

Document of  
**The World Bank**  
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Report No: ICR00006208

IMPLEMENTATION COMPLETION AND RESULTS REPORT

ON

THE GRANTS

IN THE AMOUNT OF US\$5,329,452 FROM THE  
GLOBAL ENVIRONMENT FACILITY'S LEAST DEVELOPED COUNTRIES FUND (TFA4390)

AND

IN THE AMOUNT OF US\$2,700,000 FROM THE  
GLOBAL FACILITY FOR DISASTER REDUCTION AND RECOVERY (TFA4389)

TO THE

DEMOCRATIC REPUBLIC OF CONGO

FOR A

Strengthening Hydro-Meteorological and Climate Services Project (P159217)

July 11, 2023

Urban, Resilience And Land Global Practice  
Eastern And Southern Africa Region

## CURRENCY EQUIVALENTS

(Exchange Rate Effective Jan 31, 2023)

Currency Unit = Congolese Franc (CDF)

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CDF 2009.8 = US\$1

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US\$1.348 = SDR1

FISCAL YEAR

July 1 – June 30

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## ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
ASECNA	Agency for Aerial Navigation Safety in Africa and Madagascar
BEAU	Architecture and Urbanism Design Office ( <i>Bureau d'Etudes d'Architecture et d'Urbanisme</i> )
CAS	Country Assistance Strategy
COP21	21st Conference of Parties
CREWS	Climate Risk and Early Warning Systems
CRG	Geophysics Research Center ( <i>Centre de Recherche en Géophysique</i> )
CVM	Maritime Transport Authority ( <i>Congolaise des Voies Maritimes</i> )
DA	Designated Account
DCP	Data Collection Platform
DPC	Directorate of Civil Protection (Direction de la Protection Civile)
DRC	Democratic Republic of Congo
DRE	Directorate of Water Resources (Direction des Ressources en eau)
ESF	Environmental and Social safeguards
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
Eumetsat	European Organization for the Exploitation of Meteorological Satellites
EWS	Early Warning Services
FCV	Fragility, Conflict and Violence
FM	Financial Management
FY	Fiscal Year
GBON	Global Basic Observation Network
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFDRR	Global Facility for Disaster Reduction and Recovery
GRM	Grievance Redress Mechanism
IBRD	International Bank for Reconstruction and Development
ICAO	International Civil Aviation Organization
ICR	Implementation completion and results
ICT	Information and communications technology
INERA	National Agronomical Study and Research Institute ( <i>Institut National pour l'Etude et la Recherche Agronomiques</i> )
IRI	Intermediate Result Indicator
ISR	Implementation Status and Results
ISTA	Applied Studies Institute ( <i>Institut Supérieur des Techniques Appliquées</i> )
LDCF	Least Developed Countries Fund
M&E	Monitoring and Evaluation
MECNDD	Environment, Nature Conservancy and Sustainable Development

	Institute ( <i>Ministère de l'Environnement, Conservation de la Nature et Développement Durable</i> )
MettelSat	National Agency for Meteorology and Remote Sensing
MoU	Memorandum of Understanding
MTR	Mid Term Review
NFCS	National Framework for Climate Services
NGO	Non-Governmental Organization
OVD	Office of Roads and Drainage (Office des Voiries et Drainage)
PAD	Project Appraisal Document
PIC	Project Implementation Cell
PDO	Project Development Objectives
PRSP	Poverty Reduction Strategy Paper
QMS	Quality Management System
REGIDESO	Water Distribution Authority (Régie de Distribution d'Eau)
RVA	Airways authority (Régie des Voies Aériennes)
RVF	Waterways authority (Régie des Voies Fluviales)
SELAR	Socio-Economic Loss Assessment Report
SNEL	National Electricity Company (Société Nationale d'Électricité)
SOFF	Systematic Observations Financing Facility
SOP	Standard Operating Procedures
SORT	Systematic Operations Risk- Rating Tool
TF	Trust Fund
TTL	Task team Leader
UNDP	United Nations Development Program
USD	United States Dollar
WB	World Bank
WIS	WMO Information System
WMO	World Meteorological Organization

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**DATA SHEET**

**BASIC INFORMATION**

**Product Information**

Project ID	Project Name
P159217	Strengthening Hydro-Meteorological and Climate Services
Country	Financing Instrument
Congo, Democratic Republic of	Investment Project Financing
Original EA Category	Revised EA Category
Partial Assessment (B)	Partial Assessment (B)

**Organizations**

Borrower	Implementing Agency
Democratic Republic of Congo	National Agency of Meteorology and Teledetection by Satellite (Mettelsat)

**Project Development Objective (PDO)**

Original PDO

The proposed Project Development Objective (PDO) is to improve the quality of the Government of the DRC's targeted hydro-meteorological and climate services.



**FINANCING**

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
<b>World Bank Financing</b>			
TF-A4390	5,329,452	5,329,452	5,080,465
TF-A4389	2,700,000	2,572,093	2,572,093
<b>Total</b>	<b>8,029,452</b>	<b>7,901,545</b>	<b>7,652,558</b>
<b>Non-World Bank Financing</b>			
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total Project Cost</b>	<b>8,029,452</b>	<b>7,901,545</b>	<b>7,652,559</b>

**KEY DATES**

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
08-Mar-2017	22-Feb-2018	08-Sep-2020	30-Jun-2022	15-Jan-2023

**RESTRUCTURING AND/OR ADDITIONAL FINANCING**

Date(s)	Amount Disbursed (US\$M)	Key Revisions
10-Dec-2019	2.09	Change in Loan Closing Date(s)
29-May-2020	2.73	Change in Results Framework Change in Loan Closing Date(s)
25-Jun-2020	3.44	Change in Loan Closing Date(s)
03-Jun-2021	6.15	Change in Results Framework Change in Components and Cost
29-Jun-2022	6.57	Change in Loan Closing Date(s)

**KEY RATINGS**

Outcome	Bank Performance	M&E Quality
Moderately Unsatisfactory	Moderately Unsatisfactory	Modest



**RATINGS OF PROJECT PERFORMANCE IN ISRs**

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	10-Jul-2017	Satisfactory	Satisfactory	0
02	27-Apr-2018	Satisfactory	Moderately Satisfactory	0
03	19-Dec-2018	Satisfactory	Moderately Satisfactory	.79
04	14-May-2019	Moderately Satisfactory	Moderately Satisfactory	1.23
05	17-Dec-2019	Moderately Satisfactory	Moderately Satisfactory	2.09
06	24-Jun-2020	Moderately Unsatisfactory	Moderately Unsatisfactory	3.44
07	23-Dec-2020	Moderately Unsatisfactory	Moderately Satisfactory	6.02
08	24-Jun-2021	Moderately Satisfactory	Moderately Satisfactory	6.16
09	23-Dec-2021	Moderately Unsatisfactory	Moderately Unsatisfactory	6.41
10	16-Jun-2022	Moderately Satisfactory	Moderately Satisfactory	6.74
11	19-Dec-2022	Moderately Satisfactory	Moderately Satisfactory	6.98
12	12-Jan-2023	Moderately Satisfactory	Moderately Satisfactory	6.98

**SECTORS AND THEMES**

**Sectors**

Major Sector/Sector	(%)
<b>Agriculture, Fishing and Forestry</b>	<b>5</b>
Other Agriculture, Fishing and Forestry	5
<b>Information and Communications Technologies</b>	<b>29</b>
ICT Infrastructure	29
<b>Transportation</b>	<b>11</b>
Aviation	11



<b>Water, Sanitation and Waste Management</b>	<b>55</b>
Public Administration - Water, Sanitation and Waste Management	11
Other Water Supply, Sanitation and Waste Management	44
<b>Themes</b>	
Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
<b>Private Sector Development</b>	<b>69</b>
ICT	69
ICT Solutions	69
<b>Public Sector Management</b>	<b>69</b>
Data Development and Capacity Building	69
Data production, accessibility and use	69
<b>Human Development and Gender</b>	<b>100</b>
Gender	100
<b>Urban and Rural Development</b>	<b>51</b>
Disaster Risk Management	51
Disaster Preparedness	51
<b>Environment and Natural Resource Management</b>	<b>51</b>
Climate change	51
Adaptation	51

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## I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

### A. CONTEXT AT APPRAISAL

#### Country Context

1. **At appraisal, despite its rich natural resources, the Democratic Republic of Congo (DRC) was associated with political instability and poverty.** In a context of fragility, conflict, and violence (FCV), the DRC was undergoing a rapid and unplanned urbanization process. DRC's population, estimated at over 75 million people, was considered among the most vulnerable in the world, with limited access to basic services.
2. **An effective capacity to monitor and forecast hydro-meteorological (hydromet) conditions and transfer improved knowledge into decision making and planning was critical to increasing the DRC's adaptation ability and resilience.** However, the country's institutions had limited capacity to provide reliable hydromet information and forecasts. The mandate for hydromet services resided in the Ministry of Transportation and Communication Channels and the National Agency for Meteorology and Remote Sensing (*Agence Nationale de Météorologie et de Télédétection par Satellite – MettelSat*). At appraisal, despite its country-wide mandate, MettelSat was only providing aeronautical meteorological services in some airports including the airport of Lubumbashi, a secondary city, and operating a small network of surface stations. Observation and forecasting services were provided mostly by the Waterways Authority (*Régie des Voies Fluviales - RVF*), the Airways Authority (*Régie des Voies Aériennes - RVA*), the Maritime Authority (*La Congolaise des Voies Maritimes - CVM*) and the agriculture research institute (*Institut National pour l'Etude et la Recherche Agronomique - INERA*). However, there were no satisfactory arrangements for the inter-operability of these networks or inter-institutional collaboration, which would allow the development of climate services adapted to the needs of different sectors. Meteorological assistance to aviation was handled in part by RVA, while MettelSat was the national authority with responsibility to comply with the International Civil Aviation Organization (ICAO) and World Meteorological Organization (WMO) norms, regulations and standards.
3. **Overall, the national observation network was in a generally degraded condition and MettelSat faced significant challenges in delivering basic services to users (e.g., aviation, civil protection, agriculture, and the public).** At appraisal, MettelSat had 22 automatic and 29 manual stations, none of which were reporting to the WMO Information System (WIS)<sup>1</sup>. All other essential elements of the observation system, such as upper air, meteorological radars, wind profilers, and lightning detection, were either non-existent or had been shut down many years ago. The MettelSat communications system, based on high frequency radio signals, emails and regular post office delivery, was outdated, unreliable and not intended to work in real time. MettelSat had a studio to prepare radio and TV broadcasts, but limited capacity to prepare them in time or to disseminate them. Considering the need to understand climate change impacts, to protect the population against severe climate events, and to better manage the resources of the Congo River, there was a critical need at appraisal to strengthen the country's hydromet services.

#### Rationale for Bank support

4. **The project was well aligned with national priorities.** At appraisal, the Government was in the process of proposing a new legislation on meteorology which, once approved, would provide a legal framework for the coordination and harmonization of hydromet activities in accordance with the practices and standard procedures of the WMO. Moreover, climate change was a prioritized development challenge for the DRC. Under

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<sup>1</sup> In the early 1960s, MettelSat had a network of 125 synoptic stations, 700 rainfall stations, six upper air stations, and other infrastructure.



the country's 2011-2015 Poverty Reduction Strategy Paper (PRSP-2), in Pillar Four: Environmental Protection and Combatting Climate Change, the Government strived to build resilience against the impact of climate change on agriculture, water resources, energy, forest and vector-borne diseases. Capacity building of meteorological services was also mentioned as necessary to anticipate changes in climate and meteorology, to supply early warning systems, and to transfer improved knowledge for decision making and planning.

5. **The project was aligned with the World Bank Country Assistance Strategy (CAS) for DRC (FY13-FY16)**, which called for building the capacity to monitor and forecast hydromet in the DRC for building climate adaptation and resilience. It was also aligned with Pillar 2 of the World Bank Strategy for Africa<sup>2</sup>, that emphasized the need to address Africa's infrastructure deficiencies to achieve long-term sustainable growth, as well as the two core principles of the World Bank Africa Strategy for Climate Adaptation<sup>3</sup>: supporting ongoing development efforts while making them more resilient to climatic risks, and linking development, climate change adaptation, and disaster risk reduction as one integrated agenda.
6. **The World Bank added value to the project by bringing its previous experience in leading the preparation and implementation of technically complex projects supporting hydromet and climate services<sup>4</sup>**. Strengthening of hydromet services was considered an integral part of the World Bank climate business plan presented at the COP21. The availability of accurate hydromet information was recognized as an essential condition in the DRC for: (i) the management of water resources for irrigation, hydroelectricity, and drinking water; (ii) health service planning; (iii) providing safe access to air, river, and road transport; and (iv) reducing the social impacts of floods, droughts, and other extreme weather events. The Bank had provided technical and financial assistance for increasing DRC's resilience in the agriculture, urban development, energy, transport, and aviation sectors, through which potential linkages, synergies and the use of hydromet services could be envisaged.
7. **Understanding hydromet and climate risks would help assess social and economic impacts and develop adequate policy responses to support the country's sustained development**. Many economic sectors in the DRC could specifically benefit from more accurate, relevant, and timely hydromet information, warning and services. Greater understanding, monitoring, and forecasting of severe weather and weather events could result in reduced loss of life and property, economic gains, and the prevention of losses, and most importantly, improved adaptation capacity within sectors having to the negative impacts of climate variability and change.

## Project context

8. **The project was the first of its kind to be implemented by MettelSat, which faced budgetary, governance and infrastructure challenges in a poverty-stricken and FCV context**. The estimated project cost of about US\$8 million was financed by grants from the Global Environment Facility (GEF) Least Developed Country Fund (LDCF) and the Global Facility for Disaster Reduction and Recovery (GFDRR). The project was consistent with the LDCF's focus on reducing the vulnerability of key sectors and resources that are central to development and livelihoods, by enhancing Government capacity to produce and deliver hydromet services tailored to sectors and users' needs; and developing Government capacity to better manage disaster risk reduction in urban areas via enhanced institutional cooperation. As MettelSat had no prior experience in managing World Bank or donors' funds, a Bank-executed grant of about US\$2.5 million under the Climate Risk and Early Warning Systems (CREWS initiative<sup>5</sup>) was mobilized to facilitate increased support by the Bank. The DRC CREWS grant included a separate allocation managed by WMO to develop the capacities of stakeholders involved in early warning activities (e.g., civil protection, selected Municipal Councils, population in areas prone to flash-floods, and navigation services

<sup>2</sup> Africa's future and the World Bank's Support to it, March 2011

<sup>3</sup> Making development Climate Resilient – A World Bank Strategy for Sub-Saharan Africa, report #46947-AFR, October 2009

<sup>4</sup> 150+ operations since the 1980s, a dozen projects under implementation at appraisal time and several at the conceptual stage.

