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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON PROPOSED GRANTS

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

AND

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

TO THE

DEMOCRATIC REPUBLIC OF CONGO

FOR A

Strengthening Hydro-Meteorological and Climate Services PROJECT (P159217)

FEBRUARY 16, 2017

Social, Urban, Rural and Resilience Global Practice
AFRICA

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CURRENCY EQUIVALENTS

(Exchange Rate Effective January 31, 2017)

| Currency Units | |
|----------------|-------|
| CDF1,287 = | US\$1 |
| US\$0.000777 = | CDF1 |

FISCAL YEAR

January 1 - December 31

ABBREVIATIONS AND ACRONYMS

| | |
|--------|---|
| AAL | Average Annual Loss |
| AAP | Average Annual Population affected |
| ACE | National Environment Agency (<i>Agence Congolaise de l'Environnement</i>) |
| ACMAD | African Center of Meteorological Applications for Development |
| AFD | French Development Agency (<i>Agence Francaise de Développement</i>) |
| AFDB | African Development Bank |
| AMESD | African Monitoring of the Environment for Sustainable Development |
| ARMP | Market Regulation Authority (<i>Agence de Régulation des Marchés Publics</i>) |
| ASECNA | Agency for Aerial Navigation Safety in Africa and Madagascar |
| AWS | Automatic Weather Stations |
| BCA | Benefit Cost Analysis |
| BCR | Benefit Cost Ratio |
| BEAU | Architecture and Urbanism Design Office (<i>Bureau d'Etudes d'Architecture et d'Urbanisme</i>) |
| BIP-M | Basic Instruction Package for Meteorologist |
| CAS | Country Assistance Strategy |
| CEMAC | Central Africa Economic Community (<i>Communauté Économique et Monétaire des Etats de l'Afrique Centrale</i>) |
| CFAA | Country Financial Accountability Assessment |
| CGPMP | Project Management and Public Markets Cell (<i>Cellule de Gestion des Projets et des Marchés Publics</i>) |
| CICOS | Congo-Oubangui-Sangha Basin Intergovernmental Commission (<i>Commission Internationale du Bassin Congo-Oubangui-Sangha</i>) |
| CNIE | National Environment Information Center (<i>Centre National d'Information sur l'Environnement</i>) |
| COFED | European Development Fund National Authorizing Officer Support Unit |

| | |
|------------|--|
| CONAPAC | National Congolese Confederation of Farming Producers |
| COPACO-PRP | Congolese farmers' Confederation |
| COP21 | 21st Conference of Parties |
| CPTM | Project implementation unit of the Multimodal Transport Project |
| CQ | Consultant Qualification |
| CRCE | Cellule Réglementation et Contentieux Environnementaux |
| CRG | Geophysics Research Center (<i>Centre de Recherche en Géophysique</i>) |
| CSO | Civil Society Organization |
| CTB | Belgian Cooperation (<i>Coopération Technique Belge</i>) |
| CVM | Maritime Transport Authority (<i>Congolaise des Voies Maritimes</i>) |
| DA | Designated Account |
| DCP | Data Collection Platform |
| DFID | Department for International Development |
| DMVN | Navy and River Transportation Directorate |
| DRC | Democratic Republic of Congo |
| ECWMF | European Centre for Medium-Range Weather Forecasting |
| ESMF | Environmental and Social Management Framework |
| ESMP | Environmental and Social Management Plan |
| EP | Exceedance Probability |
| EU | European Union |
| Eumetsat | European Organization for the Exploitation of Meteorological Satellites |
| EWS | Early Warning Services |
| FAO | Food and Agriculture Organization of the United Nations |
| FB | Fixed Budget |
| FFGS | Flash Flood Guidance System |
| FM | Financial Management |
| FTP | File Transfer Protocol |
| GDP | Gross Domestic Product |
| GEEC | Groupe d'Etudes environnementales du Congo |
| GEF | Global Environment Facility |
| GFCS | Global Framework for Climate Services |
| GFDRR | Global Facility for Disaster Reduction and Recovery |
| GMES | Global Monitoring for Environment and Security |
| GPN | General Procurement Notice |
| GPRS | General Packet Radio Service |
| GRS | Grievance Redress Service |
| GTS | Global Telecommunication System |
| HFA | Hyogo Framework for Action |
| HRC | Hydrologic Research Center |
| HYCOS | Hydrological Cycle Observation System |
| IBRD | International Bank for Reconstruction and Development |
| IC | Individual Consultants |

| | |
|-----------|--|
| ICAO | International Civil Aviation Organization |
| ICB | International Competitive Bidding |
| ICR | Implementation completion and results |
| ICT | Information and communications technology |
| IDA | International Development Association |
| IFAC | International Federation of Accountants |
| IFR | Interim Financial Report |
| IGF | General Finance Authority (<i>Inspection Générale des Finances</i>) |
| INDC | Intended Nationally Determined Contribution |
| INERA | National Agronomical Study and Research Institute (<i>Institut National pour l'Etude et la Recherche Agronomiques</i>) |
| IP | Indigenous People |
| ISP | Implementation Support Plan |
| ISR | Implementation Status and Results |
| ISTA | Applied Studies Institute (<i>Institut Supérieur des Techniques Appliquées</i>) |
| LAM | Local Area Model |
| LCS | Least-Cost Selection |
| LDCF | Least Developed Countries Fund |
| M&E | Monitoring and Evaluation |
| MECND | Environment, Nature Conservancy and Sustainable Development Institute (<i>Ministère de l'Environnement, de la Conservation de la Nature et du Développement Durable</i>) |
| MESA | Monitoring for Environment and Security in Africa |
| MettelSat | National Agency for Meteorology and Remote Sensing |
| MoF | Ministry of Finance |
| MoTC | Ministry of Transportation and Communication Channels |
| MoU | Memorandum of Understanding |
| MSG | Meteosat Second Generation |
| MTAP | Meteorological Transition in Africa Project (<i>Projet de Transition Météorologique en Afrique</i>) |
| MTR | Mid Term Review |
| NAPA | National Adaptation Program for Action |
| NCB | National Competitive Bidding |
| NGO | Non-Governmental Organization |
| NMHS | National Hydrological and Meteorological Services |
| NOAA | National Oceanic and Atmospheric Administration |
| NPV | Net Present Value |
| NSC | National Steering Committee |
| NWP | Numerical Weather Prediction |
| OCHA | Office for the Coordination of Humanitarian Affairs |
| O&M | Operation and Maintenance |
| OP | Operational Policy |

| | |
|----------|--|
| OP/BP | Operational Policy/Bank Procedure |
| PAARSA | Agriculture Rehabilitation and Recovery Project (<i>Projet d'Appui à la Réhabilitation et Relance du Secteur Agricole</i>) |
| PAD | Project Appraisal Document |
| PANA-ASA | Climate Adaptation and Resilience Project for Food Security and Agricultural Production (<i>Projet de renforcement des capacités d'adaptation et de gestion des impacts des changements climatiques sur la production agricole et la sécurité alimentaire en République Démocratique du Congo</i>) |
| PANA-AFE | Climate Adaptation and Resilience Project for Women and Children |
| PANA-ZC | Climate Adaptation and Resilience Project for Coastal Risk Management in Moanda Region |
| PEFA | Public Expenditure and Financial Accountability |
| PER | Public Expenditures Review |
| PIC | Project Implementation Cell |
| PIM | Project Implementation Manual |
| PMR | Procurement Management Report |
| PMURR | Multisector Emergency, Rehabilitation and Reconstruction Program (<i>Programme multisectoriel d'urgence de réhabilitation et reconstruction</i>) |
| PDO | Project Development Objectives |
| PSRP | Poverty Reduction Strategy Paper |
| QBS | Quality Based Selection |
| QCBS | Quality and Cost Based Selection |
| QMS | Quality Management Systems |
| REGIDESO | Water Distribution Authority (<i>Régie de Distribution d'Eau</i>) |
| RPF | Resettlement Policy Framework |
| RVA | Airways authority (<i>Régie des Voies Aériennes</i>) |
| RVF | Waterways authority (<i>Régie des Voies Fluviales</i>) |
| SADC | Southern African Development Community |
| SADIS | Satellite Distribution System |
| SCTP | Congolese Company for Transportation and Ports |
| SEA | Sectoral environmental assessment |
| SERBaK | Monitoring and Evaluation of Water Resources of the Kasai Watershed |
| SNCC | Congo National Railway Company |
| SNEL | National Electricity Company (<i>Société Nationale d'Électricité</i>) |
| SOP | Standard Operating Procedures |
| SORT | Systematic Operations Risk- Rating Tool |
| SPN | Specific Procurement Notice |
| SSB | Single Side Band |
| SSS | Single Source Selection |
| SWFDP | Severe Weather Forecasting Demonstration Project |
| SYNOP | Surface synoptic observation |

| | |
|----------|--|
| THEMA | Thematic Action |
| ToR | Terms of Reference |
| TTL | Task team Leader |
| UKMO | UK Met Office |
| UNAGRICO | National Union of Congolese Farmers |
| UNDP | United Nations Development Program |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNHAS | United Nations Humanitarian Air Service |
| UPS | Uninterruptible Power Supply |
| USAID | United States Agency for International Development |
| USD | United States Dollar |
| VSAT | Very small aperture terminal |
| VSL | Value of statistical lives |
| WB | World Bank |
| WIS | WMO Information System |
| WMO | World Meteorological Organization |
| WRI AGFA | World Resources Institute Aqueduct Global Flood Analyzer |
| WTP | Willingness-To-Pay |

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Country Director: Ahmadou Moustapha Ndiaye

Senior Global Practice Director: Ede Jorge Ijjasz-Vasquez

Practice Manager: Meskerem Brhane

Task Team Leader(s): Jean Baptiste Migraine

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**BASIC INFORMATION**

| | | |
|--|--------------|--|
| Is this a regionally tagged project? No | Country(ies) | Lending Instrument Investment Project Financing |
|--|--------------|--|

☐ Situations of Urgent Need of Assistance or Capacity Constraints

☐ Financial Intermediaries

☐ Series of Projects

| | | | |
|------------------------------|-----------------------------|---|------------------------------|
| Approval Date 07-Mar-2017 | Closing Date 30-Jun-2022 | Environmental Assessment Category B - Partial Assessment | Focal Area Climate change |
|------------------------------|-----------------------------|---|------------------------------|

| |
|------------------------------|
| Bank/IFC Collaboration No |
|------------------------------|

Proposed Development Objective(s)

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

Components

| Component Name | Cost (US\$, millions) |
|--|-----------------------|
| Component A. Institutional and regulatory strengthening, capacity building and implementation support | 1.58 |
| Component B. Modernization of equipment, facilities and infrastructure for basic observation and forecasting | 4.46 |
| Component C. Improvement of hydromet information service delivery | 1.27 |
| Component D. Project Management | 0.73 |

Organizations

Borrower : Democratic Republic of Congo



Implementing Agency : National Agency of Meteorology and Teledetection by Satellite (Mettelsat)

☐ Counterpart Funding

☒ Trust Funds

☐ Parallel Financing

Total Project Cost:

8.03

Total Financing:

8.03

Financing Gap:

0.00

Of Which Bank Financing (IBRD/IDA):

0.00

Financing (in US\$, millions)

| Financing Source | Amount |
|---|-------------|
| Global Environment Facility (GEF) | 5.33 |
| Global Facility for Disaster Reduction and Recovery | 2.70 |
| Total | 8.03 |

Expected Disbursements (in US\$, millions)

| Fiscal Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------|------|------|------|------|------|------|
| Annual | 0.04 | 1.90 | 3.00 | 1.20 | 1.20 | 0.33 |
| Cumulative | 0.04 | 2.30 | 5.30 | 6.50 | 7.70 | 8.03 |

INSTITUTIONAL DATA

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Contributing Practice Areas



Climate Change and Disaster Screening

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

Gender Tag

Does the project plan to undertake any of the following?

