Report Number: ICRR0022803

1. Project Data

Project ID P127508	**Project Name** NP: PPCR: Climate Hazards
Country Nepal	**Practice Area(Lead)** Urban, Resilience and Land

L/C/TF Number(s)	Closing Date (Original)	Total Project Cost (USD)
TF-13557,TF-13665	30-Nov-2018	24,918,956.35
Bank Approval Date	**Closing Date (Actual)**	
15-Jan-2013	15-Nov-2020	

	IBRD/IDA (USD)	Grants (USD)
Original Commitment	31,000,000.00	31,000,000.00
Revised Commitment	24,918,956.35	24,918,956.35
Actual	24,918,956.35	24,918,956.35

Prepared by	Reviewed by	ICR Review Coordinator	Group
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2. Project Objectives and Components

a. Objectives

According to the Project Appraisal Document (PAD) (p. v) and the Financing Agreement of April 30, 2013 (p. 4), the objective of the project was “to enhance government capacity to mitigate climate related hazards by improving the accuracy and timeliness of weather and flood forecasts and warnings for climate-vulnerable communities, as well as developing agricultural management information system services to help farmers mitigate climate-related production risks.”

b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

The project included four components:

Component A: Institutional Strengthening, capacity building and implementation support of the Department of Hydrology and Meteorology (DHM) (appraisal estimate US$5.1 million, actual US$3.35 million) was to finance three sub-components:

Sub-component A.1: This sub-component was to finance: i) DHM institutional development and strategic planning, ii) development and/or strengthening of a legal and regulatory framework for DHM operations, including development of standard operating procedures, assessment of new business models and enhancing public private partnerships; and iii) “twinning” operational support from advanced National Weather Services (NMSs) and World Meteorological organization (WMO).

Sub-component A.2: This sub-component was to finance capacity building including: i) development and implementation of a DHM capacity building program including DHM personnel training and retraining, professional orientation for DHM senior staff; education in universities and training in WMO regional training centers; and ii) Implementation of training activities for major users (i.e., agriculture, water resources management, health, energy, transportation).

Sub-component A.3: This sub-component was to finance systems design and integration, project management and monitoring including: i) provision of support for detailed design, procurement and implementation of DHM systems; ii) project management, reporting, monitoring and evaluation for Components A, B and C; iii) development of a needs assessment and design for air quality, water quality and sediment monitoring networks; iv) development of design documents for reconstruction/refurbishment of DHM’s headquarters and regional offices; and v) support for environmental and social due diligence and protection.

Component B: Modernization of the Observation Infrastructure and Forecasting (appraisal estimate US$16.45 million, actual US$13.99 million): This component was to finance the following sub-components:

Sub-component B.1: Technical modernization of observation networks including: i) rehabilitation and technical re-equipment of the hydrological network; ii) improvement of the environment of the hydrological stations (bank stabilization, improvement of flow conditions, engineering works, etc.); iii) special equipment for hydrological stations (current meters, sediment samplers, tracer laboratory equipment, training, staff gauges, boats); iv) delivery and installation of weather radar for detection of heavy precipitation and other meteorological phenomena; v) renewal of temperature-wind sounding of the atmosphere; vi) upgrading and expansion of automated surface observing systems for aviation safety; vii) surface meteorological and lightning detection networks; viii) glacier and snow monitoring (equipment and surveys); ix) establishment of DHM calibration facilities; and x) vehicles to support DHM field operations, maintenance and inspections.

Sub-component B.2: Modernization of DHM's Communication and ICT Systems including: i) communication equipment; ii) archiving and data base development; and iii) Satellite receiving system, remote sensing and GIS laboratory.

Sub-component B.3: Improvement of the Numerical Hydrometeorological Prediction System including modern computer equipment for numerical weather prediction.

Sub-component B.4: Design and pilot operation of an environmental monitoring network including piloting operation of air quality, water quality, and sediment monitoring networks.

Sub-component B.5: Refurbishment /reconstruction of DHM offices and facilities including access to uninterrupted power supply.