<sup>5</sup> The CREWS Initiative is a multi-donor grant program launched in 2017, which aims to significantly increase the capacity to generate and communicate effective impact-based, multi-hazards, gender-informed, early warnings and risk information to protect lives, livelihoods, and assets in Least Developed Countries and Small Islands Developing States. The World Bank/GFDRR, WMO and UNDRR are Implementing Partners of the initiative.

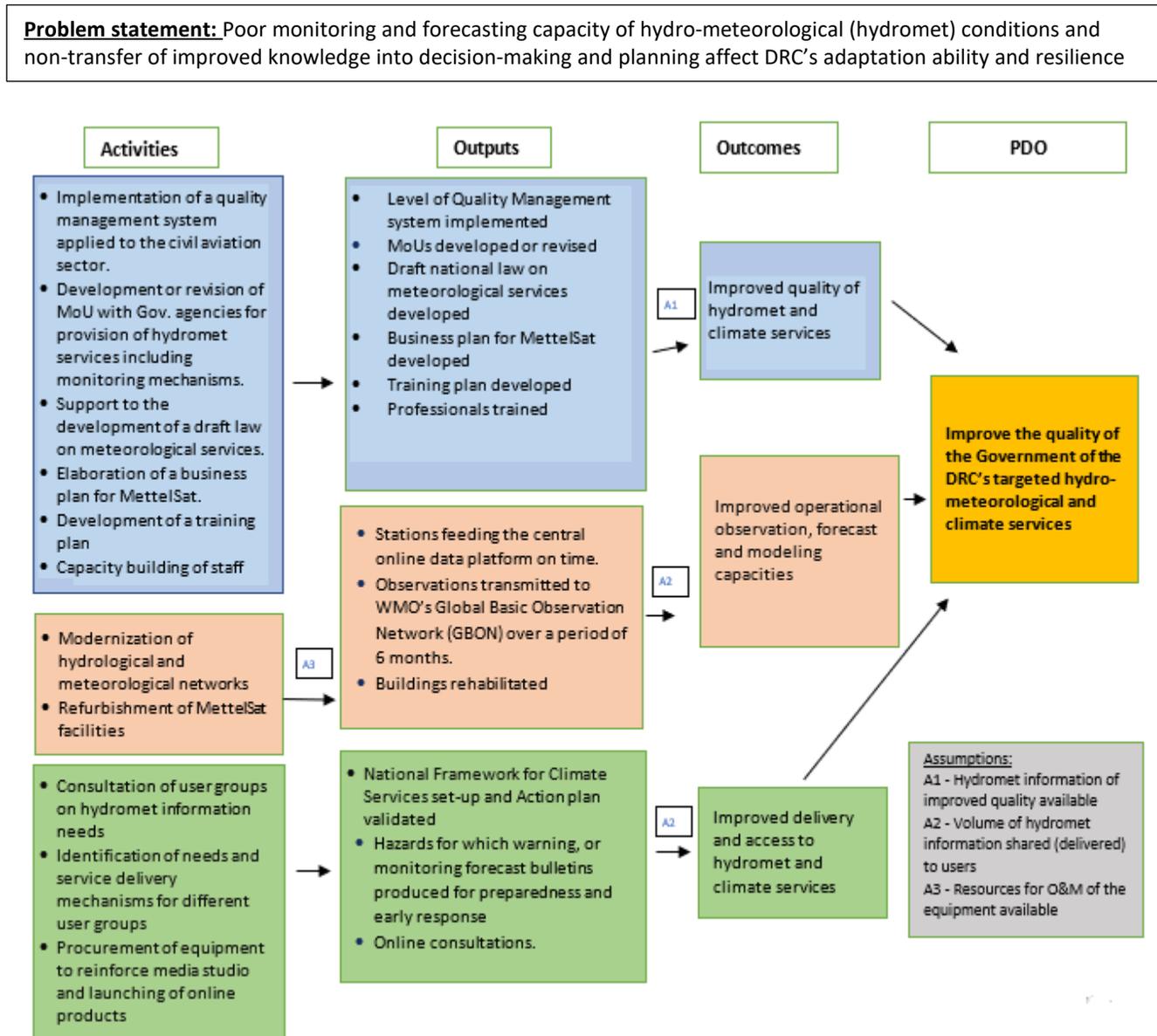


for severe weather forecasting in large lakes). The CREWS grant supported complementary activities, which are outlined in Annex 7.

Theory of Change (Results Chain)

9. The Theory of Change (ToC) illustrated in Figure 1 was developed for this ICR based on the project design in the PAD. A ToC was not required to be developed prior to appraisal.

Figure 1 – Theory of change diagram





### Project Development Objectives (PDOs)

10. The Project development Objective was to **improve the quality of the Government of the DRC's targeted hydro-meteorological and climate services**<sup>6</sup>.

### Key Expected Outcomes and Outcome Indicators

11. The original PDO level indicators identified were as follows:

- (a) Improved hydromet service delivery to key user groups, measured by the number of operational Quality Management Systems to different sectors (number).
- (b) Operational observation, forecast and modelling capacities improved (composite index).
- (c) Direct project beneficiaries (number), of which female (percentage).

### Components

12. The project was designed with four components to support the achievement of the PDO.

13. **Component A: Institutional and regulatory strengthening, capacity building and implementation support (Cost at appraisal US\$1.58 million, at completion US\$0.40 million).** This component included: (i) reinforcing the legal and regulatory framework of MettelSat to develop partnerships and Standard Operating Procedures (SOPs) for service delivery; (ii) strengthening the Quality Management Systems (QMS) to raise standards and quality control/verification procedures across the institutions; and (iii) implementing a long-term and on-demand capacity development and training program for staff.

14. **Component B: Modernization of equipment, facilities and infrastructure for basic observation and forecasting (Cost at appraisal US\$4.46 million, at completion US\$5.19 million).** This component financed: (i) hydrological and meteorological monitoring networks (small-scale rehabilitation of priority stations and installation of new sensors for about 12 meteorological and six hydrological stations); (ii) transmission, data management and data dissemination hardware; (iii) refurbishment of facilities needed to support the services in Kinshasa and up to two provincial offices; and (iv) technical systems and software for performing meteorological, hydrological and climate forecasting products and services.

15. **Component C: Improvement of hydromet information service delivery (Cost at appraisal US\$1.27 million, at completion US\$0.23 million).** This component provided technical assistance for the delivery of more accurate, timely and user-friendly products and services to users and decision-makers. It defined the requirements and developed feedback mechanisms with different user groups (in line with the National Framework for Climate Services).

16. **Component D: Project Management (Cost at appraisal US\$0.73 million, at completion US\$1.83 million).** This component provided resources for: (i) incremental operating costs; (ii) technical design of sub-projects; (iii) procurement, financial management, safeguards, monitoring and evaluation, quality control and contract management; and (iv) audit, studies and assessments required under the various project components.

### B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

17. **A project restructuring was approved in June 2021** to: (i) reduce the scope of some project activities (such as the number of sectors benefiting from the application of a quality management system and the number of synoptic stations to acquire and install under the project); and (ii) update the results framework to focus on the

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<sup>6</sup> Hydrometeorological and climate services are a tool developed through climate information and allow better ex-ante decision-making for individuals and organizations. These services require an interactive involvement of end-users to appropriately respond to their needs. Hydrometeorological services include high-quality data from national and international databases on temperature, rainfall, wind, soil moisture, and ocean conditions, as well as maps, risk and vulnerability analyses, and long-term projections and scenarios.



activities that had already made good progress at that stage of project implementation, and which would directly contribute to achieving the PDO. Adjustments to component activities and costs were justified by: (i) the higher cost for some activities than anticipated at appraisal (most notably building rehabilitation and acquisition of hydromet equipment); (ii) the lack of expected Government contribution to finance incremental operating costs; and (iii) the need to adapt the scope of project activities to the remaining available funds, time, and implementation capacity.

Revised PDO Indicators

18. The changes to the PDO indicators are shown in Table 1. In addition, two intermediate result indicators (IRIs) were dropped; four new IRIs were introduced and the end targets for three IRIs were adjusted. The indicator ‘Implementation of a National Framework for Climate Services’ was moved from the intermediate level to the PDO level, as it was considered a good measure to capture the quality of climate services.

Table 1: Revision of Results Framework

PDO indicators		
Revised indicators		
Indicator Name	Formally Revised Indicator Name	
Improved hydromet service delivery to key user groups, measured by the number of operational Quality Management Systems (QMS) to different sectors’ (number)	Implementation of a quality management system applied to the civil aviation sector (percentage)	
<i>It was decided to limit the QMS implemented by the project to only the aviation sector. The QMS would benefit other sectors (fluvial and lake navigation, civil protection, and agriculture and food security) but would not be applied specifically to these sectors.</i>		
Indicator Name	Original Target	Formally Revised Target
Operational observation, forecast and modelling capacities improved (composite index)	4	3
<i>The target value was revised down from 4 (defined as ‘operational forecast is performed numerically and systematically by crosscutting data from other stations, from remote sensing and from other global and regional models’) to 3 (defined as ‘operational forecast is performed numerically and experimentally by crosscutting data from other stations, from remote-sensing and from other global and regional models’) because of the difficulties in obtaining spare parts to bring old hydromet equipment to full functionality.</i>		
New indicators		
Indicator Name	Baseline	End Target
Implementation of a National Framework for Climate Services (percentage)	0	100
<i>This indicator was moved from the intermediate level to the PDO level as it was a good measure of quality of climate services, which was otherwise not captured at the PDO level.</i>		
Dropped indicators		
Indicator Name	Baseline	End Target
Direct project beneficiaries (number)	0	2,978,690
Female beneficiaries (percentage)	0	43
<i>These indicators were dropped for three reasons: (i) the initial methodology was based on several hypotheses (internet and television weather forecast usage, delivery and use of agrometeorological services, urban flood warning, and benefits to aviation passengers) that were not verifiable in practice; (ii) the impracticality of developing a credible methodology to measure the achievement of this indicator, given data shortage issues; and (iii) progress against this indicator would be measurable substantially only at the very end of the project and hence was not a measure of implementation progress.</i>		

Revised Components

19. The changes to component activities and costs are presented in Table 2. The reductions in the amounts allocated to Components A and C were partially compensated by technical assistance funded by the World Bank and the WMO-executed CREWS trust fund, as explained below.



**Table 2: Changes to Project Components**

Component	Appraisal budget	Change	Revised budget
<b>Component A: Institutional and regulatory strengthening, capacity building and implementation support.</b>	\$1.58 million	-\$0.96 million	\$0.62 million
<p><u>Rationale:</u> The reduction in funding was due to the underfunding of Component B and consequential scale back of the QMS activity. It was decided to limit project support to implementing a QMS only for civil aviation (which was one of three areas foreseen at appraisal). As a related additional activity, the project would provide limited technical assistance to support the elaboration of a draft law on meteorology, as project implementation experience demonstrated the need, among others, to clarify the functional assignments of sector institutions.</p>			
<b>Component B: Modernization of equipment, facilities and infrastructure for basic observation and forecasting</b>	\$4.46 million	+\$1.16 million	\$5.62 million
<p><u>Rationale:</u> The cost overrun was caused by the higher-than-expected cost of building rehabilitation and hydromet equipment. The purchase and installation of complementary stations was scaled down to meet the restructured indicator on 'Number of stations rehabilitated or improved by the project', for a total of twelve synoptic and six hydrological stations, plus 20 rain-measuring stations around the rivers N'djili and Kalamu. Installation of the 28 stations donated by the Chinese cooperation was financed by the project. In addition, only the main MettelSat facilities in Kinshasa and one regional MettelSat center would benefit from the improved buildings (compared to the appraisal estimate of up to six regional centers).</p>			
<b>Component C: Improvement of Hydromet information service delivery</b>	\$1.26 million	-\$1.14 million	\$0.12 million
<p><u>Rationale:</u> The reduction in funding was due to the underfunding of Component B. The application to flash flood warning was scaled down to two urban zones (as opposed to ten at appraisal). Applications to agriculture would focus only on the improvement of general hydromet information in the country, and pilot projects at three sites (Mbankana, Gimbi and Kiyaka).</p>			
<b>Component D: Project Management</b>	\$0.73 million	+\$0.94 million	\$1.68 million
<p><u>Rationale:</u> This component financed eligible incremental operating costs, in addition to those that were already indicated in the PAD, in the absence of the expected contribution of funds from the Government for these expenditures.</p>			

**Other Changes**

- The grant closing date was extended three times for a total of 14.5 months:** (i) for the GFDRR funding (TFA4389) from December 31, 2019 to May 31, 2020 (five months) and then to September 1, 2020, rectified to August 31, 2020 (three months), through restructurings approved in April 2020 and May 2020 respectively; and (ii) for the GEF funding (TFA4390), from June 30, 2022, to January 15, 2023 (six and a half months) through restructuring approved in June 2022. The main reasons for the three closing dates extensions were to account for implementation challenges due to the impact of the COVID-19 pandemic related restrictions.

**Rationale for Changes and Their Implication on the Original Theory of Change**

- The restructurings adapted the scope of project activities to the remaining available funds and implementation capacity** (see paragraphs 65 to 69; and 72-73). Overall, these changes did not have a major impact on the theory of change.



