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IDA/R2018-0113/1

May 8, 2018

Closing Date: Friday, May 25, 2018 at 6:00 p.m.

FROM: Vice President and Corporate Secretary

Pakistan - Pakistan Hydromet and DRM Services Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed credit to Pakistan for a Pakistan Hydromet and DRM Services Project (IDA/R2018-0113), which is being processed on an absence-of-objection basis.

Distribution:
Executive Directors and Alternates
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Bank Group Senior Management
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The World Bank

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Report No: PAD2492

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR 129.4 MILLION
(US$188 MILLION EQUIVALENT)

TO THE

ISLAMIC REPUBLIC OF PAKISTAN

FOR A

PAKISTAN HYDROMET AND DISASTER RISK MANAGEMENT (DRM) SERVICES PROJECT

May 4, 2018

Social, Urban, Rural and Resilience Global Practice (GSURR)
Disaster Risk Management and Climate Change Unit, South Asia Region

CURRENCY EQUIVALENTS

(Exchange rate effective March 31, 2018)

Currency unit	=	Pakistani Rupee (PKR)
PKR 115.78	=	US$1
US$1.45	=	SDR 1

FISCAL YEAR
July 1 – June 30

Acting Regional Vice President:	Ethel Sennhauser
Country Director:	Patchamuthu Illangovan
Senior Global Practice Director:	Ede Jorge Ijjasz-Vasquez
Practice Manager:	Christoph Pusch
Task Team Leader(s):	Haris Khan, Ditte Marie Gammelgaard Fallesen, William Young

ABBREVIATIONS AND ACRONYMS

ACAS	Agriculture and Climate Advisory Services
AGP	Auditor General of Pakistan
AGPR	Accountant General of Pakistan & Revenues
AWS	Automatic Weather Station
BCA	Benefit-cost analysis
BCR	Benefit-cost ratio
BER	Budget Execution Report
CER(C)	Contingent Emergency Response (Component)
CONOPS	Concept of Operations
CPS	Country Partnership Strategy
DA	Designated Account
DDMA	District Disaster Management Authority
DMIS	Disaster Management Information System
DRM	Disaster risk management
DRR	Disaster risk reduction
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EWS	Early warning system
FABS	Financial Accounting and Budgetary System
FFC	Federal Flood Commission
FFD	PMD Flood Forecasting Division
FMS	Financial management specialist
GCC	Gender and Child Cell
GDP	Gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
GLOF	Glacial Lake Outburst Flow
GoP	Government of Pakistan
GRM	Grievance redress mechanism
ICT	Information and communication technology
IDA	International Development Association
IFR	Interim financial report
ISP	Implementation Support Plan
M&E	Monitoring and evaluation
NAM	New Accounting Model
NDMA	National Disaster Management Authority
NDMP	National Disaster Management Plan
NEOC	National Emergency Response Center
NFCS	National Framework for Climate Services
NMHSs	National Meteorological and Hydrological Services
NPV	Net present value
NWP	Numerical weather prediction
O&M	Operations and maintenance
OM	Operations Manual
PDO	Project Development Objective
PDMA	Provincial Disaster Management Authority
PID	Provincial irrigation department
PMD	Pakistan Meteorological Department
PIU	Project implementation unit
PPSD	Project Procurement Strategy for Development
RAPs	Resettlement Action Plans
RCOFs	Regional Climate Outlook Forums
RPF	Resettlement Policy Framework
SAARC	South Asia Association for Regional Cooperation
SAR	South Asia Region
SOP	Standard operating procedures
SI	System Integrator
SORT	Systematic Operations Risk-Rating Tool
USAID	United States Agency for International Development
USAR	Urban search and rescue
VLD	Voluntary Land Donations
WAPDA	Water and Power Development Authority
WBG	World Bank Group
WMO	World Meteorological Organization
WTP	Willingness to pay

BASIC INFORMATION

Is this a regionally tagged project?	Country(ies)	Financing Instrument
Yes	South Asia, Pakistan	Investment Project Financing

[ ] Situations of Urgent Need of Assistance or Capacity Constraints

[ ] Financial Intermediaries

[ ] Series of Projects

Approval Date	Closing Date	Environmental Assessment Category
25-May-2018	30-Jun-2023	B - Partial Assessment

Bank/IFC Collaboration
No

Proposed Development Objective(s)

To strengthen Pakistan's public sector delivery of reliable and timely hydro-meteorological and disaster risk management services.

Components

Component Name	Cost (US$, millions)
Hydro-meteorological and Climate Services	106.00
Disaster Risk Management	82.00
Contingent Emergency Response Component	0.00

Organizations

Borrower :	Islamic Republic of Pakistan
Implementing Agency :	Pakistan Meteorological Department National Disaster Management Authority

PROJECT FINANCING DATA (US$, Millions)

[✓] Counterpart Funding	[ ] IBRD	[✓] IDA Credit	[ ] IDA Grant	[ ] Trust Funds	[ ] Parallel Financing

Total Project Cost:	Total Financing:	Financing Gap:
210.00	210.00	0.00
	Of Which Bank Financing (IBRD/IDA): 188.00	

Financing (in US$, millions)

Financing Source	Amount
Borrower	22.00
International Development Association (IDA)	188.00
Total	**210.00**

Expected Disbursements (in US$, millions)

Fiscal Year	2019	2020	2021	2022	2023
Annual	10.00	43.00	53.00	52.00	30.00
Cumulative	10.00	53.00	106.00	158.00	188.00

INSTITUTIONAL DATA

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Contributing Practice Areas

Water, Global Facility for Disaster Reduction and Recovery

Climate Change and Disaster Screening

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

Gender Tag

Does the project plan to undertake any of the following?

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

Yes

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

Yes

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

Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Substantial
9. Other	Moderate
10. Overall	Substantial

COMPLIANCE

Policy

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

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Natural Habitats OP/BP 4.04		✓
Forests OP/BP 4.36		✓
Pest Management OP 4.09		✓
Physical Cultural Resources OP/BP 4.11		✓
Indigenous Peoples OP/BP 4.10		✓
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37		✓
Projects on International Waterways OP/BP 7.50		✓
Projects in Disputed Areas OP/BP 7.60		✓

Legal Covenants

The Recipient shall establish and maintain throughout the implementation of the Project: (a) a Project Implementation Unit, each within PMD's and NDMA's regular structure, headed by a Project director, with mandate, composition, staffing and terms of reference acceptable to the Association, to be responsible for the overall coordination and monitoring of the implementation of their respective Parts of the Project; and (b) a Project Coordination Committee (PCC), co-chaired by the Recipient's Aviation Division and Climate Change Ministry, with mandate, composition (including senior representatives from relevant federal and provincial departments) acceptable to the Association, to be responsible for providing overall guidance and coordination for the implementation of the Project.

The Recipient shall cause PMD and NDMA to establish no later than six months from the Signature Date and thereafter maintain throughout the implementation of the Project: (a) a system for the handling of procurement complaints acceptable to the Association; and (b) a procurement documentation and record keeping system acceptable to the Association.
The Recipient shall carry out the Project in accordance with the arrangements and procedures set out in the Project Operations Manual.
The Recipient shall ensure that the Project is carried out in accordance with the Safeguards Instruments, in a manner and substance satisfactory to the Association.

The Recipient shall prepare and adopt by not later than June 30th of every year, an annual work plan and budget for the following fiscal year in a manner and substance satisfactory to the Association, which plan shall identify the Project activities by component and subcomponent, together with their related expenditures and financing sources, including those funded by the Recipient, and implement the Project activities during the relevant fiscal year in accordance such annual work plan and budget.

Conditions

Disbursement under Component 3: The Recipient has determined that an Eligible Crisis/Emergency has occurred and has requested assistance under the CER Component; The Bank has accepted the request and notified the Recipient. The Recipient's Coordinating Authority has adequate staff and resources. The Recipient has adopted a CER Operations Manual acceptable to the Bank, and has prepared and disclosed all safeguards instruments.

PROJECT TEAM

Bank Staff Name	Role	Specialization	Unit
Haris Khan	Team Leader (ADM Responsible)		GSU18
Ditte Marie Gammelgaard Fallesen	Team Leader		GSU18
William Young	Team Leader		GWA06
Khalid Bin Anjum	Procurement Specialist (ADM Responsible)		GGOPZ
Akram Abd El-Aziz Hussein El-Shorbagi	Financial Management Specialist		GGOAP
Adnan Ashraf Ghumman	Team Member		GMTSA
Ahsan Tehsin	Team Member		GSU18
Babar Naseem Khan	Social Safeguards Specialist		GSU06
Juan Carlos Alvarez	Counsel		LEGES
Julian Jose Palma Diaz	Team Member		GSU18
Rahat Jabeen	Environmental Safeguards Specialist		GEN06
Vladimir V. Tsirkunov	Team Member		GFDRR
Victor Ordonez	Senior Finance Officer		WFACS
Anwar Ali Bhatti	Financial Analyst		SACPK

Extended Team

Name	Title	Organization	Location
Alice Soares	Scientific Officer	World Meteorological Organization	
Haleh Kootval	Meteorology and Service Delivery Specialist	Consultant with World Bank Group	
Thomas Adams III	Hydromet Specialist	Consultant with World Bank Group	

PAKISTAN HYDROMET AND DRM SERVICES PROJECT (P163924)

TABLE OF CONTENTS

I. STRATEGIC CONTEXT

A. Regional and Country Context

1. **Pakistan, with an estimated population of over 207 million people, is the world's sixth most populous country.** In recent years, it has achieved continued GDP growth and substantially reduced poverty. Provisional official estimates suggest that the GDP grew by 5.8 percent for FY17/18, up from 5.4 percent in FY16/17, and the government growth target for FY19 is 6.2 percent. Fiscal and external imbalances may, however, erode these gains in future if not addressed. The national poverty headcount declined from 64.3 percent in FY02 to 29.5 percent in FY14, however, inequality persists and the country continues to rank low on the human development index, at 147th out of 188 countries.

2. **A key dimension of vulnerability in South Asia is exposure to hydrological and meteorological (hydromet) hazards, including storms, floods, and droughts.** Across South Asia, the number of disasters has quadrupled over the past four decades, causing over 800,000 deaths and US$80 billion in damages[1]—equivalent to an estimated 2–6 percent of GDP—and slowing economic growth and poverty reduction.[2] Climate change is expected to have an adverse impact on Pakistan, which ranks 7th on the climate risk index.[3] It continues to be one of the most flood-prone countries in the South Asia Region (SAR); it suffered US$18 billion in losses between 2005 and 2014 (US$10.5 billion from the 2010 floods alone), equivalent to around 6 percent of the federal budget.[4] Coupled with rapid population growth and uncontrolled urbanization, hydromet hazards have a disproportionate and growing impact on the poor.

3. **Agriculture in Pakistan is very much exposed to climate and weather-related risks.** The sector contributes 21 percent of GDP and 13 percent of national exports, employs 45 percent of the labor force, and is hugely reliant on irrigation, which accounts for 95 percent of total national water use. Thus, irrigation underpins national food security and is critical to the livelihoods of the rural poor. Increasing food demands and water demands from other sectors mean that water scarcity issues are becoming more and more challenging for Pakistan. To maximize the economic value of its relatively scarce water resources, Pakistan needs to greatly improve water management (on all scales, from the basin level to the farm) through interagency coordination and greatly improved water data and information exchange. The productivity of other key economic sectors—such as transport, disaster risk management, energy, and aviation—is also compromised by inadequate weather, water, climate, and information services.

4. **Regional and international collaboration is important for helping Pakistan provide better weather and climate information services.** World Meteorological Organization (WMO) members establish data-sharing arrangements and operational guidelines, implement best practices, and share capacity-building efforts. However, international and regional collaboration depends on continued national-level investment in meteorological observational networks, major computing infrastructure, and research and development, as well as regional investment and collaborative efforts in downscaling global data products to regional and national application.

[1] Not including indirect losses.
[2] World Bank Program Brief: *South Asia Regional Program on Hydromet, Climate Services and Resilience* (2017). http://www.worldbank.org/en/region/sar/brief/south-asia-hydrological-and-meteorological-hydromet-resilience-program.
[3] Global Climate Risk Index 2017 https://germanwatch.org/en/download/16411.pdf.
[4] World Bank (2015) *Fiscal Disaster Risk Assessment Options for Consideration: Pakistan*. Chapter 1, page 2. https://openknowledge.worldbank.org/handle/10986/21920.

B. Sectoral and Institutional Context

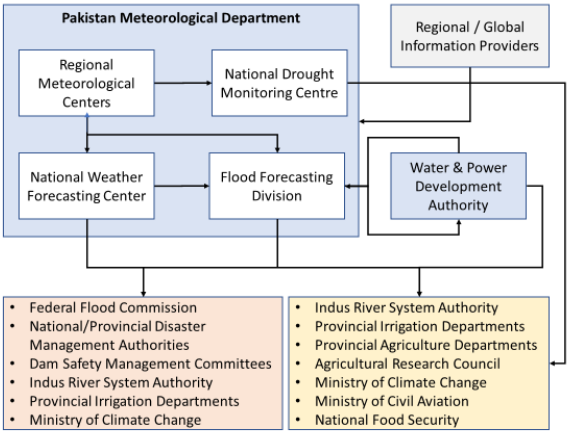
5. **Climate change is likely to exacerbate the frequency and severity of extreme weather and water events, with consequent effects on Pakistan's economy.** If the country is to maintain and build on its recent development gains, it must strengthen its adaptation to and preparedness for natural hazards, and improve the provision of and access to weather, water, and climate-related information. Improved development and delivery of hydromet information services and early warnings can make important contributions to economic productivity while also enhancing community resilience to natural hazards. Stronger institutions and a higher level of observation, forecasting, and service delivery capacity can foster climate-resilient development, making a significant contribution to safety, security, and economic well-being.[5]

6. **The modernization of Pakistan's national metrological and hydrological services will be crucial to help the national and provincial disaster management authorities, which are its most important stakeholders, to improve early warning systems and the level of planning and preparedness for, and response to, disasters.** This approach has been adopted by nearly all governments that recognize the importance of a strong partnership between their national meteorological and hydrological services and disaster management authorities in the delivery of services, in particular, the last-mile connectivity in the early waning chain, which is central to the provision of weather, climate, and hydrological services.

7. **The Pakistan Meteorological Department (PMD) within the Cabinet Secretariat (Aviation Division) has primary responsibility for generating accurate and timely hydromet data, products, and services in Pakistan.** PMD's main objectives are to provide meteorological services for aviation; public weather services; early warning services (cyclones, storms, floods, glacial lake outburst flow [GLOF], heat waves); agro-meteorological services; climatological services; geophysical and seismic services; and marine meteorological services. The PMD National Weather Forecasting Center is responsible for public national weather forecasts. The PMD's Flood Forecasting Division (FFD) in Lahore is responsible for storm and flood forecasting as well as river flow forecasts and water availability outlooks. Although responsibility for hydrological information services resides with PMD, the Pakistan Water & Power Development Authority (WAPDA) and provincial irrigation departments (PIDs) operate most hydrological observation networks. Multiple federal and provincial government agencies are key stakeholders of PMD's information services. The Federal Flood Commission (FFC), which is responsible for the development and maintenance of flood protection and control systems in the country, is dependent on PMD's information services.