Component C: Enhancement of the Service Delivery System of DHM (appraisal estimate US$3.45 million, actual US$1.61 million): This component was to finance:

Sub-component C.1: Introduction of a public weather service including: i) forecaster workstations; ii) specialized communications instruments including TV studio, radio alert services, internet websites; and iii) development and operationalization of a forecast accuracy verification system and survey of forecast utility.

Sub-component C.2: Strengthening of Disaster Risk Management (DRM) operations including piloting of "end-to-end" early warning systems in two river basins in the western and eastern parts of Nepal including: i) development of Standard Operating Procedures (SOPs), early information protocols and signals agreed with all basin and DRM stakeholders including Emergency Operations Centers and District Development Committee/Village Development Committee (DDCs/VDCs); ii) forecaster workstations, communication systems and software development; and iii) operational training and drills with government stakeholders, non-government stakeholders and communities.

Sub-component C.3: Improvement of service delivery (i.e., warnings and advisories) to communities including introduction of mobile applications.

Sub-Component C.4: Establishment of a national climate service including: i) computer systems to access climate information; ii) support for the development of a National Framework for Climate Services and sectoral working groups; iii) development of a digital library of climate-relevant information from all sectors for Nepal; iv) software development to downscale climate forecasts and v) operational support and information exchange between water resources, public health and climate databases.

Component D: Creation of an Agriculture Management Information System (appraisal estimate US$6.0 million, actual US$5.97 million): This component was to finance the following sub-components:

Sub-component D.1: AMIS Portal, Hardware and Software including: i) detailed design of the AMIS Portal and assessment of information requirements; ii) acquisition and installation of AMIS Portal (e.g., software, data and web server, computer, monitor, printer, digital color scanner, plotter) at the Ministry of Agriculture and Livestock Development (MoALD); iii) rehabilitation of the offices of the MoAD Geographical Information System (GIS) Section to facilitate communication with the AMIS Portal; iv) acquisition of vehicles and motor bikes to support field operations including outreach to farmer communities and data collection; v) acquisition and installation of communication links to district level extension offices and outreach stations of the Nepal

Agriculture Research Council (NARC); and vi) Agriculture Management Information System (AMIS) infrastructure (software and hardware) at NARC's central office.

Sub-Component D.2: Information Products including: i) agricultural and spatial data digitizing and archiving; ii) development of agriculture monitoring products and decision support tools such as mapping of climate-vulnerable farming communities and establishment of a crop monitoring system; and iii) exploratory research to develop financial risk transfer instruments for the agriculture sector, such as agricultural insurance.

Sub-component D.3: Information Dissemination including: i) development of mobile applications based on data from AMIS; ii) production and dissemination of advertisements for mass media (FM radio, TV channels); iii) production and dissemination of publications; and iv) feasibility studies for AMIS Portal product dissemination.

Sub-component D.4: Capacity Building including: i) provision of training to staff of selected agencies in weather data analysis, including short term training and advanced degrees; ii) provision of training to staff of selected agencies at the regional, district and community level in the use of AMIS Portal tools and in awareness of climate resilience; iii) building partnerships with farmers to raise awareness and capacity, including provision of basic thermometers and rain gauges to selected farmers; and iv) organization of agro-climate workshops at the regional and district levels.

Sub-component D.5: Support for project management and monitoring, and for social outreach, communication, and evaluation activities under component D.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The project was estimated to cost US$31.0 million. Actual cost was US$24.9 million.

Financing: The project was to be financed by a Trust Fund of US$16.0 million (of which US$12.96 million was disbursed) and a Trust Fund of US$15.0 million (of which US$11.96 million was disbursed).

Borrower Contribution: The Borrower was to contribute US$300,000. Actual contribution was US$2.34 million.