## II. OUTCOME

### A. RELEVANCE OF PDOs

#### Assessment of Relevance of PDOs and Rating

22. **The PDO remains highly relevant to the DRC's strategic planning framework.** The National Strategic Development Plan 2019-2023 proposed to strengthen the country's economic sectors' resilience to climate change as per Pillar 5, which related to environmental protection, fight against climate change, and sustainable development. This consists mainly of: (i) climate monitoring and early warnings; (ii) reducing the risks of disasters and the impacts of climate-related risks; (iii) promoting resilient livelihoods; and (iv) fighting against coastal erosion. In addition, the national plan for adaptation to climate change 2022-2026 envisages increasing the meteorological observation stations and preventing extreme weather events through (improved) early warning systems. The DRC's 2021-2025 action plan for the establishment of the National Framework for Climate Services (NFCS) is built on, among other things, the production of hydromet information and climate services adapted to the needs of partners and end-users, the improvement of communication and access to climate services by partners and end-users, as well as the strengthening of users' capacities in understanding and using climate information.
23. **The project is consistent with the World Bank's current country and regional objectives.** Objective 2.2 of the World Bank Country Partnership Framework (FY 22-26) for DRC emphasizes the need for equitable access to basic infrastructure services of improved quality. The design or the rehabilitation of such infrastructures is subject to climate considerations with adequate hydrological and meteorological information. Objective 1.2 aims to improve interconnectedness between and within communities to reduce exclusionary dynamics. It thus supports investments in resilient infrastructure and urban services. Moreover, the World Bank strategy for Africa through "The Next Generation Africa Climate Business Plan"<sup>7</sup> (World Bank, 2020) encourages the improvement of Sub-Saharan Africa's capacity for disaster and climate resilience by enhancing national weather, water, and climate (hydro-meteorological) services, including early warning, knowledge, and advisory services, and connecting national systems with regional and international partners.
24. **The project makes a significant contribution to expanding the World Bank climate-resilient agenda across the portfolio.** At completion, several ongoing projects relied directly on the achievements of, and lessons learned from the Hydromet Project. Among these are the Transport and Connectivity Support Project (P161877), which plans to asphalt 440 km of road and the implementation of a resilient road management system considering climatic hazards. The design of structures under this project will benefit from the climate data newly developed by the Hydromet Project, which has also digitized the climatological archives of 125 stations. The Kin Elenda project (P171141), which plans to increase Kinshasa's resilience to erosion and flooding, as well as to implement flood and erosion control measures, is building on the achievements of the Hydromet project on flood warnings mainly in the N'djili and Kalamu watersheds.
25. **The relevance of the PDO is rated High.**

### B. ACHIEVEMENT OF PDOs (EFFICACY)

26. **The ICR rates outcomes based on a split evaluation.** The original PDO was not changed; however, the project restructuring updated the Results Framework to reduce the scope of some activities. This was accompanied by either dropping or adding indicators, as well as changes to few target values. A split rating will be applied for two periods: (i) Original scope from approval to June 2021 restructuring; and (ii) Revised scope from June 2021 restructuring to completion. Table 3 outlines the achievement of PDO indicators under both scopes.

<sup>7</sup> <https://openknowledge.worldbank.org/entities/publication/e44b41cc-9835-5acb-bce5-d5718bccb7bb>



**Table 3: Achievement of PDO indicators**

		Original scope	Revised scope
#	PDO Indicators	Target	After 2021 restructuring
<b>PDO: Improve the quality of the Government of the DRC’s targeted hydro-met and climate services</b>			
1	Improved hydromet service delivery to key user groups, measured by the number of operational Quality Management Systems to different sectors’ (number)	4	N.A.
	Implementation of a quality management system applied to the civil aviation sector (percentage)	N.A.	100
	Achievement rating of indicator	N	M
2	Operational observation, forecast and modelling capacities improved (composite index)	4	3
	Achievement rating of indicator	S	H
3	Implementation of a National Framework for Climate Services (percentage)	N.A.	100%
	Achievement rate of indicator	N.A.	(H)
4	Direct project beneficiaries (Number in million)	2.7	N.A.
	Achievement rating of indicator	Not measurable	Indicator dropped
	Female beneficiaries (Percentage)	43	N.A.
	Achievement rating of indicator	Not measurable	Indicator dropped
<b>Overall PDO Rating</b>		<b>M</b>	<b>S</b>

Legend: N.A. – Not applicable; H – High; S – Substantial; M- Modest; and N – Negligible.

**ASSESSMENT OF ACHIEVEMENT OF EACH OBJECTIVE/OUTCOME**

- 27. **The PDO was to improve the quality of DRC’s targeted hydro-meteorological and climate services.** The quality improvement referred to the enhancement of MettelSat’s abilities to provide basic services to user groups, taking into account their specific needs. This included, *inter alia*, upgrading of MettelSat’s technical capacities in managing modernized observation networks and a better delivery of hydromet and climate information. The targeted services involved the main user groups that rely on hydromet information, i.e.: (i) aviation, (ii) fluvial and lake navigation; (iii) civil protection; and (iv) agriculture and food security.
- 28. **The evaluation of the efficacy is structured around the PDO three outcomes as defined in the Theory of Change:** (i) improved quality of hydrometeorological and climate services; (ii) Improved operational observations, forecast, and modeling capacities; and (iii) improved delivery and access to hydromet and climate services.

**Outcome 1: Improved quality of hydrometeorological and climate services**

- 29. To improve the quality of hydromet and climate services, the project intended to: (i) strengthen the QMS to raise standards and quality control/verification procedures across the institutions; (ii) reinforce the legal and regulatory framework of MettelSat to develop partnerships for service delivery; and (iii) implement a long-term capacity development and training program for staff. Activities realized to meet this outcome are discussed below, against the original and the revised scopes, and assessed based on indicators included in Table 4.

**Outcome against the original scope**

- 30. **Under the original scope, it was foreseen to implement a QMS in four sectors,** namely civil aviation, fluvial and lake navigation, civil protection, and agriculture and food security. Three years into project implementation, only the aviation sector had recorded some progress, estimated at 40 percent, in executing the steps required to implement a QMS, while the process had not started yet for the other three sectors, mainly due to limited capacity to carry out this activity. Hence, at MTR, it was decided to focus on the aviation sector. The related PDO



indicator was amended to reflect this.

31. **Strengthening of institutional and governance capacities was meant to be measured by (i) the number of Memoranda of Understanding (MoUs) having been developed or revised with other institutions using and/or providing hydromet services; as well as by (ii) the number of professionals having participated in trainings.** Under the original scope, collaboration agreements between MettelSat and users of hydromet information were largely in place, with the intermediary target exceeded. Of the eight MoUs initially targeted to be in place by project closing, ten were already signed at MTR, at which point it was decided to revise the target upwards. The MoUs, initiated by MettelSat, established a partnership and exchange mechanism between the providers and users of hydrometeorological services. This facilitated continuous improvements in the information produced for the different sectors.
32. **In terms of technical capabilities, the project contributed to improving the skills of MettelSat's human resources through capacity building.** A total of 339 staff and managers (against a target of 360, unchanged under the original and revised scope) benefitted from training in the use of state-of-the-art observation technology (with up-to-date sensors and automatic transmission via a mix of satellite networks and cell phones), climatology and hydrology (targeted administrators of WMO open-source database), weather forecasting, hydrological forecasting (in the N'djili and Kalamu watersheds) and service production. These trainings provided MettelSat with skilled staff in the installation, operation, and maintenance of hydrometeorological networks. The retention of skills inside the agency is meant to be supported through a long-term training plan which was developed and validated by MettelSat with support from the project.

#### Outcome against revised scope

33. Overall, the targets under the revised scope – one unchanged, two revised and two new – were largely met, as discussed below.
34. **The aviation QMS was necessary to allow DRC's meteorological services to meet the needs of user groups in accordance with the International Civil Aviation Organization's requirements in the civil aviation sector.** In line with a roadmap prepared by the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA), the project implemented 12 of the 21 steps required to implement a QMS – which is assessed at 57.14 percent of achievement at project closing (see Table 4). The completed steps include the identification of interested parties and their requirements, the preparation of the quality policy, processes and mapping, and quality documents. The remaining steps – to be handled by MettelSat- are mainly related to capacity building in aeronautical meteorology and the implementation of the certification audit.
35. **The 13th MoU with the Airways Agency (RVA) was not signed at project closing.** This is due to a long-standing dispute over the management of meteorological services in airports and the sharing of aeronautical royalties between the two institutions. The setup of MoUs prevents overlapping interventions and emphasizes the need to improve the quality of information produced through partnership and collaboration. The latter is meant to facilitate feedback mechanisms between producers and different user groups as well as to leverage the support of donors within the sector. Under the revised scope, 92 percent of the target of the indicator measuring this activity was achieved. The list of signed MoUs is provided in Annex 6.
36. **The project provided limited technical assistance to support the elaboration of a Draft Law on Meteorology, as project implementation experience had demonstrated the need, among others, to clarify functional assignments of sector institutions.** The draft law proposed a legal coordination and harmonization framework for meteorological services. This legal framework was also meant to lead to the recovery of costs for meteorological assistance to multimodal transport, agricultural activities, fishing, and livestock. At project closing, the draft law was submitted to the Government for approval. However, the effectiveness of this



legislation is dependent on the outcome of the debate within the government on whether to enact it as a law versus a decree – which is outside the project’s control. The process leading to a draft final law – which marked the full achievement of this intermediary result indicator – included extensive consultations with all stakeholders and technical inputs from consultants.

- 37. **To help improve MettelSat’s revenue stream, the project supported the development of a business plan for MettelSat, which was adopted by its management.** The business plan contains a strategy to assure sustainability of project results. The document also provides an analysis of revenues that can be collected in the aviation sector and determines allocations from air navigation royalties to MettelSat, as well as possible commercial revenues from other meteorological data users. The target for this activity, added under the revised scope, was fully achieved.

**Table 4: Summary of Achievement of Outcome 1, Improved quality of hydromet and climate services**

Indicators	Baseline	Targets under the original scope	Targets under the revised scope	Final Result	Level of achievement
<b>PDO</b>					
Implementation of a quality management system applied to the civil aviation sector* (percentage)	0		100	57	Partly achieved
<b>IRI</b>					
Number of professionals having participated in trainings (Number)	0	360		339	Mostly achieved
Number MoUs developed or revised, with mechanisms for monitoring (Number)	0	8	13	12	Almost achieved
Draft national law on meteorological services developed (Percentage)	0		100	100	Achieved
Elaboration of a business plan for MettelSat (Percentage)	0		100	100	Achieved

\* The original target was four sectors.

### Efficacy of Outcome 1: Summary

- 38. The efficacy of the Outcome 1 is rated **Negligible** against the original scope, and **Modest** for the revised scope. The main PDO indicator under Outcome 1 was not achieved, despite positive achievements under the revised scope.

### Outcome 2: Improved operational observations, forecast, and modeling capacities

#### Outcome against the original scope

- 39. **The improvement of MettelSat’s technical capacities to provide basic services to key users was assessed based on a four-level system that considered both the capabilities and capacity of MettelSat.** Under the original scope, the project refined MettelSat’s operational forecast from its baseline Level 1 - operational forecast is produced on paper on a daily basis for 24 hours - to Level 3 (against a targeted Level 4), reaching a substantial achievement<sup>8</sup> (see Table 4). Level 3 corresponds to the production of forecasts using data stations, remote-sensing, and other global and regional models.

<sup>8</sup> At PDO level, it was foreseen that MettelSat would reach Level 4, which refers to the development of operational forecast numerically and systematically by crosscutting data from other stations, from remote sensing and from other global and regional models.



40. The improvement of forecast and modelling capacities was further measured by the IRI: Number of stations feeding the central online data platform on time. To achieve Outcome 2, an important upgrading of MettelSat's observation stations network was a prerequisite. It was foreseen to rehabilitate 40 stations and install 80 stations to supply the main online data platform. These two activities were captured at the intermediate results indicator level. The 80 stations to be installed would include new equipment procured through the project, as well as existing equipment stored in MettelSat premises. Under the original scope, there was no installation completed, hence the IRI was not met. In addition, due to the lack of spare parts for hydromet equipment, it was decided at MTR to, on the one hand, drop the rehabilitation of stations (and thus its IRI), and on the other hand to reduce the target for the installation of stations from 80 to 60.
41. **To improve the transmission of data coming in and out of MettelSat, it was foreseen to improve connectivity and provide necessary ICT equipment, including modems, routers, power supply, and data collection systems; and tools to verify/clean data records.** The observations Data Collection System, which allows the reception of the information sent by the stations (whether they are automatic or manual), would be modernized to allow the reception of all national hydromet data of interest to MettelSat and their handling, so that they may be used by the central forecasting and the climate monitoring systems. This activity -despite achieving some positive results, as MettelSat had started transmitting data- was not captured by a specific indicator under the original scope. This was added at MTR.

#### Outcome against revised scope

42. **Under the revised scope, MettelSat's operational forecast capability did not progress beyond the level reached under the original scope.** However, the target of the PDO indicator was downscaled from Level 4 to Level 3, which reflected its full achievement.
43. **The target for the installation of stations was exceeded, as 63 stations were installed and fed the central data platform.** This network was also reinforced by the provision of 20 telephones to facilitate the transmission of data from remote areas to the National Meteorological Center. The project also supported the digitization of historical hydrometeorological and climatic data of 125 stations, from 1945 to date, which would facilitate data sharing.
44. **Working conditions were improved through the rehabilitation of building facilities and procurement of vehicles to support field missions.** Three MettelSat buildings were refurbished as planned (reaching 100 percent of the target), namely the General Direction and the Analysis Center in Kinshasa, as well as the Provincial Office of Tshopo in Kisangani. The renovation of buildings reinforced the protection of equipment in the analysis room, the media studio, and office premises. Working conditions of the staff improved and their productivity increased. The project's vehicles facilitated data collection and equipment maintenance missions in remote locations.
45. **The number of observations transmitted to the WMO Global Basic Observation Network (GBON) improved, however not to the expected extent.** Indeed, only 3,189 observations (of the 109,440 observations expected from the upgraded network) over the 180 days (6 months) preceding January 15, 2023, were transmitted through the WMO Information System (WIS) to international forecasting centers. This result corresponds to an average of 17.7 observations transmitted per day. Data transmission protocols were still being adjusted around the project closing date. The effectiveness of international data transmission is expected to be achieved after the finalization of the raw data encoding protocol, possibly during the second semester of 2023. It should then be able to produce an average of 288 observations per day with the 12 automatic stations. This will correspond to 51 840 observations for 180 days (6 months), which is nearly 47.36 percent of the target.