[5]Upgrading all hydro-meteorological information and early-warning systems in developing countries has been estimated to have the potential to save 23,000 lives annually and provide US$3–30 billion per year in economic benefits. See Hallegatte (2012), "A Cost-Effective Solution to Reduce Disaster Losses in Developing Countries: Hydro-meteorological Services, Early Warning, and Evacuation," Policy Research Working Paper 6058, World Bank, Washington, DC.

Figure 1. Inter-Agency and Intra-Departmental Dependencies of the Pakistan Meteorological Department and Stakeholders



8. **PMD aspires to become a service-oriented organization, focused on diverse stakeholder information needs.** PMD currently generates 1- to 2-day weather forecasts, 3- to 5-day outlooks, and 24-hour hydrological forecasts. This is insufficient to meet the needs of stakeholders who require information for short-term operations (including more actionable forecasts and warnings) and for medium- to long-term planning, particularly in the context of increased climate variability. PIDs require hydromet information to better manage irrigation water distribution; and provincial agriculture departments (PADs) need monthly weather outlooks tailored to 19 agricultural zones. WAPDA requires better hydrological forecasts to guide reservoir management and hydropower operations, and the Indus River System Authority requires improved river flow forecasts to inform inter-provincial water allocation. The Pakistan Civil Aviation Authority needs improved and more automated hydromet services, including forecasts, for flight operations. The Ministry of National Food Security and Research requires forecasts to develop agro-meteorological and water resources–related information services for its stakeholders. A well-functioning PMD equipped with modern infrastructure, tools, and technologies will be able to respond to these requirements.

9. **To achieve this transformation, PMD needs a new business model that focuses on end-user needs and recognizes the private sector as a strategic partner**. Since cultural change in institutions happens slowly, the proposed project represents the first phase of a planned long-term engagement on hydromet modernization.[6] It needs to lay a strong foundation that can be developed over time. PMD must develop and own a clear, long-term strategic framework based on a solid theory of change that will guide its business and coordinate donor investment. This framework will need to be supported by a Concept of Operations (CONOPS) that is based on user requirements and prepared in coordination with users and stakeholders to ensure the viability of the concepts presented.

10. **Private sector hydromet and climate-related opportunities in Pakistan could increase PMD revenue and expand service delivery and infrastructure.** Public-private partnership arrangements could complement and enhance PMD's functions by developing revenue-generating activities or sales of value-added information to supplement operations and maintenance (O&M) costs during and after project implementation. The most promising of these opportunities are in agriculture and aviation.

[6] Modernization of the US National Weather Service took over 10 years and US$4.5 billion. See Rogers and Tsirkunov (2013), *Weather and Climate Resilience: Effective Preparedness through National Meteorological and Hydrological Services*, World Bank; and GFDRR & JMBSC (2016), *Modernization of Meteorological Services in Japan and Lessons for Developing Countries*.

Public-private partnerships will be critical for the range and specificity of information products and their market penetration. Furthermore, automatic weather stations (AWS) could be installed on telecommunication masts owned by those companies, minimizing the need for PMD to acquire land, and minimizing O&M costs and other overheads.

11. **The relationship between PMD and the National Disaster Management Authority (NDMA) will serve to demonstrate to other stakeholders across the hydromet value chain the benefits of working together to bridge the gap between the producers and users of meteorological and hydrological services for the protection of lives and economic assets**. Up until the 2005 earthquake, Pakistan's disaster risk management (DRM) mechanisms focused on reactive strategies. The Government's first shift to an ex-ante risk management approach was in 2006 through the introduction of the National Disaster Management Ordinance, which later led to the NDMA Act 2010. A comprehensive disaster management system has been established under the NDMA Act of 2010, and institutional mechanisms at the national, provincial, and district levels have been put in place in the form of NDMA, Provincial Disaster Management Authorities (PDMAs), and District Disaster Management Authorities (DDMAs). In accordance with the provisions of the NDMA Act 2010 and in line with the Disaster Risk Reduction (DRR) Policy, NDMA formulated a comprehensive National Disaster Management Plan (NDMP, 2012-2022) outlining 10 priority areas and 118 specific interventions and projects for implementation over the next 10 years. The NDMP also includes critical infrastructure requirements for flood management by the FFC under the National Flood Protection Plan.

12. **The NDMA was established in 2010 to formulate and enforce policies for the prevention of national disasters, coordinating efforts with various Government ministries and international organizations.** Constituted under the NDMA Act 2010, the PDMAs were established to strategize the management of and response to natural disasters at the provincial and local levels. Given the critical role of the still-nascent DRM institutions, fixing capacity weaknesses and gaps in the DRM system warrants high priority**.** There are also significant variations in the development, efficiency, and expertise of disaster management institutions, and in the services they deliver, in various regions/provinces. While institutional structures have been put in place, human resource and institutional capacities are lacking in most of these authorities.

13. **In view of the country's vulnerability to multiple disasters and climate-related risks, strengthening Pakistan's DRM system is considered a very strategic part of assisting the Government to achieve its national and global commitments:** The Five-Year Development Plan of the Government of Pakistan (GoP), the Sustainable Development Goals, the Nationally Determined Contribution, and the Sendai Framework for Disaster Risk Reduction. Both top-down and bottom-up approaches need to be used in supporting the Government of Pakistan in implementing its DRR policy and NDMP 2012-2022.

C. Higher-Level Objectives to which the Project Contributes

14. **This project will use the hydromet value chain as a framework to fill gaps in the delivery of climate and weather information services.** The value of meteorological and hydrological information lies in its ability to inform and enable disaster management, first responders, and other affected sectors to respond effectively to mitigate disasters. This starts with observing weather, water, climate, and forecasting through to decision-making in government and response at all levels down to the community. The project has been designed so that Component 1 (on hydro-meteorological and climate services) and Component 2 (on DRM) are directly linked and feed into each other. The modernization of PMD will allow NDMA to use and share more accurate, timely, and relevant information so that

impact-based warnings can be generated jointly and appropriate response mechanisms can be developed for the protection of life and property. The design of the project also conforms to best global practices established by the WMO, and it draws on best practices from previous World Bank-financed operations. This approach will lay the foundation for support from the Bank as well as future support from the Bank and/or other development partners. These linkages and benchmarking practices will be better captured in the CONOPS, while the project steering committee (co-chaired by Secretary of Climate Change and Secretary of Aviation) will ensure overall coordination as well as desired outcomes during project implementation.

15. **The proposed Pakistan Hydromet and DRM Services Project is aligned with the World Bank's Country Partnership Strategy (CPS) FY15-19, discussed by the Board on May 1, 2014 (Report no. 84645), which was extended to FY20 in the Performance and Learning Review, discussed by the Board on June 15, 2017 (Report No. 113574).** It is also aligned with the twin goals of ending extreme poverty and promoting shared prosperity. It supports CPS Results Area III, Inclusion, by "strengthening Pakistan's public sector delivery of reliable and timely hydro-meteorological and disaster risk management services." The operation is aligned with the Government's NDMP, and it specifically supports CPS Outcome 3.3 "Increased resilience to disasters in targeted regions," through the establishment of early warning systems (EWS). The operation also supports the CPS by addressing the cross-cutting themes of gender and climate change adaptation and mitigation by contributing to climate resilience in Pakistan's water, food, and energy security. There is a strong development rationale for public sector support for the operation. The Bank has experience supporting the design and implementation of similar programs—for example, in Nepal, Bangladesh, and Turkey.

16. **The project will support climate change adaptation, and a preliminary assessment by the Bank's Climate Change Group has assessed climate co-benefits to be 100 percent of project financing.** Modernizing hydromet services through the project will improve the quality and reliability of climate information and facilitate the information sharing on weather and water resources that is critical for decision-making in a changing climate. Moreover, the project will strengthen the EWS that are required to respond rapidly and effectively to climate-induced hydromet hazards. In addition, the proposed project aligns very well with the World Bank Group (WBG) strategy of identifying risks associated with disasters and climate change that would hamper the achievement of its twin goals and development objectives. The 2014 *World Development Report*: *Managing Risk for Development* endorsed the idea that addressing poverty and stabilizing climate change cannot be considered in isolation. Furthermore, the WBG's Climate Change Action Plan, adopted in April 2016, recognized that if no action is taken, climate change could push more than 100 million additional people into poverty by 2030. In terms of the Sendai Framework for Disaster Risk Reduction 2015-2030, the proposed investments would directly contribute to priority action No. 2, Strengthening disaster risk governance to manage disaster risk, and priority action No. 3, Investing in disaster risk reduction for resilience.[7]

17. **Finally, the project will also support the South Asia Association for Regional Cooperation (SAARC) commitment to "address the challenges posted by climate change and natural disasters."**[8] A significant stride was made at the 2014 SAARC Heads of State Eighteenth Summit meeting in Kathmandu. It was agreed that members would establish a cross-border information sharing and regional cooperation mechanism to fight climate change and to minimize the risks of natural disasters. Recognizing that hydromet risks are based on regional weather patterns that cross boundaries, the WBG

[7] http://www.unisdr.org/we/coordinate/sendai-framework
[8] SAARC is South Asia's official organization for facilitating regional cooperation.

can play a catalytic dual role in these efforts at the national and regional levels because of its extensive and active hydromet portfolio in the region and strong collaboration with the WMO and other leading hydromet agencies.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

18. To strengthen Pakistan's public sector delivery of reliable and timely hydro-meteorological and disaster risk management services.

B. Project Beneficiaries

19. **At the economy-wide level, improved hydromet services will benefit Pakistan's general public and key economic sectors.** Project beneficiaries include people who are at risk from climate, weather, and water-related disasters[9] and whose productivity depends on higher quality hydromet information, as well as government ministries and departments at the federal and provincial levels. The immediate beneficiaries of the project at the government level will be PMD and NDMA. PMD will be able to enhance its effectiveness as a modern organization that provides reliable, useful, and timely information on meteorological, hydrological, climate, and seismic events. Through better linkages with PMD, the NDMA, PDMAs, and DDMAs will improve their EWSs and level of planning and preparedness for, and response to, disasters and climate variability. In addition, the FFC, PIDs, and WAPDA will receive enhanced forecasts to better support water distribution for irrigation and will leverage hydropower operations to improve electrical power generation; the Pakistan Civil Aviation Authority will benefit from new forecasting and monitoring tools, which are crucial for the enhanced safety of aviation operations; and finally the modernization of PMD will allow PADs to provide more timely and accurate weather forecasts and monthly outlooks tailored to different agricultural zones.

C. PDO-Level Results Indicators

20. **Progress in achieving the PDO will be measured through the following indicators** (further elaborated in Section VII). The improvement in the quality of hydro-meteorological services and products will be measured by Indicators 1 and 2. Indicator 3 will measure the capacity to deliver enhanced DRM information and services.

- Indicator 1: Improved weather forecasting. This indicator will measure the *improvement in weather forecasting skills (of 24-hour public weather forecasts for mean temperature and rainfall measured by forecast verification techniques).*
- Indicator 2: Increased satisfaction of departments and communities with PMD services. This indicator will *assess the users and stakeholders' satisfaction with forecasts and warning services provided by PMD.*
- Indicator 3: Increased capacity to deliver DRM services to user departments and communities. This indicator will *measure the tools and mechanisms NDMA uses for delivery of DRM services to user departments and communities. Through project interventions, more sophisticated tools and mechanisms will be put in place to enhance delivery of DRM services.*

[9] Over 30 million people have been affected by floods between 2010 and 2014, according to NDMA. Since 1950, around 12,000 people have lost their lives directly as a result of flooding disaster, according to the National Flood Protection Plan IV of the FCC.

III. PROJECT DESCRIPTION

A. Project Components

21. The project has three main components and will be implemented over a period of five years. Project activities are listed below and detailed in Annex 1.

Component 1: Hydro-meteorological and Climate Services (Total US$106.0 million). This component will include four subcomponents.

Sub-component 1.1: Institutional Strengthening and Capacity Building (Total US$6.0 million, of which US$2.0 million is IDA regional funding).

- Institutional strengthening and development of a legal and regulatory framework (US$1.40 million).
- Capacity building and training of PMD and main stakeholders (US$4.15 million).
- Outreach and public education, awareness raising, marketing (US$0.45 million).

Sub-component 1.2: Modernization of the Observation Infrastructure, Data Management, and Forecasting Systems (Total US$86.7 million, of which US$20.0 million is IDA regional funding).

- Technical modernization of the observation networks (US$58.5 million).
- Modernization of PMD data management, communication, and ICT system (US$12.3 million).
- Improvement of the weather forecasting process, including the numerical weather prediction (NWP) system (US$3.2 million).
- Improvement of the hydrological forecasting system, including the flood modeling system (US$1.2 million).
- Expansion and refurbishment of PMD's operational facilities (US$11.5 million).

Sub-component 1.3: Enhancing PMD Service Delivery and Building Partnerships with the Private Sector (Total US$9.3 million, of which US$3.0 million is IDA regional funding).

- Introduction of public weather and hydrological services (water resources, DRM, agriculture, irrigation, media, civil aviation, transport, health, energy, etc.) (US$1.7 million).
- Strengthening of end-to-end early warning system (EWS) including a regular post-event review process (US$1.0 million).
- Introduction of impact-based forecast and warning services in support of operations of the DRM sector and other stakeholders (US$1.6 million).
- Development of Agriculture and Climate Advisory Service (ACAS), including drought monitoring (US$2.5 million).
- Creation of the National Framework of Climate Services (NFCS) (US$1.5 million).
- Strengthening services for aviation (US$1.0 million).

Sub-component 1.4: Project Management, Systems Integration, and Monitoring and Implementation Support of PMD (Total US$4.0 million).

- Assessment of existing systems and design of an optimum composite observation network and of forecasting and service delivery processes (weather, climate, and hydrological) (US$2.0 million).
- Project management, monitoring, reporting, and evaluation (US$1.0 million).
- Operations and maintenance (O&M) costs (US$1.0 million).

Component 2: Disaster Risk Management (Total US$82 million). The component will consist of three subcomponents.

Sub-component 2.1: Legal Policy and Institutional Strengthening (Total US$40 million).

- Advisory services to strengthen the existing legal disaster risk management framework and policy (US$0.5 million).
- Institutional strengthening for DRM (US$4.5 million).
- Strengthening of disaster risk financing mechanisms (US$2.0 million).
- National Disaster Response Force (NDRF) local and community response (US$20.0 million).
- Strengthening of urban search and rescue (USAR) teams (US$7.0 million).
- Multi-hazard vulnerability and risk assessment (US$4.0 million).
- Analytics and research on hazard impacts (US$2.0 million)

Sub-component 2.2: Infrastructure for Resilience (Total US$35 million).