Dates: The project was restructured twice:

- On August 14, 2018 the project was restructured to change the project's loan closing date from November 30, 2018 to December 31, 2019 to allow for the completion of project activities of components A, B and C which were being implemented by DHM. Implementation of these activities had been delayed due to several events such as the 2015 earthquakes, trade blockade on the Indian border, flooding in Southern Plains, and delays due to 2017 three-tier elections as well as some internal procurement delays and lengthy governmental approval processes.
- On December 10, 2019 the project was restructured to change the project's closing date from December 31, 2019 to November 15, 2020 to allow for various specialized training packages being awarded, which had been delayed because of low budget estimation by the implementing agency,

Department of Hydrology and Meteorology (DHM), compared to the significantly higher quoted budget by prospective vendors.

3. Relevance of Objectives

Rationale

At the time of appraisal, Nepal made marked gains in eradicating poverty, but remained one of the poorest countries in the world. The Gross Domestic Product (GDP) per capita remained low at US$712 (2011) and poverty varied widely across geographic location, ethnicity, caste and gender. The population was largely rural and heavily dependent upon agriculture. According to the PAD (p. 1) at the time of project appraisal about 82 percent of the population (estimated at around 26.6 million) lived in rural areas and agriculture contributed 35 percent of the country's Gross Domestic Product (GDP). Poverty was much more severe in rural areas (27 percent) compared to urban areas (15 percent) and especially severe in mountainous areas (42 percent).

According to the PAD (p. 2), in 2011 the global risk analysis firm Maplecroft ranked Nepal the 4th most climate-vulnerable country in the world due to its extremely varied and challenging geography, its poor, resource dependent population, and its weak institutional capacity. Also, climate projections for the country had been predicting increases in temperature and in the frequency of extreme events. The impacts of climate change have started to negatively impact economic growth, food security, and wildfires.

The PAD further stated (p. 3) that food security was further threatened since climate change was expected to affect agricultural productivity through three primary channels: i) rising temperatures, ii) climate variability and related changes in the timing, intensity, and volume of rainfall, and iii) rising carbon dioxide levels. The threat of climate change on Nepal's rich biodiversity changed agro-ecological zones, prolonged dry spells, encroachment of alien and invasive species, and increased prevalence of disease and pests.

Especially, the poor population was largely dependent upon subsistence agriculture for its livelihoods. At the time of appraisal, recent records in Nepal showed increasing incidents of droughts, floods, hailstorms, landslides and crop disease. As a result, the need for a well-functioning early warning system was identified as a key priority in the government's National Strategy for Disaster Risk Management.

The project's objective supported the government's 2020 Second Nationally Determined Contribution (NDC II), which reinforces the government's commitment to developing and implementing adaptation policies, plans, and actions. Also, the objective of the project was in line with the government's Disaster Risk Reduction National Strategic Plan of Action for 2018-2030 (DRRNSPA), which aims to expand and modernize the real-time weather observation systems and real-time water level and rainfall observation systems in major flood-prone river basins.

According to the ICR (p. 7), the project was one of five program components identified in Nepal's Strategic Program for Climate Resilience (SPCR). The SPCR was developed by the government with support from the Bank, the International Finance Corporation (IFC), and the Asian Development Bank (ADB) and approved in June 2011.

The objective of the project was in line with the Bank's most recent Country Partnership Framework (CPF) for Nepal (FY19-23) which aims to increase resilience to natural disasters and climate change under focus area three. The Bank had been engaged in the sector since 2011 through the Building Resilience to Climate Related Hazards (BRCH) Project, which was one of five program components identified in Nepal's Strategic Program for Climate Resilience (SPCR).

Rating
High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective
To enhance government capacity to mitigate climate related hazards by improving the accuracy and timeliness of weather and flood forecasts and warnings for climate-vulnerable communities, as well as developing agricultural management information system services to help farmers mitigate climate-related production risks

Rationale
Outcome 1: Improved accuracy and timeliness of weather and flood forecasts and warnings

Theory of Change: The project's theory of change envisioned that project activities such as the development of the DHM's legal, regulatory and institutional frameworks, development and implementation of a capacity building and trainings program as well as design and implementation of an integrated hydromet system were to result in the following outputs: A hydromet bill and regulation being drafted, capacity building and training programs being developed and implemented, as well as an integrated hydromet system being developed and implemented. These output activities were to result in the higher-level outcome—critical for Nepal—of improved accuracy and timeliness of weather and flood forecasts and warnings for climate-vulnerable communities.