Table 5: Summary of Achievement of Outcome 2, Improved operational observations, forecast, and modeling capacities

Indicators	Baseline	Targets under the original scope	Targets under the revised scope	Final Result	Level of achievement
<b>PDO</b>					
Operational observation, forecast and modelling capacities improved (composite index)	1	4	3	3	Achieved
<b>IRI</b>					
Number of stations feeding the central online data platform on time (Number)	0	80	60	63	Exceeded
Number of observations transmitted to WMO’s Global Basic Observation Network (GBON) over a period of 6 months (Number)	0	109,440		3,189	Not achieved
Number of buildings rehabilitated (Number)	0	3		3	Achieved
Number of stations rehabilitated or improved by the project (number)		40			Indicator dropped

### Efficacy of Outcome 2: summary

46. The efficacy of Outcome 2 is rated **Substantial** against the original scope, and **Substantial** for the revised scope.

### Outcome 3: Improved delivery and access to hydrometeorological and climate services

#### Outcome against original scope

47. **To assess the improvement of service delivery to users, the PDO level indicator for Outcome 3 was to measure the number of direct project beneficiaries, including the percentage of women.** At the IRI level, it was further foreseen to measure the number of views on the online data platform, the number of hazards for which warning or monitoring forecast bulletins had been produced, and the number of user groups that had shared their needs and a resulting action plan to address them. Under the original scope, it was not feasible to assess the PDO indicators which were therefore dropped at restructuring, due to the reasons presented in Table 1. Moreover, activities related to consultations of user groups were well advanced, and supported the establishment of the NFCS, associated with an Action Plan (2021-2025). Since the implementation of an NFCS was critical to measuring the quality of climate services, the indicator linked to it was upgraded from IRI to PDO level at restructuring. This was the only change under this Outcome, as the other IRI remained unchanged, as discussed below and shown in Table 6.

#### Outcome against revised targets

48. **Under the revised scope, the PDO related to the establishment of a NFCS was fully achieved.** Following consultations at the national level, six priority sectors have expressed their needs for meteorological services support (against the target of four): (i) Agriculture and Food Security; (ii) Water Resources; (iii) Health; (iv) Energy; (v) Natural Disaster Risk Management; and (vi) Environment. The NFCS brought together the producers of meteorological, hydrological, and climate information, primarily MettelSat, and the main users of this information in the climate-sensitive sectors, mentioned above. It is a platform for dialogue, exchange, and decision support for all activities affected by climate hazards. It facilitated access to suitable information to either protect the respective sectors from hazards, or to take advantage of the opportunities related to these hazards. It is an essential tool for adaptation to climate change. The implementation of the NFCS is governed by the provisions of Decree N°22/19 of



13 May 2022 related to the creation, organization, and operation of the NFCS, supported by the project – which marks the full achievement of this indicator. The operationalization of the NFCS was launched through a high-level workshop on December 19, 2022, which confirmed the government's willingness to mobilize all actors around the framework.

- 49. **The diversification of communication tools improved the delivery of weather services to the public.** The project allowed better distribution and access to weather forecasts, which are shared via the MettelSat website (*www.meteordc.cd*), the Facebook page, and the YouTube channel. In the final month of the project, the number of consultations went from 392 reported in July 2022 to 3,503 at project closing (against the target of 5,000, unchanged under the original and revised scope). With the reinforcement of the media studio equipment at the end of the project, consultations are expected to increase significantly after project completion. The introduction of mass communication tools such as broadcasting media, social media, and the internet have helped to disseminate data to many users within a short period and have facilitated interaction between the producer and users.
- 50. **As a result of the equipment procured and the accompanying capacity building, the broadcasting of weather forecast and warning bulletins expanded from one event at project inception, to four events** (namely temperature, wind, rainfall, and humidity), hence fully achieving its target of four at project closing (unchanged under the original and revised scope). The increase in MettelSat’s equipment network allowed the updating of forecast bulletins from every 24 hours to every six hours, and then from every six hours to every three hours to deal with extreme weather. The six-hour or three-hour weather forecasts are available on request. In addition, the warning bulletins for flood risks on the N'djili (Kinshasa) and Kalamu (Central Kongo, Boma) watersheds and for agriculture can now be disseminated upon demand, with the completion of the deployment of the "WIMES" visualization interface for hydrometeorological stations (likely by the second semester 2023).

**Table 6: Summary of Achievement of Outcome 3, Improved delivery and access to hydromet and climate services**

Indicators	Baseline	Original target	Revised target	Final Result	Level of achievement
<b>PDO</b>					
Implementation of a National Framework for Climate Services (percentage)	0		100	100	Achieved
<b>IRI</b>					
Number of consultations of the online data platform (Number)	0	5,000		3,503	Mostly achieved
Number of hazards for which warning, or monitoring forecast bulletins have been produced with sufficient lead-time for preparedness and early response (Number)	1	4		4	Achieved
Number of user groups having expressed their needs and developed a resulting action plan to address them (Number)	0	4		6	Exceeded

**Efficacy of Outcome 3: summary**

- 51. The efficacy of Outcome 3 is rated **Negligible** under the original scope, and **Substantial** under the revised scope. The original PDO indicators were dropped as not measurable, while the new PDO indicator under the revised scope was achieved.

**Justification of Overall Efficacy Rating**

- 52. **The overall efficacy is rated Modest for the original scope, and Substantial for the revised scope.**



## C. EFFICIENCY

### Assessment of Efficiency and Rating

53. **At appraisal, project costs were estimated at \$17.65 million, which included grant financing of \$8 million, as well as costs for O&M and repair at an assumed 10 percent of total project investment for modernization of equipment and new installations.** O&M costs of the additional infrastructure (valued at \$6 million) delivered by the Government of China were also considered in the analysis. The present value (PV) of benefits was estimated at \$107.41 million in benefits over 15 years, of which \$15.86 million (including \$2.2 million for the aviation sector) were expected to be realized during the project's life. These benefits were to be contributed from: (i) reduced damages and losses related to flooding in urban areas (\$30.93 million, 500,000 persons); (ii) enhanced agricultural productivity (\$59.78 million); (iii) optimized air traffic navigation (through routing, and during landings and take-offs, \$15 million); and (iv) benefits to households (\$1.7 million). The realization of these benefits was intimately linked to assumptions related to the provision of services to various sectors, and of sufficient budget allocation to MettelSat for administration, O&M, and service delivery.
54. **The economic analysis was updated at project completion and evaluated the PV at \$675,000 in revenues generated by the aviation sector during the project lifetime.** This means that only 31 percent of the benefits anticipated for the aviation sector during project implementation was achieved and is mainly related to the provision of air navigation services at Lubumbashi and Kolwezi airports. The installation of equipment and workstations mostly towards the end of the project resulted in the anticipated services not being provided to the different sectors (including floods, agriculture, roads and households). Additional details are available in Annex 4.
55. **Design Efficiency.** The design, built on the World Bank's global hydromet experience, was considered appropriate for a country with institutional challenges. Components A: institutional strengthening, and Component B: Equipment modernization, were straightforward, consisting mainly of consulting services, institutional capacity building and interinstitutional knowledge exchange, the procurement and installation of equipment, as well as refurbishment of buildings. The project design was sufficiently flexible to accommodate needed adjustments. Indeed, the budget for Component C: Service delivery, was significantly reduced from \$1.26 million to \$0.12 million. Similarly, the budget for Component A had to be reduced in favor of Component B, due to the underfunding of the latter which accounted for higher-than-expected costs of building rehabilitation and hydromet equipment. Other considerations regarding the project design are outlined in Section III A: Key factors that affected implementation and outcome.
56. **Implementation Efficiency.** At closing, the project had executed 95.3 percent of the planned budget and achieved only 31 percent in terms of socio-economic benefits planned at appraisal for the aviation sector. The absence of government counterpart funding (\$200,000 per year over the project's lifetime) as well as the non-transfer of the expected 60 percent of subsidies collected for aeronautical meteorology from RVA to the benefit of MettelSat negatively affected both MettelSat and the project. The latter issue was due to a longstanding dispute between MettelSat and RVA over cost-sharing revenue for the meteorological services provided to aviation as well as airport access in Kinshasa, which remained unsolved until project closing. This forced the downsizing of activities initially planned under Component A, and the increased financing of activities related to the MettelSat operational charges under Component D (Project Management) which were not budgeted at appraisal. To account for implementation challenges (including delayed grant effectiveness, limited PIC capacity, procurement delays, excessive changes in key government staff and MettelSat management, ESF and FM issues, and COVID-19 related delays), the grants for the project were extended for a total of 14.5 months through three extensions, hence negatively impacting project efficiency. Further details can be found under Section III: Key factors that affected implementation and outcome.
57. **Based on the above discussion, Efficiency is rated Modest.**



#### D. JUSTIFICATION OF OVERALL OUTCOME RATING

58. **The overall outcome of the project is rated Moderately Unsatisfactory, based on the combined evaluation of Relevance (High), Efficacy (Modest/Substantial), and Efficiency (Modest), as shown in Table 7.** Efficacy is rated based on a split evaluation for each outcome and the implementation period under the original and revised scope. Based on sub-ratings, the outcome rating is automatically derived based on the methodology in the ICR guidelines<sup>9</sup>. The rating of the PDO in the ISR was Moderately Satisfactory, which is higher than the Outcome rating in the ICR. The ISR PDO rating reflected the Substantial rating of the project under the revised scope and is due to a split rating not being carried out.

**Table 7. Overall Outcome Rating**

		Original Scope	Revised Scope (June 2021- January 2023)
<b>1. Relevance</b>		<b>H</b>	
<b>2. Efficacy (PDO)</b>		<b>M</b>	<b>S</b>
1	Improved quality of hydrometeorological and climate services	<b>N</b>	<b>M</b>
2	Improved operational observations, forecast, and modeling capacities improved	<b>S</b>	<b>S</b>
3	Improved delivery and access to hydrometeorological and climate services	<b>N</b>	<b>S</b>
<b>3. Efficiency of the PDO</b>		<b>M</b>	
<b>Outcome</b>			
1	Outcome Rating	MU	MS
2	Numeric value of the outcome rating	3	4
3	Disbursement (US\$) 7.652 million	6.15 million	1.502 million
4	Share of disbursement (%)	80.4	19.6
5	Weighed value of the outcome rating (Row 2 X Row 4)	2.41	0.78
<b>Outcome Rating</b>		<b>3.19 =&gt; MU</b>	

#### E. OTHER OUTCOMES AND IMPACTS

59. **Gender.** The project PAD highlighted the importance of mainstreaming gender in hydro-meteorological services, as such services trigger early warnings where women are the main beneficiaries in certain sectors. Although the project supported women trainees in the digitalization of historical data and the integration of women in forecasting teams, this mainstreaming was not achieved; the project had negligible involvement of women within the technical teams of MettelSat. Of the 339 staff trained, only 12 were women; they were trained in administrative matters.
60. **Institutional strengthening.** The project strengthened the institutional capacity of MettelSat. It funded trainings, including a study tour in Niger, knowledge and skill improvement workshops, pairing consultants with MettelSat staff or managers for knowledge transfer. The pairing included expertise in procurement, financial management, environmental and social safeguards, and monitoring and evaluation. The project served as a management model for MettelSat for future donor-funded projects. The working capacity of MettelSat was also improved by the procurement of office equipment, including computers, automobiles and studio broadcasting kits.

<sup>9</sup> Bank Guidance - Implementation Completion and Results Report (ICR) for Investment Project Financing (IPF) Operations, dated March 2, 2020. Appendix H 'Deriving the Overall Outcome Rating' provides the overall outcome rating based on sub-ratings of relevance, efficacy, and efficiency. Appendix I 'Application of Split Ratings' outlines numerical values attributed to outcome ratings: 1 for Highly Unsatisfactory, 2 for Unsatisfactory, 3 for Moderately Unsatisfactory, 4 for Moderately Satisfactory, 5 for Satisfactory, and 6 for Highly Satisfactory.



61. **Mobilizing Private Sector Finance.** The project did not consider any co-financing or private sector financing arrangement.
62. **Poverty Reduction and Shared Prosperity.** Poor communities are disproportionately vulnerable to floods compared to the average population<sup>10</sup>. While the project did not specifically target poor communities, the modernized equipment installed in the N'djili and Kalamu watersheds would help to produce early warnings to the exposed population.

### Other Outcomes

63. **Potential financial leveraging.** The project was instrumental in developing the capacity of MettelSat to ensure that it could qualify for funding from the Systematic Observations Financing Facility (SOFF), which will be critical to the agency's sustainability. The DRC was confirmed in November 2022 as part of the first batch of countries eligible to receive support from the SOFF, which is an initiative created by the major development and climate finance institutions through the Alliance for Hydromet Development to scale up and unite efforts to generate better weather forecasts, early warnings, and climate information. SOFF funding and technical assistance cover activities related to establishing, operating, and maintaining national observation networks to meet the requirements of the GBON regulations. Based on the achievements and lessons learned from project implementation, DRC is about to close 60 percent of the GBON gap and is therefore likely to meet the SOFF programming criteria. SOFF is expected to create leverage and sustainability for Hydromet project investments. Meteo Swiss has prepared a SOFF readiness document, and will work with AfDB to prepare MettelSat towards accessing SOFF funding.

