches, and

² The Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan

³ Based on 2006 GDP figures (GDP in both countries was about US\$2.8 billion).

⁴ According to stakeholder interactions.

⁵ See *Weather and Climate Services in Europe and Central Asia: A Regional Review*; World Bank Working Paper No. 151; The World Bank (2008).

seasonal river flooding. Almost 50 percent of Kyrgyz GDP is weather dependent and urgently requires upgrades to the currently inadequate hydrometeorological and climate information to plan daily and seasonal operations. Estimated economic losses from hazardous weather events range as high as 1.0 to 1.5 percent of GDP. The capacity of Kyrgyzhydromet to deliver weather and water services to decision makers is very limited. The service requires upgrades in both human capacity and physical infrastructure.

10. The Republic of Tajikistan is a landlocked, mountainous country with variable continental and subtropical and semi-arid climate. Even though high mountains shield the cold air masses from the Arctic, the Fergana valley and other lowland areas experience sub-zero temperatures for more than three months in a year. Tajikistan is prone to natural disasters and severe weather incidents, the population depends on rain-fed agriculture for food, and the national economy depends on irrigated agriculture for exports. Tajik glaciers and mountains comprise an environmentally sensitive and key area of the upper watershed of the Aral Sea Basin. For all these reasons, strengthening the capacity of Tajikhydromet to deliver weather, water, and climate services is vital to Tajikistan and important for the region. The Republic of Tajikistan lacks capacity to accurately predict local weather and without upper air measurements, forecasts supplied by the global modeling centers are imprecise. Hydrological data, critically important for the national economy, remains completely inadequate.

11. Other CA countries are vulnerable to weather, climate and water-related hazards. A 2007 World Bank regional study estimated that Kazakhstan's average annual economic losses from dangerous hydrometeorological events are US\$78 million (in US\$ at 2000 constant prices). A similar 2008 assessment in Turkmenistan revealed estimated annual losses of US\$40 million (in US\$ of 2006 constant prices), undertaken by the Global Facility for Disaster Reduction and Recovery (GFDRR).

12. Kazakhstan's topography is varied with elevations as high as over 7,000 meters (Mount Khan Tengri) and as low as -132 meters (in the Caspian Depression). Seventy percent of the country is either desert or semi desert. The country contains an extensive network of rivers including Syr Daria, Ural, Irtysh, and Tobol and several large lakes such as the Aral Sea. Kazakhstan is vulnerable to a range of weather hazards— droughts, floods, strong winds, extreme heat and cold waves, hailstorms, and avalanches. The Ministry of Emergencies estimates average annual losses from extreme weather events at US\$61 million during 2000-05. However, national experts point out that Ministry data include only direct losses from catastrophic events, and that economic losses from natural hazards are actually a multiple of this amount since data on losses are not collected in most sectors. National experts assess NHMS (Kazakhhydromet) status as below national minimum needs. Kazakhstan lacks meteorological radar or specialized stations to receive satellite data. Numerical weather forecasting capacity is minimal and information technology capacity is poor. Most observations continue to be taken manually by field-based staff. Kazakhhydromet recognizes the urgent need to modernize infrastructure and recruit and train its staff. Recently, some hydrological and meteorological stations have been reopened and new automatic sensors are being piloted.

13. Uzbekistan is a landlocked country between Amu Daria, Syr Daria, the Aral Sea and the Tien Shan mountains. Its climate is classified as continental, with hot summer and cool winters.

The country is located in a region where mudflows and avalanches are the most dangerous weather-related phenomena. Floods, caused by heavy rains or rapid snowmelt, are also serious and frequent disasters. Intensive land use in the mountains and piedmont areas is a major cause of these problems. Historically, during the Soviet Union times, Uzbekistan was a hydrometeorological center for the whole of Central Asia. Since then the Uzhydromet Headquarters in Tashkent continues to serve as a Regional World Meteorological Organization (WMO) Center including a Regional Telecommunication Hub, Regional Specialized Meteorological Centre, Regional Training Centre and Regional Drought Management Centre in Central Asia. Uzhydromet has capacity to operate weather radars, to run numerical weather prediction models, undertake research activities including climate change projections. Nevertheless, significant deterioration of its observation systems is evident. There is a major need for modernization of main networks and infrastructure.

14. Turkmenistan is a landlocked country, situated between the Caspian Sea to the west and the Amu Daria to the east. The Karakum Dessert covers 80 percent of the total area. Turkmenistan is vulnerable to a number of disasters including floods and landslides. Floods account for a third of the disasters in Turkmenistan with average annual economic losses at about US\$ 7 million.⁶ Turkmenistan has limited access to high-resolution numerical weather forecasting.⁷ Available forecasts lack probabilistic information and key variables, including relative humidity and wind speed, among others. These data would enable the NHMS (Turkmenhydromet) to better serve agriculture and the livestock subsector, municipal services, and transport (road, rail, and aviation). Turkmenistan's national networks of surface weather stations, hydrological posts and upper air sensing are inadequate by WMO standards. Existing equipment is obsolete and deteriorating and repair parts are difficult to source; NHMS requires capacity building to update technical skills.

15. In addition to benefits occurring at the country level, important benefits can be achieved that spill over country boundaries. Economic assessments of key sectors (see Annex 7) show that measurable regional economic benefits and prevention of economic losses from hydrometeorological hazards (including the loss of human lives from weather-related disasters) are possible even with modest investments in strengthening NHMSs in the region. Political boundaries do not constrain atmospheric processes. Collecting and exchanging information on how the atmosphere behaves in an entire region can help improve the forecasting capabilities and outcomes throughout a region such as Central Asia. It is due to the cross-border nature of weather, water and climate that the World Meteorological Organization (WMO) promotes activities through regional data networks and training centers, including one in Central Asia. From the very outset it is imperative that a coherent regional approach to developing hydromet services be adopted. In general, standalone national interventions in hydromet services are not considered optimal when compared to regional or subregional approaches. For example Moldova's NHMS cooperates with its Romanian counterpart service to obtain data on weather patterns that affects both countries. Relying totally on its own data network would be costly for a poor country such as Moldova. This is because there needs to be a continuum of quality and

⁶ Central Asia and Caucasus Disaster Risk management Initiative (CA DRMI): Risk Assessment for Central Asia and Caucasus Desk Study review (2009).

⁷ While Turkmenistan is not participating in the Project, a summary description of issues facing TurkmenHydromet is included for completeness and to underline some of the common issues facing Central Asia NMHSs.

accuracy at three interrelated levels: (i) data collection; (ii) data sharing, modelling, and analysis; and (iii) delivery of products and services to users and decision-makers. The proposed regional approach pursued in Central Asia under this project with the support of the World Bank and other international partners aims to provide the necessary conditions to achieve these outcomes.

16. The project aims to assist the national governments and regional institutions to revitalize this important regional public service. While all Central Asian NHMSs need some strengthening of their capacities, as well as investments in their infrastructure, the needs of the Republic of Tajikistan and Kyrgyz Republic are particularly pronounced and resources are extremely limited. In these two countries infrastructure networks to collect hydromet data and the capacity to analyze it and provide adequate services to the public and decisionmakers are extremely limited. After two decades of neglect and underinvestment, their hydromet services have fallen further behind. This deteriorating situation is unsustainable and more is needed to help them to “catch up” with their neighbors and to contribute to the pool of useful information that can serve the common purposes of the countries in the region. This will be achieved by investments in numerical forecasting capacity, basic observational infrastructure, communication and IT technologies, and recruitment and training for a modernized workforce.

17. *World Bank engagement:* In September 2008, international, regional and national partners joined the World Bank to initiate work on a regional hydromet-strengthening program, endorsed by the Central Asia Regional Economic Cooperation Program (CAREC) countries under a broader Central Asia and Caucasus Disaster Risk Management Initiative (CAC DRMI). During 2009, the program was further developed drawing on 2008-09 assessment results from the Kyrgyz the Republic, Republic of Tajikistan, and Turkmenistan. The GFDRR financed the assessments and the results were used in a regional workshop in Tashkent and the Republic of Uzbekistan to discuss the scope, main activities, cooperation modalities, and national and donor financing for a hydromet-strengthening program, attended by some 100 participants. At the conclusion, all Central Asian NHMSs signed a Protocol; in April 2010, a Memorandum of Understanding (MoU) for cooperation was finalized, and a Draft Program of Regional Activities to complement the country-level activities designed with GFDRR support were supported and agreed in principle.

18. Regional and national institutions played a pivotal role in this process. In particular, the Executive Committee of the International Fund for Saving the Aral Sea (EC-IFAS) and its Regional Center of Hydrology (RCH) made significant contributions. The International Fund for Saving the Aral Sea (IFAS) is an international organization established by Central Asian Governments in order to fund joint regional environmental and research programmes and projects aimed at saving the Aral Sea, as well as solving regional socio-economic problems. EC-IFAS is the executive working body of IFAS. The RCH is an institution founded under EC-IFAS and comprises the five NHMSs of Central Asia. Both EC-IFAS and the RCH are currently located in Almaty and have braches in all five Central Asian countries.

19. Following the Tashkent workshop, a working group was established with representatives from NHMSs Central Asia, EC-IFAS, donors and international organizations. Stakeholders asked the World Bank to serve as the coordinating body for the group, which will continue to develop the regional program. Based on follow-up consultations with Central Asia NHMSs, the

first working group meeting was conducted in Almaty on February 10-11, 2010. The Bank team also attended the donors' coordination meeting of the Third Aral Sea Basin Program in Almaty (May 2010).⁸ These meetings helped prioritize regional- and national-level activities, and allowed the World Bank team access to Kyrgyzhydromet and Tajikhydromet to develop plans to strengthen these two services given that their infrastructure and technical capacity has deteriorated considerably compared with Kazhydromet and Uzhydromet.

20. To support the overall goal of strengthening the delivery of weather, water, and climate services in Central Asia, the World Bank is working with CA NHMSs to develop the Central Asia Hydrometeorology Modernization Project (CAHMP).⁹ Four of the five Central Asian countries (except Turkmenistan) agreed to participate in the proposed Project, which aims to increase cohesion between the CA NHMSs to share data, information and expertise to rebuild infrastructure and human capacity to reduce disaster risks, manage consequences of climate variability, and support economic development in agriculture, water resources, energy, and transport sectors throughout the region. While Turkmenistan has not yet formally made a decision on its participation, the proposed CAHMP will lead to improvements in the regional system of hydrometeorology that Turkmenistan can benefit from should it choose to do so at a later time. Turkmenistan can strengthen the capacity of its NHMS with its own resources or approach its partners, including the World Bank, for assistance. The CAHMP will include regional- and country-level activities. The EC-IFAS and the RCH Coordinating Council (RCH-CC) will coordinate regional cooperation activities.¹⁰ The RCH was established under the EC-IFAS by the heads of CA NHMSs and endorsed by the IFAS Board in 2004.¹¹ To support country-level activities, the CAHMP will help Kyrgyzhydromet and Tajikhydromet to improve physical infrastructure required to observe and forecast changes in the environment; increase workforce capacity; and develop new business practices to sustain these services.

21. There is strong rationale for Bank involvement.

- (i) There is regional consensus that global action is required and national demand is strong for strengthening hydromet service delivery and improving coordination and information sharing among all NHMSs.
- (ii) Isolated national interventions are insufficient to remedy critical regional gaps. Other multilateral and bilateral donors finance country-focused assistance on climate change, crisis prevention, hydrological and weather services, but the World Bank occupies the

⁸ Donors to the Aral Sea Basin Programme (Phase 3) are likely to consider the Regional Program for financing later this year. The World Bank's CAHMP will complement financing generated under the ASBP-3 process.

⁹ The CAHMP is closely aligned with the Central Asia Energy-Water Development Program (CAEWDP), under preparation by the World Bank.

¹⁰ IFAS, established in 1993, is the only regional political platform uniting all five Central Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan). The Fund is developing an Action Programme on assisting the countries of the Aral Sea basin for the period of 2011-15, aimed at integrated water resources use taking account of the interests of all states in the region.

¹¹ The main RCH objectives include support to develop hydrometeorological monitoring systems, strengthen cooperation between NMHSs of Central Asia, share data particularly on hazards, and coordinate training, research and development. The RCH is managed by Coordination council comprising the heads of Central Asia NMHSs, the Director of IFAS Executive Committee, and the RCH Executive Director.

central ground needed to tackle regional challenges involving coordination and sharing of important hydrometeorological information among Central Asian NHMSs.

- (iii) The World Bank has experience with regional investments, innovative reforms, and ability to broker partnerships with regional institutions, which facilitated the proposed program design.
- (iv) A major goal of the World Bank is to improve public service delivery; providing weather, climate, and hydrological forecasts is a key area of public service; the Bank has financed similar investments in Albania, Moldova, Poland, Romania, Russia, and Turkey.
- (v) The World Bank has a track record of effective donor coordination and United States Agency for International Development (USAID), United Nations Development Programme (UNDP), Finnish Meteorological Institute (FMI) and the Swiss Agency for Development and Cooperation (SDC) have expressed interest in supporting regional priority activities. In this respect, the Bank team hopes to forge strong ties among key development partners in Central Asia, toward continuing improvements to regional hydromet services.

C. Higher level objectives to which the project contributes

22. At the regional level, the proposed CAHMP supports the higher-level objective of reducing human and economic losses from hazardous weather events. The proposed Project also aims to diminish economic losses related to the high degree of uncertainty for businesses and agriculture caused by weather and climate-related risks. The CAHMP provides a vehicle to implement key strategic priorities of all hydrometeorological institutions. The NHMSs and EC-IFAS are committed to a regional approach, as highlighted in the Resolutions of RCH-CC (December 3, 2010), NHMS Working Group meetings (October-November 2010), and the Memorandum of Understanding (MoU) for cooperation among heads of NHMSs in November 2009, signed in March 2010.

23. The proposed CAHMP aligns with the priority of strengthening the system of disaster risk management of the Joint Country Support Strategy Progress Report of Kyrgyz Republic (Report No. 39719-KG) and the CPS for Tajikistan (Report No. 50769-TJ). Governments of both countries recognize that reducing environmental disaster risks is important to mitigating macroeconomic risks and improving welfare. Kyrgyz Republic and Republic of Tajikistan have allocated US\$2.0 million from their IDA country allocations for improving disaster preparedness by modernizing their hydromet services and by participating in a regional cooperation program. Because of its geography, topography, and climate, Tajikistan is affected regularly by natural disasters such as floods, mudflows, landslides, avalanches, earthquakes, and droughts. Climate change is expected to exacerbate the frequency of natural disasters associated with hydro-meteorological conditions, which harms the rural economy disproportionately. In this context, it is pertinent to mention that the Pilot Program for Climate Resilience (PPCR) is providing support to Tajikistan to promote climate resilient development. PPCR support to Tajikistan will enable Tajikhydromet to develop hydrometeorological products that will help society and government agencies better prepare for weather-related hazards and adverse impacts of climate change. Finally, the Uzbekistan Country Assistance Strategy (Report No. 43385-UZ) highlights disaster

risk management, weather forecasting, and climate adaptation as important areas that could benefit from Bank support. In Kazakhstan, understanding the national impacts of energy-water linkages depends on availability of reliable information that the national hydromet service (Kazhydromet) can provide.

24. In addition, the Project will strengthen public sector management by improving public service delivery, and supporting the investment climate and long-term growth. Improved efficiency and quality in weather forecasting will reduce economic risks and support investment, mitigating natural disaster and environmental risks. Improved forecasting will mitigate risks from floods, drought and fire, winds and extreme weather conditions and will support emergency preparedness for these events. However, for this to happen, more cooperation is needed between the NHMSs and agencies responsible for disaster risk management. Through this Project and other efforts, support for connecting NHMSs to early warning systems will be provided. Otherwise, there is a danger that the benefits of strengthening NHMS capacity through this Project will not be fully achieved.

II. Project Development Objectives

A. PDO

25. The objective of the Central Asia Hydromet 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.

26. The CAHMP will carry out the following regional-level activities: (i) improve technical and organizational capacity for information acquisition and exchange for CA NHMSs; (ii) improve regional training, re-training, and professional development for meteorology, hydrology, and climate; (iii) improve services for early warning, weather forecasting, and climate change assessments; (iv) support Project management costs and support NHMSs through a systems integrator consultancy for the Project.

27. Country-level activities include: (i) carry out institutional strengthening of NHMSs, improve human resources capacity and financial sustainability; (ii) improve hydrometeorological observation networks to provide timely extreme and hazardous weather warnings, and to manage water resources; (iii) enhance service delivery; and (iv) manage CAHMP country-based components and ensure integration with the overall regional system. Strengthening NHMSs of Kyrgyz Republic and Republic of Tajikistan will enhance regional cooperation by reducing infrastructure and capacity bottlenecks and sharing of hydrological data from watersheds where most regional water resources are formed.

1. Project Beneficiaries

28. Project benefits will be widespread. Country and regional activities will benefit all hydromet service consumers in Central Asia and specifically in Republic of Tajikistan and Kyrgyz Republic due to increased reliability and timeliness of hydromet forecasts. The benefits include reduced human vulnerability to natural hazards, reduced risk of damage to property and

the potential for overall reduction of economic losses as a result of natural disasters. Improved coordination and information exchange among the NHMSs, and better regional cooperation in support of climate adaptation, can yield multiple indirect benefits for the public and private sectors by generating more reliable data that can support economic activities in sectors such as agriculture, energy, and transportation. For example, if farmers were interested in insurance products to cover weather risks, insurance firms would need reliable weather information to provide relevant products and services. This Project could help provide such information in the medium-term. Estimating the number of indirect beneficiaries is inherently difficult given the public goods nature of the products and services that the CAHMP will help produce. However, some rough estimation of direct beneficiaries is possible. Direct beneficiaries will include a subset of the staff of the participating hydromet services and the EC-IFAS/RCH. The total number of staff in these agencies is about 5,950. Of these over 3,400 staff (57 percent) are women (varying from 42 percent in Tajikhydromet to 66 percent in Kazhydromet).

29. The proposed CAHMP focuses on four of five countries in Central Asia that have expressed interest in participating in the regional project. Turkmenistan is not participating in the proposed Project at this time. Although Turkmenistan's participation would have further strengthened regional linkages in hydrometeorology, the participation of the other four countries in this Project is a major step forward and can encourage Turkmenistan to join later on should it so desire by using its own resources or seeking assistance of the World Bank or other partners. Turkmenistan will, of course, be able to learn from the experiences of the other countries since it is a member of both IFAS and the RCH.

2. PDO Level Results Indicators

30. The following performance indicators will be used to monitor PDO achievement.

- Increased accuracy and timeliness of basic weather forecasts—Accuracy of weather forecasts of 72 hours lead time from 60-65 percent to 85-90 percent.
- Increased accuracy of seasonal river flow forecasts—Accuracy of seasonal river flow forecasts from 60-70 percent to 85-90 percent.

III. Project Description

A. Project components

31. The CAHMP comprises three components: (A) Strengthening regional coordination and information sharing; (B) Strengthening of Hydromet Services in Kyrgyz Republic; and (C) Strengthening of Hydromet Services in Republic of Tajikistan. CAHMP-supported components are summarized below; detailed activity descriptions are in Annex 2 and attachments. It is important to note that capacity building through training and knowledge sharing is a critical aspect of the CAHMP. Capacity building activities at the regional level will bring together staff from all four NHMSs to learn jointly about common issues in the area of information exchange and early warning systems. At the country-level, NHMS staff in Kyrgyzstan and Tajikistan will strengthen their capacity to deliver services in a local context.

Component A: Strengthening regional coordination and information sharing (US\$8.7 million)

32. This component aims to ensure that each participating NHMSs in the region—Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan—can use, share, exchange, and archive common hydromet data and information, and that each has comparable expertise data and information generation and delivery of hydromet services. Component A will finance the technical and infrastructural capacity that will enable the NHMSs of the participating countries to collect and share more information, analyze it and collaborate to develop useful products and services for Project beneficiaries.