Outputs:

- The project supported the drafting of a hydromet bill and regulation ("development of legal and regulatory framework of DHM operations") as well as the standard operation procedures (SOPs) for DHM on hydromet services. The hydromet bill and regulation envisioned a cost recovery mechanism through fees levied on civil aviation for providing aviation weather services to enable continued upgrading of the DHM aviation forecasting capability. The project did not completely achieve its target of supporting DHM's mission and implementing fully functional DHM regulations and operational guidelines.
- The percentage of DHM professional staff being trained increased from 22 percent in 2015 to 72 percent in 2020, not achieving the target of 100 percent. Some of the trainings envisioned by the

System Integrator (SI) were incomplete such as weather presentation system, hydromet workstation, aviation meteorology, quality management system, and nowcasting.

- 16 synoptic stations of DHM were transmitting all of the surface synoptic observations from its central database to the World Meteorological Organization's (WMO's) Global Telecommunication System (GTS) / WMO Information System (WIS), resulting in a 94 percent data transmission rate, almost achieving the target of 95 percent.
- The percentage of automated weather stations (AWSs) operating in line with the hydromet services' Standard Operating Procedure (SOP) of DHM increased from 10 percent in 2013 to 100 percent in 2020, surpassing the target of 90 percent. The project installed and operationalized 88 AWSs.
- The percentage of hydrological stations operating in line with the hydromet services' SOPs of DHM increased from 10 percent in 2013 to 100 percent in 2020, achieving the target of 80 percent.
- The percentage of stations providing reliable and uninterrupted real-time information in an appropriate form to users increased from 10 percent in 2013 to 80 percent in 2020, achieving the target of 80 percent.
- A National Framework for Climate Services (NFCS) was prepared by the Asian Disaster Preparedness Center through a parallel project ("Climate Adaptation and Resilience to South Asia (P171054)) but remains to be adopted by the government. Also, an assessment of climate impact by sector was not started. Therefore, the project did not achieve the target of conducting a climate impact assessment by sector.

Outcomes:

- The financial sustainability of DHM operations increased from 40 percent in 2013 to 100 percent in 2020, achieving the target of 100 percent. This achievement meant DHM budgeted sufficiently for O&M expenditure. The allocated total DHM operational budget for FY2019-20 was US$2.7 million and for FY 2020-21 it was US$8.9 million. Annual maintenance and reinvestment costs were estimated at US$1.44 million. According to the ICR (p. 28), these budget allocations were sufficient to cover 100 percent of the Operations & Maintenance needs of the DHM. It is not entirely clear how the financial sustainability of DHM operations reflects improvement in accuracy and timeliness of weather and flood forecasts and warnings.
- The accuracy and timeliness of DHM's weather forecasts—a skill measured between zero and one for weather forecasts of 24 hours lead time--was 0.47, not achieving the target of 0.75. The weather forecast verification skill score for 2019-2000 was computed by the DHM for a 24-hour lead time forecast using a complex formula. The ICR (p. 11) stated that the target was not achieved since the forecast verification system was not updated with a more advanced automated system by the end of project implementation as was originally planned.
- User satisfaction remained at its baseline of 51 percent, not achieving the target of 65 percent. However, user satisfaction surveys reported a five percent increase compared to the baseline in terms of the timeliness, adequacy, and accuracy of DHM's services. In flood prone communities such as in Sunsari, Saptari, Mahottari, Rupandehi, Banke, and Kailali districts where the DHM provides early warnings for extreme weather events, the CUSI score was 43 percent compared to the end target of 65 percent, indicating that the DHM needs to further improve the accessibility and quality of its services.