## III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

### A. KEY FACTORS DURING PREPARATION

64. **Project objectives and design.** The project objectives were clear and remained highly relevant throughout project implementation. The project design was relatively simple with one entity carrying out all project management activities. Its focus around the ICAO QMS approach intended to raise the country's international profile. Initially, it was targeted to be applied to four main user groups/sectors: civil aviation, fluvial and lake navigation, civil protection, and agriculture and food security, with specific systems setup to service each one. However, during implementation this was found to be too ambitious, and the project was restructured to apply the QMS only to the aviation sector, while it would still benefit the other sectors.
65. **Implementation arrangements.** MettelSat, as the official national hydromet agency, was the main implementing entity. However, it had no prior experience in managing World Bank funds, hence additional supervision support by the Bank was foreseen to ensure the full delivery of services. A National Steering Committee was established under the leadership of the Ministry in charge for Transportation, to (i) coordinate project activities and ensure that they were harmonized with related activities of other government stakeholders; and (ii) approve the overall implementation plan and annual project budget. A Project Implementation Cell (PIC) was also set up within MettelSat to bring together the required expertise from across the organization, and strengthen its capacity with consultants, where needed. An innovative system of "pairing" one MettelSat staff with a consultant expert was put in place to facilitate knowledge transfer and capacity building.
66. **Risk assessment and mitigation measures.** The project risk was rated as Substantial. The Systematic Operations Risk-Rating Tool (SORT) was not applied at project appraisal; however, the risk rating was updated during implementation to reflect new guidance on the rating of residual risk to the PDO after mitigation measures. The main risk came from institutional capacity for implementation and sustainability. The project included activities to

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<sup>10</sup> World Bank, Policy Research Policy Paper No 7480, Disaster Risk, Climate Change, and Poverty.



improve MettelSat's revenue stream directly related to project outputs (through the development of a business plan and more equitable cost-sharing of revenues from civil aviation with the civil aviation authority). In addition, the Government had included additional operating budget in the budget law, which however was not disbursed. Fiduciary risk came from the operating environment and MettelSat capacity. This risk was to be mitigated by increased frequency of procurement and FM reviews by the Bank.

67. In summary, the project design after restructuring was appropriate to meet the project's objectives.

## B. KEY FACTORS DURING IMPLEMENTATION

### Factors subject to implementing entity control

68. **Slow start-up.** Grant effectiveness of the project was delayed by seven months. The project experienced start-up problems due to MettelSat's lack of prior project implementation experience. Implementation accelerated after the official launch workshop was held on March 6, 2019, i.e., almost two years after Board approval of the GEF Grant on March 8, 2017.
69. **Changes in PIC management and staff turnover.** The PIC was responsible for day-to-day project implementation activities, with the MettelSat General Director appointed Hydromet Project Coordinator. Governance issues at MettelSat led to the suspension of the Project Coordinator on two occasions. The third Project Coordinator was appointed in December 2021 and remained in office until project closing. These changes caused delays of several months due to the absence of signatories to represent the Government. MettelSat was also affected by repeated labor strikes for several months. Overall, the lack of an effective administration in MettelSat negatively affected project implementation.
70. **Until project closure, the institutional arrangement at MettelSat was not fully implemented.** The MettelSat strategic diagnosis carried out at project start-up clearly showed that its institutional statute was not implemented, and its functioning was highly unsatisfactory. Consequently, the Bank agreed on the urgent need to put MettelSat back on track to not jeopardize project investments. The institutional strengthening of MettelSat cannot be achieved without the commitment of MettelSat's management and the Government. However, until project closing, the Board of Directors and the Auditors, who would be able to defend a budget and guarantee human resources management, were not established. In addition, the absence of Government counterpart funding reflected a lack of political will to support MettelSat in fulfilling its mission.
71. **Limited capacity in ESF resulted in the need for extensive support from the Bank and caused delays in implementation.** The Bank advised MettelSat to suspend building rehabilitation works in October 2019 until the identified shortcomings in the implementation of ESF recommendations were resolved in December 2019. The late preparation of the ESF instruments led to delays in the installation of equipment.
72. **Management of funds.** The project incurred ineligible expenditures in two instances: (i) the first one in the amount of \$23,800 for direct payments by MettelSat to ASECNA staff in the context of a capacity building collaboration agreement; and (ii) the second one in the amount of \$144,000 due to a seizure of project funds imposed by a third party on the designated account (DA), hence outside the control of MettelSat. The full amount (\$167,800) was eventually reimbursed by the Government. However, the DA was suspended for several months and could not receive cash advances due to the seizure of funds. During that period, the project relied on direct payments. Under such conditions, it was not possible to launch the implementation of new activities.
73. **The sustainability of project investments was undermined by the financial situation of MettelSat.** The expected Government counterpart funding to cover incremental operating costs of MettelSat (\$200,000 per year over five years) did not materialize by project closing, even though they were included in the 2018-2019 and 2020 Budget law. Thus, the project had to continue financing activities related to the operational cost of the PIC. The Bank provided support to increasing MettelSat revenues by a better sharing of revenue with the civil aviation agency



(RVA) and the development of a business plan, which could have improved the long-term financial situation of MettelSat. Although the underlying analysis for the RVA cost sharing was raised in several management letters, it did not receive formal Government endorsement until project closing.

#### Factors subject to World Bank control

74. **The World Bank assigned experienced task team members to the Project from the Country Office.** There was turnover in Task Team Leaders (TTLs) during project implementation, with three ADM TTLs leading the project. However, the changes in TTLs did not negatively affect project implementation, even though the waiting period for the Bank's non-objection notification was sometimes long. The Bank ensured that there was no gap between the changes, and the TTLs were supported by dedicated staff working on the project. Moreover, the third (and final) TTL was based in the country, which helped build a strong relationship with the PIC and gain a deeper understanding of the local context of the project.
75. **The Bank provided adequate guidance and responded to issues that arose during implementation.** Frequent Implementation Support Missions, regular check-in meetings and the MTR highlighted the timeliness of World Bank support in addressing implementation issues, including PIC capacity, procurement, safeguards, and financial management compliance. The restructuring that followed the MTR addressed pertinent issues in terms of project scope and RF adjustments to better reflect project progress and results.

#### Factors outside the control of the Implementing Entity and the World Bank

76. **Changes in the Government team.** There were several changes in the DRC Government composition during project implementation, including in the Ministry of Transport (the line ministry for the project), which counted five successive ministers from project inception until closing. This negatively impacted the ownership of the project and its strategic oversight, as each new team had to go through a learning curve to understand the project and the issues at stake.
77. **The COVID-19 pandemic and technical issues impacted the installation of project equipment and training activities due to the travel restrictions in the country.** The delivery of observation equipment was on schedule (August 2020), however their installation could only be finalized in end-2021, due to missing technical parts (Data Collection Platforms – DCP – for transmission to Eumetcast), delays in finalization of the building refurbishment which was a prerequisite for the installation of the forecasting central system, as well as safeguards issues. The execution of meteorological and hydrological analysis and forecasting software at MettelSat Binza was delayed by power disruptions at the Analysis Center, which was eventually solved by MettelSat by end-2022 with the installation of solar panels and backup batteries.

## IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

### A. QUALITY OF MONITORING AND EVALUATION (M&E)

#### M&E Design

78. **The RF did not adequately reflect the initial project design; not all PDO indicators were suitable and directly measurable toward the objectives and outcomes.** By design, results for some indicators were only to be measurable at the very end of the project and hence there was a partial disconnect between overall implementation progress and progress towards achievement of the PDO. Several indicators were changed or amended during implementation to better reflect project progress, as addressed through the restructuring which adapted the scope of project activities. For instance, the indicator meant to measure implementation of the NFCS was not clearly defined to assess the result of this activity (which in essence would continue beyond project



implementation). Moreover, that same indicator had to be moved from IRI to PDO level, to measure the quality of climate services otherwise not captured at PDO level under the original scope. One PDO level indicator (which was dropped at restructuring) and an IRI on capacity building were designed to capture female involvement; however, these were not systematically tracked. The baselines were established for all indicators, which helped in following progress over time. A main shortcoming in the M&E arrangements was that the PIC that was to assure the project's M&E function was not sufficiently versed in rigorous project monitoring and reporting and was also not used to consolidating and reporting on results, which impacted the quality of M&E reports. This was mitigated during project implementation by the hiring of an external expert to monitor project progress using the RF and measuring the results indicators.

### M&E Implementation

79. **The PIC regularly shared updates of results indicators with the Bank, both through quarterly M&E reports and during meetings and missions.** The M&E methodology and reporting, including mid-term and final reports, despite being succinct, were of a minimum quality acceptable to the Bank. At closing, the PIC prepared a Project Completion Report, which was shared with the Bank. Overall, data and information regarding project implementation was collected regularly, reports generated and shared both with the Government and the Bank.

### M&E Utilization

80. **The M&E was used to assess the implementation status of the project, guide decision-making on project management, and provide inputs to the Bank's supervision missions and its reporting to management in ISRs.** At MTR, the M&E enabled project restructuring by reducing the scope of a few project activities, updating the RF, and adjusting the costs of component activities.

### Justification of Overall Rating of Quality of M&E

81. The overall rating of the Quality of M&E is **Modest**.

## B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

### Environmental and social safeguards

82. **The implementation of environmental and social safeguards is rated Moderately Unsatisfactory.** The project complied with the World Bank environmental safeguards. It was considered Category B (Partial Assessment) based on its potential environmental and social impacts. It triggered the Bank safeguard policy on Environmental Assessment (OP/BP 4.01) and was rated a low environmental risk because the project was expected to have small-scale and localized negative impacts from the construction of the MettelSat buildings and the installation and rehabilitation of hydrological and meteorological stations. The PIC prepared the Environmental and Social Management Frameworks (ESMFs) before appraisal of the Project. Elaboration of other E&S safeguards instruments (the ESIA and the ESMPs) were subject to extensive delays. This was mainly due to the lack of renewal of the Environmental Specialist's contract by MettelSat; he was brought on board again at the very end of the project.
83. **The project was assessed to have a low risk on gender-based violence (GBV).** The recruitment of an NGO to implement GBV activities was not considered necessary due to the insignificant risk. However, for the installation of hydrometeorological equipment in the Kalamu and N'djili watersheds, a communication and awareness campaign was conducted for MettelSat staff.
84. **Incidents, grievances, or settlements were rare during the project lifetime.** The grievance redress mechanism



(GRM)<sup>11</sup> was operational and functional and was operated by a GRM committee using suggestion boxes, phone line and mail. Few complaints were recorded, processed, and resolved, despite the failure by the PIC to produce regular quarterly reports. During implementation, grievances and queries were made through the GRM on project activities and payments to the entrepreneur; all complaints were resolved at closing. In the process of acquiring land for the hydro-meteorological stations in N'djili and Kalamu watersheds, the communities agreed to concede their lands in return for payment of customary rights. The signed and legalized transfer property acts had not been transmitted to the Bank at project closing and the procedures for obtaining registration certificates were still ongoing. In addition, potential future conflicts could arise on the installation of hydro-meteorological equipment in the N'djili sub-basin where, besides Government land, the other sites are subject to land conflicts with the owners. It would therefore be important for Mettelsat to legally acquire these lands, in agreement with the owners. For minor works to connect the MettelSat buildings in Kinshasa to the electricity network via a dedicated line, a Socio-Economic Loss Assessment Report (SELAR) was prepared before the start of work on the electric cabin, which describes the financial compensation of 26 people for a total amount of US\$2,000; the SELAR implementation was declared completed by the PIC but the report has not been shared with the Bank.

### Financial management (FM)

85. **The project FM risk was rated substantial throughout the project's implementation phase and FM performance was rated moderately satisfactory.** FM supervision was conducted annually, and the project benefited from permanent FM support to the PIC, because of the bottlenecks that froze project implementation. Apart from the freeze period due to the lack of signatories for the DA, withdrawal applications were submitted regularly. Many weaknesses encountered by the PIC were also linked to factors external to the project. Interim financial reports (IFRs) were submitted regularly and were acceptable to the Bank. The Bank team provided support to the PIC to ensure that the IFRs submitted were of good quality.
86. **Overall, the external audit reports' opinion was unqualified, but some weaknesses were identified in FM controls.** The reports for Fiscal Years 2019 and 2021 were initially rejected by the Bank and were accepted after revision. The internal control shortcomings were followed up in the IFRs regularly. At the closing date, the final external audit report was not yet due. The external audit expense from July 2022 to January 2023 is ineligible for funding from the project, due to delay in contract amendment to include the extended project implementation period.

### Procurement

87. **Procurement management during project implementation was moderately satisfactory.** A procurement specialist worked for the PIC under the supervision of the Project Coordinator (the MettelSat General Manager). *Ad Hoc* Offer Evaluation Committees were set up, while the standing committee was responsible for reviewing and approving offer evaluation reports, technical and financial proposals, and expressions of interest as well as shortlisting and contract award proposals. Despite delays at various levels of the procurement process, the procurement process was carried out without major difficulties. Delays in developing environmental and social safeguards tools impacted procurement planning and delayed the implementation of some contracts, such as the Kisangani Meteorological Center. The management of the contract for the supply and installation of hydrometeorological equipment was also a major challenge for MettelSat, which it was able to meet in collaboration with the Bank.

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<sup>11</sup> A grievance redress mechanism is a formalized way to accept, assess, and resolve community feedback or complaints.



## C. BANK PERFORMANCE

### Quality at Entry

88. **The project was prepared in about 13 months from Activity Initiation Summary to approval by the World Bank Board on March 8, 2017.** For its effectiveness and implementation, the project developed an execution manual that contained details of the project design, institutional arrangements, key risk identification, environmental and social management, financial and procurement mechanisms, monitoring and evaluation as well as grievance redress mechanisms. The implementation of this document was supported by other tools such as software and procedures manual which provided day-to-day guidance on project management. In addition, it was the first project prepared under the Africa Hydromet Framework Program, which was jointly developed by the WMO, the African Development Bank (AfDB) and the World Bank Group. The project design benefitted from lessons learned from the engagement of the respective institutions in hydromet modernization projects. In addition, activities by development partners (AfDB, UNDP, European Union, Southern Africa Development Community, African Center Meteorological Applications for Development, and the People's Republic of China) that were ongoing were considered in the design of the project.
89. **The PDO was sufficiently broad to address the original and revised scope of activities.** The PAD demonstrated the Bank's awareness of the difficult country context and the weak institutional capacity of the implementing entity. MettelSat had a clear lack of experience in managing donor-funded projects and fiduciary weaknesses, and whereas the implementation arrangements were overall adequate, the proposed mitigation measures (i.e., sustained implementation support) to overcome these capacity constraints turned out to be less efficient than expected. The original project scope was somewhat overly ambitious while the costing of some project components was underestimated and required adjustment during project implementation.
90. **The Bank task team's composition was relevant to support the design and implementation.** The team comprised specialists in procurement, ESF, FM, DRM, and technical matters. Additional local and international experts (both Bank and consultants) were a part of the preparation and supervision teams. While tremendous efforts were put in technical preparations and institutional support, the land acquisition needs of the project could have been more thoroughly assessed with its potential adverse impact on implementation. Measures to minimize land acquisition could have been embedded in the design.