33. Activities proposed under component A will be financed by the IDA regional grant for regional organizations available under the pilot established in 2009 at the IDA15 Mid-Term Review. The pilot was created to build capacity of regional institutions so that they can facilitate regional integration more effectively and efficiently. Component A is focused on building institutional capacity of the EC-IFAS and its RCH, whose mandate is to promote cooperation and coordination between national hydromet agencies and facilitate the integration of the network of Central Asia hydromet services. Component A is designed to strengthen regional hydromet services and their ability to work together to develop products and services that can be mutually beneficial. It will strengthen institutional capacity of EC-IFAS and its RCH through skills development/training, technical studies and recruitment of personnel (US\$4.9 million), as well as purchase of physical equipment (US\$3.8 million) needed to ensure interoperability/synchronization between NHMSs and allow the regional institution to facilitate the efficient exchange of hydromet data in a truly integrated regional network. If the EC-IFAS and RCH are unable to fulfill their role in coordination and facilitation of regional collaboration between the Central Asian countries, individual infrastructure investments in hydromet sector already undertaken and planned to be funded under this project (US\$19 million) will be underutilized, undermining the impact and rationale for the project.

34. Therefore, the proposed investments constitutes an essential part of institutional development and capacity building of the EC-IFAS and RCH enabling them to perform their mandate as a facilitator of regional cooperation in the hydromet sector. In addition, while the proposed investment constitutes a small fraction of an overall project, it is indispensable for the regional infrastructure already in place and planned to operate as an integrated regional network.

35. EC-IFAS will be the recipient of IDA grant funds, which is consistent with the six eligibility criteria established for regional institutions under the IDA regional grant pilot. More details are provided under the section on implementation arrangements and in Annex 3.¹²

¹² Eligibility requirements include: (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; and (6) The regional entity is associated with an IDA-funded regional operation involving some of the participating member states.

36. *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\$1.68 million).* This activity will improve EC-IFAS and RCH’s capacity to foster cooperation among NHMSs on how information is received, integrated, and exchanged in the region, similar to efforts in Western Europe. The regional system of hydrometeorological data acquisition will be modernized with new information processing and visualization systems that can access large volumes of data and information generated by the global numerical weather prediction centers, which will be shared widely via dedicated satellite links and combined with regionally acquired remote sensing information.

37. *Sub-Component A.2 – Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate (US\$1.53 million).* Qualified staff to maintain and operate modern equipment, utilize the latest forecasting techniques, and provide customer and user focused service delivery are essential for sustainability of these modernization programs. The number of highly qualified staff in the region is limited; a strategy is needed that will blend e-learning with face-to-face training sessions. Expertise must be shared among staff of each NHMS. Courses should draw upon the experience of WMO members and learning development experts; WMO member trainings are normally conducted through WMO regional training centers. The regional, integrated training approach will ensure consistency across Central Asia and foster opportunities to exchange data and information, and develop common operational procedures that will improve forecasting and warning dissemination.

38. *Sub-Component A.3 – Improve the provision of hydrometeorological services by the National Hydrometeorological Services through: (i) improved early warning systems for extreme events; 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\$1.64 million).* This activity will improve forecasts of extreme weather events using advances in numerical weather prediction in leading global forecast centers. Improving high-impact weather forecasts depends on access to numerical weather prediction products from major global centers and capacity to adapt these products for the specific needs of a geographical region. Key elements include ability to understand ensemble predictions (probabilistic forecasting methods) and apply them to forecasts for specific user applications; and capacity to access large volumes of information from global centers via the Internet.

39. *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\$3.85 million).* The CAHMP will be coordinated and implemented regionally through the EC-IFAS; and nationally through the NHMSs. The critical element of this approach is systems integration and a systems integrator (a management consultancy) which will ensure components are fully connected and that common procedures create interoperable regional and national services. Developing a system to link the NHMSs is complex and national experience is lacking in large-scale modernization. Therefore, NHMSs will require assistance from a systems integrator to ensure that activities supported by the CAHMP are integrated and efficient. The NHMSs have agreed to combine the detailed technical design development and the integration function into

one consultancy that will assist participating NHMSs during the Project life span. The integrator will contribute to national/regional capacity building so the NHMSs can sustain the cooperation developed under the CAHMP among national specialists.

40. This sub-component will support implementation of other regional activities including procurement and financial management functions for EC-IFAS.

Component B: Strengthening of Hydromet Services in Kyrgyz Republic (US\$6.0 million IDA Credit/Grant)

41. This component aims to strengthen Kyrgyzhydromet so the infrastructure and capacity can sustainably observe, forecast, and deliver weather, water and climate services to meet national economic and social needs (See Annex 2). This national component has the following three sub-components:

42. *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; and (iii) revising the scientific methodological basis of the Kyrgyzhydromet operations to World Meteorological Organization standards (US\$845,000).* This subcomponent will provide technical support and training to the hydromet staff so they can engage effectively in the modernization program. A potential impediment to successful implementation of the modernization strategy is that staff has a vision, based on long-term accommodation of existing work conditions. Unless encouraged to do otherwise, staff may adopt an incremental approach to modernization that will reestablish observing networks and sustain the current structure. This will not achieve desired changes in service delivery. Experience suggests that staff need to observe how other similar-sized organizations deliver modern NHMS products and services to develop and sustain modernization beyond initial implementation. This is an opportunity to develop, test and implement a cost-recovery scheme to offset ongoing operations if incremental costs of providing better services are not fully supported by government.

43. *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; and (iii) development of forecasting systems (US\$3.8 million).* Restoring and improving the meteorological and hydrological observing networks will enable the NHMS to provide timely warnings to agencies responsible for reducing and preventing injury and death and economic losses related to extreme weather events. Mitigation of consequences and better emergency preparedness are important components of the modernization program. Improving hydrological observation and forecasting systems is also essential to manage national water resources, cope with climate variability, and provide data to inform climate change adaptation. To monitor weather, climate, and water, new automatic and semi-automatic weather and

hydrological stations will be installed, snow and avalanche monitoring sensors will be provided, as along with means to calibrate and repair this equipment.

44. *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\$0.88 million).* Today, more economic sectors are weather- and climate-sensitive; this has created a new client base for forecasting products and services. However, users often have little knowledge or understanding of how weather, water, and climate specifics affect their decisions so a more collaborative approach to service delivery is required. Joint training of NHMS personnel and users will improve sector knowledge within the NHMS staff and educate technical staff in the user sector about basic meteorological processes. It is anticipated that this will lead to joint development of decision-support tools for weather and climate sensitive sectors to integrate meteorological information more effectively.

45. *Sub-Component B.4 – Support implementation of Component B of the Project (US\$475,000).* This will support implementation of country-specific activities of this component and contribute to sustainability of country-based investments.

Component C: Strengthening of Hydromet Services in Republic of Tajikistan (US\$13 million, of which US\$6 million IDA Grant and US\$7 million PPCR Grant)

46. The Tajikistan NHMS is also weak and this component aims to modernize the Tajikhydromet to ensure that it has infrastructure and capacity comparable with other countries in the region, to sustainably observe, forecast, and deliver weather, water and climate services that meet national economic and societal needs. Tajikistan is a pilot country for the Pilot Program for Climate Resilience (PPCR). Support from the PPCR is provided to each pilot country in two phases. In the first phase, national climate resilience priorities were identified. Investment support for Tajikhydromet was approved for phase 2 implementation. The activities listed below will be partly financed through PPCR support.

47. *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 World Meteorological Organization standards (US\$1.34 million).* Similar to the modernization program for Kyrgyzhydromet, the Tajikhydromet staff needs technical support and training for program sustainability. Modernization program success depends on staff ability to adopt new working practices and skills. This activity will engage staff in developing an overall concept for the Service. Tajikhydromet is developing a marketing program to enhance capacity to provide fee-based services. It is as yet unclear which approach will be the most effective to provide these services; the objective is to identify new revenue sources to sustain services level provided by the modernization. Support is provided to test and develop business models, including one in which tailored services are offered to other government departments on a fee basis, therefore, the service quality must meet or exceed customer expectations. Many other

NHMSs offering fee-based services could provide some guidance. Tajikhydromet strengthening is an opportunity to pilot new ways of doing business.

48. *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\$8.81 million).* The objective is to restore meteorological and hydrological observational networks, and ensure efficient and timely transmission of observational results. Implementation will help to meet the needs of the national economy and users for reliable hydrometeorological data, and fulfill national and international obligations for information exchange on national hydrometeorological conditions. These data are essential to assess and manage of water resources, support climate change assessments, and develop national climate adaptation strategies. Investment in IT infrastructure is needed to establish a modern software-hardware environment that provides efficient and timely data collection from the observational network and can process information products from leading international meteorological centers. This will improve quality and lead times for storm warnings and forecasts, which will improve the quality of hydrometeorological services delivered to authorities, Ministries of emergencies and agriculture, water management, and other users.

49. *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; and (ii) specialized training to staff involved in service delivery (US\$2.3 million).* As stated above with respect to the Kyrgyzhydromet modernization, service delivery is an important element of modern meteorological services with customized products that optimize social and economic benefits. Nascent sectors have new and emerging needs for meteorological services and NHMS staff should have sufficient training to communicate effectively with clients and establish a more collaborative approach to service delivery. Otherwise users may be unable to use meteorological information effectively for decision making. Climate services are also important in Tajikistan to assess the likely wide-ranging impact of climate change. This element provides initial investment in climate services, which will improve Tajikhydromet's capacity to provide climate assessments and raise national resilience to the effects of climate change. It should be noted that the PPCR is financing complementary climate modeling activities through a project to be implemented by the Asian Development Bank (AsDB). The focus of the proposed CAHMP and its activities in Tajikistan is to establish some of the basic systems and capacities that are a necessary condition for Tajikhydromet's ability to provide additional services related to climate adaptation.

50. Important users include the energy and agriculture sectors, and disaster reduction. The proposed modernization program will contribute to service improvements in these sectors. For the Emergency Management Committee (EMERCOM) this activity will enhance EMERCOM capacity to disseminate NHMS's information about severe weather conditions to the regional and local branches of the committee, and divide national territory into probability zones for hazardous hydrometeorological events, including vulnerability assessment of Tajik regions. It

will also include staff training for local EMERCOM divisions to raise awareness of weather hazards and facilitate better utilization of hydromet information in EMERCOM operational activities.

51. *Sub-Component C.4 – Support implementation of Component C of the Project (US\$0.55 million).* The activity will support implementation of country specific activities of this component and contribute to sustainability of country based investments.

B. Project Financing

1. Lending Instrument

52. The lending instrument to be used is a Specific Investment Loan (SIL). The Project will benefit from the IDA Regional Program and EC-IFAS will benefit from the IDA regional grant pilot for regional institutions that was established in 2009 at the IDA15 Mid-Term Review. Financing of country-level activities will take place through an IDA grant to the Republic of Tajikistan, and IDA grant/credit to Kyrgyz Republic. Financing terms will depend on national eligibility for IDA support. In addition, the Republic of Tajikistan will receive a grant from the Pilot Program for Climate Resilience (PPCR).

2. Project Cost and Financing

Project Components	Project cost	IDA Financing	PPCR Financing	% Financing (IDA+PPCR)
(A) Regional	US\$8.70 m	SDR 5.6 m (US\$8.70 m)		100%
(B) Kyrgyzhydromet	US\$6.00 m	SDR 3.9 m (US\$6.00 m)		100%
(C) Tajikhydromet	US\$13.00 m	SDR 3.9 m (US\$6.00 m)	US\$7.0 m	100%
Total Project Costs	US\$27.70 m	US\$20.70 m	US\$7.0 m	

C. Lessons Learned and Reflected

53. Many lessons helped guide the preparation of the CAHMP. Some relate to generic issues that pertain to the development of Regional IDA operations. Some lessons from the Africa Region and the ECA Region are highlighted below.¹³ The team also benefited from lessons of a GEF-financed regional project that involved the EC-IFAS and the Bank-financed Central Asia HIV/AIDS Control Project.¹⁴ Important insights came from the Swiss (SDC) Program to Support

¹³ IDA14 Mid-Term Review of the IDA Pilot Program for Regional Projects, Regional Integration Department, Africa Region, World Bank (2004).

¹⁴ Aral Sea Water & Environmental Management GEF Project (P008236).

Hydrometeorological Services in the Aral Sea Basin, completed in 2010. The most significant lessons are listed below:

- *Regional institutions have limited capacity.* Many regional projects deal with nascent institutions that require extensive capacity building. Therefore, regional operations require a regional lens but implementation should be carried out at the national level. The experience of the Water and Environmental Management Project (WEMP) confirmed this; it had “relatively trouble-free implementation of some national-level components, and national projects such as the Syr Darya Northern Aral Sea Control project in Kazakhstan, and the Water Supply and Sanitation projects in Kazakhstan and Uzbekistan. A recommended approach is to “design programs for the regional level but divide projects and activities into efforts at the national level.” This aligns activities with regional goals and coordination, but places implementation mostly under national institutions. The CAHMP will use this approach. Most of the CAHMP will be implemented through national-level components in Kyrgyz Republic and Tajikistan. However, the regional component to be implemented under EC-IFAS will bring together the four hydromet services to jointly undertake regional activities and coordinate the implementation of the CAHMP.
- *Multiple stakeholders increase challenges of coordination.* Regional projects engage regional sector institutions and national institutions in each participating country so implementation arrangements must be as clear as possible. Therefore, the team focused on these arrangements. Activities planned under the CAHMP are highly desirable for individual countries *and* the Central Asia region. The risks and challenges have become clearer and the team is working on these with counterparts during preparation.
- *Anchoring compliance across countries with protocols and project agreements in separate legal agreements is challenging.* The CAHMP exemplifies this legal complexity. The team has focused on clarifying legal aspects early on during project preparation. For example, three sources of financing combined with three legal recipients will require four legal agreements. In addition, the charters and legal status of EC-IFAS and RCH were carefully assessed to avoid problems during implementation.
- *Procurement and Financial Management.* Regional projects rely on differing national systems for procurement and financial management. To resolve this issue, the CAHMP will focus on providing fiduciary support at the national and regional level. The EC-IFAS through the RCH Coordination Council will coordinate activities and national activities will rest entirely with Kyrgyzhydromet and Tajikhydromet.
- *Inadequate preparation burdens implementing agencies and the Bank supervision staff during implementation.* The CAHMP implementing agencies have limited capacity. The team is providing all possible support to help these agencies carry out their preparation activities to ensure minimum preparedness standards are met. In this context, the team is confident that by project effectiveness, some procurement packages will be ready and implementation teams will be in place. However, the CAHMP will be less advanced in

some aspects of readiness for implementation than most national projects in countries with more capacity.

- *Project design should align with beneficiaries' ability to absorb proposed changes.* A multi-year Swiss program aimed to support NHMSs in the CA region demonstrated that introducing modern instruments and technologies proved too complicated for NHMS's staff to operate; operating condition requirements and supplying spare parts were too demanding and incompatible with NHMS routine operations. Sometimes the equipment was used improperly or not used at all, and failed to achieve expected improvements. The CAHMP has selected, in consultation with the participating NHMSs, a mix of interventions based on traditional manual and new automatic instruments. In addition, a massive training program will ease the difficulties of introducing new technologies.

IV. Implementation

A. Institutional and Implementation Arrangements

54. ***Regional Implementation Arrangements.*** As discussed earlier, EC-IFAS will receive an IDA grant to implement component A of the CAHMP. Under the IDA 15 regional IDA pilot¹⁵, the grant will help strengthen the capacity of EC-IFAS for effective regional integration in hydrometeorology. EC-IFAS meets the eligibility requirements established for regional institutions under the IDA15 regional pilot. Annex 2 provides details in this regard.

55. EC-IFAS and its RCH will play a critical convening and coordinating role, supporting knowledge sharing and advocacy efforts. The RCH-CC, a body which consists of the heads of participating NHMSs, RCH Executive Director and EC-IFAS Chairman, would be responsible for overseeing regional activities under the CAHMP, and coordinate overall implementation progress of the program. EC-IFAS will maintain the CAHMP project management unit (PMU) in Almaty. The CAHMP will finance fiduciary and technical support for the PMU. The RCH-CC in its meeting held on December 3, 2010 unanimously agreed that implementation of component A would be conducted from Almaty until Project closure. The Chief Accountant of the EC-IFAS will have overall responsibility for financial management and disbursement functions with support of a financial management specialist (to be recruited as a consultant). On December 15, 2010 the IFAS Board approved the CAHMP and its implementation arrangements.

56. To ensure better coordination and technical support at regional and country levels, the Project proposes engaging a systems integrator to facilitate design, implementation, and supervision activities of all three components of the proposed CAHMP. The systems integrator will work closely with Tajikhydromet and Kyrgyzhydromet to coordinate national-level activities and with the RCH to coordinate activities foreseen under the regional component.

57. ***Country-based Implementation Arrangements.*** Overall implementation responsibility for country-based programs will rest with Tajikhydromet and Kyrgyzhydromet. This will ensure

¹⁵ Under the fifteenth replenishment of IDA, a pilot program was introduced that allowed IDA to provide grant funding directly to regional institutions that would help implement regional projects involving one or more IDA countries. See IDA15 Mid-Term Review of the IDA Regional Program (October 2009)

broad-based ownership and strengthen the institutional capacities of these services. In addition, activities in both countries will be implemented with the help of Project Coordination Units (PCU) established within the hydromet services. Both PCUs will include a procurement consultant and a technical expert. In addition, a financial management consultant will be hired for the PCU in Tajikhydromet to support the chief accountant with the day to day project financial management and disbursement functions. The PCUs will work under the overall guidance of Project Management Committees (PMC) established in the Republic of Tajikistan and the Kyrgyz Republic. The chief accountants of Kyrgyzhydromet and Tajikhydromet will have responsibility for overall project financial management function with the support of financial management consultants. Key project stakeholders will be represented on the PMCs. Project operational monitoring and supervision will be carried out by the PCUs, which will work with PMCs to streamline decision making.

58. **Partnership Arrangements.** The proposed program resulted from strong cooperation among the Bank, UN agencies and other development partners. Preparation of background studies and workshops which laid the basis for CAHMP was co-financed by GFDRR, WMO, UN ISDR and European Commission. The implementation of the CAHMP will, in addition to IDA resources, be co-financed by the Pilot Program for Climate Resilience (PPCR), the program jointly managed by the World Bank, European Bank for Reconstruction and Development (EBRD) and Asian Development Bank (ADB). The Bank is looking forward to building strong partnerships among key development partners in Central Asia. The WMO, UNDP, United Nations International Strategy for Disaster Reduction (UN ISDR), United Nations Educational, Scientific and Cultural Organization (UNESCO), USAID, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Finland and other donors have expressed willingness to support priority regional activities for CA NHMSs in coordination with support provided through the proposed CAHMP, and for climate change and crisis prevention priorities in general. The partners are committed to continue their assistance to the region, and the Bank is looking forward to building a strong partnership among key development partners in Central Asia. GFDRR is financing a separate grant for Kyrgyzstan's Ministry of Emergencies to establish an early warning system that was designed as part of CAHMP preparation and will benefit from information produced by a strengthened Kyrgyzhydromet.

B. Results Monitoring and Evaluation

59. The participating countries and the EC-IFAS and RCH are committed to using a common framework to monitor Project performance, as described in Annex 3, which includes qualitative and quantitative measurements of CAHMP outcomes and outputs. Indicators of Project success have been discussed with the NHMSs, and are fully in line with development of specific performance benchmarks to evaluate achievement of the Project objective. Achievement of the PDOs would be measured by improvements in the accuracy and timeliness of forecasts and quantity of hydromet data shared by NHMSs. The Results Framework focuses on accountability for results and emphasizes intermediate and final outcomes. Countries will be responsible for coordinating data collection for national activities, including preparation for routine Project reporting. Regional-level responsibility will be located at EC-IFAS. Implementation of the M&E framework will be tracked during Project implementation, and will be central to Project supervision. In the case of Tajikistan, a common format for reporting on results achieved due to

both IDA and PPCR financing has been developed. This framework utilizes a logic that is consistent with the PPCR results framework. Information on results from this Project will be reported both at the Project level as well as at the level of the overall Tajikistan PPCR program. Those results will feed into the broader PPCR framework.