Outcome 2: Availability of AMIS services for farmers to mitigate climate-related production risks

Theory of change: The project's theory of change envisioned that project activities such as the development of an Agriculture Management Information System (AMIS) , the provision of AMIS interface infrastructure to users, the development and dissemination of agromet information products to users in pilot districts as well as training of technical agency staff and farmers on agromet information interpretation were to result in the following outputs: an AMIS being developed, an AMIS interface infrastructure being delivered to targeted farmers as well as AMIS information products being developed and disseminated. These outputs were to result in the outcome of staff farmers capacity to interpret agromet information being improved.

Outputs:

- The linkage between AMIS and the World Meteorological Organization (WMO) AMIS was improved by linking 100 percent of AMIS products to the WMO AMIS, surpassing the target of linking 80 percent of AMIS products to the WMO AMIS.
- 100 percent of farmer groups and cooperatives in all 26 pilot districts were provided with AMIS infrastructure (software and hardware) to interface with AMIS, achieving the target of 100 percent. A total of 1,263 sets of smart mobile phones, rain gauges, and thermometers were purchased and distributed to 1,263 selected farmers and cooperatives in the pilot districts. Also, one central-level and 52 district-level Kisan Call Centers (KCCs) were established in the District Agricultural Development Offices and District Livestock Services Offices to be later transferred to 51 Agriculture Knowledge Centers (AKCs) and 47 Veterinary Hospital and Livestock Service Expert Centers (VHLSECs) under the provincial government to improve the interface with farmers and cooperatives using local dialect and facilitate information exchange with agromet experts. However, at the time when the ICR was written (p. 14), the KCCs in all pilot district offices were not functioning due to an unclear administrative structure within these offices.
- 72 percent of DHM staff received technical and professional training, not achieving the target of 100 percent of staff. According to the Bank team (December 7, 2021) a full-fledged capacity building activity could not be undertaken as originally envisioned due to procurement related issues between the DHM and System Integrator.
- The percentage of users who were satisfied with AMIS main services increased from 28.03 percent in 2015 to 40.7 percent in 2019, not achieving the target of 65 percent.

Outcomes:

- Access to AMIS was improved by monthly updates and improvements of the AMIS portal, achieving the target of monthly updates and improvements.

Rating
Modest

OVERALL EFFICACY
Rationale

Achievement of the first outcome was Modest since the target for the accuracy and timeliness of weather forecasts provided by the DHM and the target for user satisfaction were not achieved. Achievement of the second outcome was Substantial due to improvements achieved in the access to AMIS by monthly updates and in the AMIS portal, as well as an increase in user satisfaction for AMIS services. Taking everything together, the overall efficacy rating is Modest.

Overall Efficacy Rating	Primary Reason
Modest	Low achievement

5. Efficiency

Economic efficiency:

The PAD (p. 18) assessed the economic efficiency of the project through two different methodologies: a benchmarking methodology and a sector specific methodology. While the PAD's analysis indicated that the project was a worthwhile investment, the analysis is outdated since it was done ten years ago.

The ICR (p. 15) conducted an ex-post economic analysis, which quantified benefits such as those arising from reduced asset losses from natural hazards due to improved hydromet and EWS services (components A, B, C). improved agricultural productivity due to improved agromet services (component D), and improved productivity in other weather-sensitive sectors due to improved hydromet services (components A, B, C).

The ICR made several assumptions that were adequate (see ICR p. 53 for a detailed list). Also, the ICR identified the differences to the analysis conducted at appraisal. These differences included: i) actual costs instead of projected costs; ii) costs were presented in economic rather than financial prices; iii) the ICR used an annual discount rate of 9 percent while the ex-ante methodology at appraisal did not apply discounting; iv) a gradual, rather than a sudden, stream of project benefits was assumed due to the lagged adoption of new services by the beneficiaries; and v) changes in Nepal's GDP and agricultural output during the 15-year economic life of the project (2013–2027) were incorporated into the analysis rather than presuming them as constant. The ICR's use of economic costs, a discount rate, and a gradual onset of benefits were distinct improvements compared to the PAD assumptions.