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

Yes

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

Yes

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

Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

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

COMPLIANCE

Policy

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

[] Yes [✓] No



Does the project require any waivers of Bank policies?

☐ Yes ☒ No

Safeguard Policies Triggered by the Project

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

Legal Covenants

Sections and Description

The Project Implementing Entity shall, by December 31, 2019, or such other date as the World Bank shall agree upon: (i) carry out jointly with the Recipient and the World Bank, a mid-term review of the implementation of operations under the Project, which shall cover the progress achieved in the implementation of the Project; and (ii) following such mid-term review, act promptly and diligently to take any corrective action as shall be agreed by the World Bank. [GA LDCF Sch2-V.1 and PA LDCF Sch-IV.1]

Sections and Description

The Project Implementing Entity shall, no later than two months after the Effective Date hire: (i) a financial management specialist, (ii) an accountant, (iii) an internal auditor, and (iv) an external auditor, all with qualification and experience acceptable to the World Bank. [PA LDCF Sch-IV.2 and PA GFDRR Sch-IV.1]

Sections and Description

The Project Implementing Entity shall, no later than three months after the Effective Date: (i) hire a procurement consultant with qualification and experience acceptable to the World Bank, and (ii) organize a launch workshop involving all stakeholders. [PA LDCF Sch-IV.3 and PA GFDRR Sch-IV.2]



Sections and Description

The Recipient shall establish not later than one month after the Effective Date and thereafter maintain throughout the period of Project implementation, a Project Steering Committee to approve the Annual Work Plans and Budgets and provide general orientation, oversight and coordination between the relevant Recipient's ministries and agencies, for the efficient implementation and coordination of the Project, with terms of reference, composition and powers acceptable to the World Bank as further described in the Project Implementation Manual. [GAs Sch2-I.B.1]

Sections and Description

The Project Implementing Entity shall create not later than one month after the Effective Date and thereafter maintain at all times during the implementation of the Project, the Project Implementation Cell to oversee the day-to-day implementation and management of the Project with competent staff in adequate numbers and with terms of reference, qualification and experience satisfactory to the World Bank. [PAs Sch-I.A]

Conditions

Type

Effectiveness

Description

Both the GFDRR and GEF LDCF Grant Agreements have been signed and delivered, all conditions precedent to their effectiveness or the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled. [GAs 5.01.a]

Type

Effectiveness

Description

The Project Implementation Manual has been adopted by the Recipient and the Project Implementing Entity in a manner satisfactory to the World Bank. [GAs 5.01.c]

Type

Effectiveness

Description

Both the GFDRR and the LDCF Subsidiary Agreements have been duly authorized or ratified by the Recipient and the Project Implementing Entity and are legally binding upon the Recipient and the Project Implementing Entity in accordance with its terms. [GAs 5.01.b and GAs 5.02]

Type

Disbursement

Description

No withdrawal shall be made for payments made prior to the date of the Agreements, except that withdrawals up to an aggregate amount not to exceed the equivalent of USD500,000 may be made for payments made up to twelve months prior to this date, for Eligible Expenditures under Category (1). [GAs Sch2-IV.B.1]



PROJECT TEAM

Bank Staff

| Name | Role | Specialization | Unit |
|-----------------------------------|---|-------------------------------|-------|
| Jean Baptiste Migraine | Team Leader(ADM Responsible) | Early Warning Systems | GSU19 |
| Lanssina Traore | Procurement Specialist(ADM Responsible) | Procurement | GGO07 |
| Clement Tukeba Lessa Kimpuni | Procurement Specialist | Procurement | GGO07 |
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| Grace Muhimpundu | Team Member | Safeguards | GSU01 |
| Issa Thiam | Team Member | Disbursement | WFALA |
| Joelle Mudi Nke | Team Member | Team Assistant | AFCC2 |
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| Lucienne M. M'Baipor | Safeguards Specialist | Social safeguards | GSU01 |
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| Marcus Marinus Petrus Wijnen | Peer Reviewer | Hydrology | GWA01 |
| Michel De Marigny | Team Member | Disbursement | WFALA |
| Peter Chen | Team Member | Severe Weather Forecasting | GSU19 |
| Poonam Pillai | Peer Reviewer | Climate | GSU18 |

Extended Team

| Name | Title | Organization | Location |
|------|-------|--------------|----------|
|------|-------|--------------|----------|



Bernard Gomez

WMO Representative, WMO
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West A

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I. STRATEGIC CONTEXT

A. Country Context

1. **The Democratic Republic of Congo (DRC), with a population over 75 million people, is endowed with vast natural resources including perhaps the most extensive network of navigable waterways in Africa.** An abundance of natural, forest and water resources are found across the 2.3 million square kilometers of the continent's second largest country. DRC's climate is equatorial (warm and moist) in the center of the country, and tropical in the south and north. Rainfall, which is generally affected by the displacements of the Inter Tropical Convergence Zone (ITCZ), is regular and abundant, with a long-term average of around 1,490 mm per year.
2. **Despite its rich natural resources, the DRC has often been associated with political instability and poverty.** Since reaching independence in 1960, two wars have severely affected the country's economic performance and human security and left over three million people dead with nearly as many internally displaced. They have also led to continued rebellion in eastern DRC. As for poverty, with a per capita Gross National Income of US\$380 (World Bank, 2014), DRC's population – estimated at about 74.88 million (World Bank, 2014) – is among the most vulnerable in the world. Nearly 64 percent (World Bank, 2012) of its population lives below the extreme poverty line (less than US\$1.25/day). Food insecurity remains pervasive and a majority of people lack access to basic health. With a life expectancy of 58 years (World Bank, 2012) and severe child mortality (100 deaths/1,000 births), the DRC falls far behind other sub-Saharan African countries.
3. **The economy is growing fast, with an average increase of seven to nine percent in the Gross Domestic Product (GDP) per year and a large part of the economy is climate sensitive.** The main climate sensitive sectors in the DRC's economy are agriculture (39 percent of GDP in 2011), trade, construction and hydropower (60 percent of Africa's total hydropower potential is in DRC, however only 2.5 percent is tapped so far). Agriculture employs 62 percent of the nation's men and 84 percent of its women. Being an oil importer, the DRC is not suffering from the falling of oil prices. However, its economy may experience lower growth due to the sustained fall in the prices of metal, of which the DRC is a major exporter. Growth of agriculture remains an essential priority to the country's economic development.
4. **The country presents a clear deficit in relation with its infrastructure.** The DRC probably has the most challenging transport infrastructure in Africa, with a conjunction of geographic challenges, lack of investment and conflicts. Ground transportation has always been difficult as the country's vast geography, low population density, extensive forests, and crisscrossing rivers complicate the development of infrastructure networks. The country has thousands of kilometers of navigable waterways and water transport has traditionally been the dominant means of moving around approximately two-thirds of the country, albeit with insufficient port infrastructure. Air transport is developing rapidly but requires intensive effort with regards to security. The national telecom system remains one of the least developed in the region.



5. **Urban areas are increasingly becoming vulnerable to flooding.** For instance, at least 31 people died and 20,000 families were made homeless in November-December 2015 after weeks of heavy rain in the capital of Kinshasa. A sprawling city of more than 10 million people, Kinshasa has notoriously poor infrastructure, with improvised wooden shacks lining the waterfront and dirt roads that often collapse, and is heavily exposed to flooding. The DRC is undergoing a rapid and unplanned urbanization process, with the twelve largest cities estimated to be growing at 4.7 percent annually. This results in unplanned development of cities, which in turn undermines economic growth, posing challenges to urban poverty reduction and provision of adequate urban services.

B. Sectoral and Institutional Context

Sectoral Context:

6. **Climate change is a prioritized development challenge for the DRC.** Under the Poverty Reduction Strategy Paper (PRSP-2) adopted in 2012, Pillar Five entitled “Provide Balanced and Sustainable Development” calls for “Environmental Protection and Combatting Climate Change”. In particular, the Government seeks to build resilience against the impact of climate change on agriculture, water resources and vector-borne diseases. However, there is still limited knowledge about the potential effects of climate change and increased variability in the DRC. Rising temperatures are predicted to cause a surge in crop diseases such as cassava mosaic virus, and droughts will cause major disruption to the agricultural calendar, resulting in failure of both food and cash crops, and intensifying food insecurity and poverty. Climate simulations for the region indicate that rainfall will become more intense and more destructive over the coming years, bringing floods, landslides and soil erosion, especially in the region of the central Congo basin. Although the possible effects of El Niño on precipitation remain still poorly documented in the DRC, torrential rains and subsequent flooding are already causing substantial impacts and losses. From October 2015 to March 2016 flood events along the Congo River Basin resulted in major impacts, including loss of lives, destruction of thousands of homes, vital food stocks and crops, and public infrastructure, with an estimated 550,000 people affected, including from large outbreaks of cholera. By contrast, climate simulations show that the rainy seasons will become shorter in the south, which is largely made up of the dry savannah belt and accounts for 80 percent of the rural population. Impacts from drought and water scarcity could be further exacerbated by El Niño variability, which has clear and documented drying effects over East Africa.
7. **An effective capacity to monitor and forecast hydro-meteorological (hydromet) conditions and transfer improved knowledge into decision making and planning is critical to increasing the DRC’s adaptation ability and resilience.** For instance, systematic meteorological and hydrological data collection is needed to establish early warning systems for wind storms, floods, drought and other hazards, preventing losses of human lives, delivering reliable information to farmers, and increasing accessibility and reliability of agriculture insurance products.



8. **Understanding hydromet and climate risks would help assess social and economic impacts and develop adequate policy responses to support the country's sustained development.** A number of economic sectors in the DRC could specifically benefit from more accurate, relevant and timely hydromet information, warning and services. In particular, these sectors include: (i) airfreight and aviation, (ii) early warning, disaster reduction and civil protection, and (iii) agriculture investment and food productivity. Greater understanding, monitoring and forecasting of severe weather and weather events could result in reduced loss of life and property, economic gains and prevention of losses, and most importantly, improved adaptation capacity within sectors having to adapt to the negative impacts of climate variability and change. According to USAID (2012) only 28 percent of rural households have improved water sources, including two percent that have water piped into their residences: as a result 43 million people, mostly women, are thus compelled to carry water, often for significant distances, for all household needs.
9. **Strengthening of hydro-meteorological services is considered a flagship program as part of the World Bank Climate Business Plan** presented at the 21st United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP21). The Africa Hydromet Program, launched in June 2015 as a partnership framework involving The World Bank, the Africa Development Bank and WMO (World Meteorological Organization) and other partners, will support the enhancement of climate- and disaster-resilience capacity in targeted Sub-Saharan countries, by strengthening hydromet, end-user (including early warning), and knowledge and advisory services and linking national systems with regional and global counterparts. The program aims to mobilize financial resources over time to strengthen national hydromet services by providing the investment, technical assistance, and capacity building needed for integrated modernization.