- National Emergency Operations Center (NEOC) (US$14.0 million).
- National Institute of Disaster Management (US$5.0 million)
- Communications, mobile command centers and systems (US$9.0 million)
- Development of Disaster Management Information System (DMIS) (US$2.0 million).
- Investment framework and pilot activities for resilience infrastructure in the Federal Capital (US$5.0 million).

Sub-component 2.3: Project Management, Monitoring, and Implementation Support of NDMA (Total US$7 million).

Component 3: Contingent Emergency Response Component (CERC) (Total US$0 million). This component will support preparedness for and rapid response to climate and natural disasters, emergency, and/or catastrophic event as needed. The provisional zero cost for this component will allow for rapid reallocation of credit proceeds from other components under streamlined procurement and disbursement procedures. Annex 1 provides more information on the CERC.

B. Project Cost and Financing

22. **The total cost of the project is US$210 million, which will be financed through an IDA credit of US$188 million equivalent with counterpart funding estimated at US$22 million.** IDA funding will include national IDA (in the amount of US$163.0 million equivalent) and regional IDA (US$25.0 million equivalent). The regional IDA will finance activities that contribute to regional resilience and/or have a regional dimension—primarily in Component 1. GoP financing will support twinning operational support, construction of buildings and offices, vehicles, high-performance computers, architectural and supervision consultants, the system integrator, equipment for the national disaster response force, gender mainstreaming, and part of NDMA and PMD's project management and O&M. Separate budgets and accounts will be kept for counterpart funding.

23. A breakdown of costs by component and funding source is provided in Table 1.

Table 1. IDA Project Cost and Financing (US$ million)

Project component	Project cost	IDA credit financing	IDA regional financing
Component 1: Hydro-meteorological and Climate Services			
Subtotal Component 1.1: Institutional Strengthening and Capacity Building	**6.00**	**4.00**	**2.0**
Subtotal Component 1.2: Modernization of the Observation Infrastructure, Data Management, and Forecasting Systems	**86.7**	**66.7**	**20.0**
Subtotal Component 1.3: Enhancement of the PMD Service Delivery Process	**9.30**	**6.30**	**3.00**
Subtotal Component 1.4: Project Management, Systems Integration, and Monitoring and Implementation Support of PMD	**4.00**	**4.00**	**0.00**
Total Component 1	**106.00**	**81.00**	**25.00**
Component 2: Disaster Risk Management			
Subtotal Component 2.1: Legal Policy and Institutional Building	**40.00**	**40.00**	**0.00**
Subtotal Component 2.2: Infrastructure for Resilience	**35.00**	**35.00**	**0.00**
Subtotal Component 2.3: Project Management	**7.00**	**7.00**	**0.00**
Total Component 2	**82.00**	**82.00**	**0.00**
Total costs	**188.00**	**163.00**	**25.00**
Counterpart funding	**22.00**		
Total project costs	**210.00**		

C. Series of National-Level Projects to Lay the Groundwork for Regional Resilience

24. The South Asia Region regional hydromet program has been instrumental in defining a regional framework for hydro-meteorological modernization, DRM, and climate resilience. The main objective of the program is to strengthen institutions, facilitate knowledge exchange, and enhance cooperation between countries in South Asia with respect to the management of hydromet risks. A defining feature of the program is starting from national activities and building up to sub-regional and regional cooperation. Annex 1 provides details on national projects that are laying the groundwork for regional resilience.

25. Because of the regional aspects of the program, regional IDA will fund activities under Component 1. The majority of regional funding will go toward Sub-component 1.2, which will enable PMD to participate in and contribute to regional and global data-sharing and collaboration. Meteorological data will contribute to improving the regional and global numerical weather and climate prediction, which in turn will better represent the regional meteorological patterns, thereby improving the forecast accuracy and directly affecting Pakistan's ability to participate in and contribute positively to regional cooperation on hydromet. Under Sub-components 1.1 and 1.2, regional funding will support efforts to strengthen

the national strategy and define international commitments and obligations, and will build PMD's capacity to participate in regional collaboration with increased levels of confidence and technical expertise. Sub-component 1.3 will contribute positively to data-sharing and improved climate risk information, which will benefit global and regional climate impact prediction and risk management, thereby contributing to regional resilience. Regional funding provides an important incentive for the client to engage actively in regional-level dialogue and initiatives.

D. Lessons Learned and Reflected in the Project Design

26. Institutional strengthening is critical to the sustainability and success of the project. Capacity-building activities must be based on a realistic assessment of the client's existing institutional capacity. Weather agencies are generally new clients to the Bank and thus are not familiar with managing projects of this scale. Capacity building must therefore be a concerted effort throughout the project to ensure proper project management, procurement, and so on. Although system integrators have shown mixed performance in several hydromet operations in the Bank's portfolio, it has become evident that they continue to play a critical role in supporting project preparation and implementation. A strong focus on service delivery and user needs is crucial to project outcomes. The project is based on demand from key sectors—agriculture, water, and disaster management—and will also include the behavioral change PMD needs to focus its support on users/service delivery, ensuring that forecast, warning, and other advisory services address specific needs and will have benefits all the way to the community level.

IV. IMPLEMENTATION

A. Institutional Arrangements

27. The project will depend on existing government structures for implementation, and the activities and investments under the project will be implemented through two federal entities. Component 1, focusing on hydro-meteorological and climate services, will be implemented by the PMD, which is under the Cabinet Secretariat's Aviation Division, and NDMA, which is under the Ministry of Climate Change, will be responsible for implementing Component 2, focusing on DRM in the country. These federal entities will establish dedicated project implementation units (PIUs) to assist in the implementation of the project activities. Both implementing agencies will be responsible for appointing a Project Director and hiring key staff and consultants for their PIUs to meet the project requirements. A close linkage between the implementing agencies would be ensured through the connectivity of the EWS.

28. The implementing agencies, through their PIUs, will have responsibility for project implementation: reporting, knowledge management, monitoring and evaluation, social and environmental management, procurement, financial management (FM), audit and disbursements, and coordination with the line agencies and the Bank. Each PIU will be adequately resourced with the skill sets and competencies required for project implementation and monitoring. The PIUs will be created and adequately staffed within one month after project effectiveness.

29. The implementation of both components will require close coordination among different government stakeholder agencies and the implementing agencies. The PIUs will convene regular joint meetings to ensure coordination, information sharing, and knowledge exchange. To ensure overall guidance and coordination for project implementation, a dedicated Project Coordination Committee, comprising senior representatives from concerned federal and provincial departments, would be established as the apex forum (see Annex 2 for details). Key public sector partner institutions would act as implementing partners for Component 1: the Aviation Division, the NDMA and PDMAs, WAPDA/Ministry of Water and

Power, FFC, PIDs, and PADs. This joint implementation arrangement will enable stakeholders to closely oversee improvements of products and services funded by the project in their respective sectors. To facilitate this objective, a Joint Technical Stakeholder Group has already been established during project preparation.

30. **Project Operations Manual.** The project will be implemented according to the guidelines and procedures outlined in the Operations Manual (OM), which should be updated periodically and cleared by the Bank. The manual will lay out the roles and responsibilities of different stakeholders and provide details of project processes and project cycle.

B. Results Monitoring and Evaluation

31. The project will have a strong focus on monitoring and evaluation (M&E) to track implementation progress and results, and to ensure that feedback is continuously informing and improving implementation. M&E consultants will be contracted to support both implementing agencies in this endeavor. The areas that will be supervised and monitored are social and environmental aspects, physical progress, and results. Annex 2 provides more details on M&E, and the M&E system has been fully described in the OM.

C. Sustainability

32. Several aspects are critical to project sustainability.

- **Demand and government ownership.** The sustainability of this investment will rest on continued demand for weather, water, and climate products such as warnings, forecasts, and advisories from Government decision-makers, Government ministries and departments, and beneficiaries at the community level. Past hydromet projects were only partially successful when they focused on data collection only. This project has therefore been designed to transform the current system from a traditional data-gathering organization into one that is modernized and service-oriented and based on intra-government collaboration. The project has been approved at the National Disaster Management Commission (NDMC) which is Chaired by the Prime Minister and comprises of all provincial Chief Ministers, demonstrating the ownership of the project at the highest levels of Government.

- **Design and affordability.** A potential risk to the sustainability of hydromet and DRM systems is inappropriate and unaffordable design. Systems must be designed to use equipment that is suited to the geography, climate, and communities in which it will be installed. Similarly, the sustainable O&M of the system must also be designed in context, ensuring in particular, adequate skills and financing. Regarding financing, the project will provide initial O&M funding for the new investments, but over the lifespan of the project the Government will need to increasingly assume O&M responsibility. The annual incremental O&M costs are estimated at this stage in the range of US$7–8 million,[10] and are considered affordable based on international comparators. Currently, most of PMD's budget is spent on staff salaries rather than system upgrades and maintenance. It is expected that improved PMD services and better responsiveness to user demands will ensure that adequate resources are allocated for PMD's O&M budget. The Aviation Division has agreed to increase the O&M budget on a sliding scale for the new investments made under the project to be able to cover O&M needs by the project's closing date.

[10] Incremental O&M costs are typically 10–15 percent of the total budget of NMS purchased equipment and systems, depending on the composition of networks and the types of observations.

- **Staff capacity.** The modernization of hydromet services is highly technical and requires significant technical capacity from staff in PMD and its sub-departments, the service provider, and the various user agencies. An adequate number of meteorologists and hydrologists with relevant university degrees and experience will have to be recruited. A systematic training assessment will be carried out for both implementation units (NDMA and PMD) during project preparation to inform a full training plan—including training topics, modalities, and timeline—that will be financed and rolled out during implementation.

D. Role of Partners

33. **All development partners in Pakistan were fully consulted during project preparation, some through direct bilateral engagements and others through PMD and NDMA.** Where possible, the Bank will continue to seek further outreach and coordination with development partners working in the sector. Annex 2 describes the ongoing engagements that PMD and NDMA have with regional cooperation projects and various development partners.

V. KEY RISKS

A. Overall Risk Rating

Table 2. Systematic Operations Risk-Rating Tool (SORT)	
Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Substantial
9. Other	Moderate
OVERALL	Substantial

B. Explanation of Key Risks

34. **The overall risk for the project is considered Substantial (Table 2).** Key risks to achieving the project development objective include (a) counterpart capacity constraints, both technical and institutional; (b) the technical complexity and requirements of the project design; (c) fiduciary aspects; (d) an increased O&M requirement; and (e) the need for strong coordination between PMD as the implementing agency and key stakeholders/implementing partners.

35. **Political and governance risks are assessed as substantial.** The risks arise from possible changes in political leadership and the reform agenda post-elections, as well as lack of sustained political ownership. This would be mitigated through continued dialogue with key stakeholders post-election, and utilizing mechanisms such as the PCC. Sector strategy and policies also pose substantial risks, since there are multiple actors, polices and strategies in the DRM sector. The project will support a broader institutional review of the sector, which would provide recommendations to clarify roles and responsibilities,

strategies and policies. The recommendations from the review would be implemented through the project. Technical and institutional counterpart capacity constraints pose a substantial risk to the project. Considering the lack of sufficient expertise within PMD and NDMA to carry out the modernization, significant capacity building is embedded into each of the project components as a core part of the project. Existing staff will be trained on technical aspects; and where in-house or national capacity is not available, external assistance from international technical consultants will be contracted. A Systems Integrator (SI) will be contracted with the responsibility for using CONOPS to assess existing systems and design an optimum composite observation network, forecasting and service delivery processes, detailed design and specification of modernized PMD systems, integration with other stakeholders' systems, and procurement. A capacity assessment of NDMA will be undertaken at the start of the project to recommend and put in place appropriate structures, systems, and human resources.

36. **Fiduciary aspects** pose substantial risk to the project.. Additional capacity from the market will be hired to support PMD and NDMA on project management, and fiduciary aspects during project implementation to advance critical procurement activities and preparatory work. To expedite procurements, TORs of key upstream consultancies have been prepared and advertised.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

37. **To estimate the value of strengthening Pakistan's services, a benefit-cost analysis (BCA) of the proposed project was conducted**. A first-year investment of US$10.0 million was assumed (see expected disbursements in data sheet), and the remainder of the investment is assumed to be apportioned across a project implementation period of four more years. Factors for capital maintenance (e.g., depreciation) and for O&M are assumed to apply to 70 percent of the cumulative investment at a rate of 10 percent per year. More details on this analysis can be found in Annex 4.

38. **Benefits.** For benefit estimates, a simple benefit transfer in which the results of existing valuation studies are taken and transferred to the current context, was implemented. The primary transfer value used was an estimate for households' willingness to pay (WTP) for improvements to national hydromet services in Mozambique. Using an income ratio conversion from Mozambique to Pakistan and updating to 2016 income levels, the aggregate national Pakistani WTP estimate for hydromet forecast improvement equals US$90.5 million. A second transfer benefit is based on estimates for an improved cyclone warning service in Vietnam. Transferred to Pakistan and aggregated, this indicates a potential national annual WTP of US$12.9 - 19 million. Evidence from both advanced and developed economies that have undertaken these pre-disaster investments for enhancing disaster response capability and reducing vulnerability indicates that such investments yield extensive returns in terms of avoiding property damage and saving lives.

39. **Analysis results.** For all calculations, real values are applied that do not factor in inflation or potential changes in exchange rates. A discount rate of 12 percent was used, as required by World Bank guidelines on economic analysis. As part of the sensitivity analysis, a discount rate (6 percent) was looked at, that could be more applicable for Pakistan. Table 3 shows the results using the baseline analysis variables (i.e., the Mozambique WTP study estimate) to establish a baseline BCA and scaling it for diminishing O&M. A net present value (NPV) of US$308.7 million and a benefit-cost ratio (BCR) of 1.9 indicate that the project is economically viable. The present value of benefits to households is US$635.7 million, and the present value of costs is US$327 million, using a time horizon of 50 years for the project with basic assumptions and a 12 percent discount rate.

Table 3. Results of Baseline Benefit-Cost Calculations, US$ millions	
Total present value – benefits (US$)	635.66
Total present value – costs (US$)	326.96
Net present value (NPV) (US$)	308.71
Benefit-cost ratio	1.94

B. Technical

40. The project's technical design builds on the country and regional context, international best practice, extensive technical work prior to preparation, thorough consultations with government counterparts and broader stakeholders, and engagement with a range of international expert partners and consultants. The project combines investments in institutions—to both service providers and end-users (to ensure efficiency, effectiveness, and sustainability)—and investments in infrastructure (to deliver tangible benefits) for the provision of hydromet and climatological information services. Design of the hydromet modernization program conforms to best practices established by the WMO and previous Bank-financed operations in this area and (a) ensures a system-wide approach, to lay the foundation for support from the Bank and future support from other development partners; and (b) ensures that the project can stand alone—that is, its activities and investments will result in the desired outcomes without being dependent on the support of other development partners.