### Quality of Supervision

91. **Implementation support was timely, proactive, and results-oriented.** The project benefited from the Bank team's continuity, as outlined under the Section III. Most team members were based in the DRC, and this helped in regular and timely communication with MettelSat. The Aide Memoires (AMs) and ISR reports were detailed and candid about progress, issues and actions to be undertaken. Implementation support missions (ISMs) took place on average twice a year with additional technical and fiduciary missions taking place in between: a total of 12 ISMs were undertaken during the five years of project implementation. ISMs included the participation of key staff, including specialists in safeguards, procurement, FM, hydrology, and meteorology. They also comprised technical visits for the installation of equipment, as well as for the rehabilitation of the MettelSat buildings. Virtual missions and meetings were also held during the COVID-19 pandemic, when in-person ISMs were not possible. The World Bank task team used ISRs, AMs, and the MTR as efficient tools to monitor and speed-up implementation, identify key challenges and adjust performance ratings. Subsequent, the AMs noted follow-up actions. There were persistent efforts to ensure that on-ground implementation was on track.
92. **Further efforts should however have been made during the project MTR in revising the PDO, which remained unchanged despite the downsizing of components, and addressing project sustainability issues.** The economic analysis was also not revised during the MTR and remained at the level of the original scope, despite the delays accumulated in implementation and the scaling down of components.



### Justification of Overall Rating of Bank Performance

93. **Overall, the World Bank addressed challenges faced during preparation and implementation, with significant shortcomings.** Therefore, the Bank performance is rated **Moderately Unsatisfactory**.

### D. RISK TO DEVELOPMENT OUTCOME

94. **Continuous effort is required to ensure the sustainability of project outcomes.** The project resulted in an overall strengthening of the capacities of the Congolese meteorological service, but there are risks that some of these achievements will be diminished or disappear in the coming years due to insufficient funding, limited qualified personnel, and the management of the facility.
95. **The project has laid the ground for an efficient coordination and harmonization framework for meteorological services in the country with the support provided to develop the draft law on meteorology.** However, there is a high risk that the law may not be adopted and implemented. There is also a strong risk that Mettelsat will not be able to perform its role of providing assistance to aeronautics, as assigned by the State, due to the lack of effective and sufficient financing through air navigation charges, and due to the difficulties encountered in organizing this function in the framework of a Quality Management System. Despite the National Framework for Climate Services that has been adopted, its operationalization is still awaiting government funding and thus there is a risk that relations with other clients (civil protection, agriculture, energy, etc.) do not develop. There is a risk that the new skills acquired by Mettelsat staff, thanks to the project, may gradually disappear should staff leave for companies that can offer them better salaries.
96. **Appropriate operation and maintenance of deployed stations are essential to ensure long-term effectiveness.** The project provided Mettelsat with a hydrometeorological observation and forecasting system capable of performing several basic functions to improve weather forecasting and flood warnings on the N'djili and Kalamu rivers. Without adequate financial and technical support from the government, there is a high risk of deterioration in the functioning of this system, mainly related to the financing of operation and maintenance (e.g., short-term support and maintenance contract with the equipment suppliers, guaranteed funding for Internet telecommunications for the Binza analysis center, the assignment of adequate personnel for maintenance, and the budgeting of necessary maintenance missions to the observation sites). Under these conditions, there is a high risk that observations will decrease in number and quality.
97. **The concrete results of Component C: Improvement of the hydromet information service, are essentially about the warning services on the N'djili and Kalamu rivers.** Due to delays in the installation of the observation stations, tests in operational situations could not be carried out during project implementation and the alert procedures in connection with civil protection and the media could not be specified. Therefore, the functionality of the warning systems on these two rivers could not be ascertained during the project lifetime; however, it is expected that MettelSat would implement them in the coming months.
98. **Efficiencies gained in project management may not be sustained over time.** Working methods were applied within MettelSat in the areas of planning, FM, procurement, accounting and evaluation, which if sustained, would enhance MettelSat's attractiveness for other support. However, the high turnover of staff and management puts these gains at risk. In addition, the unattractive salary of MettelSat staff jeopardizes investment sustainability. Improving salaries is also essential for MettelSat internal social balance and for attracting qualified skills.

### V. LESSONS AND RECOMMENDATIONS

99. **The project grant size raises the concern about developing a stand-alone project versus incorporating the grant into a larger investment project for higher Government commitment.** As mentioned above, many factors affected project implementation, including low institutional capacity and political commitment. Capacity building of project



beneficiaries' agencies is a prerequisite to any project design. However, the latter is a long-term process not necessarily resolvable within a project lifetime. It is therefore critical for the Bank and other development organizations to strongly balance between a standalone project and providing small grant to larger operations with established and functional implementation arrangements. Embedding Hydromet projects into broader operations might enhance political commitment and build the long-term capabilities of meteorological agencies. Hydromet projects are complex and multi-sectoral, which further impedes their implementation. Their mainstreaming incorporation into large-scale operations is based on specific sub-sectoral activities to be entirely addressed as a component or sub-component. Hydromet's specific sub-sectors include meteorological assistance to civil aviation, food security, and disaster risk management. An operation in the transport sector (air transport, for example) is thus intended to improve meteorological assistance to civil aviation by strengthening the service to contribute to the safety and economic operation of aviation, both nationally and internationally.

100. **Hydromet interventions that are focused on the sector level and are geographically targeted are likely to produce better results than a country-wide, and multi-sector intervention.** Hydromet interventions carried out in a specific sector and in each territory are likely to be punctuated by positive results, easier to monitor, and to improve over time in broadening the fields of intervention. These interventions consider the specific sensitivities, strengths, and weaknesses of each sector when proposing the service to be provided. In the agricultural sector for example, strengthening agro-meteorological services can improve production, reduce losses and risks, lower costs, and optimize water use. Hydromet projects implemented on a sector level within a geographically targeted area emphasize a service-driven approach to produce data and create incentives. The hydromet information produced is intended to be distributed to users to meet a specific need. Producers and users develop incentive mechanisms to improve service quality. Thus, the memoranda of understanding signed between the two parties must focus on concrete actions and obligations on each side to improve the service.
101. **To maximize the socioeconomic benefits of hydromet services, public and private engagement can build and sustain effective hydromet value chains.** Hydromet projects must consider creating private-sector benefits without compromising the provision of public services. Private companies use hydromet services for a wide range of needs, including weather and wave forecasts, and warnings for cargo to optimize sea and air routes; seasonal forecasts for the industry to adjust stocks of seasonal products; and specialized forecasts for agricultural plantations or sporting and cultural events. These needs are often satisfied by data provided by national hydromet services that are funded and managed by the public agencies. However, the government is responsible for protecting persons and property from risks by disseminating risk information and issuing early warnings. The value of the data is higher when access is open as opposed to the price/revenue received when sold.
102. **Accumulation of delays in project implementation is crippling sustainability efforts.** As a result of ineligible expenditures, untimely changes in Mettelsat management teams, and the COVID-19 pandemic, project activities were suspended several times. These suspensions led to the late execution of some contracts towards the end of the project. This was the case with the contract for the acquisition and installation of hydrometeorological and rainfall stations. This contract's timely execution should have been accompanied by capacity building in high-tech equipment maintenance. It should also have facilitated the implementation of memoranda of understanding signed between Mettelsat and the users of meteorological data through the permanent exchange of data. In addition, the delay in the elaboration of the business plan did not allow their implementation during the project lifetime. Any institutional change takes time; hence, if there is no clear commitment for project sustainability at the time of MTR, it is critical to address this issue at that time.
103. **Leveraging investment projects through complementing TAs. It is essential to have TAs in parallel to investment projects that enable project teams to provide technical support to implementing agencies.** However, the size of the additional Bank-executed TA should be adequate to the size of the Recipient-executed grant. Indeed, the



CREWS funding was instrumental in accompanying the Hydromet project in providing technical support to MettelSat, but its size (\$2.5 million, 31 percent of the project) was too large to be absorbed during project implementation.

104. **A key lesson is on the context: DRC cannot deliver hydromet and climate services on its own.** It has to rely on partnerships with regional and global providers, prioritize the key services for its economy and the most vulnerable populations, and address those. MettelSat and the DRC Government should look to the lessons related to regional collaboration and partnership from experiences of smaller countries such as Nepal and Bhutan. It was appropriate to have a six-year project given the capacity and FCV context of the country; however, there was clearly a mismatch in the ambition of planned scope (even without the impact of the pandemic). Hydromet projects across the board need a longer time and rely on project preparation being robust for the project to start implementation.
105. **It is important to consider establishing a distinct implementation unit that can later be integrated into strengthened institutions to ensure long-term sustainability.** This raises the question of striking a balance between investing in a fragile institution to foster ownership, while recognizing the constant need for support and lack of familiarity with Bank procedures. Given the unpredictable conditions in FCV countries, maintaining consistent implementation could be facilitated by having a separate Project Implementation Unit (PIU) detached from the implementing institution, which often experiences leadership changes as has been the case throughout the project.
106. **Establishing an efficient value chain for hydromet systems and services is a multifaceted endeavor that requires significant time, resources, and collaboration across sectors, particularly in an FCV context.** It should be treated as a comprehensive project (and most likely a series of projects) for system development rather than a collection of loosely connected components such as equipment procurement, technological solutions, and capacity building, although in a context of very weak capacities, these might be the only possible achievements.



**ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS**

**A. RESULTS INDICATORS**

**A.1 PDO Indicators**

**Objective/Outcome:** To improve the quality of DRC’s targeted hydro-meteorological and climate services

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Implementation of a quality management system applied to the civil aviation sector	Percentage	0.00 03-Jul-2017	100.00 30-Jun-2022		57.14 30-Nov-2022

**Comments (achievements against targets):**

Target partially achieved at 57.14 percent, as twelve out of twenty-one steps according to the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) Roadmap for quality management system certification were under implementation at project closing.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Operational observation, forecast and modelling capacities improved (composite index)	Number	1.00 03-Jul-2017	4.00 30-Jun-2022	3.00	3.00 30-Nov-2022



**Comments (achievements against targets):**

Target fully achieved. MettelSat’s capacities for observation, forecast, and modelling reached level 3 (i.e. defined as ‘operational forecast is performed numerically and *experimentally* by crosscutting data from other stations, from remote-sensing and from other global and regional models’), with the operationalization of 63 stations and the transmission of data in real-time in the already operational sites.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Implementation of a National Framework for Climate Services	Percentage	0.00	100.00		100.00
		03-Jul-2017	30-Dec-2022		20-May-2022

**Comments (achievements against targets):**

Target fully achieved, as the decree for the operationalization of the National Framework for Climate Services was signed by the Prime Minister (Decree 22/19 of 13 May 2022) and the framework was launched (19 December 2022).

**A.2 Intermediate Results Indicators**

**Component:** Component A. Institutional and regulatory strengthening, capacity building and implementation support

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of professionals	Number	0.00	360.00		339.00



having participated in trainings		03-Jul-2017	30-Jun-2022		09-Jan-2023
<p><b>Comments (achievements against targets):</b> Target partially achieved at 94.1 percent.</p>					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of memorandums of understanding (MoUs) having been developed or revised, with mechanisms for monitoring	Number	0.00 03-Jul-2017	8.00 30-Jun-2022	13.00	12.00 30-Nov-2022

**Comments (achievements against targets):**  
Target almost fully achieved at 92.3 percent with the signature of 12 MOUs with users of hydromet information including Waterways Authority (RVF); Congolese Maritime Routes (CVM); (National Electricity Company (SNEL); Water Distribution Authority (REGIDESO); Civil Protection (Ministry of Interior); Bureau of Architecture and Urban Studies (BEAU); National Institute for Agronomic Study and Research (INERA); Applied Studies Institute (ISTA); Directorate of Water Resources (Ministry of Environment and Sustainable Development); Roads and Drainage Office (OVD); Ministry of Agriculture; Geophysical Research Center (CRG).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Draft national law on	Percentage	0.00	100.00		100.00



meteorological services developed		03-Jul-2017	30-Jun-2022		30-Nov-2022
<p><b>Comments (achievements against targets):</b>            Target fully achieved with the elaboration of a draft law on meteorological services which has been submitted to Government for consideration, thus meeting the project target.</p>					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Elaboration of a business plan for MettelSat	Percentage	0.00	100.00		100.00
		03-Jul-2017	30-Jun-2022		09-Jan-2023
<p><b>Comments (achievements against targets):</b>            Target fully achieved with the finalization and validation by MettelSat of the Business Plan document.</p>					

**Component:** Component B. Modernization of equipment, facilities and infrastructure for basic observation and forecasting

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of stations feeding the central online data platform on time	Number	0.00	80.00	60.00	63.00
		03-Jul-2017	30-Jun-2022		09-Jan-2023



**Comments (achievements against targets):**

Target exceeded by 5 % through the installation of out-of-project acquired stations.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of observations transmitted to WMO's Global Basic Observation Network (GBON) over a period of 6 months	Number	14,400.00	109,440.00		3,189.00
		03-Jul-2017	30-Jun-2022		30-Nov-2022

**Comments (achievements against targets):**

Target partially achieved by 3%. This indicator was often incorrectly assessed during project monitoring missions, as it was calculated as the cumulative value of transmitted observations. However, the indicator value should significantly increase post-project with the effectiveness of the international data transmission to the WMO's GBON.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of buildings rehabilitated	Number	0.00	3.00		3.00
		03-Jul-2017	30-Jun-2022		20-May-2022

**Comments (achievements against targets):**



Target fully achieved with the refurbishment of two buildings in Kinshasa, and one in Kisangani.