Institutional Context:

10. **The mandate for hydromet services resides in the Ministry of Transportation and Communication Channels (Ministère des Transports et Voies de Communications - MoTC) and the National Agency for Meteorology and Remote Sensing (Agence Nationale de Météorologie et de Télédétection par Satellite - MettelSat).** In the DRC, National Hydrological and Meteorological Services (NMHS) are provided by MettelSat, which monitors and forecasts weather, water and climate and is responsible for remote sensing, operational hydrology, thematic cartography, and environmental monitoring. Recently, the Government has expanded MettelSat's mandate on hydrological observation and forecasting (with the expectation that its Department of Hydrology will grow). Additional observation and forecasting is done by the Waterways Authority (RVF), the Airways Authority (RVA) and the Maritime Authority (CVM). Specifically, meteorological assistance to aviation handled by RVA works somewhat independently and better as RVA is a semi-commercial agency that has to comply with the International Civil Aviation Organization (ICAO) regulations and benefits from air traffic levies from airlines for airport and in-flight services.
11. **Overall, the national observation network is in a generally degraded condition and MettelSat**



faces significant challenges in delivering basic services to users (e.g. aviation, civil protection, agriculture, and the general public). In the early 1960s, MettelSat had a network of 125 synoptic stations, 700 rainfall stations, six upper air stations and other infrastructure. At present, MettelSat has 22 manual synoptic stations and 27 automatic weather stations (AWS). All other essential elements of the observation system, such as upper air, meteorological radars, wind profilers, lightning detection are non-existent or were shut down many years ago. The communications system, based on high frequency radio signals, emails and regular post office delivery, is very outdated, unreliable and not intended to work in real time. In terms of media, MettelSat does, however, have a studio to prepare radio and TV broadcasts. Maintenance and calibration facilities are obsolete, with only thermometer and humidity chambers still functioning. Today, only 10 hydrological stations are functioning - five on the Congo River and five on the Kasai River.

C. Higher Level Objectives to which the Project Contributes

12. The successful implementation of the project will promote mainstreaming of disaster risk management and climate adaptation in higher-level sustainable development strategies such as the examples below:
13. **The proposed Project aligns with the World Bank Country Assistance Strategy (CAS) for DRC (FY13-FY16),** which calls for the need to build the capacity to monitor and forecast hydromet in the DRC, in particular for building climate adaptation and resilience.
14. **The Project is also a critical element of the UN - World Bank joint commitment of US\$1 billion,** announced in May 2013, to the “Peace, Security and Cooperation Framework for the DRC and the Great Lakes Region” in collaboration with the region's governments, the Southern African Development Community (SADC) and the African Union. This includes financing for hydroelectric power plants, roads, and agricultural infrastructure – all of which depend on adequate hydrological and meteorological information.
15. **The World Bank Strategy for Africa¹** - the proposed project contributes directly to Pillar 2 of the Africa Strategy ‘Vulnerability and Resilience’ which emphasizes the need to address Africa’s infrastructure deficiencies as essential to achieving long-term sustainable growth. Specifically, this project will contribute to addressing vulnerability to macroeconomic and idiosyncratic shocks such as natural hazards, food shortages and climate variability.
16. **Africa Regional Disaster Risk Reduction Strategy,** -endorsed by the African Union's Assembly of Heads of State and Government in July of 2004; its Program of Action underwent a significant revision that included its extension to 2015 and alignment with the HFA². The Project supports the Strategy’s main goals of attaining sustainable development and poverty eradication through

¹ Africa’s Future and the World Bank’s Support to It, March 2011

² United Nations, Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, 22 January 2005. <http://www.unisdr.org/we/inform/publications/1037>



the reduction of social, economic and environmental impacts of disasters.

17. **World Bank African Strategy for Climate Adaption³**; The project is aligned with both core principles of the Strategy, namely: “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”.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

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

B. Project Beneficiaries

19. Beneficiaries belong to four groups, i.e., those involved in and receiving (a) weather forecasts through different media, including television and internet, (b) agro-meteorological information services, (c) extreme weather warnings (mostly in urban areas and along fluvial navigation channels), and (d) aviation services.
20. To measure progress during project implementation, MettelSat will undertake a survey with respective user groups each year to get an estimate of the number of beneficiaries reached through enhanced delivery of services. This survey will correspond to the above system so different user groups will be surveyed each year. The resulting data will be gender disaggregated. It is anticipated that beneficiaries will be more men than women in the first year, as it is expected that more men travel by air and have access to internet than women in DRC. In the latter years of the project, it is anticipated that this will balance out as the project carries out more targeted interventions in pilot communities, in both rural and urban areas. It is estimated that by the end of the project almost three million (2,978,690) people will benefit from the project.

C. PDO Level Results Indicators

21. The Results Framework (Annex 4) will be used to monitor progress towards achievement of the PDO and of intermediate indicators. Indicators would be collected and updated at the minimum with an annual frequency, while some indicators would be updated every trimester. The PDO level indicators identified are as follows:
 - a. Improved hydromet service delivery to key user groups;
 - b. Operational observation, forecast and modelling capacities improved;

³ Making Development Climate Resilient - A World Bank Strategy for Sub-Saharan Africa, report # 46947-AFR, October 2009



- c. Direct project beneficiaries (number), of which female (percentage)
22. An improvement of MettelSat technical capacities to provide basic services to key user groups will be assessed based on a four-level system that considers both the capabilities and capacity of MettelSat, as well as its ability to connect with key user groups in order to provide services that serve different needs.
23. From the MettelSat capacity development stand-point, a four-level system will be used to demonstrate the different phases of capacity development that MettelSat is expected to follow: Level 1: operational forecast is produced on paper on a daily basis for 24 hours; Level 2: strengthened use of remote sensing; forecast bulletins are updated every six hours to deal with extreme weather; Level 3: operational forecast is performed numerically and use of data from stations, remote-sensing and other global and regional models is experimented; Level 4: operational forecast is performed numerically and systematically by crosscutting data from other stations, from remote sensing and from other global and regional models.
24. In terms of the provision of user services, the project will be designed around the ICAO Quality Management System (QMS) approach. This approach encourages organizations to analyze customer requirements, define the processes that contribute to the achievement of a product which is acceptable to the customer, and keep those processes controlled. This approach expresses the need for validation and verification procedures to be established which ensure that quality requirements (accuracy, resolution, and integrity) and traceability of data are met. At the core is the "process approach", which defines a process as any activity that resources and transforms inputs into outputs. A simple example of an aeronautical information management system process is data input to database which is converted to output for chart production. QMS requirements focus on systematically identifying, organizing, documenting, managing and improving processes, and interactions between processes. For the purposes of this project, this will be done with respect to three main user groups/sectors: aviation, agriculture and civil protection, with specific systems setup to service each one to ensure consistent service delivery.

III. PROJECT DESCRIPTION

A. Project Components

25. **Component A. Institutional and regulatory strengthening, capacity building and implementation support** (US\$1,578,000) will invest in strengthening institutional setup and building capacity of human resources. This includes: i) reinforce the legal and regulatory framework of MettelSat in order to develop partnerships and Standard Operating Procedures (SOPs) for delivery of service (with civil protection, fluvial and aeronautical navigation, agriculture services, cities); ii) strengthen the Quality Management Systems to raise standards and quality control/verification procedures across the institutions (adopting a quality-based approach to



development and delivery of hydromet services); iii) implement a long-term and on-demand capacity development and training program for staff (strengthening the capacity of actual and future staff to ensure sustainable capacity development). Capacity building in gender awareness, along with promoting more women in hydro-meteorological services, will also be supported under this component.

26. **Component B. Modernization of equipment, facilities and infrastructure for basic observation and forecasting** (US\$4,462,000) will finance: i) hydrological and meteorological monitoring networks (small-scale rehabilitation of priority stations and installation of new sensors, for about 20 meteorological and six hydrological stations); ii) transmission, data management and data dissemination hardware (equipment needed for data concentration from the field to Kinshasa, management of secured databases interoperable with producers and users of hydromet information, etc.); 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. In addition, this component will ensure participation of women and the equipment purchase should also take into account literacy level of the users and limited resources for consumables.
27. **Component C. Improvement of hydromet information service delivery** (US\$1,256,000) will provide technical assistance for delivery of more accurate, timely and user-friendly products and services to users and decision-makers. The component will specifically (i) define requirements (parameters, lead time, resolution, frequency) and develop feedback mechanisms with different user groups (in line with the National Framework for Climate Services); and (ii) develop and deliver customized products and services made available to user groups through dedicated interfaces (dedicated bulletins, model outputs, decision support tools, developed to guide specific decisions). Priority target end-users are those involved in (a) agro-meteorological information services, (b) food security; (c) civil protection emergency and contingency plans; and (d) aviation. This component will target beneficiaries with a gender-disaggregated approach. Within this context, the delivery of information will use a combination of media (radios, TV, newspapers), Internet, cellphone and smartphones to reach users according to their needs. The following steps are recommended to ensure a gender approach to implementation of this component: i) carry out gender analysis early, ensuring balance among the needs and interests of women, men, girls, and boys, and make sure it is comprehensively applied in detailed planning and implementation of all activities; ii) use sex-disaggregated statistics in all phases of work, and ensure prompt adjustments in response to intermediate results to promote better outcomes; and iii) build a solid and robust Monitoring and Evaluation System. The success of this service delivery component will be dependent upon how users of hydro-meteorological information will receive support (from other projects) in developing capacities at the right level (local governments, farmers' associations, etc.) in select zones in order to convert information into action/decision. This component is essential in promoting the image of the hydromet service to the public and decision makers and potentially generating new sources of revenues in the future.
28. **Component D. Project Management** (US\$733,452) will finance the following activities:



(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 various project components