C. Financial Management

41. The FM arrangements of both implementing agencies were reviewed during preparation to assess the risks and develop mitigation measures. The implementing entities are not familiar with fiduciary reporting requirements under IDA credits, including maintaining and operating designated accounts, and both will need to engage FM specialists with relevant qualification in accounting. The FM risks for the project are rated as Substantial. Separate Designated Accounts (DAs), established in US dollars, will be opened for each PIU of the project in accordance with the agreed procedures issued by the Finance Division of the Finance Ministry, GoP. Disbursements will be based on statements of expenditure during the first year of the project until the accounting and reporting systems are strengthened and both PIUs can base disbursements on interim financial reports (IFRs). Implementing entities will submit their semiannual IFRs within 45 days after the close of each semester. The project will also be subject to an annual audit by the Auditor General of Pakistan, and the audited project financial statements will be submitted to the Bank within six months after the end of each financial year.

D. Procurement

42. The procurement arrangements of both implementing agencies were reviewed during preparation to assess the risks and develop mitigation measures. There are risks of delays in processing procurement activities because of the limited capacity and experience of the entities, and the low clearance thresholds. It will take time to build the learning curve of the organization to process procurement activities swiftly. In terms of risk mitigation measures, procurement planning and management needs to be strengthened for timely completion of activities. Internal auditors will be hired for internal controls. Further, procurement and contract management functions, and SOPs have been defined in the project OM. During implementation, close supervision and monitoring by the implementing agencies' management is required to ensure that the planned timelines are met. Implementing agencies are also required to identify the project's critical path and to plan all activities in line with that critical path. The recommended

procurement approaches for PMD and NDMA are contained in the Project Procurement Strategy for Development. The Procurement Plan for the first 18 months of the project has approved and disclosed.

E. Social (including Safeguards)

43. **The social risk classification for the project is Moderate.** The project will support several interventions, but the scale of these interventions is not expected to require large parcels of land that can lead to resettlement. Because the exact location of infrastructure remains to be finalized, a Resettlement Policy Framework has been prepared, and its impact on resources will be assessed in depth through the Environmental and Social Management Framework (ESMF). The Resettlement Policy Framework has been reviewed and cleared by the World Bank and adopted by PMD and NDMA. Further, it has been disclosed on the PMD, NDMA and World Bank websites on March 19, 2018.

44. **Citizens' engagement will be a priority for the project.** Consultations with citizens who would potentially benefit from the project were carried out, and their feedback was incorporated in the project design. The project will use several interventions to promote citizens' participating in consultations, and benefiting from EWSs and disaster preparedness (see Annex 2). Regular feedback and input from communities prone to disasters will be sought, and will feed into project implementation.

45. **Gender analysis.** Studies have shown that disaster fatality rates are much higher for women than for men, largely because of gender-based differences in capacity to cope with such events and in access to information and early warnings. In Pakistan, one of the main social problems caused by the 2010 floods was females' adjustment, especially at relief camps. Women are more vulnerable than men in the same natural disaster setting. Gender inequality, socio-cultural dynamics and lack of access to appropriate healthcare, increases the risk faced by women in relief camps. The Government of Pakistan, through the NDMA, established the Gender and Child Cell (GCC) to recognize and respond to issues relating to gender and other vulnerabilities in all phases of disasters. In addition, it deals with each of the areas with reference to institutional processes, capacity development, implementation, and data management. Through the GCC's gender mapping effort, NDMA has identified six structural gender gaps that need to be accorded high priority: (a) capacity building of government institutions; (b) adequate use of information by women; (c) economic justice for women; (d) governance and women's empowerment; (e) gender mainstreaming in disaster management policies; and (f) poverty incidence by demography.

46. ***Gender action.*** The project design and implementation plans have taken gender differences into account, considering that men and women often have different access to relevant information, perceptions of risk, take on different roles in emergencies and disaster preparedness, and face different impacts. The project has prioritized three gender gaps that will be addressed through this project delineated under a, b and e as identified above. This includes access to information, capacity building of government institutions on gender responsive DRM services and gender mainstreaming in disaster management policies. The project will strengthen the GCC to increase outreach and undertake awareness raising activities to target women, as well as include gender considerations in all policies, plans and strategies to be developed by NDMA. In particular, the annual flood contingency plans will incorporate gender considerations as part of contingency planning.

47. ***Gender monitoring.*** Broadly, the project will monitor the percentage of female beneficiaries benefitting from the overall activities at user departments and at the community level. To ensure that the aforementioned gender specific actions are delivered, the project will monitor women and men's

improved access to DRM information, review the number of NDMA strategies, plans and policies from gender lens and assess the relevant Government's staff understanding of gender responsive DRM services.

F. Environment (including Safeguards)

48. **The overall environmental risk is rated as Moderate.** The project is assigned environmental and social safeguard category B because of the low to moderate environmental impacts that could arise from construction and civil works under Components 1 and 2: potential temporary and localized noise, dust and erosion, as well as potential adverse social impacts on public health and safety, traffic, and social conflicts. These issues necessitate proper planning, effective implementation and monitoring, and responsive and adaptive management. Therefore, a framework approach has been proposed for environmental assessment under the World Bank's Operational Policy 4.01, *Environmental Assessment*. An ESMF has been prepared to manage the potential impacts. It describes (a) institutional arrangements to manage the environmental impacts of the project, (b) monitoring requirements to ensure effective implementation of mitigation/enhancement measures, (c) training needs, and (d) reporting and documentation requirements. In addition to the ESMF, Environmental and Social Management Plans (ESMPs) have been prepared for proposed civil works, including the installation of radar in Lahore PMD office premises and the modernization and upgrading of the Monsoon Monitoring Center at PMD's head office in Islamabad. The ESMF and ESMPs were reviewed and cleared by the World Bank, and adopted by NDMA and PMD. Further, the safeguards documents have been disclosed on the PMD and World Bank websites on March 19, 2018.

49. **The climate co-benefits for the project are estimated to be 100 percent of project financing.** The improvement in the quality and reliability of climate information and facilitating information sharing on weather and water resources, through modernization of hydromet services, is critical for decision-making in a changing climate

G. World Bank Grievance Redress:

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

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY : Pakistan

Pakistan Hydromet and DRM Services Project (PHDSP)

Project Development Objectives

To strengthen Pakistan's public sector delivery of reliable and timely hydro-meteorological and disaster risk management services.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Improved weather forecasting		Number	0.50	0.70	Baseline, annually, end of project	Review of skills during regular training to be conducted during the project lifetime, and forecast verification techniques.	Self-reported by PMD
Description: This indicator will measure the improvement in weather forecast skill of 24 hour public weather forecasts for mean temperature and rainfall, to be measured through forecast verification techniques. Skill is defined as 0-1, where 1 is perfect score. As baseline, quality assessments indicate the range of 0.5							
Name: Increased satisfaction of departments and communities with PMD services		Percentage	25.00	40.00	Baseline, MTR, and end of project	Based on international benchmarking of similar NHMS baseline and improvement targets for similar interventions. The team will develop the surveys that will be used to measure desired improvements.	Self-reported by PMD.
Description: This indicator will measure composite satisfaction index expressed as a %, with 100% meaning completely satisfied.							
Name: Increased capacity to deliver		Percentage	10.00	50.00	Baseline, MTR, and end of	Based on national benchmarks established through other Bank	Self-reported by NDMA.

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
DRM services to user departments and communities					project	projects with similar interventions at the provincial level. The team will develop the surveys that will be used to measure desired improvements.	
Description: This indicator will measure composite satisfaction index expressed as a %, with 100% meaning completely satisfied. DRM services will be gender responsive.							

Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Number of beneficiaries within selected subgroups in user departments and communities, gender disaggregated		Number	0.00	500,000.00	Baseline, annually, end of project	For departments: Regular consultations with key stakeholder departments. For communities: (a) public surveys, consultations and workshops conforming with WMO methodologies, disaggregated where possible for gender and vulnerable groups; and (b) direct feedback from users through PMD and NDMA websites.	Self-reported by PMD
Description: This indicator will assess the number of people and user departments benefitting from improved forecasts and warnings generated by PMD. The indicator will only measure project investments, therefore, the baseline is set at 0. Women will be equally represented in information dissemination consultations, workshops and other activities.							
Name: Improved access to and use of training opportunities in PMD		Percentage	20.00	90.00	Baseline, annually, end of project	Identified through training assessment and surveys.	Self-reported by PMD.
Description: This indicator will assess percentage of trained/retrained professional PMD staff. Training here is defined as (a) formal classroom courses, in-house or elsewhere, (b) seminars and/or lectures, and (c) duly evidenced self-study. This indicator will target staff of PMD and stakeholders. As baseline, 20% staff are already trained (30 staff).							
Name: Meteorological observation stations operating in compliance		Percentage	0.00	90.00	Annually	Periodic inspections by PMD HQ staff.	Self-reported by PMD.

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
with SOPs							
Description: This indicator will measure the number of meteorological stations complying with SOPs.							
Name: Improved subregional information exchange		Text	None	Provision of monsoon information from PMD to neighboring countries through a Web portal	End of project	Monitoring the web portal.	Self-reported by PMD
Description: This indicator is related to the amount of information available on the Web portal set up to show the information produced by the Monsoon Center. It will measure the establishment of the Monsoon Center and provision of monsoon products and information from PMD to neighboring countries.							
Name: Gender mainstreaming at NDMA		Number	0.00	4.00	Baseline, annually, end of project	Consultations with NDMA.	Self-reported by NDMA.
Description: This indicator will monitor the number of strategies, plans, and policies that incorporate gender aspects.							
Name: Number of multi-hazard vulnerability risk assessments completed		Number	0.00	10.00	Baseline, annually, end of project	Consultations with NDMA.	Self-reported by NDMA.
Description: This indicator will measure the number of available and completed multi-hazard risk assessments. The indicator will measure the MHVRA financed by the project and therefore baseline is set at 0.							
Name: Establishment of the National Disaster Response Force		Number	0.00	1.00	End of project	Consultations with NDMA	Self-reported by NDMA
Description: This indicator will measure the capacity of NDMA to respond to disasters. Currently, NDMA has limited urban search and rescue capacity, however these are distinct from that national disaster response force.							

Target Values

Project Development Objective Indicators

Indicator Name	Baseline	End Target
Improved weather forecasting	0.50	0.70
Increased satisfaction of departments and communities with PMD services	25.00	40.00
Increased capacity to deliver DRM services to user departments and communities	10.00	50.00

Intermediate Results Indicators

Indicator Name	End Target
Number of beneficiaries within selected subgroups in user departments and communities, gender disaggregated	500,000.00
Improved access to and use of training opportunities in PMD	90.00
Meteorological observation stations operating in compliance with SOPs	90.00
Improved sub-regional information exchange	Provision of monsoon products and information from PMD to neighboring countries through a Web portal
Gender mainstreaming at NDMA	4.00
Number of multi-hazard vulnerability risk assessments completed	10.00
Establishment of the National Disaster Response Force	1.00

ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY: Pakistan
Pakistan Hydromet and DRM Services Project

1. The project interventions are expected to improve hydro-meteorological information and services, strengthen forecasting and EWSs, improve the dissemination of meteorological and hydrological forecasts, warnings and advisory information to stakeholders and end-users, and strengthen the DRM capacity and services of the NDMA. The project has three main components and will be implemented over five years.

2. In support of climate change adaptation, Sub-components 1.1, 1.2, and 1.3 will improve PMD's capacity to collect and analyze data and inform stakeholders so they can more efficiently use this information in planning and decision-making. While this project will focus its support on DRM, agriculture, and water as its main beneficiaries, many other sectors—including energy, transport, and health—can benefit from improved hydro-meteorological services to promote adaptation to climate change. Early during project preparation, a climate change screening assessment determined that the risks associated with climate change for this project are medium to low.

Component 1: Hydro-meteorological and Climate Services (Total US$ 106.0 million)

3. The objective of this component is to improve the capability of the PMD to understand and make use of meteorological and hydrological information for decision-making. In line with international best practices, this objective will be achieved through investment in strengthening the institutional set-up and building the capacity of human resources at the PMD. The Concept of Operations (CONOPS) is an important tool for PMD, which will provide a conceptual overview of the proposed system and subsystems. The component will include four sub-components.

4. **Sub-component 1.1: Institutional Strengthening and Capacity Building (Total US$6.0 million, of which US$2.0 million is IDA regional funding).**
   - *1.1.A: Institutional strengthening and development of a legal and regulatory framework (US$1.4 million).* This activity will support PMD in developing a national strategy for weather, climate and hydrological services and improvement of EWS; improving its legal and regulatory framework for its operations; assessing its ability to engage in public-private partnerships; and improving its operational relations with federal and provincial entities.
   - *1.1.B: Capacity building and training of PMD and main stakeholders (US$4.15 million).* This activity will support PMD in training technical personnel, establishing potential collaboration with local universities for research and development, and providing training support for main stakeholders and training activities for end-users, including agriculture, water resources, DRM, civil aviation, energy, and health.
   - *1.1.C: Outreach and public education, awareness raising, marketing (US$0.45 million*). This activity will include the preparation of materials, documentaries, brochures, website, and so on, as well as school visits, participation in events, organizing seminars. All these knowledge products and information services will be gender responsive. Women, men, boys and girls will be covered in information dissemination activities.

5. **Sub-component 1.2: Modernization of the Observation Infrastructure, Data Management, and Forecasting Systems (Total US$86.7 million, of which US$20.0 million is IDA regional funding).** This sub-component aims to upgrade and expand the meteorological, agro-meteorological, and hydrological observations networks and ensure that they are well functioning and interoperable; modernize data management, communication, and information and communication technology (ICT) systems; improve weather and hydrological forecasting processes and numerical prediction systems; and refurbish PMD's operational facilities. The bulk of the activities in this component include procurement and installation of goods such as monitoring equipment and ICT. Because of the large level of investment in highly complex and technical infrastructure under this component, it is essential that effective O&M processes for and adequate year-on-year allocations are established for the sustainability of the investment, to ensure that the equipment/systems continue to provide their expected benefits throughout their design life. Over the course of the project, the project would support the incremental costs for O&M on a declining basis, with the

Government of Pakistan progressively taking these up through counterpart finances and regular allocations as part of the budget. The sub-component will include five activities.

- *1.2.A: Technical modernization of the observation networks (U$58.5 million).* This activity will support the expansion and upgrade of the prioritized stations of the network, expansion of the Doppler radar network, restoration of upper air observations, installation of wind profilers, improvement of hydrological stations and systems, and expansion and re-equipment of the agro-meteorological network.
- *1.2.B: Modernization of PMD data management, communication, and ICT system (U$12.3 million).* This activity will support the modernization of communication and computer equipment and data management systems for weather, climate, and hydrological data, including remote sensing data acquisition and processing.
- *1.2.C: Improvement of the weather forecasting process, including numerical weather prediction (NWP) system (US$3.2 million).* This activity will include access to global and regional NWP digital data and products, implementation of real-time forecast process monitoring and verification, high-performance computers for implementation of now-casting and very-short-range forecasting systems, NWP calibration and post-processing, flood early warning system (FEWS), and establishment of standard operational procedures for weather forecasting.
- *1.2.D: Improvement of hydrological forecasting system, including flood modeling system (US$1.2 million).* This activity will provide access to global hydrological products, the implementation of real-time forecast evaluation, model verification, and calibration and post-processing systems and visualization tools.
- *1.2.E: Expansion and refurbishment of PMD's operational facilities (US$11.5 million).* This activity will establish the Monsoon Monitoring Center in Islamabad and upgrade the Flood Forecasting Division (FFD) to a National Flood Forecasting Center with five Regional Flood Forecasting Centers. It will also refurbishment the PMD operational facilities, including the Institute of Meteorology and Geophysics and FFD. An engineering design and supervision firm will be engaged to support this activity.