C. Sustainability

60. ***Institutional.*** At the regional level, there is strong and broad based ownership in the participating countries for the proposed Project. The endorsement of the heads of the four hydromet services augurs well for sustainability. The EC-IFAS capacities will be strengthened to support regional harmonization on a sustained basis during Project implementation and after completion. At the national level, Government commitment in both Kyrgyz Republic and Republic of Tajikistan to the objectives of the CAHMP is a good indicator of its sustainability. Borrower ownership has been clear during the Project preparation stage. In addition, the strategy of relying and strengthening existing structures will improve chances of sustainability. Furthermore, strong technical support by the Bank and other donors will enhance chances of sustainability.

61. ***Financial.*** CAHMP activities have been carefully selected to minimize increases in operating and maintenance (O&M) costs associated with acquisition of hydromet equipment or development of related facilities. Several important but unaffordable activities were dropped or limited due to prohibitively high O&M costs; these included resuming upper air soundings, installation of Doppler radars, and monitoring high-altitude mountain zones. Furthermore, a substantial part of the CAHMP is devoted to capacity building through training and knowledge sharing, activities that do not impose incremental O&M costs. Preliminary assessment of O&M costs required to ensure sustainable operation of improved systems reveals that for Kyrgyz Republic, annual O&M costs could increase by about US\$200,000, and for Tajikistan, by about US\$400,000. To offset some of these incremental costs, the Project aims to raise the economic value of hydromet service provision to public and private sectors, so that Tajikhydromet and Kyrgyzhydromet can generate additional revenue as happens in the case of many NHMSs. To some extent, the improvement of forecasting services is likely to help make a stronger case for further government investments in NHMSs.

V. Key Risks and Mitigation Measures

62. ***Complexities of a regional project in a volatile region.*** The risk related to regional cooperation activities in a region such as Central Asia is high. This relates to political differences and limited institutional capacity, which makes cooperation more challenging. There is also a risk that stakeholder commitment may be weaker than initially claimed, especially government commitment to the CAHMP. There is a risk that a country can unilaterally decide to stop sharing hydromet information. However, steps have been taken to reduce this risk. Along with ongoing efforts leading up to the CAHMP to develop supportive constituencies, a Memorandum of Understanding established government and donor community support of hydromet cooperation, including specific areas of cooperation. In addition, under the proposed CAHMP, strengthening of Kyrgyzhydromet and Tajikhydromet remains a considerable incentive for both governments. On the other hand, other Central Asian countries benefit from proposed information sharing that

can happen only if upstream countries can collect and share useful and high-quality data. The program has been included in IFAS' ASBP-3. In addition, investments to support hydromet services will improve data quality and quantity to be shared with neighbouring countries or the World Meteorological Organization (WMO). As a result, it is expected that participating countries will reach compliance with their international obligations under WMO agreements. The program will support the deepening of technical cooperation between the hydromet services of the region, especially within the framework established by WMO.

63. ***Financing operating and maintenance costs.*** The World Bank team advised the Governments of Republic of Tajikistan and Kyrgyz Republic that incremental O&M costs may result from some investments and that Governments or implementing agencies would bear such costs to ensure post-implementation sustainability. If these costs are not budgeted, equipment will likely operate less efficiently or will become inoperable without spare parts, power fuel or qualified maintenance. To some extent, the NHMSs in the region have not received sufficient support to invest in infrastructure and capacity building to be able to provide the types of services decision-makers would find useful. This has led to even more underinvestment in these important services. Over the last few years, and particularly because of concerns related to climate change, there is renewed interest in hydromet services around the world and in Central Asia. While this is good news, the NHMSs still require support in order to prove their value to governments. Demonstrating that value added will help unlock additional fiscal support for these agencies and the proposed CAHMP is an important step in that direction. At this stage, the Project design entails relatively limited incremental O&M costs. The NHMSs and the Bank team have reviewed options for mitigating some of these costs. For example, there is preliminary agreement for O&M cost-sharing with the cartography agency for high resolution satellite data. Also, new business models will be developed, tested and implemented during implementation to help NHMSs recover costs for delivering customized services for specialized users, as happens in other countries around the world. The governments have also been advised of potential post-implementation incremental O&M costs. In Tajikistan, the Government is contemplating increasing salaries of specialized technical staff and key NHMS staff can potentially benefit from such a move. But, more concrete steps to increase budgets of NHMSs are likely only after governments in the region see demonstrable value added services.

64. ***Implementation capacity and coordination.*** This is a high risk area due to generally low capacity in some Central Asian countries and due to multiple implementing entities for national- and regional-level activities, which can complicate coordination. The Bank will work closely with the hydromet services of both countries and the EC-IFAS and its RCH to strengthen their capacity. To some extent, capacity will be developed during Project implementation, but in the interim, the Project will finance regional-level systems integrator services to facilitate design, implementation and supervision activities of all three components of the proposed CAHMP. The systems integrator will work closely with both Kyrgyzhydromet and Tajikhydromet to coordinate national-level activities, and with EC-IFAS/RCH to coordinate regional component activities. These measures will directly support capacity-building activities to help effectively implement this Project. Separate agencies will implement individual national-level and regional-level components, and overall Project leadership will be provided by the RCH-CC and all stakeholders have agreed to that.

65. **Rotation of IFAS/RCH.** IFAS/RCH is a regional umbrella organization that houses the network of all national meteorological and hydrological services (NHMSs) in the CA countries. IFAS (and thus EC-IFAS/RCH) rotate among CA countries every three years. In the next rotation, IFAS is scheduled to move to Tashkent, which poses a serious risk to smooth CAHMP implementation since implementation arrangements would have to be revised and that is likely to cause substantial delays and uncertainty. To mitigate this risk, the EC-IFAS, RCH and participating NHMSs have agreed to maintain the CAHMP implementation unit in Almaty, until Project closing. The CAHMP will finance fiduciary, technical and administrative support for the EC-IFAS/RCH. This support will be provided by consultants selected as part of the Project.

VI. Appraisal Summary

A. Economic and Financial Analysis

66. To assess the CAHMP's economic efficiency, estimated economic losses potentially prevented as a result of Project implementation were compared with the cost of this prevention. Before proceeding to the results of the formal economic analysis it is important to note that economic and social losses (e.g., to transportation or public utility systems) can be mitigated by better quality weather information. Furthermore, improved weather information is a key building block to better resilience to weather and climate variability that can exacerbate the impact of weather-related disasters. These types of benefits may not neatly fit in an economic analysis but they are clearly very important for the people of Central Asia. The cost-benefit analysis estimates the economic feasibility of the project by calculating the present value of cost and benefit streams and by determining the internal rate of return of the Project. The analysis, based on conservative assumptions, concludes that the economic internal rate of return of the project is 22.13 percent. At 12 percent assumed opportunity cost of capital, the present values of the net benefit streams over the Project's time horizon is \$8.31 million, and benefit-to-cost ratio is 1.39. Even excluding many socioeconomic and environmental dimensions of the project benefits that are difficult to estimate in monetary terms, the Project's internal rate of return exceeds the opportunity cost of capital of 12 percent. Therefore, the project is economically viable.

67. Annex 7 describes the economic analysis of the project investments.

B. Technical

68. The proposed Project technical design is based on improvements of critical elements of weather, climate and hydrological information system such as observations infrastructure (land-based meteorological and hydrological networks), communication networks, data collection, archiving and processing facilities. Intrinsic to overall project design is capacity building, institutional strengthening and service improvement for participating NHMSs. The regional activities emphasize data sharing and coordination among participating countries. This approach and main Project activities have been discussed intensively and agreed upon with all participating hydromet services. The Project design was vetted by reputable international experts and by WMO officials participating in Project preparation.

C. Financial Management

69. Responsibility for national-level Project financial management (FM) will rest with the chief accountants of the Kyrgyzhydromet and Tajikhydromet, who will maintain satisfactory project accounting systems, capable of tracking all project resources and expenditures and generating regular financial statements. The Chief Accountant of the EC-IFAS will be responsible for project financial management function at the Regional level. The financial management arrangements of Kyrgyzhydromet, Tajikhydromet and EC-IFAS (for the Regional activities) have been assessed to determine if these arrangements-budgeting, accounting, reporting, internal control, staffing, funds flow and audit-are satisfactory to the Bank.

70. The financial management arrangements established by the EC-IFAS are, overall, satisfactory to the Bank (see details in Annex 3). However, the accounting system will need to be modified to have capacity to generate IFRs, the manual will be updated to include activities of the proposed project, and a financial management consultant will be hired to support the chief accountant with the day to day project financial management and disbursement functions. The financial management risk at the regional level is considered substantial, but additional actions are indicated to reduce the risk to moderate and ensure that the FM arrangements fully meet the requirements of the World Bank. The project financial statements will be subject to independent audit by auditors satisfactory to IDA.

71. Financial management arrangements of Kyrgyzhydromet are moderately satisfactory (see Annex 3 for details), and further strengthening will be realized with modification to the accounting software to have capacity to generate IFRs, development of a manual of financial procedures, and training during implementation, specifically on World Bank procedures for financial management, disbursement and procurement, with support provided by the financial management consultant as needed. The financial management risk is considered moderate, but additional measures are indicated to ensure that the FM arrangements fully meet the requirements of the World Bank. The project financial statements will be subject to independent audit by auditors satisfactory to IDA.

72. Financial management arrangements of Tajikhydromet are moderately satisfactory (see Annex 3 for details), and further strengthening will be realized with full automation and development of a manual of financial procedures, accompanied by training during implementation, specifically on World Bank procedures for financial management, disbursement and procurement, with support provided by the financial management consultant. The financial management risk is considered substantial, but will be reduced to moderate upon satisfactory implementation of the mitigation measures stated above, in addition to independent audit by auditors satisfactory to the World Bank and periodic financial reporting.

D. Procurement

73. Each hydromet agency will be responsible for procurement for its own component (i.e., the Kyrgyz NHMS, Tajik NHMS, and EC-IFAS). A procurement capacity assessment was carried out at the national level and regional level as well. Kyrgyzhydromet and Tajikhydromet have staff in place for their own procurement following national procurement procedures, but

neither has prior experience with World Bank (or other International Financial Institution or IFI) financed procurement. The EC-IFAS/RCH does not have adequate procurement capacity. Therefore, the main procurement risk would be potential delays due to low capacity. Another risk is that there is little competition in procurement due to the high cost of doing business in the region and limited development in the local manufacturing industry. To mitigate these risks, a procurement consultant familiar with Bank procurement procedures will be recruited for each of the three implementing agencies. The Bank's regional procurement team will provide regular advice and assistance. Procurement packaging and plans will be carefully developed with a view to attracting international bids; procurement notices will be advertised widely. Initial procurement plans covering the entire Project period were developed and the Bank team provided assistance to refine them before and at Project negotiations. Details on procurement arrangements are in Annex 3.

E. Social

74. Project social outcomes are expected to be positive. A key social development outcome will be decreased human vulnerability to risks from natural hazards; the Project will reduce human, economic, and financial losses due to natural hazards through strengthening institutional and technical capacity for emergency responses; providing early warning for weather-related hazards through accurate hydrometeorological forecasts and services; and by helping individuals be aware of and adapt to threats from climate variability, and other natural hazards. The Project aims to extend protection from extreme weather events to people living in vulnerable areas through improved forecasting by hydromet services. The Project will introduce technical measures to improve the lead time and accuracy of weather and flooding forecasts, and by adopting streamlined information delivery techniques. The Project will enhance service delivery, engage consumers and potential clients in interactions with NHMS, and expand external and internal user access to observation data and information products. Based on the proposed activities, the Project is anticipated to have no significant adverse social impacts. There will be no land acquisition to trigger resettlement.

F. Environment

75. The proposed Project is classified as environmental Category C; no adverse environmental impact is anticipated. Moreover, the Project will provide environmental benefits, since it mitigates natural hazard risks and improves observations for environmental management. Comprehensive hydrometeorological system coupled with a strong agency responsible for its operation and maintenance will lay a foundation for reducing risks associated with floods, drought and fire, winds, and extreme weather events.

Annex 1: Results Framework and Monitoring

CENTRAL ASIA: Hydrometeorology Modernization Project Results Framework

Project Development Objective (PDO):

The objective of the Central Asia Hydromet 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.

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
Indicator one: Increased accuracy and timelines of basic weather forecasts	☐	Accuracy (%) of weather forecasts of 72 hours lead time	60-65% for KgHM and TjHM	No change	70%	75%	80%	85%	Annual	Based on internal reports of NHMSs, PIUs and Integrator reports	NHMSs	Accuracy of weather forecasts and warnings must be sufficient to achieve credibility with users
			75-80% for KzHM and UzHM	No change	85%	87%	89%	90%				
Indicator Two: Increased accuracy of river flow forecasts		Accuracy (%) of seasonal river flow forecasts (for vegetation period)	60-70% for KgHM and TjHM	No change	70%	75%	80%	85%	Annual	Based on internal reports of NHMSs, PIUs and Integrator reports	KgHM, TjHM	Seasonal river forecast accuracy needed for credible water management decisions
			80-85% for KzHM and UzHM	No change	85%	87%	89%	90%				

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
INTERMEDIATE RESULTS												
Intermediate Result (Component A):												
Improve regional coordination and information sharing between NHMSs of the Central Asian countries												
<i>Intermediate Result indicator one:</i> Improved information sharing between CA NHMSs	<input type="checkbox"/>	Data received/sent by each NHMS daily	20Mb/8Mb	Agreeing means and formats of exchange for new information products	Agreeing procedure on emergency situations warnings at regional levels	300Mb/35Mb	500Mb/50Mb	600Mb/70Mb	Annual	Based on NHMS reports and Integrator verifications	RCH, participating NHMSs, PIUs	Volume of shared hydromet data
<i>Intermediate Result indicator two:</i> Increased access of CA NHMSs to remote sensing data and integration of information to increase timeliness, quantity and quality of information needed to improve lead time and accuracy of forecasts	<input type="checkbox"/>	Access and amount of high resolution remote sensing data	CA NHMSs have limited access to satellite data and analysis tools	No change	Upgrade satellite downlinks and communications links	NHMS's received high-volume satellite products and produce visualization products for users		Integration of satellite based products Increases value and utilization of forecasts by users including agriculture, water resources, transport, and disaster risk reduction	Annual	Based on NHMS reports	EC-IFAS	Satellite data collection, imagery analysis and product generation produced in real time

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
Intermediate Result (Component B):												
Strengthen hydromet service delivery in Kyrgyz Republic												
<i>Intermediate Result Indicator One:</i> Improved status of hydrometeorological observation networks	<input type="checkbox"/>	% of meteorological stations gauging main meteorological parameters	13% of meteorological stations	No change	30%-	50%	80%	100%	Annual report of PIU	Based on internal reports of Kyrgyzhydromet (KgHM)	KgHM	Meteorological instruments are installed, staff trained to use them
		% of stream gauges reporting operational data	44%	No change	50%	55%	65%	70%				Stream gauges are repaired and telemetry installed to send data to central site
		% stream gauges measuring discharges	77%	No change	80%	85%	90%	95%				Stream gauges are equipped to measure discharges
<i>Intermediate Result indicator Two:</i> Better transmission of data to global telecommunication system (GTS)	<input type="checkbox"/>	% stations transmitted to GTS on time	86%	No change	90%	95%	98%	100%	Annual	Based on internal reports KgHM	KgHM	The regional data contribution responsibility of KgHM is not being met. WMO will provide statistics

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
												showing improved contribution of NHMS.
<p><i>Intermediate Result Indicator Three:</i></p> <p>Increased institutional strength and sustainability of Kyrgyzhydromet</p>	□	<p>Concepts, regulations, operational guidelines, KgHM budgets, assessment of O&M needs</p>	<p>Existing legal structure, operating procedures and staffing are inadequate to meet KgHM mission's needs</p> <p>Investment and O&M needs far exceed KgHM budgets</p>	<p>Develop concept for overall KgHM development including "fee-for-service" arrangements</p>		<p>KgHM new regulations and operational guidelines developed in line with new concept, modernized observation infrastructure and technologies</p> <p>"Fee-for-service" arrangements piloted in few sectors</p>		<p>KgHM regulations and operational guidelines fully functioning</p> <p>KgHM budget sufficient to cover O&M needs of regular operations</p>	Annual	Government decree or resolution, KgHM reports	KgHM	<p>New legal and regulatory documents Updated operational procedures</p> <p>Better match between budget needs and available resources</p>

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
Intermediate Result (Component C):												
Strengthen hydromet service delivery in Tajikistan												
<i>Intermediate Result indicator One:</i> Improved status of hydrometeorological observation networks	<input type="checkbox"/>	% of meteorological stations measuring main meteorological parameters	19% of meteorological stations	No change	40%-	70%	80%	90%	Annual	Based on internal reports of Tajikhydromet (TjHM)	TjHM	Meteorological instruments are installed, staff trained to use them
		% of stream gauges reporting operational data	16%	No change	25%	36%	45%	50%				Stream gauges are repaired and telemetry installed to send data to central site
		% stream gauges measuring discharges	49%	No change	60%	75%	80%	90%				Stream gauges are equipped to measure discharges
<i>Intermediate Result Indicator Two:</i> Better transmission of data to global telecommunication system (GTS)	<input type="checkbox"/>	% stations transmitted to GTS on time	70%	No change	80%	90%		100%	Annual	Internal reports of NHMS	TjHM	The regional data contribution responsibility of TjHM is not being met. WMO will provide statistics

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
												showing improved contribution of NHMS.
<p><i>Intermediate Result Indicator Three:</i></p> <p>Increased sustainability and strengthened performance of Tajikhydromet operations</p>	□	Concepts, regulations, operational guidelines, TjHM budgets, assessment of O&M needs	Existing legal structure, operating procedures and staffing are inadequate to meet TjHM mission's needs	Develop concept for overall TjHM development including "fee-for-service" arrangements		TjHM new regulations and operational guidelines developed in line with new concept, modernized observation infrastructure and technologies		TjHM regulations and operational guidelines fully functioning	Annual report of PIU	Government Decree or resolution TjHM reports	TjHM	New legal and regulatory documents Updated operational procedures Better match between budget needs and available resources
			Investment and O&M needs far exceed TjHM budgets			"Fee-for-service" arrangements piloted in few sectors		TjHM budget sufficient to cover O&M needs of regular operations				

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
<p><i>Intermediate Result Indicator Four:</i></p> <p>Increased reliability of climate data</p>	<input type="checkbox"/>	Number of climate assessments	Current climate information is limited and inadequate quality	No change	No change	Ability to downscale climate information to local scales for at least 70% of country		Ability to downscale climate information to local scales for at least 90% of country	Annual	Report of TjHM	TjHM	Current capacity to understand climate change is limited by lack of key meteorological observations. Restoration of network will improve reliability of long-range climate outlooks

Annex 2: Detailed Project Description

76. Central Asian countries are vulnerable to a wide range of weather-related disasters, including floods and mudflows, droughts, frosts, avalanches, hails, and strong winds, which constitute a major part of all economic losses attached to natural hazards. Climate change is a major source of uncertainty likely to increase economic losses unless managed effectively. Reducing vulnerability requires good weather, water, and climate services capable of providing user-specific information. Such information is particularly relevant for early warning, support of disaster reduction strategies and to improve operations and inform climate adaptation strategies in such sectors as agriculture and food security, transport, water resources management, hydropower generation and public health. National Meteorological and Hydrological Services (NHMSs), which are part of a global information network, provide this information. However, the capacity of all of the CA NHMSs has been in steady decline since at least 1985 and cannot currently provide the necessary level of service to meet their countries' needs. For instance, in Kyrgyzstan, Tajikistan and Turkmenistan the accuracy of basic weather forecasts with 3-5 days lead time is in the range 60-70 percent in comparison to 90-95 percent accuracy of forecasts in NHMSs in developed countries. Table 2.1 illustrates the deterioration in observing networks with a corresponding decline in the capacity to produce forecasts and deliver services. The situation in Kazakhstan and Uzbekistan is somewhat better with regard to observing systems in contrast with Kyrgyz Republic, Republic of Tajikistan and Turkmenistan. Hence the CAHMP country focus is on the Kyrgyz Republic and Republic of Tajikistan with investments at the regional level enhancing the capacity to share data and expertise, which will benefit the weaker countries.