The analysis calculated a benefit-cost ratio ranging from 2.8 to 14.0. With a discount rate of 9 percent, the analysis calculated an Expected Net Present Value (ENPV) of US$42.2 million and an Economic Internal Rate of Return (EIRR) of 40.4 percent. The analysis did not include non-quantifiable benefits. Therefore, the ICR assumed that actual benefits were higher.

However, the ICR's economic analysis did not take into account that several significant outputs/outcomes were not achieved. For example, the accuracy and timeliness of DHM's weather forecasts was not improved, and the target for user satisfaction was not achieved. Also, as stated in the section above, it is not entirely clear how the financial sustainability of DHM operations measures improvement in accuracy and timeliness of weather and flood forecasts and warnings. Therefore, the ICR's economic analysis was overly optimistic.

Operational efficiency:

According to the ICR (p. 16), the project was able to obtain cost savings of more than US$2.3 million by practicing competitive selection processes for most of the project's procurement packages. However, the project was extended twice for a total of two years due to a slow implementation start, the late arrival of the System Investigator, lengthy procurement process for high-value packages, frequent staff turnover and exogenous factors such as earthquakes, Terai unrest and fuel crisis in 2015-2016 as well as the Covid-19 pandemic.

Given the overly optimistic Economic analysis as well as implementation delays, the project's overall efficiency is rated Modest.

Efficiency Rating

Modest

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal		0	0 ☐ Not Applicable
ICR Estimate		0	0 ☐ Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

Relevance of the objective was High given the project's objective alignment with the Bank's most recent Country Partnership Framework (CPF) for Nepal (FY19-23), which aims to increase resilience to natural disasters and climate change under focus area three. Efficacy was Modest due to the project not being able to improve flood and weather forecasting and warnings for disasters. Efficiency was Modest due to an overly optimistic Economic analysis and operational inefficiencies. Taking everything together, the project's overall outcome rating was Moderately Unsatisfactory.

a. Outcome Rating

Moderately Unsatisfactory

7. Risk to Development Outcome

The risks to the project's outcomes can be classified into the following categories:

Government commitment: According to the ICR (p. 26), the hydromet bill and regulation to establish the DHM as legally authorized agency for hydromet services had not been promulgated by the parliament by the

time the ICR was written due to frequent changes of the Irrigation Secretary in the MOEWRI in 2021. In the absence of the bill's promulgation, it has not been possible to establish a cost-recovery mechanism for the O&M of hydromet infrastructure, which is critical to ensure the sustainability of the project outcomes.

Financial resources: The government continues to be committed to the project's objective as demonstrated by the government allocating sufficient budget to the DHM for FY20/21 to implement activities that could not be finalized by the end of project implementation. Activities that had been completed since project closure included trainings on the hydromet workstation, and the development of a web portal for public web service. According to the ICR (p. 26) the DHM made provision to its annual budget since project closure to allow for O&M equipment to be installed. However, the DHM's recurring budget was not increased sufficiently for continuous O&M. Also, the MOALD moved the AMIS over to the AITC which became responsible for the O&M of the system, upgrading of modules, and conducting capacity building activities for the operation of the AMIS portal. However, the annual budget of US$26,000 for FY20/21 might not be sufficient to maintain all functions of the AMIS without negatively impacting the quality of the agromet information and services.

8. Assessment of Bank Performance

a. Quality-at-Entry

According to the PAD (p. 12), the project was built on lessons learned from previous Bank engagement in the country and from other projects on sustainability of hydromet modernization activities in developing countries. These lessons learned identified the importance of designing a system with equipment well-suited for the local geography, needs and capacities. Also, according to the ICR (p. 19) these lessons learned emphasized the importance of the DHM being transformed into a modern service-oriented agency aiming to deliver products to other government agencies and the importance of sound coordination among ministries. The ICR (p. 25) stated that the project conducted a sound analysis and consulted extensively with various stakeholders resulting in strong ownership within the government.

The Bank team also identified relevant risks related to procurement, governance, and capacity of implementing agencies. The Bank's mitigation measures were inadequate in relation to the recruitment of the System Integrator (SI) and procurement consultants at the PMUs and lack of capacity of the DHM PMU in managing the deliverables of the SI. As a result, the project experienced implementation delays.