6. **Sub-component 1.3: Enhancing PMD Service Delivery and Building Partnerships with the Private Sector (Total US$9.3 million, of which US$3.0 million is IDA regional funding).** This subcomponent will enhance PMD's service delivery system by introducing public weather and hydrological services and enhancing end-to-end early warning systems and services, including impact forecast and warning services; developing agriculture and climate advisory services; creating a National Framework for Climate Services; and strengthening services for the aviation sector. The WMO Strategy for Service Delivery and its Implementation Plan[11] provides in-depth and step-by-step guidance for enhancing and developing service delivery. This sub-component will be essential in improving the credibility and penetration of PMD's services to the public and decision-makers and will potentially generate new sources of revenue in the future. In addition, improving information customization and dissemination to address the needs of consumers is expected to produce climate change adaptation co-benefits in terms of reducing vulnerability and improving preparedness to adverse hydro-meteorological events. Priority target end-users would initially include (a) agro-meteorological information services, (b) food security, (c) emergency and disaster risk management, (d) water resource management, and (e) aviation. The sub-component will include six activities. Activities 1.3.B and 1.3.C will strengthen the linkages between Components 1 and 2 since the main stakeholder for these activities will be NDMA.

- *1.3.A: Introduction of public weather and hydrological services (water resources, DRM, agriculture, irrigation, media, civil aviation, transport, health, energy, etc.) (US$1.7 million).* This activity will support PMD in developing and enhancing new and existing user-tailored products and services; developing a Common Alerting Protocol (CAP) capability at PMD and NMDA; improving dissemination mechanisms to all communities; and developing mechanisms to evaluate forecast utility and user satisfaction.
- 1.3.B: *Strengthening of end-to-end EWS, including a regular post-event review process (US$1.0 million).* This activity includes the development and implementation of a joint forecast and warning service desk, the strengthening of end-to-end EWS, including glacial lake outburst flow (GLOF) and post-event review and assessment as part of improving the EWS. The activity would also support strengthening of the seismic monitoring network.
- 1.3.C*: Introduction of impact-based forecast and warning services in support of operations of DRM and other stakeholders (US$1.6 million).* This activity includes the development of impact-based forecast and warning services and the introduction, pilot testing, and operationalization of impact-based forecast and warning

[11] *WMO Strategy for Service Delivery and its Implementation Plan* (WMO 2015) WMO-No.1129.

services in selected vulnerable districts/cities. These activities will be aligned with and complemented by activities 2.1.F and 2.1.G implemented by NDMA.

- 1.3.D*: Development of Agriculture and Climate Advisory Service (ACAS), including drought monitoring (US$2.5 million).* This activity will include the activation of regional agro-meteorological centers and the satellite assessment of crop condition-Global Land Assessment Model, and will encourage collaborative research with agriculture research institutions.
- 1.3.E*: Creation of the National Framework of Climate Services (US$1.5 million*). This activity will support the development and implementation of a National Framework for Climate Services as well as the development of a digital library of climate-relevant information from all sectors for Pakistan, including digitization of originals (data rescue), quality control of historical data, and a centralized and standardized database, including metadata.
- 1.3.F*: Strengthening services for aviation (US$1.0 million).* This activity will include the upgrade of the monitoring and forecasting system at airports to improve services to aviation, and the installation of an Aircraft Meteorological Data Relay system at 10 international airports.

7. **Sub-component 1.4: Project Management, Systems Integration, and Monitoring and Implementation Support to PMD (Total US$4.0).** The objective of this component is the development of detailed designs and integration of the modernization with other stakeholder systems. The activities will include the hiring of a systems integrator to provide procurement and implementation support, guidance, technical advice and support to PMD operations and the overall modernization program, and support for project management, monitoring, reporting, and evaluation of subcomponents 1.1, 1.2, and 1.3. The subcomponent includes three activities.
   - 1.4.A*: Assess and design an optimum composite observation network and forecasting and service delivery processes (weather, climate, and hydrological) (US$2.0 million).* This activity will include detailed design and specification of PMD systems and integration with other stakeholders' systems, procurement (technical specifications, bid documents, evaluation, supervision support), and implementation support (systems integrator).
   - 1.4.B*: Project management, monitoring, reporting, and evaluation (US$1.0 million).* This activity will include project management, safeguards, monitoring, reporting, and evaluation of subcomponents 1.1, 1.2, and 1.3, including evaluation of the project's results in improving the capability of PMD.
   - 1.4.C: *Operations and maintenance (O&M) costs (US$1.0 million).* The activity will support the O&M costs.

Component 2: Disaster Risk Management (Total US$82.0 million)

8. This project component will support implementation of the priorities identified in the National Disaster Management Plan, NDMP Road-Map 2016-2030, and the Sendai Framework for Disaster Risk Reduction. Under this component, capacity enhancement of NDMA will be prioritized. NDMA will be responsible for implementation of the project, and coordination with the key stakeholders. The main activities of this component will focus on strengthening NDMA's emergency response capacity; establishing the National Emergency Operations Center (NEOC), the National Institute of Disaster Management (NIDM), and the National Disaster Response Force; reviewing the country's DRM system; and conducting hazard assessments in priority districts. The component has three subcomponents.

9. **Sub-component 2.1: Legal Policy and Institutional Strengthening (Total US$40.0 million).** This sub-component will primarily focus on strengthening the country-level DRM system through a consultative process-led review of the National Disaster Risk Management Framework and the National DRR Policy. This subcomponent aims to enhance the capacity of NDMA and key stakeholders in improved availability of risk information based on quantitative and scientific evidence, the DRM capacity of government officials, and NDMA's capacity in timely and efficient emergency response. It has seven activities.
   - 2.1.A: *Advisory services to strengthen the existing legal disaster risk management framework and policy (US$0.5 million).* This activity will provide technical and legal assistance for a systematic review of the existing DRR policy, the NDMA Act, and the National Disaster Management Plan. It will study options and provide an assessment of

current and future enhanced coordination, particularly between NDMA and FCC, for enhanced delivery of DRM services.

- 2.1.B*: Institutional strengthening for DRM (US$4.5 million).* This activity will provide support for strengthening the DRM institutional structure and building the capacity of the NDMA. It will include institutional capacity assessment and a comprehensive capacity enhancement plan, mainstreaming gender, DRM and climate change in planning processes led by government departments. The institutional capacity assessment study will determine specific requirements for the capacity-building support to be provided during project implementation. Building the capacity of NDMA and key stakeholders in mainstreaming DRM, climate risk management, and resilient development will be accorded high priority. Further, NDMA's GCC will be strengthened to ensure that core capacity on gender issues is developed at the organization, and that gender continues to be a prominent consideration in future activities. The capacity enhancement plan will also include activities specific to gender mainstreaming in DRM.
- 2.1.C*: Strengthening of disaster risk financing mechanisms (US$2.0 million).* This activity will assist the NDMA in formulating, testing, and finalizing a disaster risk financing strategy. The strategy will aim to formalize the objective and scope of the Government's work in disaster risk financing, evaluate various financial and budgetary instruments to finance its contingent liability for natural disasters, and prepare the implementation of selected instruments. It will provide a framework for meeting the specific financial needs for post-disaster emergency response and reconstruction through a combination of different financial and budgetary instruments. The strategy will formalize objectives and scope, evaluate financial instruments and contingent financing, evaluate potential public-private partnership funding opportunities, and recommend the implementation of selected and prioritized interventions.
- 2.1.D*: National Disaster Response Force local and community response (US$20.0 million).* This activity is primarily designed to build emergency response capacity at the national level. It will include the hiring and training of staff and procurement of standard emergency response equipment. It will also support the response mechanisms from the local, down to the community level by developing gender responsive protocols, evacuation drills and exercises, and training for first responders.
- 2.1.E*: Strengthening of urban search and rescue (USAR) teams (US$7.0 million).* This activity will strengthen the existing USAR system. The key activities include refresher courses for the USAR teams and procurement of up-to-date equipment for them. In addition, the project will provide better search and rescue equipment and improve stockpiles and associated logistics for rescue and relief operations by NDMA and other relevant agencies. Refresher courses and training of USAR teams will also include up-to-date search and rescue certification.
- 2.1.F*: Multi-hazard vulnerability and risk assessment (US$4.0 million).* The activity will support micro-level multi-hazard risk assessment of 38 selected districts of KP and Balochistan. The assessment will be guided by the standard multi-hazard risk modeling techniques and risk information guidelines that have been developed by NDMA. This activity will feed directly into impact-based forecasting in Component 1. It will also contribute to enhancing the capacity of the national-level technical agencies to undertake risk assessments and will mainly build on existing data and capacities. The activities include establishing a knowledge base of national risk profiles, down to the union council level.
- 2.1.G: *Analytics and research on hazard impacts (US$2.0 million).* The results of this activity, supporting analytical work on climate hazards and their impacts, will benefit several sectors in the country. The analytical work will be undertaken in collaboration with the Global Climate Change Impact Study Center, to better inform mainstreaming climate resilience initiatives in development planning. This activity will also directly feed into the impact-based forecasting activities in Component 1.

10. **Sub-component 2.2: Infrastructure for Resilience (Total US$ 35 million).** This component has five activities.
    - 2.2.A*: National Emergency Operations Center (NEOC) (US$14.0 million).* This activity mainly involves developing NDMA's institutional set-up and operational capacity by establishing NEOC. The project will finance, systems, equipment, information and communications technology, and trainings. Facilities will be disaster- and climate-resilient, meeting some of their energy needs through alternative energy sources. The strengthening of NEOC will be line with global best practices and lessons learned, tailored to fit the Pakistan context. To ensure coordination and pooling of resources and capacities, the NEOC will be linked with the provinces and districts

to provide real-time data-sharing capabilities. To determine and generate early warnings and alerts, the NEOC will be connected to the PMD's joint working desk (as provided under Component 1). A training and capacity enhancement plan specifically designed for NEOC staff will also be part of this activity. This activity will further strengthen the Government's capacity to manage disaster events through: (a) an improved system for collecting and processing information related to disaster events for the generation and dissemination of early warnings and instructions to communities at risk; and (b) better integrating SOPs and resources among emergency response agencies. Envisaged improvements to EWS include enhancing the capacity of NDMA to disseminate information efficiently and in a timely way to key stakeholders.

- 2.2.B*: National Institute of Disaster Management (US$5.0 million).* This activity will provide support toward meeting the training and capacity-building needs of officials and DRM practitioners by providing learning opportunities. The National Institute of Disaster Management will serve as a Center of Excellence for training, research, and development in the field of disaster management for the country and the region.
- 2.2.C: *Communications, mobile command centers, and systems (US$9.0 million).* During disasters, it is critical that DRM authorities have an ability to reach out to affected areas, to assist communities and coordinate response with local authorities. This activity will support the establishment of communications and command centers, and will also support functions of the National Disaster Response Force.
- 2.2.D*: Development of Disaster Management Information System (US$2.0 million).* This activity will provide support for revamping, strengthening, and establishing a Disaster Management Information System (DMIS). Keeping in view the requirements of NDMA to make risk-informed decisions, the DMIS is envisioned to cover both pre-disaster baseline data and post-disaster real-time data, which would focus on the impact of disaster, resource availability, and response, along with recovery and rehabilitation needs. The DMIS will receive warning inputs through improved PMD forecasts (Component 1) and link them with risk information for a complete risk picture. This will allow for improved planning and response down to the community level, enabling a complete early warning chain.
- 2.2.E*: Investment framework and pilot activities for resilience infrastructure in the Federal Capital (US$5.0 million).* This activity is designed to initiate and implement pilot activities related to resilient infrastructure development in the Federal Capital. It will draw on findings of an assessment and mapping study of vulnerable infrastructure in the Federal Capital. The selection of test pilot initiatives will be based on the recommendations of the assessment and may include interventions showing resilient development through retrofitting, capacity building of construction workers in safer construction techniques, school safety standards implementation in selected schools, and advocacy and awareness raising on enforcement of building codes.

11. **Sub-component 2.3: Project Management, Monitoring and Implementation Support to NDMA (Total US$7.0 million).** The sub-component includes formulating and implementing an awareness and communications strategy that will be undertaken through consulting services. The project will be managed through a PIU that will support the NDMA in implementing the project, encompassing (a) incremental operating costs, including recruitment of additional short- term resources not readily available within the Department; (b) consultancy costs, including the engagement of project implementation support and supervision consultants; and (c) expenditures on fiduciary systems, safeguards requirements, and the grievance redress mechanism.

Component 3: Contingency Emergency Response Component (Total US$0 million)

12. This component will support preparedness and rapid response to a natural disaster, emergency, or catastrophic event as needed. The provisional zero cost for this component will allow for rapid reallocation of credit proceeds from other components under streamlined procurement and disbursement procedures. Following an adverse natural event that causes a major natural disaster, the GoP may request the Bank to reallocate project funds to this component (which presently carries a zero allocation of credit proceeds) to support response and reconstruction.[12] The component would thus allow the GoP to request the Bank to recategorize and reallocate financing from other project components (1 and 2) to partially cover emergency response and recovery costs. This component could also

[12] Such a reallocation would not constitute a formal project restructuring, as permitted under the particular arrangements available for contingent emergency response components (ref. *Including Contingent Emergency Response Components in Standard Investment Projects*, Guidance Note to Staff, April 2009, footnote 6).

be used to channel additional funds should they become available as a result of the emergency. Disbursements under Component 3 will be contingent upon the fulfillment of the following conditions: (a) the Recipient has determined that an Eligible Crisis or Emergency has occurred and the World Bank has agreed and notified the Recipient; (b) the GoP has prepared and adopted, and the World Bank has agreed on, a Contingency Emergency Response (CER) Implementation Plan; and (c) the GoP has prepared, adopted, and disclosed safeguard instruments required, under Bank guidelines, for all activities from the CER Implementation Plan that are eligible for financing under Component 3. Disbursements will be made against a positive list of critical goods or the procurement of works and consultant services required to support the immediate response and recovery needs. All expenditures under this component, should it be triggered, will be in accordance with OP/BP 8.00 and will be appraised, reviewed, and found to be acceptable to the Bank before any disbursement is made.