Table 2.1 Deterioration of hydrometeorological observation networks

Component of observation network	Kyrgyzstan		Tajikistan		Turkmenistan		Kazakhstan		Uzbekistan ^f	
	Number, 2008	% Reduction since 1985	Number, 2008	% Reduction since 1985	Number, 2008	% Reduction since 1985	Number, 2008	% Reduction since 1985	Number, 2008	% Reduction since 1985
Meteorological stations	32	62	57	22	48	52	259	65	78	10-20
Hydrological stations and posts	76	48	81	41	32	45	291	47	129	10-20
Upper air	0 ^a	100	0 ^b	100	0 ^c	100	9	55	0	100
Meteorological Radars	0 ^d	100	1	75	0 ^e	100	0	100	3	-
Agromet observation stations	31	55	37	46	48	15	185	55	89	-

^aThere were 3 operational upper air stations in Kyrgyz Republic

^bThere were 4 operational upper air stations in Republic of Tajikistan

^cThere were 6 operational upper air stations in Turkmenistan

^dOne radar was in pilot operation in Kyrgyz Republic

^eOne radar was in operation in Turkmenistan

^fData on reduction of hydrological and meteorological stations in Uzbekistan is based on team's assessment

77. The objective of the Project is to improve the accuracy and timeliness of the hydrometeorology services in Central Asia, with particular focus on Kyrgyz Republic and Republic of Tajikistan. This Project will rebuild the infrastructure and human capacity to help reduce disaster risks, manage the consequences of climate variability, increase resilience to a changing climate, and underpin the economic development of the agricultural, water resources, energy and transportation sectors. The CAHMP will help hydromet services throughout the region. However, the Project will focus on the weakest NHMSs, the Kyrgyz Republic and the Republic of Tajikistan, to improve their physical infrastructure required to observe and forecast changes in the environment; increase the capacity and capabilities of their workforce; and develop new business practices to sustain these services. In addition, the CAHMP will support facilitation of regional cooperation in hydrometeorology, including through sharing of information, essential to the production of extreme weather warnings at the country level. The EC-IFAS and its RCH will coordinate the CAHMP in collaboration with each of the NHMSs.

Components of the CAHMP

78. The effectiveness of NHMSs' operations depends on sharing weather, climate and hydrological data and information between neighboring countries and across continents. Weather patterns are not geographically and politically constrained. Therefore cooperation between neighbors to develop a synoptic picture of atmospheric conditions through the free and open exchange of critical data and information has always been the norm. The World Meteorological Organization (WMO) guides data exchange and encourages regional cooperation. Regional training and specialized meteorological and climate centers are common and the principal instruments in providing countries access to new techniques and technologies. CAHMP will provide coordination at the regional level is essential to improve personnel training, strengthen data exchange and information sharing between NHMSs in order for each country to provide good weather, hydrological and climate forecasts and services. This component also ensures that all of the countries benefit from the investment, while providing more capabilities to the weakest countries in the region.

79. Activities proposed under component A will be financed by the IDA regional grant for regional organizations available under the pilot established in 2009 at the IDA15 Mid-Term Review. The pilot was created to build capacity of regional institutions so that they can facilitate regional integration more effectively and efficiently. Component A is focused on building institutional capacity of the EC-IFAS and its RCH, whose mandate is to promote cooperation and coordination between national hydromet agencies and facilitate the integration of the network of Central Asia hydromet services. Component A is designed to strengthen regional hydromet services and their ability to work together to develop products and services that can be mutually beneficial. It will strengthen institutional capacity of EC-IFAS and its RCH through skills development/training, technical studies and recruitment of personnel, as well as purchase of physical equipment needed to ensure interoperability/synchronization between NHMSs and allow the regional institution to facilitate the efficient exchange of hydromet data in a truly integrated regional network. If the EC-IFAS and RCH are unable to fulfill their role in coordination and facilitation of regional collaboration between the Central Asian countries, individual infrastructure investments in hydromet sector already undertaken and planned to be

funded under this project (US\$19 million) will be underutilized, undermining the impact and rationale for the project.

80. Therefore, the proposed investments constitutes an essential part of institutional development and capacity building of the EC-IFAS and RCH enabling them to perform their mandate as a facilitator of regional cooperation in the hydromet sector. In addition, while the proposed investment constitutes a small fraction of an overall project, it is indispensable for the regional infrastructure already in place and planned to operate as an integrated regional network

81. EC-IFAS will be the recipient of IDA grant funds, which is consistent with the six eligibility criteria established for regional institutions under the IDA regional grant pilot. Component A will contribute to the following:

- Improve the technical and organizational capacity of EC-IFAS and its RCH to coordinate the work of Central Asia NHMSs and to promote information receiving, storage and exchange;
- Improve the regional system of training, retraining and professional development in the field of meteorology, hydrology and climate;
- Improve the quality of forecasts, including extreme events warnings by improving access to and use of national and regional numerical weather prediction products for each of the NHMSs; and
- Provide overall project management and systems integration for the CAHMP.

82. The complementary country-based components for the Kyrgyz Republic (component B) and the Republic of Tajikistan (component C) are:

- Institutional strengthening of the NHMSs, including improving their human resources capacity and financial sustainability;
- Improving the hydrometeorological observation networks to provide timely warnings of extreme and hazardous weather and to manage water resources;
- Enhancing service delivery; and
- Managing seamless integration of country-based components of CAHMP into the overall regional system.

Component A: Strengthening regional coordination and information sharing (US\$8.7 million)

83. The objective of this component is to ensure that EC-IFAS/RCH has the capacity to promote collaboration between NHMSs in the region. They can share, use, exchange and archive common hydromet data and information, and that each has a comparable level of expertise in the production of information and delivery of hydromet services (See Table 2.2). This is particularly important for the production of consistent warnings of extreme weather events and climate information relevant to the whole region.

84. *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\$1.68 million).* This activity will improve the process of receiving information, its integration and its exchange between each of the NHMSs in the region. It will strengthen and foster regional cooperation between NHMSs, similar to efforts in Western Europe. This will be achieved by developing a regional system of hydrometeorological data acquisition, and providing new information processing and visualization systems where needed. The capacity to access large volumes of data and information generated by the global numerical weather prediction centers is especially important. Shared widely via dedicated satellite links, this data is combined with regionally acquired remote sensing information. It will provide new capabilities to share information and data between the global providers of satellite data and numerical model products and the NHMSs of Republic of Kazakhstan, Kyrgyz Republic, Republic of Tajikistan, and Republic of Uzbekistan.

85. *Sub-Component A.2 – Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate (US\$1.53 million).* The sustainability of hydromet strengthening programs in each country and throughout the region depends on qualified staff with skills that include the capability to maintain and operate modern equipment, utilize the latest forecasting techniques and provide customer and user focused services. Given the relatively small numbers of highly qualified hydromet staff in the region, the CAHMP will provide a strategy to create blended learning opportunities that mix e-learning with face-to-face training sessions enabling staff of each of the NHMSs share expertise with each other. Such courses, developed as regional programs, draw on the experience of other WMO members and experts.

86. The regional, integrated, approach to training will ensure consistency across Central Asia and foster opportunities for the exchange of data and information, and the development of common operational procedures. This should help improve forecasting and warning dissemination. EC-IFAS/RCH can facilitate an open channel for communication between forecasters from different national hydromet services, which is a particularly valuable part of on-the-job training. The CAHMP will support the development of e-learning and training programs, improvement in the infrastructure in the WMO regional training center, and will equip a technical training center laboratory for observing system specialists to improve and maintain skills in the maintenance and use of modern hardware. It will also support access to professional training programs for trainers available from academic institutions within the Commonwealth of Independent States (CIS) countries. The systems integrator, which will report to RCH, will contribute to designing these programs.

87. *Sub-Component A.3 – Improve the provision of hydrometeorological services by the National Hydrometeorological Services through: (i) improved early warning systems for extreme events; 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\$1.64 million).* This activity will improve forecasts of extreme events by taking advantage of advances in numerical weather prediction (NWP) occurring in leading global forecast centers. Improving high impact weather forecasts depends in the first instance on access to the NWP

products of the major global centers and the capacity to adapt these products to the specific needs of a particular geographical region. Through this component, EC-IFAS/RCH will support training of personnel to create the ability to understand ensemble predictions (probabilistic forecasting methods) and to utilize these forecasts for specific user applications, as well as provide the capacity to access large volumes of information via the internet from the global centers. This will be linked to the training program to ensure frequent refreshment of forecasting skills. This activity will be developed in collaboration with the WMO's Severe Weather Forecast Demonstration Projects, which aim to train forecasters to use ensemble weather predictions.

88. This activity will also address the common need to develop and agree procedures for emergency warnings at regional and national levels. The CAHMP will provide the capacity to share information in common formats and using regionally agreed criteria for warnings and watches, which has proved successful throughout Europe, can be achieved in Central Asia. The CAHMP will support cooperative efforts to acquire these skills using the expertise of global centers and the facilitation of WMO. In addition, the CAHMP will expand capabilities to assess climate impacts in systematic ways that makes the appropriate information available for regional and national decision making. These efforts will help to strengthen the national climate services.

89. Another important area of the sub-component will be CAHMP support for the conversion of historical weather, climate and hydrological data records into digital formats. These records will be used for the evaluation of long-term characteristics of surface water resources in the Aral Sea basin. This activity is particularly important for water resources management, irrigation, agriculture which should be adapted to on-going changes in the regional climate.

90. *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\$3.85 million).* The CAHMP will support regional coordination and implementation of the project through EC-IFAS and its RCH and at the country level through the NHMSs of Kyrgyzstan and Tajikistan. A common failing of many NHMS modernization projects has been the piecemeal approach to the integration of equipment from different manufacturers within a single production suite. Therefore, a critical element of this program is systems integration. The CAHMP will support a systems integrator to ensure that the component parts are fully connected and that common procedures result in interoperable regional and national services. Project management funds will ensure implementation of all component activities and full integration between the regional and national components.

Table 2.2 Component A. Scope and estimated cost of activities

NN	Sub-Components/Activities	Cost
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	1,680,000
1.1	Modernization of the WMO Regional Meteorological Centre for improvement of the possibilities to exchange information between CA NHMS communication centres	145,000
1.2	Supply and install hardware and software for introduction of information processing system in the Regional Meteorological Centre in Tashkent at the level of participating NHMS forecasting services	250,000
1.3	Establish on-line operating module for remote sensing system, including high resolution satellite data collection and primary processing system, and its integration with the first basic module of the system to be installed at Tajikhydromet funded by Component C.	1,110,000
1.4	Arrange on-line access to satellite monitoring data, including informational products developed based on the high resolution satellite data; training	175,000
A.2	Improve the regional system of training, re-training, and professional development in the field of meteorology, hydrology and climate	1,530,000
2.1	Develop a draft Strategy for Regional Training and Retraining Activities and a draft Procedures for NHMS Interaction	80,000
2.2	Develop a remote training system for the NHMSs, with the core at the WMO Regional Training Centre, including development of electronic training courses	650,000
2.3	Retrain and professional development of observation units' staff	530,000
2.4	Develop learning aids to study technical characteristics and operation & maintenance of modern hardware including a studio for development of electronic training courses (WMO Regional Training Center)	210,000
2.5	Teacher training at the leading specialised universities of CIS countries	60,000
A.3	Improve the provision of hydrometeorological services by the National Hydrometeorological Services	1,640,000
3.1	Develop a regional approach to the cascade method of accessing numerical predictions	100,000
3..	Train national specialists in application of lead forecast centers' computing results, including WMO centers, in their operations	100,000
3.3	Introduce numerical weather forecasting techniques for national and regional forecasts in NHMS operations	250,000
3.4	Develop agreed procedures for emergency warnings at regional and national levels based on the analysis of relevant international experience	145,000
3.5	Convert historical weather, climate and hydrological data records into digital formats	650,000
3.6	Evaluate long-term characteristics of surface water resources in the Aral Sea basin	340,000
3.7	Seminars, workshops and trainings	55,000
A.4	Integration of project systems	3,000,000
A.5	Project management	850,000
	TOTAL:	8,700,000

Component B: Strengthening of Hydromet Services in Kyrgyz Republic (US\$6.0 million, of which US\$6 million IDA Credit/Grant)

91. The purpose of this component is to modernize the Kyrgyzhydromet to ensure that it has the infrastructure and capability to sustainably observe, forecast and deliver weather, water and climate services that meet the country's identified economic and societal needs (See Table 2.3). The CAHMP will support training to improve staff capabilities in modern forecasting techniques, which builds on the regional training program to reach all bench forecasters in the service; it will support the addition of new monitoring equipment and the training in the skills needed to support these networks; and the provision of new tools to engage and work more effectively with users, particularly in economic sectors vulnerable to weather extremes, climate variability and change.

92. *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; and (iii) revising the scientific methodological basis of the Kyrgyzhydromet operations to World Meteorological Organization standards (US\$0.845 million).* The subcomponent will provide technical support and training to the Kyrgyzhydromet staff to enable them to engage effectively in the modernization program. This will help develop the necessary strategy to sustain the modernization effort beyond its initial implementation. This activity will engage all of the staff to participate actively in the modernization program including planning for training and staff recruitment and retention.

93. Increasingly the cost of providing NHMS products and services are not fully supported by the ministry responsible for the NHMS. The result is either a decline in the products and services offered to match the government level of support, or the NHMS is encouraged to develop some form of commercial services to compensate and in some cases to provide a return on investment to the parent Ministry. While this is a way to provide additional revenue for the NHMS, it needs to be managed carefully to ensure that the public mission is achieved as a public good and that the commercial services are offered competitively or within a well-defined and approved governmental structure. A number of different approaches to commercial services exist and need to be tested to determine the appropriate model for Kyrgyzhydromet.

94. The CAHMP will support the development and testing of an appropriate business model for the delivery of commercial weather, climate and hydrological services in the Kyrgyz Republic in response to the needs of the commercial sector and governmental contracting requirements.

95. The CAHMP will support the compliance of the scientific methodological basis of Kyrgyzhydromet operation with WMO manuals and guidelines using the experience of CIS NHMSs. This will be achieved by receiving and adapting CIS and WMO current guidance documents in the field of observations, data processing, storage and delivery of information taking into account national legislation and practice; and by developing guidelines on making

observations that would take into account upgrading of observational networks including that of temperature-wind sounding of the atmosphere.

96. The CAHMP will support personnel education and training, which will build on and complement the regional investment in training. A modern NHMS needs highly skilled employees, who refresh and upgrade their capabilities to meet the ever changing requirements of the service. External training programs for the staff should focus on as few training centers as possible so that the training is consistent and the skills readily shared across the organization. Ideally most of the training required can be met by the RCH, although other experience outside of the region will be invaluable. While the basic meteorological and hydrological products will not change dramatically, new technical and service related expertise will be needed. The CAHMP will support an overall upgrading of skills and responsibilities and a long term plan for staffing, which will be defined in the context of the technical refurbishment and service delivery strategy. This will be reviewed in the context of other modernization efforts currently underway and will form part of modernization concept. On-going training is also a means of retaining junior staff longer and would compensate partially for relatively low pay grades. A well-defined continuous training program would provide more career opportunities and encourage staff to remain longer in the service while they acquire these new skills.

97. The CAHMP will enable special attention to be given to the specific needs of individual staff. Support for personnel training will include opportunities for study tours to provide experience of the working methods in other NHMSs and training centers. Trainers and experts from outside of the region will also be supported to assist the improving the staff capacity and capabilities.

98. *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; and (ii) establishment, refurbishment and/or technical enhancement of national centers for meteorological data collection; and (iii) development of forecasting systems (US\$3.8 million).* Improving the system of hydrometeorological monitoring will enable the NHMS to provide timely warnings to agencies responsible for reducing and preventing damage to the economy and population caused by natural weather events. Mitigation of their consequences and better emergency preparedness is an important component of the modernization program. Improvement of the hydrological observing and forecasting systems is also essential for efficient national water resources management and to fulfill the Kyrgyz Republic's obligations under international agreements.

99. The CAHMP will restore and improve the meteorological observing network and key observational sites of the hydrological and avalanche networks. This includes reliable temperature-wind sounding of the atmosphere and providing efficient and timely transmission of observational data. Observations form the basis of daily and long range forecasts for the country and for specific regions and areas. They are also used to issue storm warnings and alerts of extreme and hazardous weather in order to take timely action across all sectors of society and the economy. The CAHMP will provide automatic weather stations, hydrological sensors and snow depth and avalanche sensors.

100. The CAHMP will establish a modern software-hardware environment, which provides efficient and timely collection of data from the observational network and receives and processes information products from leading international meteorological centers. This in turn will enable better quality and longer lead time of storm warnings and forecasts and will improve the quality of hydrometeorological services delivered.

101. *Sub-Component B.3 – Enhance the service delivery system of Kyrghyhydromet through: (i) development of improved services provided by Kyrghyhydromet including expanded user access to informational products; (ii) specialized training to staff involved in service delivery (US\$0.88 million).* Today, more sectors of the economy are weather and climate sensitive resulting in a new client base demanding new products and services. However, since these users often have little knowledge and understanding of the specifics of weather, water and climate in their decisions, there is a need for a more collaborative approach to service delivery that involves both the provider and the user of the services. Unless this active engagement occurs, the users are often unable to utilize meteorological information effectively and though important, it is often discounted as factor in decision making.

102. The CAHMP will support the development of improved services that must accompany any technical refurbishment and enhancement of the Kyrghyhydromet to meet the ever changing needs of society and the economy. The results of the investment will be measured ultimately in terms of the behavior of users and the outcomes of their decisions. The CAHMP will strengthen the capacity of the Service to deliver social and economic benefits from their core activities. Staff involved in service delivery will be trained to have a good knowledge of customer requirements and staff capable of developing applications, based on forecast production, relevant to these users and in collaboration with them. The CAHMP will support the training of both NHMS and staff and users to maximize the benefit of better forecasts in decision support. The attributes of service delivery are: (i) available and timely: at time and space scales that the user needs; (ii) dependable and reliable: delivered on time to the required user specification; (iii) usable: presented in user specific formats so that the client can fully understand; (iv) useful: to respond appropriately to user needs; (v) credible: for the user to confidently apply to decision-making; (vi) authentic: entitled to be accepted by stakeholders in the given decision contexts; (vii) responsive and flexible: to the evolving user needs; (viii) sustainable: affordable and consistent over time; and (ix) expandable: to be applicable to different kinds of services. There are four stages in the delivery system, which will need to be considered in the modernization program: (i) User Engagement – identifying users and understanding their needs, as well as understanding the role of weather, climate, and water-related information in different sectors; (ii) Service Design and Development – process between users, providers, suppliers, and partners of creating, designing, and developing services, ensuring user needs are met; (iv) Delivery -- producing, disseminating, and communicating data, products and information (i.e., services) that are fit for purpose and relevant to user needs; and (v) Evaluation and Improvement – process to collect user feedback and performance metrics to evaluate and improve upon products and services.