The project's Results Framework had several shortcomings (see section 11a for more details).

Quality-at-Entry Rating

Moderately Satisfactory

b. Quality of supervision

According to the ICR (p. 26), the Bank team conducted regular supervision missions, field visits, high-level discussion with the government and technical meetings with the implementing agencies and development

partners. On a monthly basis, the Bank team conducted progress review meetings and every three months the Bank team conducted technical missions to provide support and monitor implementation progress.

However, the Bank team did not revise the Results Framework during the two project restructurings even though it would have been beneficial for measuring implementation progress towards the project's objective.

Quality of Supervision Rating
Moderately Satisfactory

Overall Bank Performance Rating
Moderately Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design
According to the PAD (p. 15), the DHM and MoAD were to be responsible for monitoring and reporting on the progress of their respective components. The project's M&E activities were to include: i) trimester monitoring and preparation of implementation progress reports (IPRs); ii) bi-annual reporting on IRIs and annual reporting on PDO-level indicators; iii) bi-annual compliance monitoring based on the ESMF progress reports and/or field verification; and iv) program-level reporting by the Ministry of Forests and Environment (MOFE).

The project's theory of change and how key activities and outputs would lead to the intended outcomes were sound and adequately reflected in the Results Framework.

However, the project's M&E had several shortcomings. First, the objective of the project was overly complex and complicated. Second, the selected indicators were often not sufficiently specific, clear, measurable and relevant for measuring the achievement towards the objective. For example, PDO indicator four ("introduction of a sustainable AMIS") was measured by a Composite User Satisfaction Index (CUSI) instead of a set of system features and as a result not measuring progress towards the achievement of the objective.

b. M&E Implementation
According to the ICR (p. 22), the PMUs produced Implementation Progress Reports (IPRs) on a regular basis and the two agencies' focal points were trained on methodology and processes for program and project reporting. The project supported the establishment of two technical committees, which collaborated with the PPCR to mainstream M&E into regular DHM and MOALD processes to allow for monitoring of project outcomes after project closure.

When the project was restructured twice, the Results Framework's shortcomings were not addressed despite challenges with the selected indicators as discussed in the section above. The end-term surveys

were integrated into the DHM and MOALD's 2018 procurement plans, which resulted in reporting on the indicators included in the Results Framework. However, since the end-line surveys were completed only in 2019, they did not fully capture the results of the project implementation.

According to the Bank team (December 7, 2021), the M&E data was reliable and of good quality. However, the PMUs struggled to produce consistent data for complex and technical indicators (e.g. IRI 3 and 6) due to ambiguities in the indicator definition and unit of measurement. Also, the Bank team stated that It is likely that the agencies continue to carry out some of the M&E functions as they continue to benefit from the SPCR Program and CARE Regional Project. However, the capacity of PMUs could be a bottleneck for the continuation of the full M&E processes.

c. M&E Utilization

According to the ICR (p. 22), M&E data was used to prepare IPRs and bi-annual/annual reports as well as to inform the PPCR annual reporting. Also, M&E data was used for the Implementation Status and Results Reports (ISRs) and to inform decision making such as the need to extend the implementation period twice. Furthermore, the project closely coordinated with the Pilot Program for Climate Resilience (PPCR) to assess the overall impact of climate adaption-related projects.

M&E Quality Rating

Modest

10. Other Issues

a. Safeguards

The project was classified as category B and triggered the Bank's safeguard policies OP/BP 4.01 (Environmental Assessment), OP/BP 4.04 (Natural Habitats), and OP/BP 4.36 (Forests) due to the potential impact that the proposed sub-projects (such as hydrological and meteorological stations, and the DHM building) might have on people and local land and water resources. According to the ICR (p. 23) the DHM prepared an Environmental and Social Management Framework (ESMF), which required each sub-project to undergo environmental screening and biannual compliance monitoring. Also, two audits/evaluations were to be conducted in the second and last year of implementation. Furthermore, an environmental specialist was to be hired to support the development and implementation of the Environmental and Social Management Plans (ESMPs). The ICR (p. 23) stated that the consultant ensured that all hydromet stations and building sites' constructions complied with the ESMPs and performed the planned environmental screening. Field staff at the regional offices received hazardous waste management training to ensure that hazardous waste from dismantled stations was dealt with appropriately. The project also complied with occupational health and safety procedures during the construction of the DHM building.