29. **Areas of Interventions and specific criteria for pilot sites:** Some basic services will be provided at a national level (seasonal and daily forecasting, ten-day agro-meteorological reports, etc.) while other more specialized services (such as flood forecasting systems, personalized agro-meteorological information services, warning reports to anticipate impacts, etc.) will be provided to pilot zones to be identified based on the following general criteria: (i) presence of specific hydro-meteorological natural hazards; (ii) exposure of populations and critical infrastructures (urban zones, roadblocks, irrigation, transport, hospitals, schools, etc.); and (iii) presence of investment projects, which would allow for an optimal utilization of hydro-meteorological services (notably across urban development, agriculture and hydro-electricity).
30. More specifically, criteria for the selection of the six to 10 urban pilot sites will be i) the vulnerability of the municipalities to heavy rains; ii) the presence of populations affected by flash floods and erosion phenomena (at their houses, works place or public buildings providing essential services); and iii) the existing support in these municipalities of the World Bank Urban Development Project (P129713), to ensure optimal collaboration with the municipal authorities and maximization of benefits to the populations.
31. More specific criteria for the selection of the three or more rural pilot sites will be i) the vulnerability of farmers and agriculture workers to climate variabilities, including those linked to natural hazards like droughts and heavy rains affecting the normal cycle of the agriculture production; ii) the presence of established networks of farmers and/or NGOs (Caritas, World Vision, etc.) supporting farmers and the agriculture production; and iii) the existing support in these areas by the World Bank Western Growth Pole Project (P124720) in the Bas-Congo Province, the Rehabilitation and Recovery Support Project (P092724) in Equateur, and the Regional Great Lakes Integrated Agriculture Development Project (P143307) in South Kivu, in order to rely on the existing lessons-learned and existing networks, and maximize benefits.
32. **Relevant World Bank Operations in the DRC:** The Bank has a large portfolio with several ongoing operations across the urban, agriculture, transport, and energy sectors. Based on discussions with the projects' teams, the project will work closely with: i) the DRC Urban Development Project (P129713), which covers nine municipalities; ii) for agriculture and optimal use of the agriculture, the Western Growth Poles Project (P124720) in the Bas-Congo province, the Rehabilitation and Recovery Support Project (P092724) in Equateur, and the Regional Great Lakes Integrated Agriculture Development Project (P143307) in South Kivu; iii) Goma Airport Safety Improvement Project (P153085) in transport; and iv) the DRC Electricity Access & Services Expansion (EASE) (P156208). Establishing linkages and synergies across these projects will ultimately help support food security, vulnerability reduction and economic advantages.
33. **Relevant partner initiatives in the DRC:** The ongoing cooperation activities by UNDP (United



Nations Development Program), WMO (World Meteorological Organization), the European Union, the African Development Bank, SADC (Southern African Development Community), ACMAD (African Center Meteorological Applications for Development), and the Popular Republic of China have been taken into account in the design of the project.

B. Project Financing

34. The lending instrument is Investment Project Financing, through two Grants, in the respective amounts of US\$5,329,452 provided by the Global Environment Facility (GEF) Least Developed Country Fund (LDCF) and US\$2,700,000 provided by the Global Facility for Disaster Reduction and Recovery (GFDRR). The total estimated project cost is US\$8,029,452. The implementation period is five years. In addition to the project financing, a project preparation grant of US\$150,000 has been provided by the Global Environment Facility (GEF) Least Developed Country Fund (LDCF).

Project Cost and Financing

| Project Components | Project cost (US\$) | IBRD or IDA Financing (US\$) | Trust Funds – GEF LDCF (US\$) | Trust Funds - GFDRR (US\$) |
|---|---------------------|------------------------------|-------------------------------|----------------------------|
| Component A: Institutional and regulatory strengthening, capacity building and implementation support | 1,578,000 | 0 | 1,178,000 | 400,000 |
| Component B: Modernization of equipment, facilities and infrastructure for basic observation and forecasting | 4,462,000 | 0 | 3,047,000 | 1,415,000 |
| Component C: Improvement of hydromet information service delivery | 1,256,000 | 0 | 481,000 | 775,000 |
| Component D: Project management | 733,452 | 0 | 623,452 | 110,000 |
| Total Project Cost | 8,029,452 | 0 | 5,329,452 | 2,700,000 |

C. Lessons Learned and Reflected in the Project Design

35. This project is prepared under the Africa Hydromet Framework Program. It is the first one prepared under the Program, which is jointly developed by the World Meteorological Organization, the African Development Bank and the World Bank Group. Being part of the Program, it will be able to pull lessons learned from decades of engagement of respective institutions in hydromet modernization projects and will focus on:



- a. improving hydromet and early warning capacity and strengthening networks through open data and information sharing;
- b. leveraging partnerships and fostering interagency coordination to maximize economies of scale and regional integration and promote south-south cooperation to ensure transformational change and longer-term sustainability;
- c. aligning with the principles of the Global Framework for Climate Services (GFCS) and identifying the requirements of users as a starting point for generation of services, products and data.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

- 36. The **implementing agency** will be MettelSat, defined in a decree of 2012 as the official national hydromet agency, a publicly funded technical and scientific service with legal status and financial autonomy under the Ministry of Transportation and Communication Channels and supported by the State Subsidiary Budget.
- 37. **Project National Steering Committee (NSC):** Since many other agencies and ministries have a stake in hydromet information generation, dissemination and use, a National Steering Committee will be established by the Minister in charge for Transportation, to coordinate project activities and ensure that they are harmonized with related activities of other government stakeholders. The role of the project National Steering Committee will be to provide overall policy direction on project implementation resolving any policy hurdles, inter-ministerial barriers or policy conflicts. The NSC will be responsible for approving the overall implementation plan and annual project budget, and will meet as often as needed but at least every quarter to review and follow up on project progress. The NSC will ensure that adequate staffing arrangements in MettelSat are in place. Within two months following effectiveness, the NSC will ensure that an Internal Audit Department is set up and adequately staffed with an internal auditor whose terms of reference will cover all activities under the project. The Chair of the Steering Committee will be designated by the Ministry in charge for Transportation and MettelSat will provide secretariat services. Annex 2 provides a list of the Steering Committee's members.
- 38. **Implementing Arrangements:** To facilitate project implementation a Project Implementation Cell (PIC) will be established within MettelSat, bringing together the required expertise from across the organization, and strengthening its capacity with consultants, where needed. The PIC will perform day-to-day project implementation activities and will also function as a Secretariat for the Steering Committee. Annex 2 provides a list of the PIC team's main members/functions.
- 39. The main responsibilities of the PIC will be to (a) prepare annual implementation plans for the project activities, as well as the annual budget, for Steering Committee approval; and (b) carry out all work related to fiduciary functions including procurement, financial management, disbursement, audit, reporting and monitoring and evaluation. The PIC will be responsible for the



overall project's fiduciary management and procurement in compliance with World Bank's regulations. The PIC will be responsible for processing all the International Competitive Bidding (ICB) and selected National Competitive Bidding (NCB) contracts and payments. In addition, the PIC will interact with relevant stakeholders, including non-governmental organizations (NGOs) and municipalities, to guide them in the implementation process where necessary.

B. Results Monitoring and Evaluation

40. The PIC will be responsible for the overall coordination of M&E activities and the preparation of periodic M&E reporting. The project M&E system will be based on the Results Framework and implementation arrangements. The PIC will take responsibility for data collection, and for following procedures and methods established within each involved Ministry.
41. The PIC will also take steps to build overall M&E capacity within the hydromet sector. This will include technology, equipment, training on data collection, content management, information updates and basic system troubleshooting and maintenance.
42. Gender indicators will be included in the M&E system. Although collecting outputs such as the number of women beneficiaries or the number of women trained is important, the project will consider outcomes that enable opportunities for women's empowerment. Better early warning systems should not only reach and be understood by both women and men, but also promote women's agency and exploit technical assistance more fully to reach wider development objectives⁴.

C. Sustainability

43. Sustainability is a challenge to hydromet services globally and presents risks to both GEF LDCF and GFDRR investments. In the past, MettelSat benefited from donor support that has not led to sustainable achievements due to a lack of investment in operation and maintenance. To mitigate these risks, components 1 and 3 of the project will directly support an improvement of Mettelsat's capacities to recover the costs of its services, in particular from the aviation sector. In addition, attention will be given to: (i) the optimal use of hydromet equipment that can be easily maintained; (ii) a long-term plan for consolidating institutional, human and ICT capacity for modelling, forecasting and decision support systems; and (iii) developing other solutions to ensure financial sustainability in the hydromet sector. Already during project implementation,

⁴ Radio programming, for example, is preferable to text messaging, due to the country's limited cell phone coverage, and because of the high cost of sending teams to conduct interactive programs in remote locations. Radio programming should include debates and call-in question and answer programs to encourage the use of practical information. They should employ easy-to-understand serial stories (soap operas) of family life in the context of changing social and economic conditions to catalyze discussion and foster acceptability of more flexible roles for men and women. Some civil society innovators are planning women's radio programming, and there are reportedly more women trained in or working in media in DRC than in any other sector. If people listen to the experiences of others who call in for advice on improving their use of a new technique for child rearing cultivating for a new crop, they may be more inclined to try it themselves. Well-facilitated discussions about the acceptability of changing social norms may similarly contribute to greater openness to change and possibly serve as topics for debate within local associations (USAID, 2012).



additional financing in the amount of US\$800,000 is included in the provisional budget of MettelSat to ensure availability of funds for operation and maintenance during and after project implementation.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

44. The overall risk for the proposed operation is rated as **substantial** with regards to risks anticipated during implementation, as well as with regards to sustainability of hydromet services in the long run. This will be mitigated, through strong management support, long-term capacity building activities, focus on quality standards and project planning, strengthening financial planning and management and balancing investments with consideration to long-term, optimal use. The team also considered the risk of inaction. If the World Bank is unable to provide support to DRC's hydromet services, new investments in economic sectors (such as transport, navigation, hydropower etc.) will face undermining uncertainties. Equally, with a continued weakened monitoring and analysis of water and weather, the Government of DRC may not be able to build resilience and adaptation capacity in the face of negative impacts of climate change. In line with the SORT table in the data sheet, the risks are indicated as follows:
- (i) **Political and Governance: Substantial.** This risk may interfere with hiring of international consultants and procurement of imports and supervision. However, the project will be implemented by MettelSat which is an independent legal entity, and should be able to operate in a difficult political environment; for this reason the risk is rated as substantial and not high.
 - (ii) **Macroeconomic: Substantial.** A satisfactory macro-economic environment can be expected over the duration of the project, however fluctuations are still likely to happen and could have impacts on imports of goods and services.
 - (iii) **Sector strategies and policies: Moderate.** The relationship and collaboration between ministries will require to be improved to ensure optimal use of hydromet products and services across sectors and realize all benefits; however this is expected to be supported under component 1.
 - (iv) **Technical design of the project: Substantial.** The design is relatively simple with one entity carrying out all project management activities, however, given the lack of experience of the entity with World Bank operations, additional supervision support is expected to be needed in order to ensure full delivery of services to customized services to end-users in selected sectors.
 - (v) **Institutional Capacity for Implementation and Sustainability: Substantial.** The implementing agency would be MettelSat, which faces budgetary, governance and infrastructure challenges in a poverty-stricken and post-conflict context. Specific risks



anticipated are related to the capacity of staff to develop new capacities and skills to maintain, operate and sustain the equipment used for observation, forecasting and service delivery; and, secure the necessary financial resources for the long-term sustainability and continued development of the services.