103. It is particularly important to satisfy the requirements of the parent ministry of a NHMS. In this case the Ministry of Emergency Situations. This is often a difficult task because the

Ministry has two competing roles, that of customer and owner. These functions need to be kept as distinct as possible with different people taking responsibility for each. The CAHMP will support the integration of meteorological products into the decision systems of the Ministry of Emergency Situations. This will enable the ministry to take full advantage of the planned technical modernization and could be used to showcase the capability of the NHMS. The CAHMPO will support the development and documentation of a unified warning, prevention and emergency response system.

104. *Sub-Component B.4 – Support implementation of Component B of the Project (US\$0.475 million).* The activity will support implementation of country specific activities of this component and contribute to sustainability of country based investments.

Table 2.3 Component B. Scope and estimated cost of activities

NN	Sub-Components/Activities	Costs
B.1	Strengthen the institutional capacity of Kyrgyzhydromet, including improvement of its human resources and its financial sustainability model	845,000
1.1	Producing a concept for Kyrgyzhydromet development	70,000
1.2	Improving specialized hydromet service delivery (commercial). Developing, testing and commissioning of the NHMS commercial activities model	100,000
1.3	Introducing legal and regulatory changes in line with the institutional and technological changes in NHMS's performance and operations	80,000
1.4	Enhancing technical and educational provisions for the personnel training and re-training	240,000
1.5	NHMS personnel training and logistic support	250,000
1.6	Individual consultancies	105,000
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	3,800,000
2.1	Restore key sites for hydrological observation network and installation of hydrological equipment	860,000
2.2	Restore and technical upgrade of meteorological observation network	1,400,000
2.3	Restore precipitation measurements by hydrological gauges	120,000
2.4	Resume agrometeorological observations	230,000
2.5	Supply cross-country motor vehicles for observation networks, first of all for remote-access high-mountain stations	160,000
2.6	Resume snow measuring and snow-avalanche observation network	180,000
2.7	Establish national center for metrological and technical support, incl. supply of stationary and mobile calibration equipment sets	370,000
2.8	Refurbish national and regional centers of meteorological data collection	160,000
2.9	Technical enhancement of regional Hydrometeorological centers and national HMC to improve data preparation and processing for archiving	90,000
2.10	Introduce data processing system in Hydrometeorological center of NHMS	180,000
2.11	Develop long-term runoff forecasting system	50,000
B.3	Enhance the service delivery system of Kyrgyzhydromet	880,000
3.1	Engage consumers and potential clients into interaction with NHMS	60,000
3.2	Expand external and internal users access to observation data and informational products, incl. data achieves	250,000
3.3	Provide technical conditions for improved assessment of climate changes, including rapid access to information archives and hydrometeorological service delivery	500,000
3.4	Improve national climate service	70,000
B.4	Support implementation of Component B of the Project	475,000
	TOTAL:	6,000,000

Component C: Strengthening of Hydromet Services in Republic of Tajikistan (US\$13 million, of which US\$6 million IDA Grant and US\$7 million PPCR Grant)

105. The purpose of this component is to strengthen Tajikhydromet to ensure that it has the infrastructure and capability to sustainably observe, forecast and deliver weather, water and climate services that meet the country's identified economic and social needs (see Table 2.4). As with Kyrgyzhydromet, the key elements are forecaster training, the introduction of new production methods, restoration and improvement of observing networks, and the capacity to develop decision support services for users. In particular, restoration of the meteorological monitoring network will provide the data needed to improve statistical (empirical) downscaling of climate information from coarse spatial scales to finer scales. This will improve understanding of relationship between the large-scale patterns of climate elements (e.g., indicators of atmospheric circulation) and the local climate (e.g., seasonal, monthly or daily temperature and precipitation) and therefore increase the reliability of climate change scenarios.

106. *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 World Meteorological Organization standards (US\$1.335 million).* Similar to the program for Kyrgyzhydromet, the CAHMP will support Tajikhydromet staff development to have a clear vision of the program to ensure its long term sustainability. The success of the program depends on the ability of the staff to adopt new working practices and to acquire new skills.

107. Tajikhydromet has started to develop a marketing program to enhance its capacity to provide fee-based services. At present it is not unclear how best to provide these kinds of services, where the aim is to secure new sources of income to support and sustain the level of services provided. The CAHMP will support the development of a model that tailors services for other government agencies and state owned enterprises on a fee basis. For this to succeed the quality of the services provided must meet or exceed the customers' expectations. Many other NHMSs are involved in fee-based services and may provide some guidance.

108. The scientific methodological basis of Tajikhydromet operations must comply with WMO manuals and guidelines using the experience of CIS NHMSs. The CAHMP will support adaptation of CIS and WMO guidance in the fields of observations, data processing and information delivery. In addition, the CAHMP will support the development of new technical regulations for weather modification and hydrographic surveys.

109. The education and training requirements for Tajikhydromet are similar to those defined for the Kyrgyzhydromet. The CAHMP will support training to develop highly skilled employees, who refresh and upgrade their capabilities to meet the ever changing requirements of the service. External training programs for the staff will focus on a few training centers so that the training is consistent and the skills readily shared across the organization.

110. While the basic meteorological and hydrological products will not change dramatically, new technical and service related expertise will be needed. The CAHMP will support an overall upgrading of skills and responsibilities and a long-term plan for staffing, which will be defined in the context of the technical refurbishment and service delivery strategy. This will be reviewed in the context of other modernization efforts currently underway.

111. The CAHMP will provide support for individuals to participate in study tours and training activities at leading institutions and for tutors and consultant to work with the Tajikhydromet where the skills needed are not readily available.

112. *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\$8.865 million).* The objective of this activity is to restore meteorological and hydrological observational networks, ensure efficient and timely transmission of observational results. 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, first of all, essential for the assessment and management of water resources. More specifically, supply and installation of equipment for about 40 priority hydrological sites, 20 automatic hydrological complexes, including mobile hydrological laboratories for measuring water discharges and hydrographic surveys. For strengthening of meteorological network it is planned to install equipment at 40 existing meteostations, buy and install 12 automatic weather stations in the mountain regions, 30 agrometeorological complexes and other equipment.

113. The CAHMP will establish a modern software-hardware environment through investment in IT infrastructure. This environment will provide efficient and timely collection of data from the observational network and receive and process information products from leading international meteorological centers. This will enable improved storm warnings and forecasts in terms of quality and longer lead times. As a result, services delivered to clients of Tajikhydromet—Committee of Emergencies, Ministry of Agriculture, water management, processing industry and other users—will improve.

114. *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; and (ii) specialized training to staff involved in service delivery (US\$2.255 million).* Service delivery is an extremely important element of modern meteorological services. There is much greater emphasis on the specific needs of customers and users to ensure maximum social and economic benefit. The CAHMP will support NHMS staff training in the user sector to be able to communicate effectively with those clients, resulting in a more collaborative approach to service delivery. Unless this active engagement occurs, the users are often unable to utilize meteorological information effectively and though important, it is

often discounted as a factor in decision making. The CAHMP will strengthen the capacity of the NHMS to deliver quantifiable social and economic benefits. The attributes of service delivery and the process for developing and delivery user-focused services will be implemented with appropriate training of NHMS personnel and the users of NHMS services.

115. Climate services are also important in Tajikistan to assess the likely wide ranging impact of climate change. The CAHMP will provide the initial investment in climate services, which will improve Tajikhydromet's capacity to providing climate assessments.

116. The particularly important users are energy sector, agriculture and disaster reduction. The modernization program will contribute to service improvements to these sectors. For example, the CAHMP will enhance the Emergency Management Committee (EMERCOM) capacity to disseminate NHMS's severe weather information to the regional and local branches of the committee, and enable risk mapping of the country based on the probability of occurrence of hazardous hydrometeorological events. It will also include staff training for local EMERCOM divisions to raise awareness of weather hazards and facilitate better utilization of hydromet information in EMERCOM operational activities.

117. *Sub-Component C.4 – Support implementation of Component C of the Project (US\$550,000).* The activity will support implementation of country specific activities of this component and contribute to sustainability of country based investments.

Table 2.4 Component C. Scope and estimated cost of activities

NN	Sub-Components/Activities	Costs
C.1	Strengthen the institutional capacity of Tajikhydromet, including improvement of its human resources and its financial sustainability model	1,335,000
1.1	Produce a concept for Tajikhydromet development and options of institutional strengthening and system reorganization	50,000
1.2	Develop and test approaches for NHMS's "fee based" services	100,000
1.3	Introduce legal and regulatory changes corresponding to the institutional and technological changes in NHMS's performance and operations	190,000
1.4	Create a pilot zone of public-private partnership	150,000
1.5	Enhance technical and educational provisions for the personnel training and re-training	295,000
1.6	NHMS personnel training including logistical support	450,000
1.7	Individual consultants – trainers/tutors	100,000
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	8,860,000
2.1	Restore and technical upgrade of the hydrological gauges	1,800,000
2.2	Supply and install equipment for monitoring of water storage capacity of reservoirs	480,000
2.3	Rehabilitate and technical upgrade of the meteorological observation network	2,890,000
2.4	Restore precipitation measurements at hydrological observation sites	270,000
2.5	Resume agrometeorological observations	170,000
2.6	Supply cross-country motor vehicles to support operation of observation networks, primarily in remote, high-altitude stations	400,000
2.7	Restore snow measurement and snow-avalanche observation network	430,000
2.8	Introduce aerial snow surveys to verify satellite and runoff models estimates	150,000
2.9	Establish national center for metrological and technical support, including supply of stationary and mobile calibration equipment	530,000
2.10	Refurbish national and regional center of meteorological data collection, including establishing of operational monitoring and data dissemination center	420,000
2.11	Develop main elements of regional remote sensing monitoring system, including systems of receiving and processing high-resolution satellite images	990,000
2.12	Introduce data processing system in Hydrometeocenter of NHMS, modernization of regional Hydrometeocenters to strengthen technical capacity for information service delivery to users, including archived data	280,000
2.13	Develop runoff forecasting system for river basins	50,000
C.3	Enhance the service delivery system of Tajikhydromet	2,255,000
3.1	Improve NHMS interaction with users and potential clients, introduce marketing technologies to strengthen engagement of stakeholders	160,000
3.2	Expand access of external and internal users to observation data and information products	505,000
3.3	Undertake hydrographic survey of main water reservoirs in Tajikistan to determine amount of water resources in reservoirs having regional importance	150,000
3.4	Improve national climate service	350,000
3.5	Provide technical conditions for improved assessment of climate changes, including rapid access to information archives and more expedient hydrometeorological service delivery	740,000
3.6	Enhance Emercom capacity to disseminate NHMS's information about severe weather conditions to the regional and local branches of the committee	200,000
3.7	Zone country's territory based on the probability of occurrence of hazardous hydrometeorological events, including vulnerability assessment of Tajik regions	100,000
3.8	Conduct staff training for local Emercom divisions to raise awareness of weather hazards and facilitate better utilization of hydromet information in Emercom operational activities	50,000
C.4	Support implementation of Component C of the Project	550,000
4.1	PIU costs (staff, equipment, audit)	550,000
	TOTAL:	13,000,000

Annex 3: Implementation Arrangements

Regional Implementation Arrangements

118. While countries will have the overriding responsibility for implementing activities at the national level and providing leadership at the regional level, in key thematic areas EC-IFAS/RCH Coordinating Council will play a critical convening and coordinating role, supporting knowledge sharing and advocacy efforts. EC-IFAS will receive a grant under the IDA15 regional IDA pilot to implement regional activities (component A). EC-IFAS meets the six eligibility criteria established under the regional pilot. EC-IFAS is an international organization set up by the Heads of States of the five Central Asian countries to promote environmental sustainability in the Aral Sea Basin. Fiduciary assessment of EC-IFAS has recommended that while FM capacity is adequate, procurement capacity needs to be strengthened with the help of a procurement consultant. EC-IFAS is not eligible to receive IDA credits since its budget is contributed by its founder members and the international donor community supports its work through grants sometimes. Since the CAHMP will finance hydrometeorology, the products and services are for the most part public goods whose costs and benefits are not easily allocated. The CAHMP will support regional integration in hydrometeorology, an area for which public funding and donor funding in Central Asia has been very limited. CAHMP's focus on strengthening the weaker services in Kyrgyzstan and Tajikistan as a way of strengthening the regional hydromet system also supports EC-IFAS's role as a beneficiary of IDA funding.

119. The rationale for using EC-IFAS/RCH is based on the organization's capacity to facilitate knowledge sharing regionally. RCH is part of EC-IFAS and is a regional umbrella organization which houses the network of all national meteorological and hydrological services in the CA countries. And as such, it would be responsible for the oversight of the regional activities under the Project as well as for coordinating overall implementation progress of the Project.

120. Hence, the regional component will be managed by EC-IFAS and RCH-CC, the body which consists of the heads of participating NHMSs, RCH Executive Director and EC-IFAS Chairman. To stress the corporate concept of the regional component and to streamline the coordination, the RCH-CC will regularly meet or conduct meetings via videoconferencing to review and make main decisions related to regional component which as budgeting, staffing, planning, approval of procurement plans, approval of main reports, etc. The EC-IFAS and RCH-CC will also serve as a body facilitating implementation of the whole project and disseminating its results to the whole region. These regular meetings will enable countries to take stock of progress, discuss challenges, share experiences, and draw lessons.

121. IFAS/RCH rotates between CA countries every three years, and in the next rotation IFAS is scheduled to move to Tashkent. To ensure smooth implementation of the project, EC-IFAS will maintain the project management unit (PMU) for the CAHMP in Almaty. Fiduciary and technical capacity will be strengthened with support provided by consultants.

122. To ensure good coordination and technical support at the regional and country levels, services of a systems integrator will be engaged to facilitate in design, implementation and

supervision activities of all three components of the proposed CAHMP. It should be noted that the systems integrator's role is focused more on the technical aspects of how the NHMSs design and operate their hydromet systems and how they deliver services. The integrator will primarily support EC-IFAS/RCH's capacity to facilitate closer cooperation between the NHMSs. The systems integrator will work closely with both Kyrgyzhydromet and Tajikhydromet to streamline coordination of country-level activities, and with RCH for coordination of activities foreseen under the regional component. The systems integrator is not performing the role of a Project Implementation Unit for the entire Project.

123. In an evaluation of the World Bank's support for regional programs, the Independent Evaluation Group (IEG) indicated that delineation of responsibilities between regional institutions and national authorities can promote satisfactory results.¹⁶ In that context, Regional IDA projects now have a window of grant funds that can be channelled directly to such regional institutions and to strengthen their respective role in Regional IDA operation. It is with this intention that the World Bank, which remains a key facilitator of regional hydromet strengthening, proposes direct support for capacity building for IFAS/RCH.

Country-Based Implementation Arrangements

124. The basic principles of institutional arrangements are the same in the countries, namely to rely and strengthen existing institutional structures. Technical aspects of project implementation will be carried out by national hydromet services in the Republic of Tajikistan and the Kyrgyz Republic. These services will be strengthened to deal with the additional workload. There is a need for the immediate beneficiary to be actively engaged at all stages of design and implementation. This approach will contribute to ensuring project ownership and sustainability. The national hydromet services in the two countries will be supplemented by a small core team of consultants, including on fiduciary functions, as part of capacity strengthening.

125. In *Republic of Tajikistan*, the overall responsibility for project implementation will be with the Tajikhydromet service. Project Coordination Unit (PCU) responsible for fiduciary and technical support will be established within Tajikhydromet. Qualified individual consultants will be selected to support the coordination team. The Chief Accountant of Tajikhydromet will have responsibility for overall project financial management function with the support of a financial management consultant. At the national level, a Project Management Committee (PMC) will be constituted to provide oversight for project implementation and will provide leadership and ensure effective inter-governmental coordination. PMC will consist of representatives from Ministry of Finance, Committee of Environmental Protection, Ministries of Emergency, Water Resources, Energy as well as Tajikhydromet service.

126. In *Kyrgyz Republic*, the overall implementation responsibility will rest with the Kyrgyzhydromet service, which aims to strengthen the hydromet services and ensure broad-based ownership. The project activities will be implemented with the help of Project Coordination Unit (PCU) established within the hydromet service. The PCU will include financial management consultant, procurement consultant and technical experts. The Chief

¹⁶ See "The Development Potential of Regional Programs: An Evaluation of World Bank Support of Multicountry Operations;" Independent Evaluation Group; World Bank (2007).

Accountant of Kyrgyzhydromet will ultimately be responsible for the disbursement and financial management functions of Component B of the Project in the normal course of their day-to-day professional responsibilities with the support of a financial management consultant as needed. The PCU will work under the overall guidance of the Project Management Committee (PMC). Key project stakeholders will be represented on the PMC. Operational monitoring and supervision of the project will be carried out by the PCU, which will work with PMC to streamline decision-making.

Financial Management, Disbursements and Procurement

127. Financial management support for the Project will be provided by the Accounting Department of the EC-IFAS at the Regional level, and at the country level by the Accounting and Reporting Department of the Kyrgyzhydromet and the Financial and Economic Management Department in Tajikhydromet, respectively. The accounting units in Kyrgyzhydromet and Tajikhydromet consist of nine people each, including the respective chief accountants, while at the EC-IFAS the accounting unit consists of two people, including the chief accountant. It is expected that the staff of these units will handle financial management and disbursement activities of the project, manage project funds, maintain accounts and have the accounts audited.

128. **Financial Management.** The overall project financial management arrangements for the project, including budgeting, accounting, reporting, internal control, funds flow and audit, are moderately satisfactory. At the EC-IFAS, Kyrgyzhydromet and Tajikhydromet the staffing capacity of the agencies' accounting and reporting departments, in terms of numbers, is adequate. However, in terms of skills the EC-IFAS and Tajikhydromet agencies would require the services of FM specialists (to be hired as consultants), to support the chief accountants to establish and implement financial management system to support Project implementation, including elaboration of procedures for budgeting, accounting, internal control and audit in a manual of financial procedures.

129. In all the agencies the financial management function is the responsibility of the respective chief accountants, who are supported by a number of staff that ensures adequate segregation of duties. Although staffing of the financial management function is adequate in terms of numbers, staff lacks experience with project financial management and disbursement requirements of the World Bank. Therefore, experienced financial management consultants will be needed to work with the chief accountants, and be responsible for project financial management and disbursement functions. Accounting and financial reporting at the Tajikhydromet will need to be automated, with inbuilt controls to enhance reliability of financial reports produced by the accounting system. At the Kyrgyzhydromet and EC-IFAS the accounting system only needs to be modified to have capacity to generate IFRs required under the project. In addition, the manual of financial procedures, describing budgeting, accounting, reporting and internal control procedures will need to be completed to guide staff in daily project financial management operations at the country and regional levels.

130. Overall, the actions required to ensure satisfactory financial management requirements include upgrading the automated accounting system already installed at EC-IFAS and Kyrgyzhydromet to have capacity to generate IFRs, while the Tajikhydromet will need to install

automated accounting systems with inbuilt controls and capacity to generate interim financial reports.