Series of National-Level Projects to Lay the Groundwork for Regional Resilience

13. The South Asia Region regional hydromet program has been instrumental in defining a regional framework for hydro-meteorological modernization, DRM, and climate resilience. The objective of the program is to strengthen institutions, facilitate knowledge exchange, and enhance cooperation with respect to the management of hydromet risks between countries in South Asia. A defining feature of the program is starting from national activities and building up to sub-regional and regional cooperation. While regional collaboration is essential, regional cooperation mechanisms can function only if the inputs from national systems are solid. Projects under the regional program are taking place at the national level, but have critical regional dimensions that are relevant for strengthened regional cooperation. The regional program has delivered robust results through three vehicles. (a) The Nepal Building Resilience to Climate-Related Hazards Project, a forerunner among a sequence of national-level projects, is supporting Nepal in upgrading its hydromet and agricultural management information system. The Nepal project includes important regional training activities focusing on Nepal and India. (b) Similarly, the IDA-financed Bangladesh Weather and Climate Service Regional Project was conceived as the second in the sequence of national-level projects in South Asia. The Bangladesh project is strengthening hydromet monitoring and forecasting as well as service delivery run by multiple agencies and includes important regional aspects. (c) The trust-funded Bhutan Weather and Disaster Improvement Regional Project is the third in the sequence. The proposed project in Pakistan—the largest in the region to date—would also include critical regional activities. Simultaneously with the above-mentioned investment projects, technical assistance activities—funded by the Global Facility for Disaster Reduction and Recovery (GFDRR)—focusing on hydromet are ongoing in Afghanistan. Although each project is based on in-country demand and is therefore moving forward in different stages, they all share similar objectives and will contribute to developing national and regional capacity for weather, water, and climate services. This national bottom-up approach will support national development goals and will also help implement and support key regional agreements relating to environment, disaster, and climate resilience, reflected in the Kathmandu Declaration from the 18th SAARC Summit, November 2014.

14. **In 2015 a new trust fund was set up with funding from the European Union to support and further hydromet development and regional cooperation in South Asia.** This allows the region to access financing for regional initiatives and cooperation. While progress is already being made at the national level in Nepal, Bhutan, and Bangladesh, regional-level activities are also being initiated.

15. **This regional project for Pakistan meets the criteria for accessing regional IDA funds and supports positive regional externalities in the following ways**:
    (a) The sequence of projects includes five countries: Nepal, Bangladesh, Bhutan, Sri Lanka, and Pakistan. Participation by multiple countries and national-level capacity building is required for each to contribute to generating better-quality data that can be used by the Regional Specialized Meteorological Center-Tropical Cyclones New Delhi and the Regional Climate Center Pune, as well as globally through the WMO Information System/Global Telecommunications System to prepare and share regional weather and climate forecast products and services. This would contribute significantly to strengthening regional resilience. By improving monitoring and forecasting at the national level, each of the national projects would generate significant spillover effects to regional neighbors, global NWP centers, and WMO members in general. Data-sharing is a

basic requirement for weather and climate monitoring and prediction. Under various WMO resolutions, WMO members are required to share certain data and associated metadata with other members. Several countries would benefit from strengthened data collection and forecasting in Pakistan: for example, Afghanistan, whose systems lack any significant capacity; and India and Bangladesh, which would both gain from improved monsoon forecasting. During the project period, the Bank will facilitate active regional consultations to promote cooperation in data-sharing and to pool arrangements at the regional level to improve forecasting and early warning for trans-boundary climate and weather extremes. This will eventually help save lives, livelihoods, and assets.

(b) At the same time, by strengthening the capabilities of PMD and other national departments and stakeholders, the project will also support the implementation of the Global Framework for Climate Services at the regional and national scales, which WMO is promoting in collaboration with the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia. This activity focuses on instigating and coordinating an international climatological data and service exchange between national meteorological and hydrological services, national organizations, and other stakeholders on regional and national levels through Regional Climate Outlook Forums supported by Regional Climate Centers.

(c) Finally, the project would contribute to the implementation of the regional declaration made by SAARC member countries in 2014 in Kathmandu (to implement the SAARC Agreement on Rapid Response to Natural Disasters), the SAARC Convention on Cooperation on Environment, and the Thimphu Statement on Climate Change, which has disaster and climate resilience at its core.

16. **Considering the above, regional IDA will fund activities in Component 1**. The majority of regional funding will go toward Sub-component 1.2, which will enable PMD to participate in and contribute to regional and global data-sharing and collaboration. Meteorological data will contribute to improving the regional and global numerical weather and climate prediction, which in turn will better represent the regional meteorological patterns, thereby improving the forecast accuracy and directly affecting Pakistan's ability to participate in, and contribute positively to regional cooperation on hydromet. Under Sub-components 1.1 and 1.2, regional funding will support strengthening the national strategy, defining international commitments and obligations, and building PMD's capacity to participate in regional collaboration with an increased level of confidence and technical expertise. Sub-component 1.3 will contribute positively to data-sharing and improved climate risk information, which will benefit global and regional climate impact prediction and risk management, thereby contributing to regional resilience. Regional funding provides an important incentive for the client to engage actively in regional-level dialogue and initiatives.

ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY: Pakistan
Pakistan Hydro-meteorological and Climate Services Project

Project Institutional and Implementation Arrangements

1. **Project management.** A dedicated Project Coordination Committee, comprising senior representatives from concerned federal and provincial departments, will be established as the apex forum for the project. The Committee will be co-chaired by the Aviation Division and the Ministry of Climate Change and will be composed of representatives from key departments such as the Economic Affairs Division, Finance, and Planning and Development, as well as project stakeholders and beneficiary departments. The Committee will provide overall guidance and coordination for project implementation and monitor implementation progress. It will also ensure that Components 1 and 2 are fully coordinated and feeding into each other through both implementing agencies. The detailed functions and composition of the committee would be provided in the project OM.

2. **The Pakistan Meteorological Department (PMD), under the administrative control of the Aviation Division, and the National Disaster Management Authority (NDMA) will act as the implementing agencies.** PMD will be responsible for the implementation of Component 1 of the project, focusing on hydromet and climate service delivery, and NDMA will be responsible for the implementation of Component 2, focusing on improving the DRM system and building the country's resilience against disasters. Although both implementing agencies have previously worked with donors such as the Japan International Cooperation Agency (JICA) and the Asian Development Bank (ADB), they do not have experience working on World Bank–funded projects. Both would need to establish dedicated PIUs to be responsible for the implementation of their respective components: reporting, M&E, social and environmental management, procurement, FM, audit and disbursements, as well as coordination with partner agencies and the Bank.

3. **PIU staffing.** For both PIUs, the implementing agencies will appoint Project Directors (PDs) to lead the project implementation. Project coordinators and FM, procurement, safeguards, M&E, and other required staff would be hired from the market to ensure the availability of necessary skills to implement the project and address the capacity constraints identified in fiduciary and safeguards assessments. The PDs should have an independent mandate to implement the project with a degree of autonomy from the normal organizational structure of the implementing agencies. For Component 1, the PD would report to the PMD Director General as well as the Joint Secretary in the Ministry of Aviation. This arrangement will ensure that the PD can provide critical input and facilitate close dialogue with the Ministry on strategic issues. The PD for Component 2 will report directly to the Chairman NDMA. In terms of provision of services to identified end-users, it will be important to establish and encourage links through formal and informal mechanisms under the project.

4. **Implementing partners and interagency coordination.** Key partner public sector institutions would act as implementing partners: the Aviation Division, Provincial and Regional Disaster Management Authorities, Ministry of Energy, Ministry of Water Resources, Space and Upper Atmosphere Research Commission, FFC, PIDs, PADs, USAR teams across the country, Geological Survey of Pakistan, and the Capital Development Authority. Although PMD services and projects are being used by several other public agencies that might equally benefit from a central role in this project, these key partner organizations were selected as priority sectors for this first phase of hydromet modernization because of (a) the importance of hydromet services to their daily operations and overall mandate, (b) their dual role in also supplying data critical to PMD operations, and (c) their overall criticality in Pakistan. Also, NDMA works with wide array of line departments at federal and provincial levels, and with district governments during disasters; however, these implementing partners are identified to fit the scope of project activities, which primarily focus on institutional strengthening and capacity building at the federal level. Although PMD and NDMA will serve as implementing agencies, including having responsibility for procurement, safeguards, and FM, the implementation partners will guide, implement, and oversee improvements and services, funded by the project, within their specific sectors. Coordination and dialogue will focus on several key issues: (a) project coordination and

implementation, (b) data-sharing and development of an interoperable data management system, and (c) development of user-tailored hydromet services and products. To facilitate coordination at the operational level, a Joint Technical Stakeholder Group has already been established during project preparation for the implementation of Component 1. The group consists of both implementation partners and other stakeholders who will benefit from improved hydromet services. The group, which will be chaired by the Director-General of PMD, will be used as the main forum in which users and providers of weather, water, and climate information can engage in dialogue, coordinate, and solve outstanding issues related to project activities and results.

5. **Concept of Operations.** An important tool during both preparation and implementation is the Concept of Operations (CONOPS) for PMD. The Government-owned CONOPS document provides a conceptual overview of the proposed system and subsystems. It is intended to support the evolution of a fully integrated, modernized, and functional National Meteorological and Hydrological Service that provides the level of services required by its users and stakeholders. It includes information on the current status of the system, justification for and the nature of proposed system design changes, operational alternatives, a summary of impacts, and an analysis of the proposed system as well as information on more practical implementation issues such as procurement, operation, and maintenance. It is also a chance for PMD to articulate its strategic vision and explain how different subsystems are integrated into a "system of systems." The CONOPS is a dynamic document and will be coordinated in a collaborative manner with users and stakeholders to ensure the viability of the concepts presented. It will be updated continuously as the system and context change.

6. **Project Operations Manual.** The project will be implemented according to guidelines and procedures outlined in the OM, which should be adopted by project effectiveness and will cover both components. The OM will lay out the roles and responsibilities of different stakeholders and provide details of project processes and the project cycle. It will be reviewed periodically by the client, subject to approval by the Bank, and will be revised as needed to address any constraints to the successful implementation of the project.

Financial Management

7. **Staffing at PMD.** The Chief Administrative Officer, who reports to the Director-General PMD, has the overall responsibility for the FM function of PMD. The Deputy Chief Administrative Officer heads the budget section and is responsible for the preparation of budgets, reporting of monthly accounts, and coordination with auditors. PIU-PMD will engage a qualified and experienced financial Management Specialist (FMS) who will be responsible for the FM aspects of the project and report to the PD. It is envisaged that the FMS will be supported by an accountant and a computer operator in maintaining the project's books of account.

8. **Planning and budgeting at PMD.** PMD is using the Government's budgeting system, which will also incorporate the envisaged project's annual expenditures, based on the planned activities. A monthly Budget Execution Report (BER) showing budget and actual expenditure is generated from the SAP system using the Financial Accounting and Budgetary System (FABS) terminal, and is reconciled with the records maintained by the Accountant General of Pakistan & Revenues (AGPR), Office of the Controller General Accounts, GoP. PMD's budget section is responsible for the preparation of budgets according to the "System of Financial Controls and Budgeting Rules 2006." All the sub-departments submit their recurring expenditure requirements to the budget section for compilation and onward submission. The annual budget of the department is approximately PKR 1 billion (US$10 million), and staff salaries account for nearly 86%, leaving around 14% for development expenditures. The project annual budget will be prepared by the PIU-PMD and is part of the annual Public Sector Development Programme of the Planning Division of GoP. The function and object codes will capture expenditures under the components that will be linked to the Chart of Accounts under the New Accounting Model (NAM). Budgetary control is exercised through FABS connectivity. Budgetary control is also exercised by AGPR, which pre-audits and passes payments. The Finance Ministry releases funds on a quarterly basis.

9. **External auditing at PMD.** The Auditor General of Pakistan has completed the audit of the PMD up to FY2014/2015. No major control weaknesses were reported, and the reported weaknesses are under review by the Departmental Accounts Committee. The nature of the audit observations does not have any impact on the implementation of this

project. The project financial statements, with a comprehensive disclosure of the operations, resources, and expenditures, will be audited annually by the Auditor General of Pakistan and submitted, with the management letter, to the Bank within six months after the close of financial year. The PIU will provide an assertion that the funds have been used for the intended purposes and that no ineligible expenditure is reported in the financial statements. In accordance with the Bank's Access to Information Policy, the project financial statements will also be published on the Bank's website.

10. **NDMA staffing.** The Finance Directorate is currently headed by Director Finance, an officer on deputation from the Department of Auditor General of Pakistan who reports to the Member Admin & Finance Wing. The Director Finance is supported by an Additional Director Finance and other supporting staff. According to the Finance Director, an experienced and suitably qualified FMS will be hired to join the project team for managing the project's accounting and financial reporting affairs. It is envisaged that the FMS will be supported by an accountant for maintaining the project's books of account.

11. **Planning and budgeting at NDMA.** The NDMA uses the Government's budgeting system and will also incorporate DRM annual expenditures, based on the planned activities. The budgeted expenditures are classified in accordance with the NAM Chart of Accounts. At present, the Finance Directorate prepares its monthly expenditure reports using Excel. In the absence of FABS connectivity, the budgetary controls are exercised by the AGPR's office, which pre-audits payments before approving the release of checks. It is envisaged that NDMA will obtain FASB connectivity from the Controller General of Accounts for effective budgetary control. A monthly BER showing budget and actual expenditure based on the SAP system is obtained from the AGPR office for management review.

12. **Accounting and financial reporting.** PMD follows the Public Sector Accounting Standards issued by the Auditor General of Pakistan. PMD is using the cash basis of accounting to record all financial transactions: at the time of payment for goods/services, expenditures are recorded in the accounts using the NAM Chart of Accounts. Fourteen Drawing and Disbursement Officers are working at different centers of department across the country. The compilation and submission of monthly accounts to the AGPR office is the responsibility of the Budget Section. Manual records are being used for the recording of transactions at PMD. The Department has a FABS terminal to view the transaction. However, a request has been made to the Controller General of Accounts for authorization to record accounting in the FABS. The project accounting and financial reporting will follow the FABS in accordance with the accounting procedures and policies defined in NAM.

13. The NDMA uses the Government's cash basis of accounting system. The Controller General of Accounts would be requested to computerize project accounts by granting full access to the FABS and updating the NAM Chart of Accounts to include the relevant categories and components of the project. This action needs to be taken within six months after project effectiveness to provide reasonable assurance on the adequate accounting and reporting of the project finances. The project accounting and financial reporting will follow the FABS in accordance with the accounting procedures and policies defined in NAM. Adherence to NAM policies and procedures conforms to international standards and is thus acceptable to the Bank.