- (vi) **Fiduciary: Substantial.** MettelSat does not have experience with Bank policies and procedures. It is expected that these risks can be mitigated by hiring support and training services during implementation. Procedures for administration and finance will be detailed in the Project Implementation Manual.
- (vii) **Environmental and social: Moderate.** The project will have limited, if any, environmental or social impacts, and is expected to be Category B. Impacts would primarily be associated with (i) the installation and rehabilitation of observation equipment, (ii) any required establishment of access road or paths to these observation stations, and (iii) poor social and environmental safeguards management and implementation experience and capacity of Mettelsat.
- (viii) **Stakeholders: Low.** Stakeholder risks are assessed as low and the dissemination of customized services to users and stakeholders would be supported from other ongoing projects.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

45. To estimate the value of strengthening DRC's hydro-meteorological services, an economic analysis that estimates both costs and benefits of the proposed project has been undertaken. In this analysis, the assumed benefits derived by different economic sectors are estimated through benefit transfer methods. The analysis follows the overall structure of the "Triple Dividend of Resilience" framework⁵, which include: i) avoided damage and losses; ii) unlocked economic potential; and iii) development co-benefits. For each dividend a set of sectoral benefits is considered, based on a "conservative" approach towards benefits' estimation, data availability and reliability constraints. Because of the project's characteristics and baseline conditions of NMHS in the DRC, the project's benefits are considered as 10 percent of the benefits generally assigned to improved hydro-meteorological services. The time frame of the analysis is 15 years from project starting, assuming an average lifetime of equipment of 10 years and 30-40 years for buildings. The Benefit Cost Ratio of the project is also reported at project completion (5 years). Where a range of potential assumptions are generated, the most conservative values are taken, meaning that for a range of potential benefits the lowest value is used. This results in the analyzed net present value and benefit-cost ratio representing the lowest threshold of expected economic

⁵ Tanner, T.M., Surminski, S., Wilkinson, E., Reid, R., Rentschler, J.E., and Rajput, S. (2015). The Triple Dividend of Resilience: Realising development goals through the multiple benefits of disaster risk management. Global Facility for Disaster Reduction and Recovery (GFDRR) at the World Bank and Overseas Development Institute (ODI), London. www.odi.org/tripledividend.



effectiveness; most likely the truly realized economic efficiency will be greater.

46. **The costs associated with the proposed project amount to a total of around US\$8 million.** During and beyond implementation, the economic analysis includes the costs for operation and maintenance and repair, at an assumed 10 percent of total project investment for modernization of equipment and new installations, along the time period of the analysis. Operation and maintenance (O&M) costs of the additional infrastructure (value US\$6 million) delivered by the Government of China to the DRC are also considered in the analysis. A present value of US\$17.65 million of costs is estimated using a three percent rate of discount.
47. **A net present value of the proposed project of US\$112.27 million is estimated, with a benefit-cost ratio of 7.36 to-1** using the baseline assumptions and a three percent rate of discount. The present value of benefits is estimated as the sum of the dividends of resilience provided by the project. The first dividend considers how improved forecasting and EWSs reduce national asset and livelihood losses. The second dividend considers how increased risk awareness and forecasting accuracy increases agriculture productivity. It also includes the benefits of reducing weather related risks to the aviation sector, through route optimization and landing. The third dividend considers the co-benefits to households, through a willingness to pay benefit transfer from Mozambique. The analysis shows a project's benefit-cost ratio (BCR) of 2.39 at project completion.

| Summary table of benefit to cost analysis (BCA) | Present value (mil US\$) | Net Present Value (mil US\$) | Benefit-Cost Ratio (BCR) 5yrs | BCR 15 yrs |
|---|--------------------------|------------------------------|-------------------------------|-------------|
| Project costs | 17.65 | | | |
| Benefits - First Dividend | 30.93 | | | |
| Benefits - Second Dividend | 134.56 | | | |
| Benefits - Third Dividend | 1.69 | | | |
| Project benefits | 129.92 | 112.27 | 2.39 | 7.36 |

Table 1: Summary table of the proposed project BCA.

48. A basic sensitivity analysis is done with respect to assumptions on the discount rate, potential improvements in forecast quality and financial support to Mettelsat for operation and maintenance (O&M). Results are relatively insensitive to the discount rate and the same policy recommendation emerges whether using a 1 percent, three percent or 10 percent rate of discount. On the other hand, if the improvements in forecasts are less than assumed in the baseline BCA, a significant reduction in the net present value (NPV) is expected. Assuming only five percent rather than 10 percent of project's contribution to the potential overall benefits of improved hydro-meteorological services, the overall NPV falls by more than 50 percent and the BCR to 3.81. Finally, if there is no budget increase for the relevant agencies to support project operation and maintenance, the NPV estimates fall precipitously. In this case, while potentially



having a positive NPV due to the short term benefits, it is assumed to generate no benefits after the system degrades again to pre-project levels within a few years.

| Sensitivity Analysis | Parameter Value | Overall NPV | BCR 5 yrs | BCR 15 yrs |
|---|-----------------|-------------|-----------|------------|
| Baseline | 3.00% | 112.27 | 2.39 | 7.36 |
| Discount Rate | 1.00% | 133.69 | 2.40 | 7.79 |
| Discount Rate | 10.00% | 64.66 | 2.34 | 6.07 |
| Percent improvement in forecast ¹ | See Footnote 1 | 49.57 | 1.42 | 3.81 |
| Failure to support budget for long-term operation, maintenance, and repair ² | See Footnote 2 | 25.28 | 2.39 | 2.43 |
| ¹ The benefit of the project are assumed 5% (instead of 10%) of the potential overall benefit of improved hydro-meteorological systems. | | | | |
| ² Assumes that there is no spending on operations maintenance and repair above and beyond the initial investment. Assumes that the benefits realized in the first five years then degrade proportionally over the following 5 years as the system returns to current (pre-project) status. | | | | |

Table 2 – Sensitivity analysis of the proposed project BCA.

49. The analysis presents a number of omissions, biases and uncertainties. This type of economic study can consider only a part of the potential benefits and costs of a specific project, especially with respect to all of the potential indirect effects and co-benefits. This analysis only considers a few sectoral benefits. For example, benefits do not include the value of statistical life by improving weather observation and forecast in the aviation sector and through early warning of natural hazards. Moreover, the analysis does not include the potential value of climate information for longer term planning of infrastructure such as dams and water resources, hydropower production and fluvial transportation facilities.
50. The World Bank adds value to the project by bringing its previous experience in supporting the preparation and implementation of projects supporting hydro-meteorological services (150 operations since the 1980s, a dozen projects under implementation and many more at the conceptual stage). The Bank's experience has led to the adoption of a holistic approach to the strengthening of these services. Currently, the Bank manages dedicated support programs such as the Global Facility for Disaster Reduction and Recovery (GFDRR) Hydromet Program, the Africa Hydromet Program, as well as several hydromet operations. The Bank also provides technical and financial assistance for increasing DRC's resilience in the agriculture, urban development, energy and aviation sectors, through which potential linkages, synergies and use of hydromet services can be envisaged. Strengthening of hydro-meteorological services is considered an integral part of the World Bank climate business plan presented at the COP21. Improving hydromet services is integral to strengthening resilience to extreme weather events and enabling economic development across Sub-Saharan Africa. Specifically, accurate hydromet information is a critical requirement for i) developing water resources for irrigated agriculture, hydropower and



improved water supply; ii) better planning for health services; iii) providing access to safe air and road transportation, and; iv) reducing the economic and social impacts of floods, drought and other extreme weather events.

51. The public sector vehicle is relevant given the public value of hydromet data and services which are critical for strategic and security matters, such as long-term planning for environment, social and economic development and protection of vulnerable population and their livelihoods. Hydromet services have an official mandate naturally fulfilled by the public sector. Partial cost-recovery through commercial activities may be targeted as part of the longer-term business plan of MettelSat but may not be achieved during implementation of the Project due to the large number of beneficiaries spread in non-structured user groups and time needed to reach production of high-quality marketable services.

B. Technical

52. After 30-40 years of neglect, the DRC hydromet system needs considerable resources and efforts to rebuild its institutional framework, create the most basic infrastructure and develop a service delivery culture and capacity.
53. According to the decree N°12/40 of 2 October 2012 MettelSat is the agency in charge of meteorology, climatology and inventory of natural resources in the DRC. However, the current institutional context is highly fragmented. Roles and responsibilities for the hydrometeorological and climate observation and forecast are blurred and scattered across a number of entities. Over the last years, because of insufficient financial and human resource, and the institutional complexity, MettelSat has not been able to coordinate the different entities involved in hydromet information and services in the country (Figure 1).

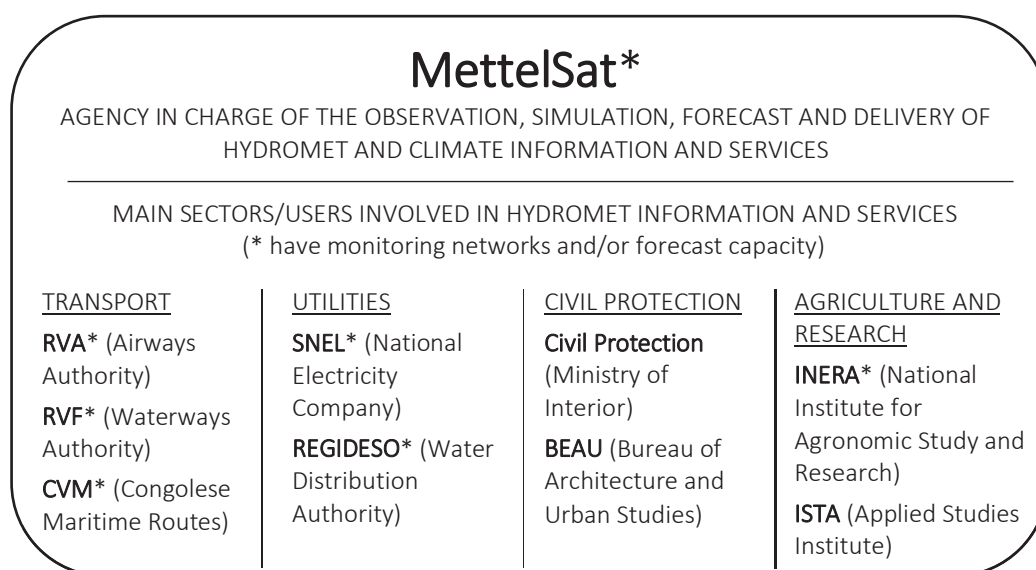


Figure 1: Institutional arrangement and main entities related to hydromet information and



*services in the DRC. Entities which have monitoring and/or forecast facilities/capacities are marked with *.*

54. Currently, the Government of the DRC is in the process of proposing a new legislation on meteorology. When approved, the law will provide a legal framework that will allow the coordination and harmonization of hydromet activities in accordance with the practices and standard procedures of WMO. The proposed legislation defines missions, mandates and responsibilities of the various entities involved in NMHS, with MettelSat as the leading agency.
55. The WMO Strategy for Service Delivery and its Implementation Plan⁶ will guide the improvement of hydromet service delivery to users and customers. WMO provides a flexible methodology to help those services to evaluate their current service delivery practices and to serve as high-level guidance for developing more detailed methods and tools to improve the service delivery process. WMO strategy is based on a continuous cyclic process for developing and delivering services based on six elements necessary for moving towards a more service-oriented culture, which include: i) evaluate user needs and decisions; ii) link service development and delivery to user needs; iii) evaluate and monitor service performance and outcomes; iv) sustain improved service delivery; v) develop skills needed to sustain service delivery; and, vi) share best practices and knowledge.
56. Milestones for the implementation of the strategy are set for the short term, medium term and long term. The key tasks resulting from the implementation of the strategy over the short term are: i) an assessment of the current level of service delivery; ii) putting in place the necessary action plan to start improving service delivery, which should include strengthening user interaction; and, iii) an assessment of the resources required to implement the action plan. Over the medium term, the implementation plan aims to help a certain percentage of hydromet services gain at least one level in their service delivery development and to document the process and share lessons learned with other hydromet services. Over the long term, the aim of the strategy is to develop or strengthen a service culture and facilitate the mainstreaming of service delivery in the programs and activities of hydromet service providers, resulting in a tangible improvement in the user's perception of their services.