131. The Table below lists the actions required to ensure satisfactory financial management system by effectiveness.

	Recommended Action	Responsibility	Deadline
	POM developed, to include financial management chapters, including project accounting and reporting, funds flow, audit arrangements, disbursement procedures, etc.	EC-IFAS /RCH / Kyrgyzhydromet / Tajikhydromet	Draft by Negotiations
	Upgrade/install automated accounting system with capacity to generate IFRs	EC-IFAS /RCH / Kyrgyzhydromet / Tajikhydromet	Effectiveness
	Recruitment of financial management consultants in Republic of Tajikistan and EC-IFAS to support respective chief accountants and be responsible for project financial management and disbursement functions at the country and regional levels	EC-IFAS /RCH / Tajikhydromet	Effectiveness
	Training of financial management staff on financial management and disbursement procedures of the World Bank	World Bank	Project Launch and during implementation

132. **Budgeting and Planning:** At the EC-IFAS budgeting and planning function within the EC-IFAS is undertaken by the Accounting Unit (AU) that prepares two types of budget – one for budget funds that is submitted to the Ministry of Foreign Affairs for consolidation and approved as one figure. While it is flexible within a given budget, the total budget figure is firm and cannot be changed. There are also budgets for different projects, split by activities. However since the projects implemented so far were lasting for less than one year, no interim reporting has been required. At the Kyrgyzhydromet and Tajikhydromet budgeting follows the budget guidelines issued by the Ministry of Finance. Overall, project budgets, prepared on an annual basis, will form the basis for allocating funds to project activities. The budgets will be prepared in enough detail, by activities and account codes, and broken down by quarters. Annual budgets should be agreed with IDA before final approval, and approved annual budgets will then be entered into the accounting system and used for periodic comparison with actual results as part of the interim financial reporting.

133. **Funds Flow:** The proceeds of the IDA Credit/Grant will be disbursed over a period of 5 years or for such longer period as will be agreed with IDA. Project funds will flow from IDA either: (i) via a single Designated Accounts operated by the EC-IFAS, Kyrgyzhydromet and Tajikhydromet (to be replenished in accordance with guidelines in the Disbursement Letter); (ii) Reimbursement with full documentation or SOEs; (iii) Direct Payments from the Credit/Grant Account with full documentation or; (iv) Special Commitments. It is expected that the EC-IFAs will open and maintain a designated account in a commercial bank satisfactory to IDA while the Kyrgyzhydromet and Tajikhydromet would open designated accounts in a financial institution in the Kyrgyz Republic and the Republic of Tajikistan, respectively.

134. **Accounting and Records:** At the Kyrgyzhydromet accounting system has been fully automated using 1C software with payroll being the only process running on a different program. The agency has installed 1C accounting software and has computerized all financial management processes, including fixed assets, inventories and cash/bank operations with financial reports being generated by the accounting software. At the Tajikhydromet the accounting system comprises manual, handwritten, and excel spreadsheet. The payroll is maintained manually; and the general ledger and balance sheet are maintained in excel. There are no plans to automate accounting and reporting, which is an area of potential weakness with substantial risk of errors that could undermine reliability of financial reports produced by the accounting system. The EC-IFAS is using automated accounting software (1C) for enterprises, which is capable of recording balances and transactions that form the basis of regular financial reporting.

135. In all the agencies automated accounting systems, based on suitable accounting software, will be used for project accounting reporting and other activities, including payroll. The accounting software installed by the EC-IFAS and Kyrgyzhydromet will be upgraded and used for the project accounting; including generation of interim unaudited financial reports (IFRs) in a format acceptable to the Bank. The Tajikhydromet will, however, need to install suitable accounting software to support project accounting and reporting. A financial management consultant is already working with the Tajikhydromet to develop specifications for automated accounting system that will have capacity to generate interim financial reports.

136. **Project Financial Reporting:** Both the Kyrgyzhydromet and Tajikhydromet prepare various reports that are periodically submitted to the Ministry of Finance and other agencies, including the Tax Authorities, Statistics as well as the Social Fund. These reports are prepared manually in excel spreadsheet, although the Kyrgyzhydromet has started generating the reports from the accounting software. The EC-IFAS on the other hand does not have obligation to prepare and submit interim financial reports. From time to time they are requested to submit the reports on budget execution to the Ministry of Foreign Affairs (as EC-IFAS gets its budget via this Ministry) in the format that is very close to that of IFRs, that allows the monitoring of budget against actual expenditures.

137. All the agencies will need accounting systems with capacity to generate the reports required by the Bank. The respective chief accountants will be responsible for submission of interim un-audited financial reports (IFRs) that will be generated by the accounting system based on formats agreed with the World Bank. The reports, to include Statement of Sources and Uses of Funds, Uses of Funds by Project activities (Components & Expenditure Categories) and Statement of Designated Account (DA), will be submitted to the World Bank within 45 days of the end of each quarter, with the first reports under the proposed Project being submitted after the end of the first full quarter following initial disbursement.

138. **Internal Control and Internal Audit:** The EC-IFAS have developed very detailed manual of financial management procedures. This manual was developed in 2009 and approved by the executive committee of EC-IFAS. To supplement the existing Manual the IFAS-EC will develop an Annex that incorporates project-related activities, processes and procedures. Particular attention should be paid to transfer of Fixes Assets (FA) that will be purchased under the project, as currently the EC-IFAS does not have experience to procure such assets for other

organizations. This procedure should be properly documented in the Manual. Compliance with the FM Manual will be reviewed during implementation support missions.

139. For the Kyrgyzhydromet and Tajikhydromet separate Project Operations Manuals, incorporating financial procedures have been developed to supplement instructions and guidance issued by the Ministry of Finance, including, in the Kyrgyz Republic, Financial Reporting instructions issued in 2008 and guidance on IPSAS provided by the MOF through Resolution #192P; and in the case of Tajikistan, the Instruction on Accounting in Budget Organizations, #157 issued on December 26, 2000 and updated in 2010. Internal control procedures, including expenditure and payment approvals, timely and complete recording of transactions, regular reconciliation of accounts and balances, segregation of duties, safeguard of data and assets, as well as regular reporting and audits, have been described in detail in the Project Operations Manuals (POM) that have been developed before negotiations.

140. **External Audit:** The EC-IFAS has been preparing financial statements that are similar to IFRs and these financial statements are subject to annual audit. The audited financial statements are public and published in the national media. The EC-IFAS has an obligation to have its financial statements audited by independent auditors on annual basis. The 2009 financial statements were audited by a local audit firm “Solomon Ltd” (this firm is not in the WB list of eligible audit companies). The audited financial statements are publicly made available (they were published in the national newspaper – “Kazakhstanskaya Pravda”). The audit report was prepared according to the International Standards on Audit (ISA) and the quality of the report is good. Audit of the proposed project will be conducted (i) by independent auditors acceptable to the Bank on terms of reference acceptable to the Bank; and (ii) in accordance with International Standards on Audit (ISA) issued by the International Auditing and Assurance Standards Board of the International Federation of Accountants (IFAC). Both Kyrgyzhydromet and Tajikhydromet have been audited periodically by the Chamber of Accounts and the Agency for Anti-Corruption and Financial Control, respectively, mainly to ensure compliance with budgetary regulations.

141. For the project there will be three separate audits for the regional activities as well as the country-level activities in Kyrgyzstan and Tajikistan. Audit of the project will include the project financial statements, SOEs and DA Statement. The annual audited project financial statements will be submitted to the Bank within six months of the end of each fiscal year and also at the closing of the project. The cost of the audit will be financed from the Credit/Grant funds. The following table identifies the audit reports that will be required to be submitted by the State Audit together with the due date of submission:

Audit Report	Due Date
Separate Project financial statements (PFSs) for EC-IFAS, Kyrgyzhydromet and Tajikhydromet. The PFSs to include Statement of Sources and Uses of Funds, Uses of Funds by Project Activity, SOE Withdrawal Schedule, DA Statement and Notes to the financial statements.	Within six months of the end of each fiscal year and also at the closing of the project.

Audited project financial statements will be publicly disclosed in accordance with the Bank’s Access to Information (AI) Policy. The agencies will publish the audit reports in a manner satisfactory to IDA and, upon receipt of the audit reports IDA will make them publicly available.

142. **Disbursements.** The proceeds of the credit/grant will be disbursed over a period of five years or for such longer period as will be agreed with the Bank. Credit/grant funds will flow through Direct Payment and via disbursements to the Designated Accounts (DA), each maintained by the EC-IFAS/RCH, Kyrgyzhydromet and Tajikhydromet, respectively. The project will follow transaction-based disbursement procedures (payments through the DA, reimbursement, direct payments, and special commitments). Withdrawals from the Credit/Grant Accounts will be requested in accordance with the guidance to be given in the Disbursement Letter. Withdrawal applications will be signed by two persons: (i) an authorized representative of the Borrower/Recipient; and (ii) another designated person as authorized by written delegated authority from the Borrower/Recipient.

143. *Designated Account:* To facilitate timely disbursements for eligible expenditures on works, goods and services, the Borrower/Recipient will open and operate, under terms and conditions acceptable to the Bank, Designated Accounts in US dollars in a commercial bank acceptable to the World Bank, in the case of the EC-IFAS/RCH and in a financial institution in the Kyrgyz Republic and a financial institution in the Republic of Tajikistan in the case of Kyrgyzhydromet and Tajikhydromet, respectively. All the three agencies will be responsible for the appropriate accounting of the funds deposited into the designated accounts, for reporting on the use of these funds and for ensuring that they are included in the audits of the financial statements. Ceiling of the Designated Accounts and the Minimum Application size for Direct Payment or Special Commitment have been communicated in the Disbursement Letters.

144. Withdrawal Applications documenting the advances to the DAs will be made on a quarterly basis, or for such shorter period as may be necessary. Expenditures against contracts for (i) goods estimated to cost greater than US\$ 200,000 equivalent each; (ii) consultant services for consulting firms estimated to cost greater than US\$ 100,000 equivalent each; and (iii) individual consultant services estimated to cost greater than US\$50,000 equivalent each. Expenditures against contracts below these limits will use SOEs. Documentation supporting expenditures claimed against SOEs will be retained by the respective implementing agencies and will be available for review when requested by Bank supervision missions and project auditors.

145. **Procurement.** *Procurement Capacity and Risk Assessment:* Procurement will be the responsibility of the respective hydromet service for its own component (i.e., the Kyrgyz NHMS, Tajik NHMS, and EC-IFAS/RCH). A procurement capacity assessment has been carried out at the both country and regional levels, and revealed that while the country NHMS has staff in place for its own procurement following national procurement procedures, neither of them has prior experience with Bank (or other IFI) financed procurement. At the regional level, EC-IFAS does not have adequate procurement system and capacity.

146. In view of above, the main procurement risk would be potential delays due to low capacity. Another risk would be low level of competition in procurement due to high cost of doing business in the region and the less development of local manufacturing industry. To mitigate these risks, a procurement consultant (who is familiar with the Bank procurement procedures) will be hired for each of the three implementing agencies. The Bank's regional procurement team will provide advice and assistance on a regular basis. The procurement

packaging and plans will be carefully developed with a review to attract international participation in bidding process; and procurement notices will be advertised widely. The procurement risk is rated as high.

147. *Applicable Guidelines:* Procurement for the proposed project will be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" published in May 2004, and revised in October 2006 and May 2010 (Procurement Guidelines); "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" published in May 2004, and revised in October 2006 and May 2010 (Consultant Guidelines); and the provisions stipulated in the Financing Agreement.

148. *Procurement Plan:* Three separate draft procurement plans have been developed covering procurement activities for the entire project period. The Bank team has provided further assistance to refine them during project preparation and the initial procurement plans were agreed at the negotiations. Thereafter, the plans will be updated from time to time or at least once per year and each update will be subject to the Bank prior review. The initial procurement plans plus the subsequent updates will be published on the Bank's external web site in line with the requirements of Bank Guidelines. Some details of the procurement plans are provided below.

(a) Component A (Regional)

- *Supply of Goods (including installation as needed):* Goods to be procured under the project would include equipment and software for: modernization of regional center for hydro-meteorological data acquisition; regional system for access to informational products generated using high resolution satellite data; supply and installation of information processing and visualization systems; and professional development and learning including development of regional distance learning systems, hardware O&M, e-learning system; as well as office equipment. ICB will be followed for majority of the procurement packages; and for a couple of small packages below \$100,000, shopping procedures will be followed. Almost all the packages will be subject to the Bank prior review.
- *Technical (non-consulting) Services:* No works contracts are expected, but technical/non-consulting services are required for survey and collection of hydro-meteorological data. In view of the availability of capacity in the region and small value (about \$650,000), NCB would be followed in procurement of such services. The package is subject to the Bank prior review.
- *Consultant Services:* Consultant services required under the project would include: services of system integrator; assessment of long-term characteristics of surface water resources in the Aral Sea basin; introduction of numerical weather forecasting techniques; development of strategy and procedures for regional personnel training and re-training; development of a regional approach for "cascade" method of accessing numerical forecasts; development of procedures for emergency warnings at regional and national levels; financial audit of project accounts; and individual consultants for project and fiduciary management as well as short-term technical assistance. QCBS will be the main

method for selection of consultants and LCS may be used for engagement of an audit firm. For small packages, CQS would be used.

- *Training and Operational Costs:* The project will finance some training activities (including training of trainers and national specialists and overseas study tours) and incremental operational costs. The project entity will develop a detailed training plan and prepare annual operational budget for the Bank team's review and clearance.

(b) Component B (Kyrgyz Republic)

- *Supply of Goods (including installation as needed):* Goods to be procured under the project would include equipment, instruments and software for: refurbishing national and regional center of meteorological data collection and telecommunication; upgrade of meteorological observation network; snow surveys; meteorological and agro-metrological observations; mobile calibration and workshop laboratory; cross-country motor vehicles; moderation of archive and services for hydro-meteorological information; visualization complex; enhancing technical and educational facilities for training and re-training; expansion of external and internal user access to observation data and information products; restoration of key sites of hydrological observation network with installation of hydrological equipment; data preparation and processing for archiving; and office equipment. ICB will be followed for majority of the procurement packages; and for a few small packages below \$100,000, shopping procedures will be followed. Majority of the packages will be subject to the Bank prior review.
- *Consultant Services:* Consultant services required under the project would include: preparation of a concept/strategy for Kyrgyzhydromet development, institutional strengthening and system reorganization; development and implementation of approaches for fee-based information services; introduction of legal and regulatory changes in line with the institutional and technological changes in NHMS's performance and operations; improvement of national climate services; development of river basin runoff forecasting system; financial audit of project accounts; and individual consultants for project and fiduciary management as well as short-term technical assistance. Most of the packages are in small value thus CQS procedures would be followed; and for audit services, LCS method would be used.
- *Training and Operational Costs:* The project will finance some training activities (including personnel training, engagement of consumers and potential clients) and incremental operational costs. The project entity will develop a detailed training plan and prepare annual operational budget for the Bank team's review and clearance.

(c) Component C (Tajikistan)

- *Supply of Goods (including installation as needed):* Goods to be procured under the project would include equipment and software for: restoration and upgrading of hydrological gauges; refurbishing of national and regional centers of meteorological data collection; upgrade of meteorological observation networks; instruments and supplies for

snow surveys; measuring devices and equipment for agro-meteorological observation; stationary calibration complex; establishment of regional remote sensing monitoring system; mobile calibration laboratory and workshop; mobile hydrological laboratory; cross-country motor vehicles; visualization complex equipment; modernization of hydro-meteorological information archiving and services; enhancement of personnel training and re-training facilities; expansion of information resources access for external and internal users; creation of a pilot zone for public-private partnership; and office equipment. ICB will be followed for majority of the procurement packages; and for a few small packages below \$100,000, shopping procedures will be followed. Almost all the packages will be subject to the Bank prior review.

- *Technical (non-consulting) Services:* No works contracts are expected, but technical/non-consulting services are required for hydrographic and bathymetric survey of main reservoirs in Tajikistan. In view of the availability of capacity in the country and small value (about \$150,000), NCB would be followed in procurement of such services. The package is subject to the Bank prior review.
- *Consultant Services:* Consultant services required under the project would include: improvement of national climate service; preparation of a concept/strategy for Tajik NHMS development and institutional strengthening and system reorganization; development and testing of “fee-based” service approaches; zoning of territory based on probability of occurrence of hazardous and extreme hydro-meteorological events to support strategic economic planning; introduction legal and regulatory changes in line with institutional and technological changes in Tajikhydromet’s performance and operations; development of a system to interact with national, regional and local authorities to improve hazardous and extreme weather warnings; development of river basis runoff forecasting system in Tajikistan; financial audit of project accounts; and individual consultants for project and fiduciary management as well as short-term technical assistance. Except one package for which QCBS would be used, other packages are all in small value thus CQS procedures would be followed; and for audit services, LCS method would be used.
- *Training and Operational Costs:* The project will finance some training activities (including personnel training; engagement of stakeholders and potential customers; and staff training for local Emercom divisions to raise awareness of weather hazards and facilitate better utilization of hydromet information in Emercom operational activities) and incremental operational costs. The project entity will develop a detailed training plan and prepare annual operational budget for the Bank team’s review and clearance.

149. A General Procurement Notice (GPN) will be published following the negotiations. More details on procurement arrangements are provided in the draft POM.

150. *Procurement Supervision and Ex-post Review:* Routine procurement reviews and supervision will be provided by the procurement specialists based in the country offices. In addition, two supervision missions are expected to take place per year during which ex-post reviews will be conducted for the contracts that are not subject to Bank prior review on a sample

basis (20 percent in terms of number of contracts). One ex-post review report will be prepared per fiscal year, including findings of physical inspections for not less than 10 percent of the contracts awarded during the review period.

151. *Additional Provisions for National Competitive Bidding:* The standard NCB provisions for Kyrgyz Republic and Tajikistan, as included in the Financing Agreement (or Project Agreements), will be applied to all the NCB contracts in the respective country. As for the Regional Component, since the EC-IFAS is incorporated in Kazakhstan, the NCB provision for Kazakhstan will apply.

152. *Procurement Thresholds:* The thresholds for procurement methods and Bank prior review are indicated in the table below.

Expenditure Category	Contract Value (US\$)	Procurement Method	Bank Prior Review
Goods	>100,000	ICB	All the ICB contracts
	≤ 100,000	Shopping	The 1st Shopping contract
	NA	DC	All DC contracts
Works (including non-consulting services)	>1,000,000	ICB	All the ICB contracts
	≤ 1,000,000	NCB	The 1st NCB contract
	< 100,000	Shopping	The 1st Shopping contract
	NA	DC	All DC contracts
Consultant Services	>200,000	QCBS, QBS, FBS, LCS	All contracts above US\$ 100,000 for firms plus the 1st CQS contract regardless of value; and all contracts above US\$ 50,000 for individuals; and all SSS contracts.
	≤ 200,000	CQS	
	NA	SSS	
	NA	IC	
Notes: ICB – International Competitive Bidding NCB – National Competitive Bidding DC – Direct Contracting QCBS – Quality and Cost Based Selection QBS – Quality Based Selection FBS – Fixed Budget Selection LCS – Least Cost Selection CQS – Selection Based on Consultants’ Qualification SSS – Single (or Sole) Source Selection IC – Individual Consultant selection procedure NA – Not Applicable			

Environmental and Social (including safeguards)

153. The proposed CAHMP supports the higher level objective of reducing the risk to life and the economy from unfavorable weather conditions. The proposed Project is intended to diminish

not only the damage to the economy that arises from avoidable weather damage, but also that which results from the high degree of uncertainty about weather and climate-related risks, which adds to the cost of doing business and limits the competitiveness of agriculture and other sectors of the economy.

154. CAHMP's low-risk activities qualify the CAHMP as a category "C" program. This category reflects that (i) no physical environmental impacts are expected and (ii) the planned activities will have indirect environmental benefits by creating information, guidance, concepts and institutional structures that may affect environmental conditions in the region in multiple ways. No safeguards policy is triggered. The operations manuals for the CAHMP's constituent activities will include a section on environmental safeguards to ensure guidance on mitigation measures for potential adverse impacts, if any.

Monitoring & Evaluation

155. Monitoring & Evaluation (M&E) of progress towards achieving the objectives of the Project will entail a process of continuous and systematic collection of data on the inputs, outputs and intermediate outcome indicators of the Project, as indicated in the arrangement for results monitoring (see Annex 1). This effort will be aimed at enabling timely management decision making by providing regular and up-to-date information on the performance of the Project and on actual/potential problems in implementation. The findings of relevant M&E activities will be reflected in annual progress reports that will be submitted to IDA and EC-IFAS/RCH. The progress reports will cover the implementation of activities under the three components, institutional activities, training and studies, performance indicators, and Financial Monitoring Reports (FMR). They also will cover any other issues identified during Project supervision and the effect of actions taken to resolve such issues.