**Component:** Component C. Improvement of hydromet information service delivery

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of consultations of the online data platform	Number	0.00 03-Jul-2017	5,000.00 30-Jun-2022		3,503.00 09-Jan-2023

**Comments (achievements against targets):**

Target partially achieved by 70%.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of hazards for which warning or monitoring forecast bulletins have been produced with sufficient lead-time for preparedness and early response	Number	1.00 03-Jul-2017	4.00 30-Jun-2022		4.00 09-Jan-2023

**Comments (achievements against targets):**

**Target** fully achieved. Bulletins for temperature, wind, precipitation and relative humidity are prepared on daily basis.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of user groups having expressed their needs and developed a resulting action plan to address them	Number	0.00 03-Jul-2017	4.00 30-Jun-2022		6.00 20-May-2022
<b>Comments (achievements against targets):</b> Target exceeded by 50%. Consultations were carried out with more user groups than targeted, in the context of elaboration of the National Framework for Climate Services.					



**B. KEY OUTPUTS BY COMPONENT**

<b>Objective/Outcome 1 - Improved quality of hydromet services applied to civil aviation sector</b>	
Outcome Indicators	1. Implementation of a quality management system applied to the civil aviation sector (percentage)
Intermediate Results Indicators	1. Number of professionals having participated in trainings (Number) 2. Number of memorandums of understanding (MoUs) having been developed or revised, with mechanisms for monitoring (Number) 3. Draft national law on meteorological services developed (Percentage) 4. Elaboration of a business plan for MettelSat (Percentage)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	1. 339 staff and managers trained 2. 12 MoUs signed with users of hydromet information 3. Draft law on meteorological services 4. Business Plan elaborated
<b>Objective/Outcome 2 - Improved operational observations, forecast, and modeling capacities</b>	
Outcome Indicators	1. Operational observation, forecast, and modeling capacities improved (composite index)
Intermediate Results Indicators	1. Number of stations feeding the central online data platform on time 2. Number of observations transmitted to WMO's Global Basic Observation Network (GBON) over a period of 6 months 3. Number of buildings rehabilitated
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	1. 63 stations installed and operational 2. 3189 observations transmitted over 6 months 3. Three buildings rehabilitated



<b>Objective/Outcome 3 - Improved delivery and access to hydrometeorological services</b>	
Outcome Indicators	1. Implementation of a National Framework for Climate Services (Percentage)
Intermediate Results Indicators	<ol style="list-style-type: none"><li>1. Number of consultations of the online data platform</li><li>2. Number of hazards for which warning, or monitoring forecast bulletins have been produced with sufficient lead-time for preparedness and early response</li><li>3. Number of user groups having expressed their needs and developed a resulting action plan to address them</li></ol>
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	<ol style="list-style-type: none"><li>1. 3503 consultations on online data platforms</li><li>2. Four hazards for which bulletins are produced.</li><li>3. Action plans developed for 4 user groups who have expressed their needs.</li></ol>

**ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION****A. TASK TEAM MEMBERS**

<b>Name</b>	<b>Role</b>
<b>Preparation</b>	
Jean Baptiste Migraine	Task Team Leader(s)
Lanssina Traore, Clement Tukeba Lessa Kimpuni	Procurement Specialist(s)
Francis Tasha Venayen	Financial Management Specialist
Claudia M. Pardinias Ocana	Counsel
Alexandra C. Sperling	Counsel
Lucienne M. M'Baipor	Social Specialist
Isabella Micali Drossos	Counsel
Poonam Pillai	Peer Reviewer
Aissatou Diallo	Team Member
Louise Mekonda Engulu	Team Member
Gaetano Vivo	Peer Reviewer
Louis Jean Michel Desvaux De Marigny	Counsel
Chalida Chararnsuk	Team Member
Grace Muhimpundu	Team Member
Robert Curle Jesse Reid	Team Member
Marcus Marinus Petrus Wijnen	Peer Reviewer
Koho Francine Takoy	Team Member
Issa Thiam	Team Member
Laurence Elodie Esther Fanny Chalude	Team Member



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Lorenzo Carrera	Team Member
Claude Lina Lobo	Social Specialist
Joelle Mudi Nke	Team Member
Marc Pierre Jacques Edmond Gillet	Team Member
Peter Chen	Team Member
<b>Supervision/ICR</b>	
Christian Vang Eghoff, Koffi Hounkpe	Task Team Leader(s)
Jean-Claude Azonfack	Procurement Specialist(s)
Bertille Gerardine Ngameni Wepanjue	Financial Management Specialist
Eric Kidude Kipasa	Team Member, ICR main contributor
Christine Kyala Foma	Environmental Specialist
Christelle Lembe Zinga	Team Member
Nadia Banota Mbanzidi	Social Specialist
Shamard Ya Jua Mungu Shamalirwa	Social Specialist
Ines Melissa Emma Attoua Ety	Team Member
Christian Albert Blondin	Team Member
Cyrille Valence Ngouana Kengne	Environmental Specialist
Marc Pierre Jacques Edmond Gillet	Team Member
Donat Vema Tunamau	Social Specialist
Elena Segura Labadia	Counsel
Seraphine Nsabimana	Team Member
Henriette B. Mampuya	Team Member, ICR main contributor

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**B. STAFF TIME AND COST**

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
<b>Preparation</b>		
FY16	9.497	127,307.20
FY17	8.733	93,469.07
FY18	0	0.00
<b>Total</b>	<b>18.23</b>	<b>220,776.27</b>
<b>Supervision/ICR</b>		
FY18	21.600	354,191.61
FY19	16.212	348,828.39
FY20	68.706	342,511.08
FY21	93.715	434,275.13
FY22	71.207	454,468.16
FY23	53.493	472,276.94
<b>Total</b>	<b>324.93</b>	<b>2,406,551.31</b>



**ANNEX 3. PROJECT COST BY COMPONENT**

<b>Components</b>	<b>Amount at Approval (US\$M)</b>	<b>Amount after Restructuring (US\$M)</b>	<b>Actual at Project Closing (US\$M)</b>	<b>Percentage of Approval (US\$M)</b>
Component A. Institutional and regulatory strengthening, capacity building and implementation support	1.58	0.61	0.39	24.68
Component B. Modernization of equipment, facilities and infrastructure for basic observation and forecasting	4.46	5.62	5.19	116.36
Component C. Improvement of hydromet information service delivery	1.27	0.12	0.23	17.81
Component D. Project Management	0.73	1.68	1.84	251.85
<b>Total</b>	<b>8.04</b>	<b>8.03</b>	<b>7.65</b>	<b>95.14</b>



#### ANNEX 4. EFFICIENCY ANALYSIS

- 1. The project delivered a variety of products from technical assistance to important modern equipment to support the DRC's hydro-meteorological and climate services.** To estimate the value of strengthening DRC's hydrometeorological services, an economic analysis that estimated both costs and benefits of the project was undertaken at appraisal. In this analysis, the assumed benefits derived by different economic sectors were estimated through benefit transfer methods. The time frame of the analysis was 15 years from project starting. The Benefit Cost Ratio (BCR) of the project was also reported at project completion (5 years). Where a range of potential assumptions were generated, the most conservative (or lowest) values were taken. Both at appraisal and completion, the economic analysis assumed benefits derived by different economic sectors following the overall structure of the "Triple Dividend of Resilience" framework. The first dividend considered how improved forecasting and EWSs reduce national asset and livelihood losses. The second dividend considered how increased risk awareness and forecasting accuracy increased agriculture productivity. It also included the benefits of reducing weather related risks to the aviation sector, through route optimization and landing. The third dividend considered the co-benefits to households, through a willingness to pay benefit transfer from DRC.
- 2. An economic analysis estimating both costs and benefits of the proposed project was undertaken at appraisal to estimate the value of strengthening DRC's hydro-meteorological services.** The objective of the benefit-cost analysis (BCA) was to verify the economic justification for the project, position the value of DRC's Hydromet services in a wider sociopolitical context, and create a baseline against which progress can be compared. As hydro-meteorological products and services are public goods, they are generally not bought and sold in markets and thus there is no direct information on the economic value of these services. For this reason, specific approaches needed to be employed to determine the economic benefits resulting from hydro-meteorological systems' improvement projects, such as benchmarking and benefit transfer methods.
- 3. In the analysis the assumed benefits derived by different economic sectors were estimated through benefit transfers methods.** The analysis followed the overall structure of the "Triple Dividend of Resilience" framework, which suggested considering the three dividends of resilience when estimating projects' benefits: i) First dividend: saving lives and avoiding damage and losses. That is, whereby an improved forecasting and extreme weather early warning system reduces loss of assets and livelihoods; ii) Second dividend: unlocking economic potential. Increased risk awareness and forecasting accuracy increases economic productivity, supporting long-term investments in productive assets and development opportunities; iii) Third dividend: generating development co-benefits. Investing in hydromet can serve multiple purposes that are not solely designed to reduce disaster impacts.
- 4. The costs in the BCA calculation were those associated with the project's investments.** The BCA included sensitivity analysis of a number of key parameters (including discount rates, benefits realization and degrading of benefits due to lack of maintenance) and explanation of reasonable and identifiable omissions, biases and uncertainties. Although the implementation period for the project was estimated at five years, the benefits could in theory be derived far beyond 2022 provided adequate repair, upgrade and maintenance. Therefore, the analysis considered a timeline of 15 years from project starting (2032). The costs associated with the project amounted to a total of around US\$8 million. During and beyond implementation, costs would be incurred for O&M and repair at an assumed 10 percent of total project investment for modernization of equipment and new installations (i.e., around 50 percent of the



investment, US\$4 million) for the time period of the analysis, which is 15 years. Costs also includes the O&M of the additional infrastructure (value US\$6 million) provided by the Government of China to the DRC for the purchase of networks infrastructure equipment.

5. **A present value of total project costs was estimated at US\$17.65 million using a three percent rate of discount.** The net present value (NPV) of the project of \$112.27 million was estimated, with a benefit-cost ratio of 7.36 to-1 using the baseline assumptions and a three percent rate of discount. A benefits' present value of over US\$129.92 million was estimated, as the sum of the dividends of resilience provided by the project. An overall benefit-cost ratio (BCR) of 2.39 after project completion was foreseen. However, the value of the PV and NPV at appraisal was corrected during the updating of the analysis at completion, as an error was identified in the benefits estimates for the agriculture sector. Thus, the revised value of the PV and NPV for 15 years was corrected from \$129.92 to \$107.41 million and from \$112.27 million to \$92.8 million respectively, with a BCR of 6.09 (instead of 7.36 initially).
6. **The economic analysis at appraisal was expecting the project to generate a total of US\$107.41 million in benefits over 15 years, out of which US\$15.86 million including US\$2.2 million for the aviation sector were expected to be realized during the project lifetime.** These benefits were contributed from (i) reduced damages and losses related to flooding in urban areas (US\$30.93 million, 500,000 persons); (ii) enhanced agricultural productivity (US\$59.78 million); (iii) optimized air traffic navigation (routing, landing and take-off, US\$15 million) and (iv) benefits to households (US\$1.7 million). The realization of these benefits was intimately linked to assumptions related to provision of services to various sectors, and of sufficient budget to MettelSat for administration, operation, maintenance, service delivery. The appraisal document had anticipated that in a scenario with no sufficient budget increase to support operation and maintenance after project completion, the benefits would fall from US\$107.41 million to US\$24.19 million, and the project would "achieve no benefits after the system degrades again to pre-project levels within a few years after project completion".
7. **The economic analysis was updated at project completion** and evaluated that 31% of the benefits anticipated for the aviation sector during project implementation were realized, in relation with the enhanced provision of services to aviation in Kolwezi airport. The project was intended to directly or indirectly impact several sectors of the DRC economy including inter alia floods, agriculture, aviation and households. However, with the late installation of equipment and workstations mostly towards the end of the project, services have not been fully provided as anticipated to the different sectors. In addition, MettelSat faced challenges related to the devaluation of the Congolese Franc and hiring of new staff without Government support, salaries in USD have therefore reduced from an average US\$ 101 per month to US\$ 36.5 per month, further reducing the availability of staff to contribute to service delivery. However, benefits can still be realized after project completion.



**Table 1 - Economic analysis at completion, showing three scenarios**

		Analysis at appraisal (million US\$, 2018-2022)	Analysis at appraisal (million US\$, 2018-2032)	Analysis at completion - scenario 1 (million US\$, 2018-2032)	Analysis at completion - scenario 2 (million US\$, 2018-2032)	Analysis at completion - scenario 3= (million US\$, 2018-2032)
Costs		8.02	17.65	11.82	15.67	120.52
Benefits - First Dividend	Avoided flood losses	3.7	30.93	0.31	0.62	6.19
Benefits - Second Dividend	Agriculture production	9.9	59.80	0.60	6.40	59.78
	Aviation – optimization of operations	2.2	14.99	2.38	3.25	15.00
	Roads – resilient design	0	0.00	0.01	0.05	0.50
Benefits - Third Dividend	Household benefits	0	1.69	0.02	0.17	1.70
Global benefits from availability of GBON observations		0	0.00	1.02	39.27	392.70
<b>Present Value (PV) in DRC</b>		<b>15.86</b>	<b>107.41</b>	<b>3.31</b>	<b>10.34</b>	<b>83.17</b>
<b>Net Present Value (NPV) in DRC</b>		<b>13.7</b>	<b>92.82</b>	<b>2.86</b>	<b>8.94</b>	<b>71.87</b>
<b>Benefit to Cost Ratio (BCR) in DRC over 15 years</b>			<b>6.09</b>	<b>0.28</b>	<b>0.66</b>	<b>0.69</b>
<b>Global PV (including GBON)</b>		<b>15.86</b>	<b>107.41</b>	<b>4.33</b>	<b>49.61</b>	<b>475.87</b>
<b>Global NPV</b>		<b>13.7</b>	<b>92.82</b>	<b>3.74</b>	<b>42.87</b>	<b>411.22</b>
<b>Global BCR</b>		<b>1.98</b>	<b>6.09</b>	<b>0.37</b>	<b>3.17</b>	<b>3.95</b>

8. The economic analysis considered 3 scenarios for the evaluation of benefits over 15-year (for the 2018-2032 period) and demonstrates the need to continue supporting MettelSat in its endeavors towards effective delivery of services to its users:

- the first scenario considers current low levels of budget for operation, maintenance and investment, the service delivery would therefore remain limited to slight optimization of air traffic navigation. Under this scenario, MettelSat would realize slightly above 1% of the benefits expected at appraisal (2.95 million USD in DRC). The benefit to cost ratio for the Project within DRC would be at **44%**, and the Benefit to Cost Ratio (BCR) for MettelSat (inclusive of all Project, staff, operation, and maintenance costs) would be as low as **9%**. With the stations installed under the project, and considering lack of budget for operation and maintenance, improvement of international data sharing up to 0.26% of GBON compliance could bring additional benefits (outside DRC) estimated at



**US\$1.0 million**<sup>12</sup>, not accounted for in the BCR.

- the second scenario considers current budget (same as scenario 1) + support from a CREWS additional financing at about 2 million USD to complete the calibration and trainings for optimal use of investments brought under the Project + support from the Systematic Observations Financing Facility (SOFF) and/or other sources to achieve 10% of GBON compliance. Under this scenario, MettelSat could realize close to 10% of the benefits expected at appraisal (US\$10.3 million in DRC) + additional benefits related to GBON at about **US\$39.3 million**. The BCR for the Project would be at **147%**, and for MettelSat (inclusive of the Project cost) at **66%** (still below 1). Benefits outside DRC are not accounted for in these BCR values.
  - the third scenario considers CREWS additional financing on top of (i) allocation by the Government of the budget requested by MettelSatT at 5,102,460 USD; (ii) development of proper synergies with sectoral projects (transportation<sup>13</sup>, urban resilience<sup>14</sup>, agriculture<sup>15,16,17</sup>. A review of 66 studies<sup>18</sup> assessing the impacts of weather and climate services in Africa indicates that the use from the community of weather and climate services varies based on livelihood strategy. These studies document farmers' application of weather and climate information to a range of decisions, including those regarding the choice of fields, crops, and/or crop varieties; the timing of agricultural tasks (to reduce losses of seeds and inputs); and the negotiation of annual loans. Some key decisions are related to water conservation; stocking decisions<sup>19</sup>, shifting livestock; selling firewood; purchasing veterinary drugs<sup>20</sup> and food security planning<sup>21</sup>
9. **Social benefits also need to be accounted for within MettelSat.** Despite salaries still at very low levels, staff benefit from, and have received training for the use of, up-to-date technologies for observing (with up-to-date sensors and automatic transmission via a mix of satellite and cellphone networks), climatology and hydrology (with an open-source database supported by WMO), meteorological forecasting, hydrological forecasting (in N'djili and Kalamu watersheds) and service production, and renovated premises with 24/7 electricity. After decades of insufficient Government support to the institution, the realizations during the Project, and evaluation of potential benefits

<sup>12</sup> The value of Surface-Based Meteorological Observation Data: Costs and benefits of the Global Basic Observing Network, [https://library.wmo.int/index.php?lvl=notice\\_display&id=21770#ZAMycnbML3k](https://library.wmo.int/index.php?lvl=notice_display&id=21770#ZAMycnbML3k)

<sup>13</sup> Project Appraisal Document, Transport and Connectivity Support Project, <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/141991655916124024/congo-democratic-republic-of-transport-and-connectivity-support-project>

<sup>14</sup> Project Appraisal Document, Kinshasa Multisector Development and Urban Resilience Project - Kin Elanda, <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/260851617415464368/congo-democratic-republic-of-kinshasa-multisector-development-and-urban-resilience-project-kin-elanda>

<sup>15</sup> Project Appraisal Document, National Agriculture Development Program Project, <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/490161624932273904/congo-democratic-republic-of-national-agriculture-development-program-project>

<sup>16</sup> Catherine Vaughan, James Hansen, Philippe Roudier, Paul Watkiss, Edward Carr. Evaluating agricultural weather and climate services in Africa: Evidence, methods, and a learning agenda (2019.) <https://doi.org/10.1002/wcc.586>

<sup>17</sup> Rodrigues, J., Thurlow, J., Landman, W., Ringler, C., Robertson, R. D., & Zhu, T. (2016). The economic value of seasonal forecasts stochastic economywide analysis for East Africa. Washington, DC: IFPRI.

<sup>18</sup> Catherine Vaughan, James Hansen, Philippe Roudier, Paul Watkiss, Edward Carr. Evaluating agricultural weather and climate services in Africa: Evidence, methods, and a learning agenda (2019.) <https://doi.org/10.1002/wcc.586>

<sup>19</sup> Carr et al., 2014; Ouedraogo et al., 2018; Zongo et al., 2016; Oyekale, 2015; Stats4SD, 2017; Klopper, 1999; Mudombi & Nhamo, 2014; Mulwa et al., 2017/2017, Klopper, 1999/2017, Klopper, 1999; Mudombi & Nhamo, 2014; Mulwa et al., 2017

<sup>20</sup> Rasmussen et al., 2014; Roncoli et al., 2002; Egeru, 2016; Lybbert et al., 2007; Ngugi et al., 2011)

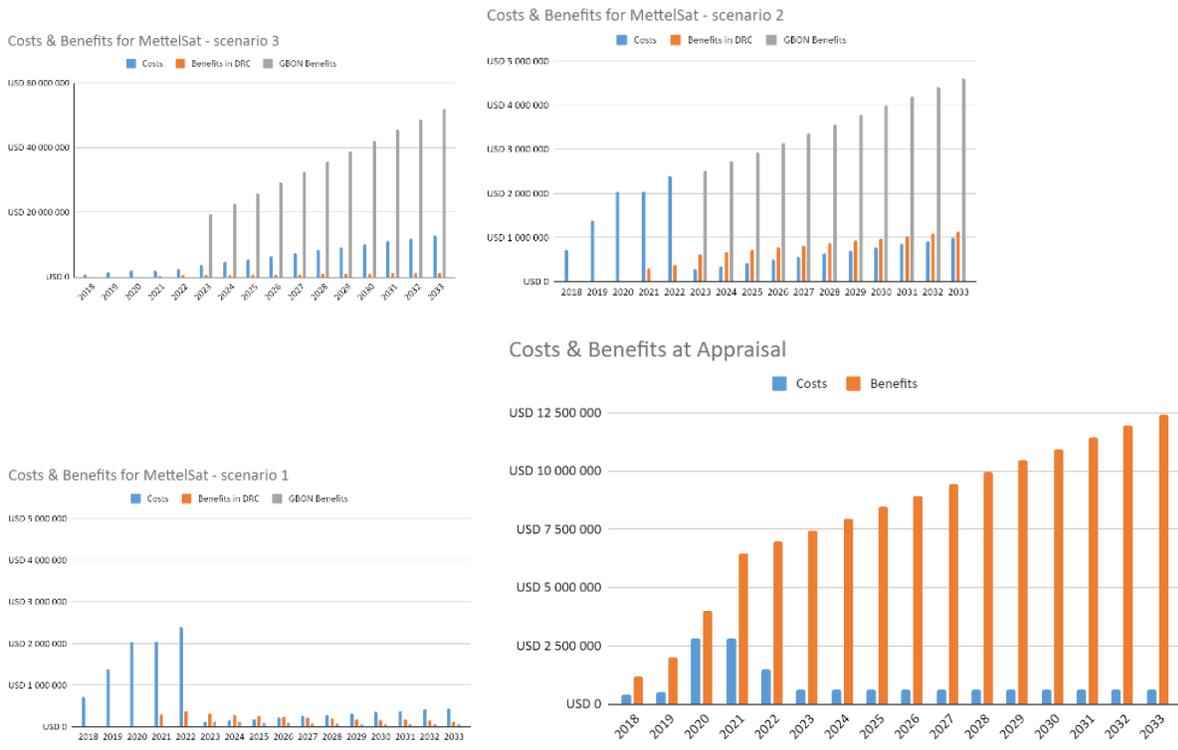
<sup>21</sup> Tarhule & Lamb, 2003



within and outside DRC from enhanced meteorological, hydrological and climate services, are also bringing hope with regards to future investments and support after the Project lifetime.

- 10. Actual costs for MettelSat in 2022 are \$500,000 per year, including \$320,000 for salaries. Depending on the strategy that will be adopted for the future of MettelSat, the different scenarios have been evaluated with costs over 15 years varying between 12 and 99 million USD, and associated benefits ranging from 4.3 million USD to 475 million USD (of which 83 million can be made in the DRC). These scenarios clearly demonstrate the relevance of maintaining support for MettelSat, ensuring adequate maintenance for the Project investments, continuing to develop further the investments to satisfy the recommendations of the WMO (GBON), motivating staff with increased salaries, retirement options, and education and training in line with the MettelSat training plan, implementing the national framework for climate services and the memorandums of understanding with the partners to ensure the provision of services that meet expectations. This could lead to the realization of benefits beyond those initially evaluated at Project appraisal.

Graph 1: Costs and benefits at appraisal compared to updated evaluation according to 3 scenarios





## **ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS**

A draft version of the ICR, translated into French, was shared with MettelSat on May 29, 2023 for comments. On Thursday June 8, 2023, a consultation meeting was held at the World Bank office. The following comments were made on the document and have been considered for the finalization of the ICR:

### **1. Country context**

- The document should highlight the fact that, before and after the implementation of the project, the management of hydromet services is the responsibility of the Ministry of Transportation and Communication Channels, through the Agence Nationale de Météorologie et de Télédétection par Satellite - MettelSat.
- Prior to the implementation of the Hydromet project, MettelSat was providing aeronautical meteorological services in some airports including Lubumbashi airport.
- When providing information on the total cost of the project, the contribution of CREWS funds should also be mentioned.

### **2. Project deliverables**

- In addition to the 12 automatic synoptic stations, the 8 other stations installed by the project as part of Chinese cooperation cannot automatically send information to WMO's GBON. MettelSat has only 12 automatic stations supplied by the Hydromet project.
- The project has not developed customized products and services made available to user groups via dedicated interfaces.
- Regarding capacity building in climatology and hydrology, the project has only strengthened the capacities of WMO-supported open-source database administrators, not the ones of database users.
- As part of the consultations to establish the NFCS, the following user groups expressed their needs for meteorological services: (i) agriculture and food security; (ii) energy, (iii) health, (iv) water resources, (v) disaster risk management and (iv) tourism and infrastructure.
- Although the project's contribution to gender is negligible, it has noted the participation of women trainees in the digitization of historical data and the integration of women into forecasting teams.

### **3. Key factors affecting the project under World Bank control**

- The Bank's non-objection notification waiting period was sometimes long, but it has not negatively affected the project implementation.

### **4. Sustainability of project investments**

- The payment of MettelSat staff is one of the key elements in ensuring the sustainability of investments and improving the agency's performance. Indeed, improving salaries is important for ensuring internal social balance, attracting new skills, and maintaining existing ones.

### **5. Lessons learned**

- The transfer of skills to MettelSat by the consultants recruited to support the project implementation has not been effective. It is desirable to include strict constraints in consultants' contracts to ensure effective skills transfer.



**Meeting participants**

<b>N°</b>	<b>Names</b>	<b>Organization</b>	<b>Function</b>
1	ITELA Y'ILONDO Joseph	MettelSat	Director General
2	NGONGO MUKANYA Liliana	MettelSat	Deputy Director General
3	MUKONKI Martin	MettelSat	Financial Director
4	ITELA ILONDO Joel	MettelSat	Director General Assistant
5	NZEMO BAWANGAMA Julien	MettelSat	IT Analyst
6	BATESA MBILA Zico	MettelSat	Accountant
7	THAMBA Olivier	MettelSat	Administrative Director and Hydrologist
8	ONYAMBOKO NYEMBA Louise	MettelSat	Legal Director
9	KIPASA KIDUDE Eric	WB	Urban Resilience Specialist
10	MAMPUYA Henriette	WB/GFDRR	Operations Officer
11	BLONDIN Christian	WB	Consultant
12	KOVACS Yves	WB	Consultant



## ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)

Project Appraisal Document - Strengthening Hydro-Meteorological and Climate Services P159217 (WB, [2017](#))

Restructuring Paper - Strengthening Hydro-Meteorological and Climate Services P159217 (WB, [2021](#))

The Systematic Observations Financing Facility: How will it work? (WMO, [2020a](#))

MettelSat's Training Plan (EAMAC, 2021)

National Framework for Climate Services 2021-2025 and Decree (Government of DR Congo, 2021)

Business Plan for MettelSat (MettelSat, 2022)

Draft Law for Meteorology in the DRC (2014 and 2022)

MoUs signed between 2017-2021 with 12 users of hydromet information including:

- Waterways Authority (RVF)
- Congolese Maritime Routes (CVM)
- (National Electricity Company (SNEL)
- Water Distribution Authority (REGIDESO)
- Civil Protection (Ministry of Interior)
- Bureau of Architecture and Urban Studies (BEAU)
- National Institute for Agronomic Study and Research (INERA)
- Applied Studies Institute (ISTA)
- Directorate of Water Resources (Ministry of Environment and Sustainable Development)
- Roads and Drainage Office (OVD)
- Ministry of Agriculture
- Geophysical Research Center (CRG).

Draft Quality Management Manual and Roadmap (2022)



## **ANNEX 7. SYNERGIES WITH THE CREWS GRANTS**

1. In November 2017, a World Bank-executed grant of \$2,511,272 was awarded, funded under the Climate Risk and Early Warning Systems (CREWS) initiative. CREWS is a multi-donor program which aims to significantly increase the capacity to generate and communicate effective impact-based, multi-hazards, gender-informed, early warnings and risk information to protect lives, livelihoods, and assets in Least Developed Countries and Small Islands Developing States.
2. The CREWS grant-financed activities included activities under Components A and C and supported the following activities: technical assistance and the organization of the validation workshop of the Law on Meteorology, the high-level workshop on the popularization of the DRC's National Framework for Climate Services, technical support and monitoring of the implementation of the equipment contract, and the organization of a study tour to Niger for an exchange of experience on the NFCS.
3. On the other hand, WMO-managed CREWS grant contributed to the organization of the high-level workshop on the popularization of the NFCS of the DRC, the formulation of the staff training plan, the capacity building of the Institute of Applied Technical Sciences (ISTA), the support to the master plan of the meteorological and hydrological observation network, the support to the realization of the QMS for aeronautics and the calculation of the cost of the meteorological service as well as the intervention of ASECNA for the internet link with Brazzaville.