6 WMO (2014). Strategy for Service Delivery and its Implementation Plan. World Meteorological Organization, Geneva, Switzerland.

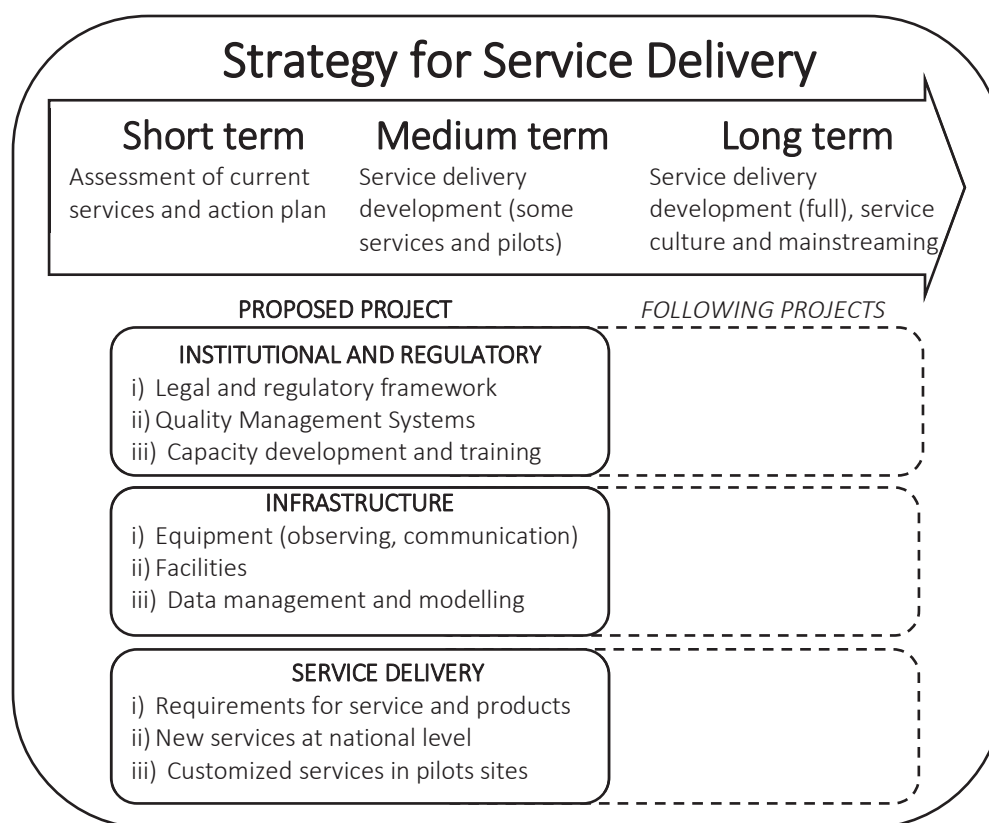


Figure 2: Strategy for Service Delivery and Implementation Plan: WMO Strategy and proposed project's activities.

57. The proposed project will work with the DRC Government, WMO and other partners to contextualize and achieve the short and medium term objectives of the strategy (Figure 2), through coordinated efforts aiming at strengthening the institutional and regulatory context, modernizing the infrastructure systems and improving the production and delivery of hydromet information and services to the different sectors. The proposed project will support the development of a specific strategy and action plan for MettelSat, which will identify the main actions to improve the cooperation between agencies and MettelSat's coordination capacity, ensuring an efficient development of NMHS in the country.
58. Finding the appropriate technical balance between significant and competing development needs and limited government resources and capacity will be one of the key challenges. The project will identify priorities among possible improvements in order to demonstrate at first the capacities of MettelSat to deliver services to the expectation of a limited number of users. The focus will be on high impact severe weather prediction and warnings, which are mainly associated with strong convection, resulting in heavy precipitation, floods, landslides and erosion. In addition to the short-range predictions, predicting the change in the weather regimes such as onset and end of rainy seasons will also be pursued, at least when associated with agricultural impacts.



59. The project's design is based on successful approaches and well-known methodologies as well as on lessons learned from past and/or ongoing global, regional and national technical capacity development projects, sustainable land and water management; urban planning and development; and disaster risk management projects.

C. Financial Management

60. In accordance with the Financial Management Manual issued in November 2005, and as revised on March 2010, the financial management arrangements of MettelSat have been assessed to determine if the implementing entities have acceptable financial management arrangements in place that satisfy the Bank's Operation Policy/Bank Procedure (OP/BP) 10.00. These arrangements would ensure that the implementing entities: (i) use Project funds only for the intended purposes in an efficient and economical way; (ii) prepare accurate and reliable accounts as well as timely periodic financial reports; (iii) safeguard assets of the Project; and (iv) have acceptable auditing arrangements.
61. Financial Management (FM) arrangements were found to be adequate subject to meeting the following requirements: (i) opening the designated account in a financial institution acceptable to the Bank, (ii) the updating of the current manual of procedures in order to take in account the grant specificities, (iii) implementation of a customized Excel spreadsheet for bookkeeping to bridge the period, not longer than two months after effectiveness, during which the acquisition of a management accounting software will take place, (iv) the recruitment of a Chief Financial Officer, (v) the recruitment of an Accountant, (vi) the recruitment of an internal auditor, and (vii) agreeing the ToRs for the recruitment of the external auditor acceptable to the International Development Association (IDA).
62. The conclusion of the assessment is that the financial management arrangements in place meet the World Bank's minimum requirements under OP/BP10.00, subject to meeting some initial requirements, and therefore are adequate to provide, with reasonable assurance, accurate and timely information on the status of the Project required by World Bank (IDA). The overall Financial Management residual risk rating at project preparation is considered **Substantial**. Additional details on the FM assessment are found in Annex 2.

D. Procurement

63. Project procurement activities will be carried out by the procurement unit (*Cellule de Gestion des Projets et des Marchés Publics*, CGPMP) to be set up within MettelSat. The project will recruit a procurement consultant that will be responsible for procurement in the first year and gradually transfer responsibilities to a selected procurement officer within MettelSat. The consultant will be responsible for both carrying out the necessary procurement procedures, but also to train the designated MettelSat procurement staff. Given: (i) the country context and associated risk; (ii) the fact that MettelSat has to set up a procurement unit to handle procurement activities; and (iii) the fact that MettelSat has no procurement experience and no procurement capacity, the procurement risk is rated high. Details are provided in Annex 2



E. Social (including Safeguards)

64. The proposed Project is not expected to have any negative social impacts or risks related to social safeguards. No land will be acquired that would lead to economic or physical displacement of people; construction of new hydro-meteorological equipment installations will be limited to public lands or buildings where they do not affect users' livelihoods; no project activities will take place on lands traditionally occupied by Indigenous Peoples (IPs). Therefore, the project will not trigger involuntary resettlement (OP/BP 4.12).

F. Environment (including Safeguards)

65. The proposed Project has an Environmental Risk Category B investment under the World Bank's Operational Policy on Environmental Assessment (OP/BP 4.01) and has a very low environmental risk. OP/BP 4.01 is the only policy triggered under the proposed Project. Impacts would primarily be associated with the installation and rehabilitation of observation equipment and any required establishment of access road or paths to these observation stations. The project will mostly rehabilitate existing hydrological (manual scales and automatic recorders) and meteorological stations (synoptic, meteorological, agro-meteorological, rain gauges) with preference when relevant for keeping the previous/current location (for continuation of homogenous climate series).

G. World Bank Grievance Redress

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



Annex 1: Detailed Project Description

Capacities and Constraints of Hydromet Services in the DRC

1. The status of MettelSat is defined by the decree N°12/40 of 2 October 2012 that defines its missions, structure, organization, management and financial obligations. MettelSat is the government agency in charge of meteorology, climatology and of the inventory of natural resources in view of their management for a sustainable development. This also includes operational hydrology, hydrometry, hydrological forecasting and the hydrological cycle, as well as general geophysics.
2. Mettelsat owns a large number of buildings across the country, many of them more than 50 years old, all in very bad condition. These buildings, located in Binza (headquarters), Lubumbashi, Mbandaka, Kisangani, Bunia, Bukavo, Kananga and Ilebo, include administrative buildings, technical buildings, and housing for the personnel. MettelSat owns five vehicles only, of which only one is presently in condition of use.
3. Mettelsat did not get funding for operations and maintenance since the early 1990s. During this period, government budget was only allocated to support the staff. MettelSat has a significant workforce of 483 staff, among which 330 are in Kinshasa and 153 in the provinces. However more than 75 percent of them are at or exceeding the retirement age. The qualification of the workforce needs significant improvement too. 146 new staff are being hired in order to compensate for the departure of senior staff. The number of engineers is 20, and of forecasters 37.
4. The observation infrastructure has seen a dramatic decline since 1960, when 125 full-scale stations and 900 stations limited to rainfall measurements were operating. Presently, only 22 stations are considered as fully or partly operating, all of them on aerodromes. Few instruments are in working condition, and all systems are extremely obsolete and need replacement. There is no radio-sounding station in condition to operate. The transmission of data from the stations to the central facility in Kinshasa/Binza is made by voice through old fashioned SSB (Single side band HF) channels. As an example, the automatic station of METTELSAT in Kinshasa N'djili airport does not work because the wireless link to the control tower is down. Observers (who in N'djili are RVA workers) have to cross the road every 30 min to get the data which is then recorded manually. These observations and synoptic observations received from nine other Congolese airports through SSB voice liaisons (at 6:00, 9:00, 12:00, 15:00 and 18:00 UTC) are translated into SYNOP messages and transmitted by a MESSIR-COM Terminal through a V-SAT link directly to the Regional Telecommunications Center in Brazzaville which is expected to insert these data into the Global Telecommunication System of WMO (GTS). The aviation specific weather observation messages (METAR) for N'djili and interior airports are made in N'djili based on the SYNOPs. It may also be noted that no observations are made at 21:00, 00:00 and 03:00 UTC. The 22 stations are equipped with Data Collection Platforms (DCP) transmitting SYNOPs by satellite which can be received by the PUMA system through EumetCast about two hours later. Presently only 12 DCPs



are working, but the data is not fed into the GTS because the connection between Binza and Brazzaville is down. Other elements of the stations are out of order in many places. Most stations have not been visited by the maintenance teams since their installation, which was generally done in 2008 and 2009. As a result of the lack of financial and human capacities, MettelSat lacks the capacity to address the requests of potential clients. It has not been able to develop a fully functional customer service and marketing unit, and the list of its clients and corresponding revenues in the past five years is very limited in terms of number and revenue generation.⁷