156. The implementing agencies for each component will gather data for their respective indicators presented in the results framework. Keeping in view the limited capacity of the implementing agencies, the number of indicators is limited. The Project will finance incremental operating costs to enable the implementing agencies to set up a data gathering system and report periodically on progress made. A position of M&E specialist at the regional level will be financed under component A. This specialist will be in charge of monitoring of and reporting on the overall results of the Project. In addition, component A will finance training in M&E for relevant staff to ensure the implementing agencies as well as the institutions develop a culture of results orientation for this Project as well as for their other responsibilities. The M&E specialist at the regional level will help ensure consistency of M&E processes for the entire Project.

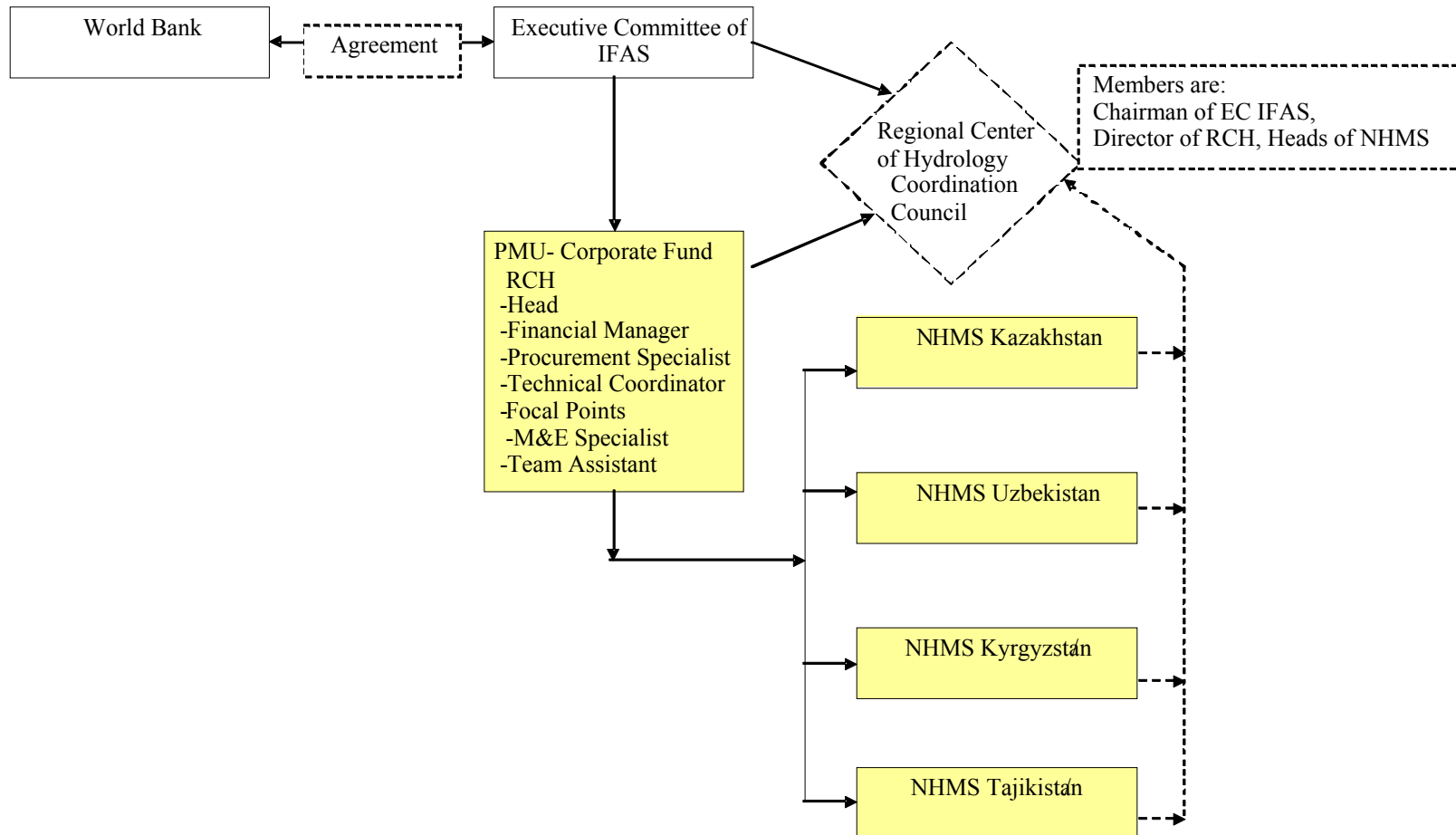
157. To the extent possible, data collection efforts will be harmonized within the existing structures of the four participating hydromet services and EC-IFAS/RCH. The results framework presented in Annex 1 does not propose completely new indicators that would impose an additional burden on the existing data collection systems. Nevertheless, given the weak institutional capacity of the implementing agencies, promoting a culture of results orientation complemented with provision of incremental operating costs will be a priority.

Role of Partners

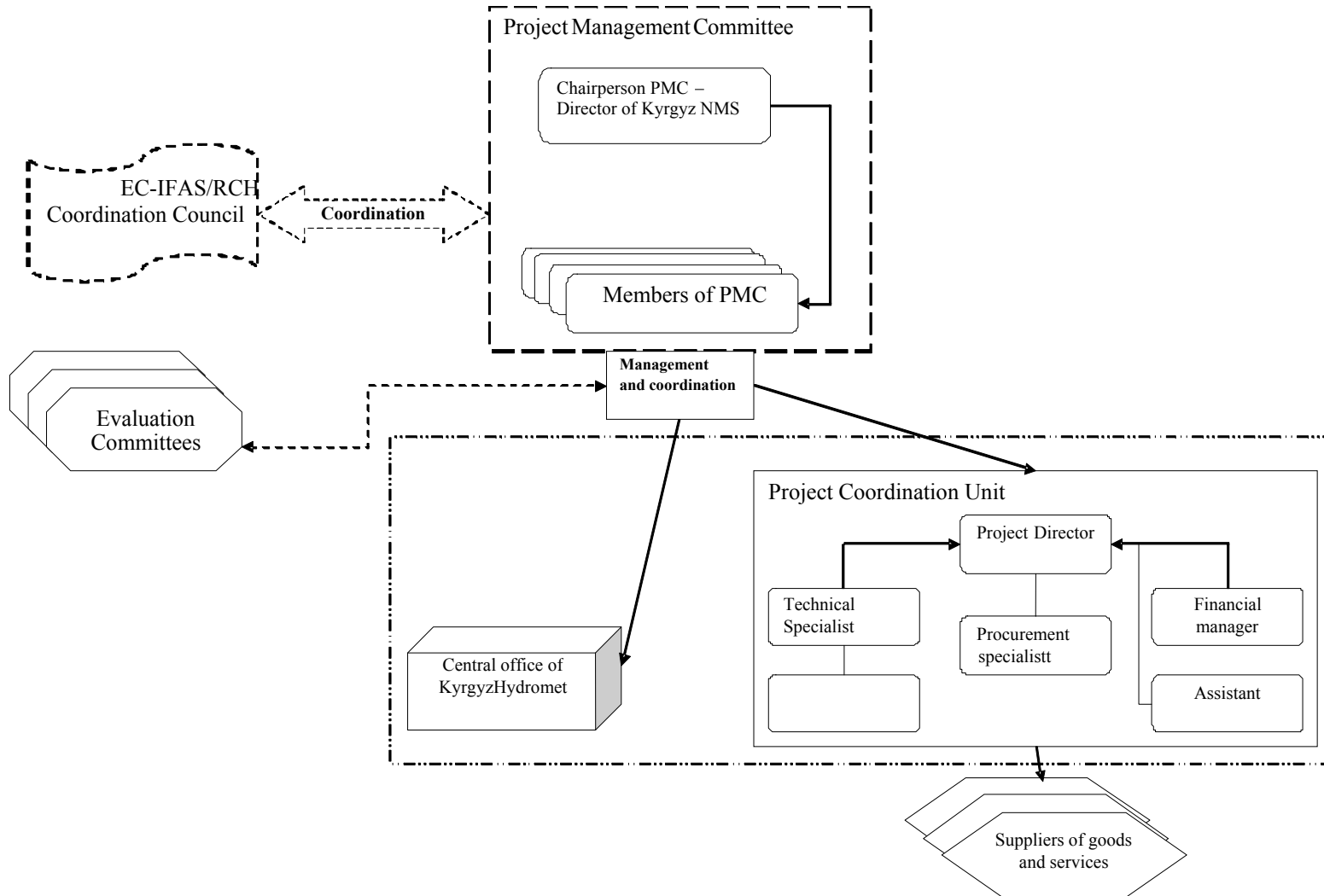
158. The proposed CAHMP is a result from strong cooperation between the Bank, UN agencies and other development partners. Donors such as GFDRR, WMO, UN ISDR and European Commission financed background studies and workshops underlying the proposed CAHMP. In addition to IDA financing, the proposed CAHMP will receive funding from the Pilot Program for Climate Resilience (PPCR), a program jointly managed by the Bank, EBRD and ADB. The World Bank, EBRD and ADB agreed to coordinate their support in the context of a PPCR grant to strengthen hydromet services in the Republic of Tajikistan.

159. Other donors have expressed keen interest in supporting regional hydromet activities in coordination with the proposed CAHMP. USAID has financed studies to assess vulnerability of infrastructure towards climate change and analysis of value of water. USAID has committed to assist in implementation of a few regional hydromet modernization activities. UNDP supports training on socio-economic assessment and evaluation of benefits of hydrological and weather services. In addition, UNDP has committed about \$4 million from its crisis prevention and recovery fund to support climate change and crisis prevention priorities. The WMO has expressed its readiness to contribute to the development of a Severe Weather Forecast Demonstration Project in Central Asia as part of component A. The WMO has implemented such projects elsewhere. UN ISDR is coordinating its efforts with the Bank to incorporate expected strengthening of hydromet services in a broader context of disaster risk reduction efforts in the region. GIZ, the German aid agency, finances several regional and national projects on capacity building of EC-IFAS, such as GIS of river water management in Kyrgyz Republic and Uzbekistan. GIZ is likely to continue supporting CA NHMSs, but the exact financial allocations are not clear at this time. Finally, Finland and SDA have provided concrete expressions of support to strengthening hydromet services in Central Asia. GFDRR will finance a complementary grant for developing an early warning system for Kyrgyzstan's Ministry of Emergency Services (MES). This system will use data provided by a strengthened Kyrgyzhydromet. These coordination efforts will contribute to significant future improvement of the hydromet services in the region.

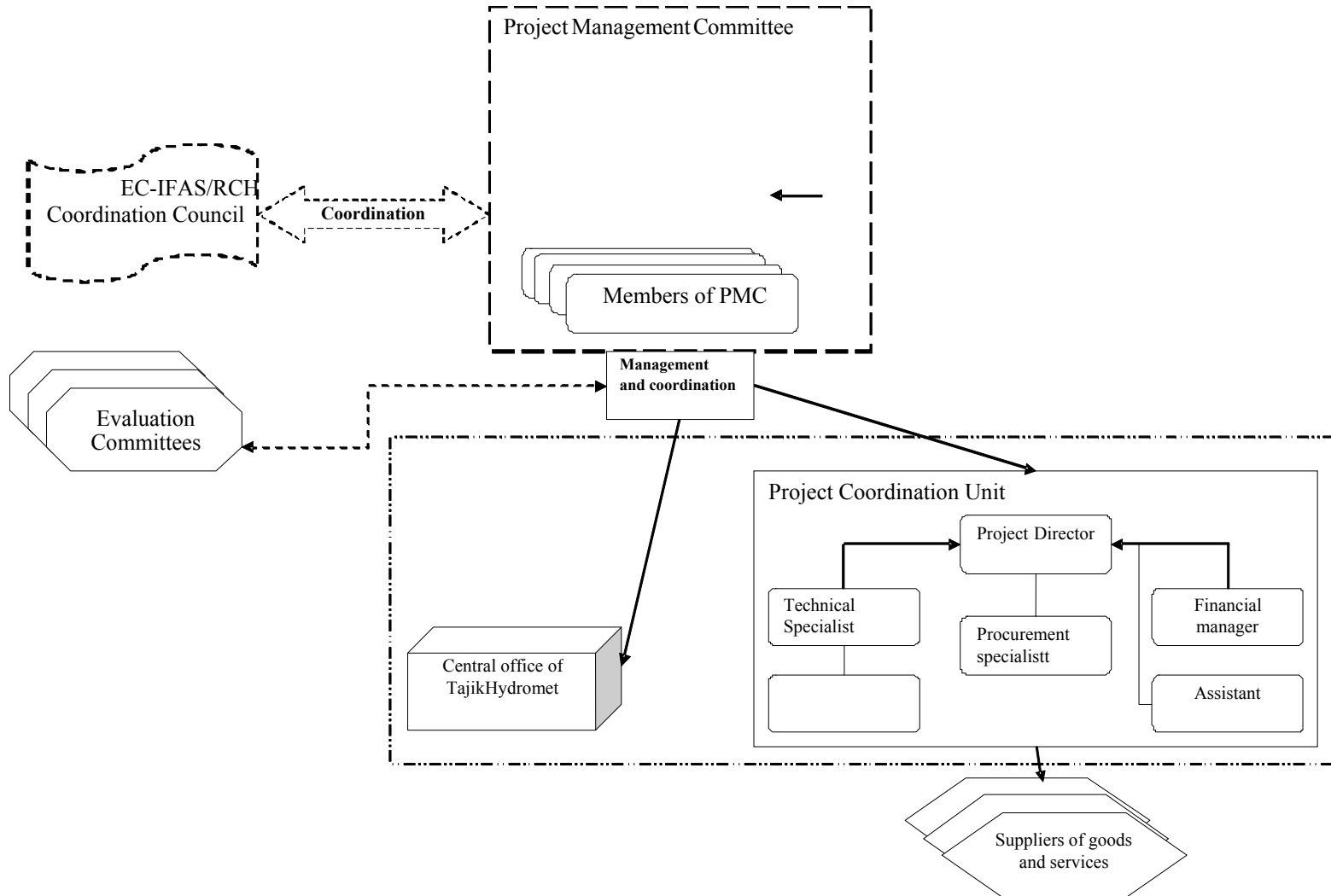
Central Asia Regional Hydrology Modernization Project
Coordination of Overall Project and
Implementation of Component A



**Central Asia Hydromet Modernization Project (CAHMP)
Implementation Arrangements for Component B**



**Central Asia Hydromet Modernization Project (CAHMP)
Implementation Arrangements for Component C**



Annex 4
Operational Risk Assessment Framework (ORAF)

Project Development Objective(s)	
The main objective of the proposed Central Asia Hydromet 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.	
PDO Level Results Indicators:	<ol style="list-style-type: none"> 1. Increased accuracy and timeliness of basic weather forecasts 2. Increased accuracy of river flow forecasts

Risk Category	Risk Rating¹⁷	Risk Description	Proposed Mitigation Measures
Project Stakeholder Risks	Medium-I	There is a substantial risk that stakeholder commitment, especially from the NHMSs or their governments to the CAHMP will not materialize. In addition, EC-IFAS and RCH may not be able to effectively play a coordinating role due to weak capacity. There is modest risk associated with lack of support for hydromet strengthening from other donor partners. Finally, the Project aims to instill a culture of doing business in new, collaborative ways but this may not happen for political or cultural reasons.	An almost 2-year process of studies, workshops and meetings has led to a formal MoU between the 5 CA NHMSs. In addition, the governments of Kyrgyz Republic and Tajikistan have formally requested the Bank's support for their NHMSs. A key mitigation measure is country ownership, through the MoU (which includes agreement on specific activities), and through the inclusion of the program in IFAS's ASBP-3. The IFAS Board has formally endorsed the CAHMP. This is important because inclusion in a program endorsed by all participating governments is as strong a mitigation measure as is possible for a regional activity in Central Asia. As far as IFAS/RCH is concerned, capacity constraints are well known. The CAHMP will result in a concerted effort to strengthen coordination capacity of IFAS/RCH. To help sustain this commitment, other partners of the NHMSs are actively considering support for regional hydromet strengthening. At the technical level, there has been

¹⁷ Risk Rating: Low = low impact/low likelihood; Medium-I = high impact/low likelihood; Medium-L = low impact/high likelihood; High = high impact/high likelihood

Risk Category	Risk Rating ¹⁷	Risk Description	Proposed Mitigation Measures
			ongoing cooperation between the NHMSs. It remains to be seen if the CAHMP will strengthen it.
Implementing Agency Risks	High	<p>Limited capacity of implementation agencies, including EC-IFAS/RCH, is a serious risk for the CAHMP. In addition, sustaining CAHMP investments without adequate budget for NHMSs could be difficult after Project implementation given that incremental operating costs will be associated with these investments.</p> <p>The main risks are lack of accountability and lack of experience in including stakeholders in decision making.</p>	<p>Implementing regional and national demonstration projects prior to modernization to demonstrate the value of new services to the NHMSs will speed up strengthening of national capacity.</p> <p>A key mitigation measure is intensive training of NHMS staff. Some training is taking place as part of project preparation. Introduction of specialized technical support by hiring a systems integrator is likely to improve NHMS capacity.</p> <p>Investments that require high incremental operating and maintenance costs have been limited.</p> <p>During implementation, new business models will be developed, tested and implemented. This will assist the NHMSs recover costs for specialized services delivered.</p> <p>The Bank team is encouraging the formation of inclusive project management committees that strengthen governance. In particular, the task team will ensure that Kyrgyzhydromet and Tajikhydromet will work with end-users from different socio-economic sectors to develop products that are relevant, timely, and of good quality. In the case of EC-IFAS/RCH, such a structure already exists because all 4 NHMSs would be clients of EC-EC-IFAS/RCH and the international partners would participate in working groups to monitor progress of regional activities.</p>

Risk Category	Risk Rating ¹⁷	Risk Description	Proposed Mitigation Measures
		<p>There is a high risk of procurement malpractice in Central Asia. It is even more so in low capacity environments such as hydromet services. Misprocurement risk increases when many, small packages create a disincentive for foreign suppliers to participate in bidding.</p>	<p>The task team proposes to recruit fiduciary specialists familiar with World Bank policies and procedures. To facilitate proper oversight, procurement plans have been prepared in advance and terms of reference and bidding packages for initial procurement will be prepared prior to effectiveness. To the extent possible, consolidated procurement packages are being prepared. Finally, the CAHMP will probably require a higher level of supervision. For this, the team will request appropriate budget but will also rely on supervision budgets associated with the PPCR to proactively supervise the Project.</p>
Project Risks			
<ul style="list-style-type: none"> Design 	Medium-L	<p>There is an inherent high risk that comes with the regional project design and with the participation of many entities. The risk is higher also because the implementation agencies have limited capacity.</p>	<p>To ensure appropriate coordination and address implementation capacity issues, expert help in the form of a systems integrator (management consultancy firm) will be required at least for the first 2-3 years of implementation. In addition, a package of trainings will strengthen the technical capacity in the three implementing agencies (IFAS/RCH, Tajikhydromet and Kyrgyzhydromet).</p>
<ul style="list-style-type: none"> Social and Environmental 	Low	<p>There are limited social and environmental risks. The CAHMP is a category C project for safeguards purposes. The CAHMP did not trigger any safeguards policies.</p>	<p>Proper supervision should be sufficient to monitor these risks. The operations manuals for CAHMP activities will include a section on managing environmental risks.</p>
<ul style="list-style-type: none"> Program and Donor 	Medium-I	<p>It is possible that other donors will not support regional hydromet activities causing continued gaps in delivering services in some countries as well as reducing incentives for regional cooperation.</p>	<p>The World Bank will continue to canvass support for regional hydromet strengthening. The World Bank's contribution through the CAHMP will likely catalyze donor support.</p>

Risk Category	Risk Rating ¹⁷	Risk Description	Proposed Mitigation Measures
<ul style="list-style-type: none"> Delivery Quality 	Medium-I	There is a risk of poor delivery quality in terms of sustainability of CAHMP investments, monitoring progress, and program management.	New business models will help mitigate incremental operating costs and chronic underfunding of NHMSs. This will complement resources provided by governments. In addition, Investments that require high incremental operating and maintenance costs are limited in number. In terms of developing a monitoring system as well as for general program management, experienced consultants can provide the essential help that IFAS/RCH and the NHMSs will need for the first few years of implementation.