The project also triggered two social safeguard policies OP/BP 4/.12 (Involuntary Resettlement) and OP/BP 4.10 (Indigenous People) due to the potential adverse impacts during the construction phase of investments such as loss of land or structures, loss of income or access to areas for livelihood support, and public safety issues. In order to address these issues, the ESMF included a Resettlement Policy Framework, a

Vulnerable Community Development Framework, and a Gender Development Framework. According to the ICR (p. 24) the project complied with the Bank's social safeguard policies.

Furthermore, the project established a Grievance Redress Mechanism (GRM) which comprised information officers at the PMU level and grievance redress cell at the district level. During implementation only one grievance was submitted, which was addressed.

b. Fiduciary Compliance

Procurement:

According to the ICR (p. 24), the PMUs had adequate systems of accountability with well-defined procurement and decision-making responsibilities. Also, the PMUs developed and maintained records of all procurement and contract documents. Furthermore, even though procurement audits were not performed in the country, the Office of the Auditor General assessed procurement decisions during the regular accounts' audit.

However, the project faced several procurement related challenges. The PMUs lacked an effective complaints management system to review and resolve complaints at the different stages of the procurement cycle. To mitigate this issue the Bank and the PMU performed post reviews of technically complex contracts and monitored high-value contracts on a regular basis. Also, the PMU did not publish contract award details, maintenance of contract implementation documentations, and submission of complete evaluation reports. Furthermore, the DHM lacked capacity to manage contracts and was responsible for delays in contract awards and payment as well as initial low disbursement.

Financial Management:

According to the ICR (p. 25), the project complied with all the financing agreement's legal covenants. However, the project experienced several issues related to financial management. Interim unaudited financial reports and audit reports were not always submitted on a timely manner. Also, the PMUs did not address issues such as weak internal controls and delayed payments to contractors in a timely manner since the project did not have a dedicated financial officer throughout the implementation period.

c. Unintended impacts (Positive or Negative)

NA

d. Other

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11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Moderately Unsatisfactory	Moderately Unsatisfactory	
Bank Performance	Moderately Satisfactory	Moderately Satisfactory	
Quality of M&E	Modest	Modest	
Quality of ICR	---	Substantial	

12. Lessons

The ICR (p. 28) provided several lessons learned, which were adapted by IEG:

- **For highly technical and complex projects such as hydromet and early warning services projects, it is critical to provide substantial technical support and to consider a multi-phased long-term engagement**. This project required capacity building, especially in the DHM, during the initial years resulting in slow implementation progress. Also, a longer-term multi-phase approach taking into account the cascading implications of the key elements of the hydromet value chain would have been more appropriate.
- **Considering a SI for hydromet programs to bring together a group of key technical providers to support system design, implementation planning, procurement, and capacity building can be challenging**. In this project, the hiring of a SI was challenging for several reasons such as immaturity of the System Integrator (SI) market, lack of SIs' local presence and client engagement, lack of clients' capacity to manage a big consultancy, and the requirement for high-level approvals of the SI contract within government. An alternative option for providing technical support could be developing prototypes that can be scaled up gradually and leveraging innovative technologies.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR provided an adequate overview of project preparation and implementation. It was internally consistent and concise. The ICR included lessons learned for future Bank engagement in this field. Finally, the ICR was sufficiently outcome driven. However, the economic analysis did not take into account that the project did not achieve key outcome targets, which might have resulted in an overestimation of the ENPV and benefit-cost ratios. Taking everything together, the quality of the ICR is rated Substantial.

a. Quality of ICR Rating
Substantial