14. ***For both implementing agencies:*** The PIU will arrange for the FABS terminal to be used for project accounting and reporting. The NAM Chart of Accounts is flexible enough to report project expenditures. Using the NAM Chart of Accounts, the PIU will maintain separate books of account for the project comprising at least (a) a bank book; (b) a budget control and expenditure register; and (c) a vendor register in a columnar format showing flow of vendor invoice number/date of receipt/amount/purchase order reference/date of payment/check number, etc. These arrangements will provide reasonable assurance on the adequate accounting of the project funds and timely generation of monthly BER. Each month the project FMS will reconcile the transactions with the Accountant General's office so that they can be recorded and reflected in the BER. The PIU will produce semi-annual Excel-based IFRs in the format agreed during project negotiations. The IFRs, which must be submitted to the Bank within 45 days after the close of the semester, will include, among other things, analysis and explanation of variances exceeding 15% between forecasted and actual expenditures. As soon as the project is granted access to the Government SAP system and its categories and components are added to the NAM Chart of Accounts to record and report transactions, IFRs will be system-generated and disbursements can be IFR-based. IFRs prepared by the PIU will be

subject to review by the Project Director before they are submitted to the Bank for disbursement of funds for meeting expenditures under the two components.

15. **Internal controls.** The Government's internal control system for expenditure is based on a series of financial regulations including the NAM, Government Financial Rules, Treasury Rules, Delegation of Financial Powers, and Budgeting Rules 2006. The PMD has engaged a qualified internal auditor, supported by two assistants and reporting directly to the DG-PMD, who is responsible for the post-audit of transactions and for ensuring control effectiveness. The NDMA follows the Government's internal control system and procedures for expenditure. At present NDMA has no internal audit department; the internal audit of the NDMA affairs is carried out by the Administrative Wing in accordance with the Government Financial Rules. The internal auditors report directly to the Chairman, NDMA.

16. ***For both implementing agencies:*** For this project, the PIU will prepare an FM manual setting out, among other things, the accounting and reporting procedures of the project transactions and the controls to be applied, and the segregation of the duties and roles and responsibilities of the PIU. The manual will describe the review and approval processes for transactions and IFR reports, in addition to the asset controls that will be applied. The project will maintain an asset register capturing all assets procured and detailing, at least, the procurement date, source of financing, and the location of each asset. At least annually, assets procured under the project will be verified by an independent party other than the custodian of project assets.

17. **External auditing at NDMA.** The Auditor General of Pakistan (AGP) has completed the audit of NDMA up to FY16-17. No major control weaknesses were reported, and the reported weaknesses are under review by the Departmental Accounts Committee. The nature of the audit observations does not affect the implementation of this project. The project financial statements for the funds managed by NDMA will be audited by the AGP (who is acceptable to the Bank as auditor), and the audited financial statements and the audit report on them, along with the management letter, will be submitted to the Bank within six months after the close of financial year. The PIU will provide an assertion that the funds have been used for the intended purposes and that no ineligible expenditure is reported in the financial statements. According to the Bank's Access to Information Policy, project financial statements will be displayed on the Bank's website.

18. ***Funds flow and disbursement arrangements for both implementing agencies.*** The project will open a Designated Account (DA) at the National Bank of Pakistan, where IDA funds will be deposited in accordance with the agreed procedures issued by the Finance Division, Ministry of Finance, GoP. The DA will be jointly operated by the Project Director and FMS or other designated officials acceptable to the Bank. The project will base disbursements on statements of expenditure. As soon as the project is granted access to the Government SAP system and its categories and components are added to the NAM Chart of Accounts to record and report transactions, IFRs will be system-generated and disbursements can be IFR-based. The PIU will submit regular replenishment requests to the Bank using a Withdrawal Application along with appropriate supporting documentation of the receipt and use of all funds. The Withdrawal Application will be signed by the designated official of the implementing agency and the respective Project Directors. As a Drawing and Disbursement Officer, the Project Director is also responsible for making timely disbursement of the Bank's funds from the DA for eligible expenditures.

Risk Analysis (both implementing entities):

Risk	Initial FM risk	Risk mitigation	FM risk after mitigation	Condition of effectiveness
Inherent Risk				
Country-level	Substantial		Substantial	NA
Control Risk				No
Budgeting	Moderate	Regular monitoring of budgetary control and ensuring the project is included on time in the annual budget.	Moderate	No
Accounting	Substantial	The project will work on getting a SAP terminal to access accounting data and generate reports through the SAP system. This will require adding the relevant project components and categories to the NAM Chart of Accounts.	Moderate	No – This action is to be taken by the project within six months after effectiveness.
Internal control	Substantial	1. Approval of Project Operations Manual. 2. Formation of project management team and FM team of qualified accountants.	Moderate	1. Yes – Condition of negotiations 2. No
Funds flow	Substantial	Timely release of funds by Finance Department.	Substantial	No
Financial reporting	Substantial	Timely submission of reviewed and approved IFR reports by the project management team	Substantial, but can be reduced to Moderate as soon as the SAP is used for recording and reporting.	No
Auditing	Moderate	PIU ensures timely submission of the project financial statements to the AGP and timely response to AGP's comments and observations. Timely submission of audited financial statements by PIU.	Moderate	No
Residual FM Risk Rating	Substantial		Moderate	

19. **Supervision plan.** The project will require frequent implementation support, particularly on the financial reporting aspects. During implementation, the WBG will review (a) the IFRs and the project audited financial statements; and (b) the project's FM and disbursement arrangements to ensure compliance with the agreed requirements and to provide guidance on report-based disbursements, including the operation of "Client Connection."

Procurement

20. An initial procurement assessment of the two implementing agencies has been conducted. The summary of the final assessment has been updated along with the Project Procurement Strategy for Development. The terms of reference for the system integrator have been prepared and procurement has been initiated. The Procurement Plan for the first 18 months of the project has been prepared and disclosed. It is estimated that procurement of approximately US$ 9 -10 million will be carried out during the first year of project implementation.

21. NDMA follows the Federal Public Procurement Rules; however, it can undertake emergency procurement under section 22 of NDMA Act 2010. The procurement function at NDMA is centralized, with separate technical and purchase committees. There is a Procurement section under the Admin Wing. During the last five years, the volume of procurement handled by NDMA is approximately US$3.8 million. The entity has experience with the procurement of goods, but only limited experience with the procurement of construction works and hiring of consulting services. The entity worked with the Bank on the Earthquake Reconstruction project; however, considerable time has passed, and the capacity built through that experience has depleted. Open competitive procurement is required for all contracts above US$5,000. Staff handling procurement functions require specific procurement and contract management training. There is also a need to strengthen the overall market analysis and cost estimation mechanism. Further, there is a need to introduce a procurement-specific position in the organizational hierarchy.

22. PMD follows the Federal Public Procurement Rules. The procurement function is centralized at PMD, with a centralized purchase committee and technical evaluation committee. There is no specific Procurement Section. PMD has no experience of working with the Bank on any Bank-financed project, and only limited experience with handling the hiring of consulting services. There is a need for procurement and contract management training for staff

handling procurement. There is also a need to have a separate procurement position within the organizational structure. The volume of procurement handled by PMD is not significant. The time PMD takes to process a procurement package is adequate, with no abnormal delays.

23. There are risks of delays in processing procurement activities because of the limited capacity and experience of the entities, and the low clearance thresholds. It will take time to build the learning curve of the organization to process procurement activities swiftly. Procurement planning and management needs to be strengthened for timely completion of activities. Close supervision and monitoring by the entities' management is required to ensure that the planned timelines are met. Implementing entities are also required to identify the project's critical path and to plan all activities in line with that critical path. The recommended procurement approaches for PMD and NDMA are contained in the Project Procurement Strategy for Development.

Environmental and Social (including safeguards)

24. **Environment.** The overall environmental risk is rated as Moderate. The project mainly involves capacity development and technical assistance, which rarely cause any environmental degradation. The proposed project offers environmental enhancement in the form of improved climate services through access to high-quality climate information. Dissemination of specialized weather, climate, and water data will reduce vulnerability to climate change risks, enabling a reduction in the economic losses caused by floods and droughts. It will also contribute to increased agricultural productivity and to the efficiency of DRM and food security interventions because of the enhanced preparedness of vulnerable communities. However, project Components 1 and 2 envisage infrastructure development that has environmental implications requiring environmental management through proper mitigation plans. PMD's construction of the Monsoon Monitoring Center triggers Operational Policy 4.01, *Environmental Assessment*, so the project is classified as Category B to reflect the degree of the expected impacts. The safeguard aspects of the project activities should be in line with the Bank-approved ESMF.

25. **The project ESMF outlines (a) institutional arrangements to manage the environmental impacts of the project, (b) monitoring requirements to ensure effective implementation of mitigation/enhancement measures, (c) training needs, and (d) reporting and documentation requirements.** It elaborates the human resource requirements for project execution, covering the PIUs, contractors, and supervision consultants, and it requires an annual third-party validation of site-specific ESMP implementation. The PIUs of PMD and NDMA will each hire a dedicated full-time environmental specialist to oversee the environmental monitoring of the ESMF and site-specific ESMPs and to provide technical support to works consultants in their development. All the civil works contractors under Component 2 must have environmental specialists in their teams for implementation of on-site environmental safeguards. The PIUs' environmental specialists will be the focal point for the Bank to provide all necessary requirements for environmental safeguards within the project/subprojects.

26. **The project social risk classification is Moderate.** Most components of the proposed project involve capacity development and technical assistance that do not have negative impacts on society. The project is likely to enhance socioeconomic conditions through improved service delivery, data dissemination, and end-to-end EWSs on behalf of the wider DRM community. Certain subprojects may require land acquisition and thus negatively affect certain households, groups, or individuals. If Operational Policy 4.12, *Involuntary Resettlement*, is triggered, subprojects need to be screened during preparation for the likelihood of land acquisition and its subsequent impacts in terms of loss of shelter, loss of assets or access to assets, and loss of livelihood. Involuntary taking of land or any form of economic displacement must be avoided where feasible or minimized by exploring all alternative subproject designs. The Government has prepared two site-specific ESMPs in accordance with OP 4.12, which will be followed for all project activities. There are no indigenous communities in the proposed project sites; therefore, OP/BP 4.10, *Indigenous Peoples*, will not be triggered.

27. **Citizen engagement.** The project will use several interventions to encourage citizens to participate in consultations, provide feedback, and benefit from EWS and disaster preparedness (Component 1.3, Enhancement of the PMD Service Delivery Process). These interventions will be further explored through the initial public consultation process.

28. **A multi-tiered grievance redress system** will help improve overall consumer/citizen satisfaction. The grievance redress mechanism (GRM) would involve maintaining a helpline, preferably external to the project, for use by end-users (citizens, communities, public institutions such as schools, basic health units, etc.); vendors; and the client (government departments and data users at various tiers). A disaggregated database (gender, nature of complaint, category of vulnerability, etc.) of complaints received and actions taken will be established and maintained. In addition, a feedback audit exercise will be conducted every six months by the project team and the third-party validation agency to determine citizen satisfaction with and the overall efficacy of the GRM. For the initial phase, a simple approach using a toll-free number should be adopted and operationalized as follows:

- *Primary contact:* The primary contact and interface for citizens will be provided in the shape of a toll-free number, which can be housed either in the project directorate or in a call center in Islamabad/Lahore/Karachi. This portal will receive complaints, add a case number, and forward the complaint to the primary redress focal point (with a copy to the PIU) with a timeline for resolution. The complainant will be provided with the case number and informed that the case has been forwarded to the relevant point of resolution.
- *Primary redress focal point:* This can be at the DC office, with a focal point assigned by the DC. Once the focal point receives the complaint from the primary contact, they will be responsible to resolve the problem within a given timeframe (3 to 5 days, based on the nature of the complaint). If they cannot resolve the problem, or if they do not resolve it in the given timeframe, the case will be flagged to the secondary level, with a copy to the concerned Project Director, PIU. The complainant will be given an update at this point that the case has been upgraded to the higher authority. If the complaint is resolved, the complainant and PIU will be informed simultaneously.

29. *Grievance Redress Committee:* This committee will be formed at the district level under the auspices of the DC, which will convene it as required. In addition, a committee will be formed at the PIU level to deal with all matters related to weather data and procurement. These committees will serve as secondary focal points, who will take up the complaints with the project teams present at the district or PIU level. If these committees cannot resolve the problem or do not resolve it in a given timeframe, the case will then be referred to the Project Director as the final authority to resolve. The complainant will be contacted by the PD's office and informed of the decision. All of the above actions will be recorded electronically, and reported to the WB periodically as a GRM performance report.

Monitoring and Evaluation

30. The project will have a strong focus on M&E to track and record progress and results, evaluate progress toward the PDO, and ensure that feedback is continuously informing and improving implementation. The Results Framework (Section VII) will provide the basis for M&E to track and report on progress made under the project. The results framework includes three PDO-level indicators and seven intermediate indicators. Since PMD and NDMA have not previously worked with the Bank, M&E consultants will be contracted to support the implementing agencies in (a) developing the detailed M&E framework and system and the tools necessary for monitoring and reporting on the individual indicators identified in the results framework, and (b) developing the user survey to measure departments' and communities' satisfaction with PMD services and products (for Component 1 only). Project monitoring will take place periodically, and will include process reviews, reporting on outputs, and maintaining proper records. The broad thematic areas that will be supervised and monitored are social and environmental aspects, physical progress, and results.

Role of Partners (if applicable)

31. All development partners in Pakistan were fully consulted during project preparation, some through direct bilateral engagements and others through PMD and NDMA. Where possible, the Bank will continue to seek further outreach to and coordination with development partners working in the sector, particularly as the project moves toward appraisal and implementation. Regarding the hydromet component of the project, France, Japan International Cooperation Agency, and China are currently looking to finance similar projects in the country, which could present a risk for World Bank investments, particularly because equipment and models may not be interoperable with the Bank's investments. To mitigate this risk, the World Bank project is considering a holistic and systemic approach to independently achieve substantial transformation in Pakistan's modernization program through three main pillars: (a) capacity building, bi) modernizing the observation network and forecasting, and (c) enhancing the service delivery system.

ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY: Pakistan
Pakistan Hydro-meteorological and Climate Services Project

Strategy and Approach for Implementation Support

1. The project Implementation Support Plan (ISP) has been developed to reflect the specific nature of the project activities, its planned implementation schedule, lessons learned from similar projects in other countries in the region, and specific needs identified by the CONOPS. The plan will be regularly reviewed and revised as required. It lays out the support activities that the Bank will provide and the project design and monitoring features that will be adopted to mitigate the most significant risks identified in the SORT. The ISP aims to enhance the quality of the client's delivery of the proposed project interventions and to address critical issues that may affect project implementation. It specifically focuses on strengthening the technical and fiduciary capacity of the Government counterparts at the beginning of the project, and providing regular implementation support through Bank implementation support missions covering technical, institutional, safeguards, M&E, and fiduciary aspects. The capacity needs of the PIUs will be periodically reviewed throughout implementation. Implementation support will comprise implementation support missions; regular technical meetings and field visits by the Bank between formal review missions; and reporting on and monitoring of FM, procurement, and safeguards.

2. **Implementation support missions.** Implementation support missions will be carried out three times during the first year, and every six months in subsequent years. During the first year of the project, given the complexity of the subprojects under Component 1, it is envisaged that regular missions will go to essential areas to support the client in initiating activities. The volume of support is expected to be high in the first two years of project implementation. The missions would include multi-GP expertise, including DRM, water, agriculture, and urban experts, to ensure appropriate sectoral inputs and value addition. Similarly, sectoral experts would work with corresponding counterparts/line departments, which are essentially end-users, to ensure ownership of various activities under the project. The multi-GP Bank team would convene regularly to discuss sectoral issues and possible solutions.