5. There is no weather forecasting permanent shift positions, working hours are from 6 A.M. to 3 P.M. Although the forecasters accept to spend the night at work in case of severe weather, this does not allow for a good follow-up of the meteorological situations for a large country like the DRC. Forecasting at the headquarters is based principally on the utilization of the PUMA satellite receiving stations which were donated by the EU and will be upgraded in 2016. The microwave point to point connection of the headquarters in Kinshasa/Binza to the WMO Information System (WIS), which is accessible across the Congo River at the Regional Telecommunications Centre of Brazzaville, is not working. Although the V-SAT connection installed by RVA between Kinshasa N'djili airport and Brazzaville is operational, this liaison does not reach Binza. There is also very limited access to high speed Internet, where many useful data and international weather forecasting products could be found. The weather forecasting numerical models received on PUMA are the Local Area Model (LAM) of the UK Met Office, Météo-France Arpège and ECMWF. The ECMWF model gives 8 day forecast, LAM 48h, Arpège five days and allows viewing of the vertical profiles. The 24 hours forecasts covering the country are made for the general public. Nowcasting is being experimented with forecast at 12 hours for severe weather. Currently, specific predictions for the provinces are made only for Katanga. Nowcasting utilizes SWFDP (Severe Weather Forecasting Demonstration Project) products disseminated through Internet from South Africa which are very appreciated despite the differences between different models. Forecasts of extreme weather indicate rainfall superior to 20mm in 24 hours in some sensitive sites. A SWFDP is starting to be developed for Western Africa, which could greatly benefit the DRC because of the use of the French language. Everything is done manually due to the lack of software and skills for analyzing the input of data and for developing products. MettelSat would benefit from a data production system which would prepare the information according to the needs of the specific users.
6. Meteorological assistance to aviation is made in relation with the Airways Authority (RVA). RVA is a private company owned by the State that has to comply with the ICAO regulations and benefits from air traffic levies collected from airlines for airport and en route services. The meteorological infrastructures of the international airport of N'djili Kinshasa as well as of the other airports in the country do belong to MettelSat. RVA has hired about 50 meteorologists based in Kinshasa, and is in the process of training and recruiting 20 new meteorologists. Presently the meteorological services to aviation are provided by RVA in N'djili and in three other international airports, and by MettelSat in the other airports. N'djili airport was equipped with a

⁷ Based on the list provided by MettelSat of "Repertoire Clients"



Satellite Distribution System (SADIS) satellite receiving station which is out of order. The satellite distribution has been terminated in July 2016, and replaced by FTP transfers. According to the MettelSat 2016-2019 Action Plan for the development of aeronautic meteorology⁸, there is no aviation forecasting position at the central forecasting office in Binza and no forecaster from MettelSat in any aerodrome. In N'Djili the forecasters are RVA personnel.

7. Only a very tiny part of the climatological records that sometimes go back to more than 40 years has been digitized. As most of these records are still on paper and sometimes stored in bad conditions in Binza and across the country, they run the risk of being lost. Records anterior to the country's independence might still be accessible in Belgium, but no inventory has been done. Extended time series are necessary to provide basic climate information to users as required by GFCs. MettelSat does not produce nor publish official climate change projections for the country. Climate data are sent from the stations at the end of each month on paper (by post) and there is a lack of equipment and staff for input. The department publishes the past weather in each province every month, and is preparing a publication on the climate in the DRC which has four distinct climates: mountain, equatorial, tropical moist, tropical dry. MettelSat's staff has participated in WMO and other training sessions, and the digital records are made using CliCom, ClimSoft, SYSTAT and Excel (for daily data). Measuring instruments for radiation are also missing. The service has daily data records from 80 stations, but mostly with long interruptions.
8. MettelSat also has eight hydrologists of baccalauréat+3 level (bachelor level) among its staff, but does not operate hydrological stations and does not produce hydrological forecasts.
9. Agrometeorology clearly lacks software and computers but also simply diagrams for recording instrumental data. Decadal bulletins are produced only for the PANA-ASA project in cooperation with INERA, the National Institute of Agronomic Research. INERA is in charge, among others, of ensuring that the provision of crops and other planting material is adapted to the local climate conditions.⁹
10. This PANA-ASA project will be followed by PANA-AFE and PANA-ZC. With the PARSA project, METTELSAT trained staff of the Ministry of Agriculture but the project will close soon. The monthly bulletin which is currently made for Kinshasa will be extended to other regions.
11. The laboratories of remote sensing, of calibration and of hydrology are out of order. MettelSat also has an Internet site at <http://www.meteo-congo-kinshasa.net>, but it has not been updated since 2008.
12. As a result of the above deficiencies, the overall performance of MettelSat seems to be so poor that without urgent and massive intervention it may become completely irrelevant to the country's needs. There is an overall lack of reliable, or sometimes any information, on weather, climate and hydrology in the DRC. There are only a few regular products presented to the country

⁸ Plan d'actions de Développement de la Météorologie Aéronautique en R.D.C 2013-2016

⁹ For more information on INERA's mandate and activities, see "Dépliant INERA"



users such as basic weather forecasts for the next 24 hours often distributed through weather studios, aviation forecasts, seasonal forecasts, agro-meteorological bulletins, some remote sensing data and data on hydrology. Much of this data and information is not reliable. There is no objective estimate of the availability of data neither of the quality of the forecasts. The DRC does not produce hydrological forecasts, severe weather forecasts or other products necessary for reduction of weather hazards and better functioning of weather dependent sectors.

13. Many organizations contribute to hydrometeorological observation in the DRC to fulfill their specific needs. Cooperation with MettelSat on this activity would benefit both sides.
 - a. INERA (Institut National pour l'Etude et la Recherche Agronomique) has 22 agro-meteorological stations which are not automatic and six semi-automatic (FAO stations, EU funding, PANA-ASA, PARRSA) non-functional stations due to the poor quality of batteries. Sensors include rain gauges, evapotranspiration trays, hygrometers, heliographs, air temperature and ground temperature (50 cm). There are also numerous secondary stations with rain gauges and thermometers (min / max). The data is used mainly for research programs to identify adapted seeds. Only some farmers involved in participatory research have access to the data. The Ministry of Agriculture is in charge of the outreach. Pooling networks would allow INERA to reduce operating costs and enjoy better coverage nationwide. The data which INERA could use could come from airports, National Electricity Company (SNEL) stations, the METTELSAT and NGOs involved in agriculture.
 - b. The Organization of Civil Protection depends on the Ministry of Interior. At the national level, a permanent office is responsible for monitoring extreme events. The Committee for the Prevention and Management of Disaster Risk chaired by the Minister of the Interior decides to launch alerts. Then the interdepartmental committee chaired by the Deputy Prime Minister can make public warnings. Provincial security committees are chaired by provincial governors, and Municipal committees by the mayors. Civil Defence also has competence to move populations out of dangerous areas. At present the forecasting bulletins are issued by MettelSat at 14h for the next 24 hours, 7 days a week, and are received by email. 12h forecasts are being tested and extreme weather forecasts are available for the next 72 hours. Civil Protection would like to have forecasts at 5am for use during the working sessions of the daily coordination, and a website with specialized interface providing data on rainfall for the next 6h, 24h, 72h.
 - c. The Régie des Voies Fluviales (RVF) is the main institution measuring the level of rivers for navigation purposes. It has resumed observations which were interrupted at five stations on the Congo River and five other stations on the Kasai River. The World Bank has provided equipment and has pledged to restore 25 stations (Multimodal Transport Project, CPTM). The 10th EDF (PANAV project) has committed to rehabilitate 60 stations starting in June 2016. It is expected that the RVF will have a total of 95 stations available



within 2-3 years. Staff costs, maintenance, telecommunications, operating and depreciation replacements are not yet assured. Data on water levels for navigation are communicated to ship-owners (upon payment of navigation fees) to anticipate the passage of boats on the river. RVF could benefit from a provision from METTELSAT observations and precipitation forecasts to model hydrology alerts for the weather, especially over lakes. Sedimentation patterns (for sedimentation depends heavily on rainfall patterns) could also benefit from METTELSAT data. RVF could help in disseminating warnings to anticipate river overflows which affect municipalities and civil protection.

- d. The CVM (Congolaise des Voies Maritimes) operates 33 gauging stations of which five with recorder on the navigable part of Congo between Banana and Matadi (6-8 hours of sailing). The hydrological stations of the CVM function normally, except for Bulambemba which has continued to produce only specific ocean observations limited to the tide and the Congo River gauging. CVM could benefit from METTELSAT severe weather warnings, data and forecasts. It could cooperate with MettelSat to disseminate warnings to anticipate river floods. In the water sector, it can be noted that there is some confusion in the respective powers of the institutions involved.
- e. The National Electricity Company (SNEL) has its own hydrologists that monitor rainfall over catchments and do rainfall-runoff modeling. This allows to anticipate releases of water to avoid risks on dams and optimize production. SNEL has fifty precipitation stations. It measures evaporation at a few sites, and a few water limnimetric stations to ensure some modeling. The production of dams with reservoirs may be better optimized. A transfer of the stations to METTELSAT could be considered to reduce the workload and benefit from the expertise of METTELSAT on rainfall-runoff modeling. SNEL is also interested in estimated real-time rainfall and forecast rainfall for the next 7-10 days to anticipate floods, in seasonal forecasts to anticipate the rains over the next three months and optimize production and in installing rain gages, water level gauges and thermometers to quantify the flow and check the strength of dams.
- f. The water company REGIDESO also makes measurements on the hydrological potential and sites of water capture on Congolese rivers. It has 95 drinking water treatment centers of which 75 are in operation, some without storage. REGIDESO is interested in hydrometeorological forecasts to avoid pollution of drinking water when rain causes sedimentation and pollution and in anticipation of low flows to ensure the sustainability of the collection point and avoid pumping sand.
- g. The BEAU (Bureau d'Etudes d'Architecture et d'Urbanisme) has a network of stations in Kinshasa to anticipate urban floods. It is interested in return periods of extreme meteorological and hydrological events under the present and future climate for the location, orientation and design of adequate structures.



Current Initiatives in Support of DRC's Hydromet Services

14. Hydrometeorology in DRC already benefits and benefited from the technical assistance from or cooperation with a large number of agencies. An evaluation of the networks for the systematic observation of climate was recently done for the Ministry of Environment. The main activities that have been identified at this stage are as follows:
- a. Under the assistance of the PMURR (Multisectoral Emergency, Rehabilitation and Reconstruction Program), MettelSat has obtained 22 automatic meteorological stations which were installed in 2008 in the main airports of the country, in order to improve the capacities of meteorological services to aviation. The project is now completed.
 - b. The World Meteorological Organization (WMO) provides support for training in aviation meteorology, climatology and other fields like EWS. Together with SADC in the framework of the Hydrological Cycle Observation System (SADC-HYCOS) project, three DCP and six hydro-meteorological stations have also been provided, which still need to be installed. Congo- HYCOS project was developed by WMO, in collaboration with Congo-Oubangui-Sangha Basin Intergovernmental Commission (CICOS) and its member countries, to the revival of hydrometric monitoring across the Congo Basin. After the implementation of the preparatory phase, during which a detailed project document was developed and validated by all the countries, CICOS and WMO are collaborating in sourcing fund for the development phase of the project.
 - c. The MTAP project (Meteorological Transition in Africa Project, or in French PTMA for *Projet de Transition Météorologique en Afrique*) in 2005-2006, financed by the European Development Fund, was initiated by the European Union and the African Union in order to help the African countries south of Sahara to obtain Meteosat Second Generation (MSG) data receiving stations and to provide them with the necessary technologies in order to best benefit from the data disseminated by the European Organization for the Exploitation of Meteorological Satellites (Eumetsat). The MTAP included the pilot Monitoring and Evaluation of Water Resources of the Kasai Watershed project (SERBaK) for the benefit of the Republic of Congo and of the Democratic Republic of Congo. The Belgian Technical Cooperation (CTB) offered additional financing to the DRC in view of preparing and structuring the users of satellite data around MettelSat.
 - d. In the framework of the PUMA and African Monitoring of the Environment for Sustainable Development (AMESD) projects, which followed the MTAP project and terminated in 2013, the European Union and the African Union have provided MettelSat with a new workstation for receiving and using the information disseminated through the EUMETCast satellite dissemination system operated by Eumetsat, as well as training.