Overall Risk Rating at Preparation	Overall Risk Rating During Implementation	Comments
High	High	

Annex 5: Implementation Support Plan

160. The strategy for implementation support has been developed based on the nature of the project and its high risk profile. It will focus on implementation of the risk mitigation measures defined in the ORAF.

161. *Monitoring and Evaluation.* Monitoring of results and performance will be critical to meeting the development objective of this Project. To that end, during implementation support missions, the Bank team will carry out regular assessment of key performance indicators against targets agreed upon at appraisal.

162. *Procurement.* The Bank will undertake supervision through a combination of prior and post reviews. A dedicated procurement specialist will work with clients on a daily basis in the first year to ensure clients understand the Bank's procurement guidelines early during Project implementation. Implementation support missions that will be geared towards:

(a) providing training to relevant staff of implementing agencies; (b) reviewing procurement documents; (c) providing detailed guidance on the Bank's Procurement Guidelines; and (d) monitoring procurement progress against the detailed Procurement Plan.

163. *Financial management.* The Bank will provide risk-based implementation support, initially every six months during the first year, and this will be reviewed during the subsequent years, based on assessment of risks and the status of the financial management arrangements. During the implementation support missions, the FM team will review the FM systems for continued adequacy, evaluating the quality of the budgets and implementing agencies' adherence thereto, reviewing the IFRs and/or annual Financial Statements, compliance with relevant manuals including Financial Policies and Operations manuals and follow up on both internal and external audit reports.

164. *Environmental and Social Safeguards.* The project has no environmental or social safeguards issues and will not require specific implementation support activities.

165. *Anti-Corruption.* The Bank team will provide guidance in resolving any issues identified. The Bank's Anti-corruption Guidelines will apply to this operation, and Bank team will supervise proper implementation of these guidelines as well.

166. **Support to Implementation.** Taking into account the risks and their mitigation measures identified in ORAF, the following summarizes the technical support needed during the implementation phase.

Time	Focus	Skills Needed	Partner Role
First twelve months	Recruiting systems integrator and carrying out training and capacity building program. In addition, ensuring a strong fiduciary supervision plan will be a key requirement.	Technical knowledge of systems integration and design of capacity building programs. In addition, procurement and FM capacity in the team should be much stronger than in an average World Bank operation.	Partners from the EC-IFAS/RCH and the NHMSs will develop the TOR for the systems integrator prior to negotiations and will help design the capacity building program after Board approval.
12-48 months	The focus will be on intensive supervision of CAHMP activities, especially the fiduciary aspects. Procurement of equipment will happen in these months and the team will need to pay a close attention to the procurement process.	It is critical for the team to have technical knowledge of the equipment required by NHMSs. In addition, procurement and FM capacity in the team should be much stronger than in an average World Bank operation.	During this time, other partners may also support CA NHMSs by providing technical expertise. For example, the WMO is likely to provide experts for capacity building. It will also review technical specifications of equipment for NHMSs.

II. Skills Mix Required (illustrative for one year)

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Team Coordination	20	2	
Technical Expertise	20	4	Mix of consultants
Financial Management	20	2	Field presence; dedicated consultant
Procurement	20	2	Field presence; dedicated consultant
Legal	3		

III. Partners

Name	Institution/Country	Role
EC-IFAS/RCH, Kyrgyzhydromet, Tajikhydromet, Kazhydromet, Uzhydromet	Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan	Main counterparts for the CAHMP.
World Meteorological Organization	Switzerland	Training, capacity building, specification reviews.
UN ISDR	Switzerland	Training, capacity building, specification reviews.

Annex 6: Team Composition

World Bank staff and consultants who worked on the project:

Name	Title	Unit
Salman Anees	Senior Urban Specialist, TTL	ECSS6
Vladimir Tsirkunov	Senior Environmental Engineer, Co-TTL	ENVGC
Aziza Nasyrova	Temporary	ECCTJ
Curtis Barrett	Consultant	ETW
David Rogers	Consultant	ECSSD
Dilshod Karimova	Procurement Specialist	ECSO2
Farzona Mukhitdinova	ET Temporary	ECCTJ
Giorgi Kaviladze	Consultant	ECSSD
Gulnora Kamilova	Program Assistant	ECCUZ
Ignacio Jauregui	Counsel	LEGEM
Irina Goncharova	Procurement Analyst	ECSO2
John Ogallo	Senior Financial management Specialist	ECSO3
Joseph Formoso	Senior Finance Officer	CTRFC
Lynette Alemar	Senior Program Assistant	ECSSD
Marina Smetanina	Consultant	ECSSD
Nargis Ryskulova	Operations Analyst	ECSS6
Nurgul Baiburaeva	Consultant	ECSS6
Oxana Shmidt	Team Assistant	ECCA
Rinat Ishakov	Operations officer	ECSS6
Sabohat Dustova	FM Consultant	ECSS6
Shodi Nazarov	Financial Management Analyst	ECSO3
Takhmina Mukhamedova	Operations Analyst	ECSS6
Viktor Kotov	Consultant	ECSSD
Yuling Zhou	Senior Procurement Specialist	ECSO2
Zaruhi Tokhmakhian	Senior Operations Officer	ECSS6
Zhadyra Baibossynova	Procurement Consultant	ECSS6

Annex 7: Economic and Financial Analysis

167. This analysis evaluates the economic impact of improvements in the quality of hydrometeorological services in Kyrgyz Republic and Republic of Tajikistan. Assessment of the project's economic efficiency compares potentially preventable economic losses in the beneficiary countries with the cost of their prevention. The analysis assumes that strengthening of hydrometeorological services, as proposed by the Project, will significantly improve the quality and lead time of weather forecasts. This will help avoid some preventable losses that might otherwise occur.

168. In 2009, the Project team developed a comprehensive report analyzing hydrometeorological conditions and hazards in Central Asian countries. The report examined the climactic conditions in the region and estimated financial and economic costs incurred by severe hydrometeorological hazards, the vulnerability of the economies to such hazards, and the potential total and preventable economic losses suffered as a result of such events. This cost-benefit analysis draws from the underlying data, assumptions, and inputs of that 2009 study.¹⁸

169. **Weather and climate hazards in Central Asia.** As documented in the report, Central Asia experiences varied climactic conditions, ranging from heavy precipitation in the mountains to arid deserts. Hydrometeorological hazards affect the Republic of Tajikistan and the Kyrgyz Republic in a similar manner. The most severe and costly are mudflows, floods and avalanches caused by melting snow and heavy precipitation. Droughts are also common in both countries and are becoming more frequent. Droughts also have a relatively high impact in these countries because they affect food security of subsistence farmers as well as the large agriculture sector of the economy. Both countries are vulnerable to hail and strong winds, and Tajikistan frequently experiences dust storms. The following table summarizes annual frequency of occurrence of major hazards using data from 1985, and the annual average economic losses for each country in 2006 prices (USD million).

Type of Event	Kyrgyz Republic		Republic of Tajikistan	
	Frequency of Occurrence	Average Annual Economic Losses	Frequency of Occurrence	Average Annual Economic Losses
Floods and Mudflows	43.0	\$11.0	42.0	\$15.7
Drought	0.5	\$7.3	0.1	\$8.6
Spring and Autumn Frosts	2.0	\$7.5	NA	NA
Severe Frosts	NA	NA	1.1	\$0.4
Rainstorms	5.6	\$0.4	3.0	\$1.5
Hail	1.6	\$0.5	7.7	\$1.6
Snowstorms	2.6	\$0.2	3.0	\$0.6
Avalanches	15.1	\$0.3	26.6	\$0.8
Wind Storms	4.5	\$0.1	8.1	\$0.8
Total Cost		\$27.3		\$29.8

170. **Weather dependency of the economies of Project beneficiaries.** The economies of Central Asian countries rely heavily on certain weather-dependent sectors. These include

¹⁸ Improving Weather, Climate, and Hydrological Services Delivery in Kyrgyz Republic, Republic of Tajikistan, and Turkmenistan, World Bank, 2009.

important sectors such as agriculture, transportation, and energy. The impact of weather on the economy manifests itself in the form of weather-related losses suffered by economic entities of these and other sectors.

171. ***Kyrgyz Republic.*** Agriculture is the leading sector of the Kyrgyz Republic's economy contributing 32 percent of GDP. The sector employs over 65 percent of the labor force. After agriculture, transport and communications is the second largest weather dependent sector of the economy. In this sector, snow avalanches pose the greatest threat for motor vehicles. The energy sector (3.9 percent of GDP) in Kyrgyzstan is responsible for power generation and distribution. A cascade of hydroelectric power plants on the Naryn River supply the country's energy needs. It generates some 93 percent of domestically consumed electricity. Annually, Kyrgyzstan exports up to 2.5 billion kWh of energy to Uzbekistan, Kazakhstan and Tajikistan. Accurate weather information, as well as the lead time of hydrometeorological hazard warnings, plays a significant role in decision making in this sector.

172. Kyrgyzstan also possesses considerable water resources. Consideration for weather factors is an extremely important component of water management and distribution for the needs of agriculture and local communities, and for irrigation water to other Central Asian countries (Uzbekistan, Kazakhstan, and Turkmenistan). Other sectors at risk include transport and communication, construction, energy production and distribution, domestic heating, health and mining. The total share of weather-dependent sectors in Kyrgyz economy is about 48 percent of GDP.

173. ***Republic of Tajikistan.*** Agriculture, which is most weather dependent, is the most important sector of Tajik economy at over 20 percent annual average share in GDP. In addition to agriculture, Tajikistan has a considerable amount of natural energy resources. Because of its substantial hydro-energy resources, the electric energy sector is an important sector of the Tajik economy. Hydropower accounts for about 80 percent of the total potential energy resources of the country. Hydropower also is important for the country's future growth potential. Tajikistan has the potential to be one of the world's top ten hydro-energy producing countries, but currently not more than 5-7 percent of overall resources are used. Other weather-dependent sectors in Tajikistan include construction, transportation and communication, housing and public utilities, which account for a further 21 percent of GDP. Overall, more than about 61 percent of the Tajik economy is weather-dependent.

174. **Cost-Benefit analysis methodology.** The economic feasibility analysis of the Project compares its estimated economic benefits with its economic costs. As the project costs are given, the primary analytical challenge of this analysis is to estimate the expected benefits that will likely occur in the future as a result of Project implementation. The expected benefits of the Project are estimated by calculating the economic losses likely be avoided as a result of Project implementation. Calculation of this benefit involves the following:

- examination of statistical and economic data of past losses from climate and weather related events;
- estimation of the likely frequency and magnitude of their potential future reoccurrence of such events;

- estimation of average future economic costs of these potential events; and
- estimation of the share of these losses avoided as a direct consequence of Project implementation.

175. To determine the Project's economic internal rates of return and other metrics of economic feasibility, the Project's cost and benefit streams are compared

176. In addition to direct preventable economic losses, there are other potential benefits that do not factor into the cost-benefit analysis described here. There are two reasons for not including these other benefits. First, estimating such benefits is impossible because of data unavailability, as is the case with incremental socioeconomic benefits associated with better performance by the household sector. Second, it is impossible to quantify the value of these benefits, as is the case with assessing the value of potentially saved lives and reduced injuries. Other such potential benefits include reduced tourism losses, safe transport, energy conservation, sustained economic activity, avoided displacement of population, etc. Therefore, estimates of benefits of the proposed CAHMP are conservative, and we can reasonably assume that the actual economic benefits will be much larger.

177. As is evident from the above description, this analysis necessarily relies upon a number of estimates of the effects of past events, as well as assumptions about the probability and frequency of their reoccurrence in the future. Key assumptions of the analysis are presented below:

178. **Project Time Horizon.** This cost-benefit analysis estimates the economic feasibility of the project by calculating the present value of cost and benefit streams and by determining the internal rate of return of the Project. The assumed time horizon of the Project can significantly impact the results of this analysis. Since Project implementation costs are given, a longer Project time horizon will result in larger incremental benefits and a higher the internal rate of return. To remain conservative, the project planning horizon of 10 years (5 years of implementation and 5 years of operation/benefit flow) is the base case scenario for this analysis. This approach limits the assumed benefits of the Project, for the purposes of cost-benefit analysis, to only five years after the completion of implementation (i.e. to 2016-2020), even though the potential benefits of Project investments are likely to last longer.

179. **GDP Growth.** Current GDP figures and growth assumptions for Kyrgyzstan and Tajikistan are from World Bank and IMF projections. According to these projections, Kyrgyzstan will likely grow 7.1 percent in 2011 and 4.7 percent annually from 2012 onwards. Tajikistan is likely to grow at a 5 percent annual rate from 2011 onwards.

180. **Estimated average annual economic losses from hydrometeorological hazards.** The IWCHSD report prepared by a Bank team in 2009 estimates economic losses from weather related events. Estimates of economic losses utilize independent approaches: Meteorological risks assessment, benchmarking method, and sector-specific assessment. Benchmarking assessment determines the level of annual direct economic losses and the level of annual preventable losses. These help calculate the marginal efficacy of a potential improvement of services. The sector-specific approach uses expert assessments of the potential preventable losses

as a result of more accurate and timely hydrometeorological information and services. These complementary approaches ensure the integrity of the results because of the complexities in the assessment of economic benefits. These complexities include absence of systematic recording of damage and losses incurred by the economy, its sectors and population from adverse hydrometeorological events. These alternative methods estimate both direct benefits expressed as reduced losses from hydrometeorological hazards (direct economic losses) as well as indirect losses (e.g., loss of employment opportunities as a result of an adverse impact).

181. In Kyrgyz Republic, the meteorological risk assessment showed that estimated annual economic losses were about 1.1 percent of GDP. Benchmarking assessment results indicated that the average annual amount of direct damage associated with hydrometeorological phenomena was about 1.0 percent of GDP. The sector-specific assessment, which includes the estimation of indirect losses, showed higher total annual loss estimate of about 1.5 percent of GDP. In summary, the estimated annual economic losses from hydrometeorological hazards in Kyrgyz Republic range from a low of 1.0 percent of GDP to a high of 1.5 percent of GDP.

182. In the Republic of Tajikistan, the meteorological risk assessment in the IWCHSD report showed that estimated economic losses from the impacts of meteorological and hydrological emergencies amounted to about 1.3 percent of GDP. The results of a benchmarking assessment showed that the total average annual amount of direct damage associated with hydrometeorological hazards was about 1.04 percent of GDP. The sector-specific assessment, which also included estimates of indirect losses, resulted in average annual economic loss estimate of 1.6 percent of GDP. In summary, the estimated annual economic losses from hydrometeorological hazards in Tajikistan range from a low of 1.04 percent of GDP to a high of 1.6 percent of GDP.

183. Of the three alternative approaches for estimating annual economic losses, sector specific assessment is the most comprehensive approach that more accurately and fully represents the underlying statistical data as well as estimates of experts from various weather dependent sectors of the economies. In addition, sector specific assessment accounts for both direct and indirect losses and therefore more accurately represents the true economic costs of hydrometeorological hazards. For these reasons, for the purposes of economic cost-benefit analysis, the annual loss estimates obtained by sector specific assessment (1.6 percent of GDP for Tajikistan and 1.5 percent for Kyrgyz Republic) were used.

184. The following table summarizes total estimated economic losses for the years 2016-2020 during which, based on the conservative assumptions of this analysis, the project benefits will materialize.

	Tajikistan	Kyrgyz Republic
Total GDP, 2016-2020	\$38,890,050,819	\$32,697,910,418
Estimated Annual Economic Losses, % of GDP	1.60%	1.50%
Estimated Total Economic Losses, 2016-2020	\$622,240,813	\$490,468,656

185. **Estimated Project benefits.** As described above, the project’s benefits are potential incremental prevented losses. The IWCHSD analyses resulted in a range of estimates that

defined incremental prevented losses in terms of percentage share of total estimated average annual economic losses. For Tajikistan, the potential prevented losses ranged from 5.80 percent to 8.40 percent of the total economic losses; for Kyrgyz Republic, they ranged from 7.50 percent to 9.50 percent. These estimates were applied to the total average annual economic losses estimated earlier to determine the projected annual benefits of the Project. To remain conservative in assessing the CAHMP's economic feasibility, this cost-benefit analysis used the lower values of these ranges, i.e. lower estimated potential benefits, for the base case assessment.

186. The following table summarizes total estimated avoided economic losses (i.e. total project benefits) for the years 2016-2020 during which, based on the conservative assumptions of the analysis, the project benefits will materialize.

	Tajikistan	Kyrgyz Republic
Estimated Total Economic Losses, 2016-2020	\$622,240,813	\$490,468,656
Project's Contribution, % of Economic Losses	5.80%	7.50%
Total Project's Benefit, 2016-2020	\$36,089,967	\$36,785,149

187. **Estimated Project costs.** The Project costs include implementation costs in each country as well as of the regional component of the Project. In addition to Project's implementation costs in years 2011-2016, the total costs of the Project include annual operating costs. The Project team estimated these costs at 5 percent of the total Project implementation costs.

	Regional	Kyrgyzstan	Tajikistan
Total Project Implementation Costs, 2011-2016	\$8,700,000	\$6,000,000	\$13,000,000
Total Operating and maintenance Costs, 2016-2020	\$2,125,000	\$1,500,000	\$3,250,000

188. **Cost-Benefit analysis results.** Based on the assumptions and parameters discussed above, the base case estimated economic internal rates of return of the project are 23.6 percent for Tajikistan and 53.4 percent for Kyrgyz Republic. At 12 percent assumed opportunity cost of capital, the net present values of the net benefit streams are \$4.6 million and \$10.3 million, respectively, and the benefit-to-cost ratios are 1.46 and 3.2, respectively. After additional regional component costs of the project are factored in, the ERR for the entire project still stays at a very strong 22.13 percent, with NPV at \$8.31 million and benefit-to-cost ratio of 1.3. As noted earlier, the base case includes a number of very conservative assumptions, producing the most conservative level of economic benefit. If some of these assumptions are relaxed (e.g. if higher estimates of potential incremental prevented losses are used, or a longer 15-year planning horizon is adopted), the ERRs of the Project would become 43 percent for Tajikistan, 67 percent for Kyrgyz Republic, and 39 percent overall with regional component costs included. The NPV values would become \$25.7 million, \$27.4 million, and 46 million, respectively. The benefit-to-cost ratios would become 3.39, 6.57, and 3.00, respectively. These ERR values, even though they do not include socioeconomic and environmental dimensions of the Project benefit, still exceed the opportunity cost of capital of 12 percent. Therefore, the Project is considered economically viable.

Economic Rate of Return, Tajikistan	23.66%
Economic Rate of Return, Kyrgyz Republic	53.41%
Economic Rate of Return, Overall	22.13%

Net Present Value, Tajikistan	\$4,594,053
Net Present Value, Kyrgyz Republic	\$10,320,207
Net Present Value, Overall	\$8,312,371
Benefit/Cost Ratio, Tajikistan	1.46
Benefit/Cost Ratio, Kyrgyz Republic	3.26
Benefit/Cost Ratio, Overall	1.39

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