Table 3.1. Implementation Support Plan and Resource Requirements

Time	Focus	Skills needed	Resource estimate (US$ m)
First 12 months	Project start-up; prepare safeguards instruments; train fiduciary staff; set up the PIUs; engage system integrator, and design and supervise firms; initiate procurement of equipment; launch works	See Table 3.2	68
12–48 months	Provide support to implementation of project activities; develop an observation and forecasting network; strengthen weather forecasting and EWSs; foster regional cooperation; and encourage research and knowledge sharing	See Table 3.2	78
Total			146

Table 3.2: Skills Requirements

Skills needed	Number of staff weeks	Number of trips
Team Leader	35	14
Senior Hydro-meteorological Specialist	15	10
Procurement Specialist	18	12
Financial Management Specialist	10	7
Environmental Safeguards Specialist	10	7
Social Safeguards Specialist	10	7
Technical Specialist	10	20

ANNEX 4: ECONOMIC ANALYSIS

COUNTRY: Pakistan
Pakistan Hydromet and DRM Services Project

1. Pakistan's economy is vulnerable to natural disasters, especially floods. Because of the fragility created by frequent flooding, Pakistan has been ranked 7th in the Long-Term Climate Risk Index between 1996 and 2015. The frequency of flooding in Pakistan has more than tripled in the last 25 years compared to the previous two decades. According to one estimate, the economic impact of flooding in Pakistan during 2013 was around US$1.2-1.8 billion, equivalent to 0.5–0.8 percent of the country's GDP.[13] Adding indirect costs—such as fiscal losses and decline in productivity—would yield far higher total economic losses. Potential increases in the frequency and intensity of severe hydromet events related to climate change or increases in vulnerability have been and will be compounded by increases in population (i.e., a larger population at risk) and increases in wealth (i.e., more assets and economic activity at risk). The proposed improvements in hydromet operations have the potential to contribute significantly to reducing losses to the economy, infrastructure impacts, and loss of life.

2. **Sectoral context.** *Agriculture.* Agriculture is the largest economic sector in Pakistan, generating 21 percent of GDP and accounting for 39 percent of male employment and 75 percent of female employment in 2016. Even though the crop production index and food production indexes have generally grown over the last 50 years, there is still food insecurity in the country because of low productivity increases, food distribution inefficiency, inadequate social and food safety nets, and low investment in research and development in the agriculture sector. For instance, wheat is Pakistan's largest crop and is largely grown in arid and semi-arid areas that are highly vulnerable to extreme weather and climate impacts. For rice, Pakistan's second-largest crop, decreases in production and the length of the growing season may lead to production declines of up to 18 percent by 2080. Research shows that improved hydromet and climate information can reduce agricultural vulnerability, reduce rural employment variability, and improve food security. *Water.* The water sector is concerned with activities in a wide range of areas: drinking water supply, wastewater treatment, water pollution, irrigation, drought, flooding, power production, ecosystem services, and recreation. Thus "water" is closely linked to agriculture (e.g., rain-fed agriculture, irrigated agriculture, flooding, drought) and energy (29 percent of power in Pakistan is generated through hydropower). *Disaster Risk Reduction and Potential Value of Improved Hydromet Services:* Reliable and valid historical hydromet information at appropriate temporal and special scales is the foundation of insurance products. The 2015 WMO/USAID/World Bank book on the economic assessment of hydromet services states that National Meteorological and Hydrological Service "improvements to reduce disaster losses in developing countries benefit-cost ratios range from 4 to 1 to 36 to 1."[14]

3. **Economic analysis.** To estimate the value of strengthening Pakistan's hydromet services, a benefit-cost analysis (BCA) of the proposed project was conducted. The costs total US$188.0 million. It is assumed that the total project implementation occurs over a five-year period beginning in FY19, with an initial year investment of US$10.0 million. The balance of the total investment is assumed to be allocated across a project implementation period of the remaining four years (see Table 4.1). Project projections indicate that at least 25 percent of costs will be used for consultancies, training, and project management and that civil works will not require O&M. Therefore, our analysis uses 70 percent of project cost as the base for calculating 10 percent of O&M and depreciation as shown.

Table 4.1.: Baseline Cost, Depreciation, and O&M Assumptions (US$ millions)

Fiscal year	Annual project investment	Cumulative cost	O&M (10%/year of 70% of total investment)	Depreciation (10%/year of 70% of total investment)	Total year investment, O&M, depreciation
2019	10.00	10.00	0.7	0.7	11.4
2020	43.00	53.00	3.71	3.71	50.42
2021	53.00	106.00	7.42	7.42	67.42
2022	52.00	158.00	11.06	11.06	74.12
2023	30.00	188.00	13.16	13.16	57.20

[13] World Bank, 2015, "Fiscal Disaster Risk Assessment Options for Consideration."
[14] WMO, World Bank, GFDRR, and USAID (2015). *Valuing Weather and Climate: Economic Assessment of Meteorological and Hydrological Services*. WMO-No. 1153, World Meteorological Organization, Geneva, Switzerland.

2023 and on		188.00	13.16	13.16	26.32

4. A BCA for a period of 50 years was conducted. Although the project investment occurs over a four-year period, the benefits will be realized over a much longer time period if the ongoing costs for O&M and depreciation are met. It is also noted that the value of investment in climate change information may not be realized until far into the future, so some of that value may not captured.

5. **Benefits.** For the benefit estimates, benefit transfer is used, in which results from existing valuation studies are transferred, correcting and adjusting for the current context. Two studies were identified from which values were transferred to the current project: the first is a recent survey conducted in Mozambique for a World Bank project with objectives similar to this project's. The second study (from Vietnam) estimated the benefits to households of an improved cyclone warning service, which is only a subset of likely improvements in Pakistan and may apply directly only to cyclone-prone areas in Pakistan. For the purpose of this analysis, though, it is thus assumed that non-cyclone-vulnerable populations in Pakistan have comparable values for the range of other hazards subject to improved forecasts. Table 4.2 illustrates the conversion of per-household willingness to pay (WTP) to Pakistan from Mozambique and Vietnam using simple income ratios as well as adjusting for the year of the original studies and then aggregating to national benefit estimates. The multi-step income ratio conversion from Mozambique to Pakistan using per capita GDP estimates from the World Bank–adjusted 2013 Mozambican to 2016 Pakistani WTP is shown in Table 4.2. This yields a Pakistani WTP estimate for hydromet forecast improvement equal to US$2.81 (US$1.28–US$6.35, 95 percent confidence interval). This is taken as a per-household estimate to be aggregated across all households (32,205,111) to get a national benefit estimate with a central estimate of US$90.5 million/year. Using a similar approach, for Vietnam, two-point estimates of WTP for the medium and maximal improvement programs were transferred to Pakistan and aggregated, indicating a potential national WTP of US$12.9 million to US$19.0 million, depending on program attributes.

Table 4.2: Conversion of Contingent Valuation Method Household WTP Based on Income Ratios

		Mozambique (2013)			Vietnam (2016)	
		Lower	Central	Upper	Medium	Maximal
Annual WTP (US$)		0.53	1.16	2.62	0.59	0.88
GDP per capita (current US$)						
	Mozambique (2013)	605.98	605.98	605.98		
	Pakistan (2013)	1,272.44	1,272.44	1,272.44		
	Vietnam (2016)				2,185.69	2,185.69
	Pakistan (2016)	1,468.19	1,468.19	1,468.19	1,468.19	1,468.19
Inc. Ratio - Pk/Moz (2013)		2.10	2.10	2.10		
Inc. Ratio - Pk/Pk (2013–16)		1.15	1.15	1.15		
Inc. Ratio - Pk/Vietnam (2016)					0.67	0.67
Adjusted Pakistan WTP (2016)		1.28	2.81	6.35	0.40	0.59
Households		32,205,111				
Agg. Nat'l WTP (US$16 M)		41.4M	90.5M	204.4M	12.9M	19.0M

6. The economic benefits of any investment in DRM can be mainly assessed by measuring the reduction in losses due to natural disasters. However, lack of aggregate data makes it challenging to measure economywide losses caused by natural disasters. Pakistan's economy is prone to natural disasters, in which floods are a leading factor. The frequency of flooding has increased more than 3-fold in last 25 years in Pakistan compared to previous two decades. According to one estimate, annual economic impact of flooding in Pakistan during 2013 was around US$1.2 billion to US$1.8 billion, equivalent to 0.5–0.8 percent of GDP.[15] If indirect costs are accumulated, the total economic losses would be far greater due to transmission through various channels including fiscal losses, and decline in productivity.

[15] World Bank, 2015, "Fiscal Disaster Risk Assessment Options for Consideration."

Evidence from both advanced and developed economies which have undertaken these pre-disaster investments for enhancing disaster response capability and reducing vulnerability yield extensive returns in terms of evasion of damages to property and lives saved.

7. **BCA results.** For all calculations, real values are applied that do not factor in inflation or potential changes in exchange rates. A discount rate of 12 percent was used, as required by World Bank guidelines on economic analysis. As part of the sensitivity analysis, a discount rate (6.0 percent) that could be more applicable for Pakistan, was looked at. Table 4.3 shows the results using the baseline analysis variables (i.e., the Central Mozambique Household WTP study estimate) to establish a baseline BCA and scaling it for the benefits of investing in DRM. A net present value (NPV) of US$308.7 million and a benefit-cost ratio (BCR) of 1.9 indicate that the project is economically viable. The present value of benefits to households is US$635.7 million and the present value of costs is US$327 million, using a time horizon of 50 years for the project with basic assumptions and a 12 percent discount rate.

Table 4.3. Results of Baseline Benefit Cost Calculations, US$ millions	
Total present value – benefits	635.66
Total present value – costs	326.96
Net present value (NPV)	308.71
Benefit-cost ratio	1.94

8. A sensitivity analysis was conducted using (a) lower and upper bound benefits estimates; (b) a lower discount rate; (c) an analysis of no ongoing investment in program upkeep (depreciation replacement) or O&M; and (d) reasonable assumptions about potential increases in population, income, and vulnerability due to climate change. Table 4.4 shows summary results from the various sensitivity analyses. Using a lower bound benefit estimate from Vietnam and all other baseline BCA parameters generates an NPV of US$ –236.6 million and a BCR of 0.28. This understates the potential value of improving hydromet services and DRM in Pakistan because the Vietnam WTP value was for a somewhat limited set of investments in improving tropical cyclone warnings. However, using the largest benefit estimate yields a significant NPV of US$1,108.8 million and a BCR of 4.39. This could represent an upper bound to the project's value in Pakistan. The choice of a 12 percent discount rate is based on a review of other BCAs in developing countries. The table illustrates the same baseline BCA but using a lower discount rate (6.0 percent), which may more closely reflect current discount rates in Pakistan; this case yields an NPV of US$1,069.7 million and a BCR of 4.11.

9. O&M is a critical issue with project implementation because it requires an internal commitment by the Government to support its ongoing, long-term costs. An alternative analysis assumed that after the first four years there is no ongoing O&M or investment to counter depreciation. As shown in Table 4.4 shows, if it is assumed that benefits end immediately, the NPV falls to US$29.2 million and the BCR falls to 0.85. If instead benefits are assumed to decline over a four-year period following full program implementation, the NPV falls to US$39.55 million and the BCR to 1.21. These results indicate that if the Government does not commit to ongoing support of the initial investment, Pakistan would lose a significant portion of the full potential benefits of investments in hydromet and DRM improvement.

10. Given potential changes in income and population, and increased vulnerability to climate change over the long run, an analysis was undertaken, assuming (a) a 4 percent per year increase in income, which translates into a 4 percent per year increase in WTP for improved hydromet services; (b) a 1.2 percent increase in population per year; and (c) a 1 percent per year increase in vulnerability to hydromet events as a result of the impacts of climate change, which translates into an equivalent 1 percent per year increase in the value of hydromet products and services to mitigate and adapt to climate impacts. It is assumed that the O&M and depreciation costs of providing these products and services do not increase—because these are public goods, this is a reasonable assumption, along with assuming the increased benefits to the growing population with higher income and greater vulnerability. As Table 4.4 shows, the basic policy conclusion does not change, although the NPV and BCR both increase substantially: the project NPV of the investment in hydromet products and services increases more than threefold over baseline to US$1,102.2 million

and the BCR increases to 4.37. This represents a potentially strong argument for looking closely at the longer-term trends in Pakistan.

Table 4.4. Sensitivity Analysis with Alternative Benefit Estimates

	Baseline	Alternative benefit estimates		Alternative discount rate	No ongoing contribution for depreciation and O&M		Increase in pop. (1.2%); per capita income (4.0%), vulnerability (1.0%)
		Lower	Upper		End after Yr 4	Diminish after Yr 4	
Annual benefits (US$ mill/year)	90.5	12.9	204.4	90.5	90.5	90.5	90.5
Discount rate %	12	12	12	6	12	12	12
Total present value benefits (US$ mill/year)	635.66	90.39	1,435.76	1,294.65	159.24	227.97	1,429.11
Total present value costs (US$ mill/year)	326.96	326.96	326.96	538.88	188.41	188.42	326.96
Net present value (US$ mill)	308.71	–236.56	1,108.77	755.76	-29.18	39.55	1,102.16
Benefit-cost ratio	1.94	0.28	4.39	2.40	0.85	1.21	4.37

11. **Omissions, Biases, and Uncertainties.** A number of potential omissions, biases, and uncertainties could affect the analysis, given the lack of primary studies on benefit transfer. Specifically, extensive information on the current and potential accuracy of hydromet products and services was not available. It is also noted that the analysis presented here should be tied more directly to specific planned hydromet improvements and likely end-user decisions and societal outcomes. This may require primary research and data collection with end-users in the public and private sectors and with the public as well. Other omissions include potential benefits from improved hydromet information that would likely increase benefit estimates, including (a) the value of hydrological services, which were not fully assessed because the studies for benefits transfer were focused on values for meteorological services; (b) the potential value of climate information from longer and more reliable climate records; (c) the potential value of increased in-country capacity from the project's investment in developing human capital; (d) the potential value of contributions to global weather forecasting data; (e) the potential value of the reduced impact of natural hazards on economic development; and (f) the potential use of an improved climate record for Pakistan for use in agricultural crop insurance. The macroeconomic benefits of reducing the impacts of natural disasters have not been directly estimated. As discussed above, evidence shows that natural disasters can reduce economic growth. Improved hydromet and DRM services would help reduce the impact of natural disasters on GDP, which could have significant cumulative benefits because GDP growth compounds year on year, and the negative impacts of natural disasters can have long-term impacts. It is further noted that sector-specific analysis has not been undertaken at this time (e.g., in agriculture, water resources, or disaster risk reduction) or examined regional differences or other distributional issues (e.g., differential gender or rural-urban benefits). These differences could represent important policy, development, or equity issues that could be examined as needed with further analysis.