- e. The new Monitoring for Environment and Security in Africa (MESA) program builds on the results obtained by MTAP, PUMA and AMESD, in order to consolidate and widen the operational environmental services developed in AMESD, and to propose new services, such as African climate services. Funding is obtained from the 10th European Development Fund of the European Union, with a budget of 37 million Euros. The timeframe of the implementation is from 2013 to 2017. MESA has started deploying satellite receiving stations to the beneficiary institutions in Africa, with a first batch of seven reference stations and a training center which are being shipped in 2016 to Botswana, Mauritius, Niger, Kenya and Democratic Republic of Congo. In total, 55 stations for meteorological services, 115 stations for environmental services and related sectors, and four training centers will be installed. At the time of the mission, five new PUMA stations had just arrived to Kinshasa, which will be installed shortly at MettelSat Binza, at CICOS, at RVF, at the Applied Studies Institute (ISTA) and at the water management authority in the Ministry of Environment. The EU also provides for technical and user training. The MESA Program should end in 2017 but the plans are to continue the collaboration (formulation mission carried out in 2015) in the scope of the "GMES & Africa" initiative (based on collaboration with the European program "Copernicus"). A total amount of Euro 28 million should be allocated to the Global Monitoring for Environment and Security program ("GMES Africa") starting in 2017 for a duration of three to five years, which should ensure as much as possible continuation, consolidation and extension of the services, including the development of new ones.
- f. The Government of the UK has donated a studio for preparing TV broadcasts and should renew it in the future.
- g. The Government of China has donated 20 weather stations, eight automatic weather stations and a radio-sounding station and will provide for their installation.
- h. The International Commission of Congo-Oubangui-Sangha (CICOS) is an intergovernmental organization created in 1999. Its members are Cameroun, Central African Republic, the Republic of Congo and the DRC, with Angola being an observer. CICOS has a mandate of a river catchment organization, in charge of promoting the navigation and the integrated management of water resources. Important programs for ancient hydrological data recovery (until the early twentieth century) have already been conducted. The river flows have not been recalibrated since 1980. The rate of the Ubangi River has declined by 30 percent. Modeling the hydroelectric potential of the rivers has been achieved. The French Development Agency (AFD) has recently signed with CICOS a 500,000 euros project to improve the hydrological monitoring of the Congo River and an integrated management of water resources. CICOS is one (among six others) of the implementing centres of MESA, and which is mandated by the Economic Community of Central African States (*Communauté Économique et Monétaire des Etats de l'Afrique*



Centrale, CEMAC) for the Thematic Action ("THEMA") "Water Management in Central Africa ". The MESA grant contract is of a value of Euro 1,846,051. More specifically CICOS is in that scope developing the following services:

- Water level alert system for navigation, including in situ and satellite measurements (Oubangui sub-basin), low waters alert system (Oubangui sub-basin)
 - Monitoring the water cycle in the main sub basins of the region (Rainfall, Evapotranspiration over Oubangui sub-basin) in order to issue Water cycle / Humid Forests monitoring bulletins, Oubangui sub-basin. Key users are Ministries, Universities and Research centres, Agro pastoral services, etc.
- i. The PANA-ASA and PARRSA (North of Equateur province) projects have installed and refurbished around 30 agro-meteorological stations of INERA (Institut national des études et recherches agronomiques) with the participation of MettelSat to pursue research on seeds. MettelSat has developed decadal bulletins for this purpose. There will be an additional PARRSA financing of US\$50 million from July 2017, and Mettelsat could receive additional equipment in this framework. A new project on women and children (PANA-AFE) will start shortly and MettelSat will be associated.
- j. A number of international organizations (WMO, ACMAD, SADC, etc.) and advanced hydromet services (Météo-France, United Kingdom Met Office), provide training at various levels of competency.

Detailed Component Description

15. After 30-40 years of neglect, the hydromet sector of the DRC needs considerable resources and efforts to rebuild its institutional framework, create the most basic infrastructure and develop a culture and capacity for service delivery. At the same time the project should be affordable to the government in order to remain sustainable in the long run. Finding the appropriate balance between significant and competing development needs and limited government resources and capacity will be one of the key challenges. The project will therefore identify priorities among possible improvements in order to demonstrate at first the capacities of MettelSat to deliver services to the expectation of a limited number of users. The focus will be on high impact severe weather forecast and warnings, which are mainly associated with strong convection, resulting in heavy precipitation, floods, landslides and erosion. As an example, according to the Office for the Coordination of Humanitarian Affairs (OCHA), the toll in DR Congo after five months of floods which took place from October 2015 to February 2016 was of more than 550,000 people affected, 65,000 dwellings damaged or destroyed and 5,000 hectares of crops submerged. The most affected province was the Eastern Province. In addition to the short-range predictions of severe weather a few days ahead, predicting the change in the weather regimes such as onset and end of rainy seasons will also be pursued, at least when associated with agricultural impacts.



16. The indicative breakdown of project financing is as follows:

| Component, Sub-Component and indicative budget (US\$) | LDCF | GFDRR | Total |
|--|------------------|------------------|------------------|
| Component A - Institutional and regulatory strengthening, capacity building and implementation support | 1,178,000 | 400,000 | 1,578,000 |
| A(i) - Reinforce the legal and regulatory framework of MettelSat in order to develop partnerships and Standard Operating Procedures (SOPs) for delivery of service | 148,000 | | 148,000 |
| A(ii) - Strengthen the Quality Management Systems to raise standards and quality control/verification procedures across the institutions | 325,000 | | 325,000 |
| A(iii) - Implement a long-term and on-demand capacity development and training program for staff | 705,000 | 400,000 | 1,105,000 |
| Component B - Modernization of equipment, facilities and infrastructure for basic observation and forecasting | 3,047,000 | 1,415,000 | 4,462,000 |
| B(i) - Hydrological and meteorological monitoring networks (small-scale rehabilitation of priority stations and installation of new sensors) | 1,934,500 | | 1,934,500 |
| B(ii) - Transmission, data management and data dissemination hardware | 37,500 | 400,000 | 437,500 |
| B(iii) - Refurbishment of facilities needed to support the services | 900,000 | 465,000 | 1,365,000 |
| B(iv) - Technical systems and software for performing meteorological, hydrological and climate modelling and forecasting | 175,000 | 550,000 | 725,000 |
| Component C - Improvement of hydromet information service delivery | 481,000 | 775,000 | 1,256,000 |
| C(i) - Define requirements, delivery and feedback mechanisms with different user groups (in line with the National Framework for Climate Services) | 143,000 | | 143,000 |
| C(ii) - Develop customized products and services made available to user groups through dedicated interfaces | 338,000 | 775,000 | 1,113,000 |
| Component D - Project Management | 623,452 | 110,000 | 733,452 |
| D(i) - Coordination and technical implementation support | 432,452 | 74,000 | 506,452 |
| D(ii) - Fiduciary and safeguard aspects and audit | 191,000 | 36,000 | 227,000 |
| Total | 5,329,452 | 2,700,000 | 8,029,452 |

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

17. Component A will invest in the human and institutional resources that can implement and sustain hydromet observation and forecasting. Considering the need to address the current challenges in staffing and policy mandates, the Component will include three sub-components.

i) Reinforce the legal and regulatory framework of MettelSat in order to develop partnerships and Standard Operating Procedures (SOPs) and delivery of service



18. MettelSat has a mandate given in the Decree of 2 October 2012 that defines its duties and responsibilities. However, in order to make this mandate fully effective, it remains necessary to clarify the respective roles of the main public services or agencies that act on hydrometeorology, and may supply MettelSat with data or utilize its information. An Institutional diagnosis, including a comparative review of the roles and mandates of these agencies will be made, with a priority to the Régie des Voies Aériennes (RVA), the Régie des Voies Fluviales (RVF), the Congolaise des Voies Maritimes (CVM), the Civil Security and the Ministry of Agriculture. Efforts will also be made towards the Ministry of Transports and Communication Channels (MTVC) and the Ministry of Finance with the objective of raising the level of the government financial contribution to MettelSat.
19. Following this comparative review, a Strategy and an Action Plan will be defined for MettelSat, which will identify the main actions in order to increase cooperation and avoid overlap between agencies, ensuring an efficient development of hydrometeorology in DRC.
20. The first priority is to agree on new working arrangements with the Airways Authority (RVA) in order to organize the cooperation on meteorological service delivery to aviation and guarantee a fair and sustainable revenue for these services, bringing in return a reliable and quality assessed service to airline companies with a high level of security. The organization, the equipment, the personnel and the procedures of the meteorological services to aviation in DRC are at present very far from being compliant with the ICAO and WMO requirements, as stated in the Convention on International Civil Aviation (Convention of Chicago) and its annexes. MettelSat owns and operates presently 22 observing stations on airports, but most of the data are not available and MettelSat issues no forecasts for aviation. The services to aviation in N'djili, which is the largest airport in DRC, are provided by RVA. RVA has recruited recently 47 meteorological staff to provide meteorological services mainly in N'djili but also in a few other airports. As MettelSat does not receive at present any substantial revenue from aviation, an institutional workshop on evaluating cost recovery from aviation involving all key players and stakeholders will be organized as soon as possible. Improving cooperation between MettelSat and RVA, and both institutions' capacity to provide quality meteorological services to the aviation sector would significantly support DRC's needed efforts to comply with the international requirements and safety of flight.
21. A number of other working arrangements will be reviewed or initiated with organizations operating hydrometeorological networks and with users or potential users of hydromet information. This includes the Régie des Voies Fluviales (RVF) concerning the hydro-meteorological network development and operation and the exchange of data, the Ministry of Interior which is in charge of civil protection, the Ministry of Agriculture which is a consumer of agro-meteorological products and services, the Ministry of Environment, the Geophysics Research Center (CRG), the National Electricity Company (SNEL), the Applied Studies Institute (ISTA), the National Institute for Agronomic Study and Research (INERA), the Congolaise des Voies Maritimes (CVM) and the Water Distribution Authority (REGIDESO). Agreements shall then be negotiated and signed with these potential partners. The implementation of the agreements will need ministerial-level approval and an agreement with the Ministry of Environment should also



be sought. The Parties to those agreements will need to coordinate the development and implementation of protocols and guidelines so as to ensure their effective implementation across the agencies and to avoid overlaps. An Institutional workshop on MettelSat missions and expected services and possible cooperation (for instance concerning data exchange) will be organized with all the concerned institutions at the very beginning of the project. This could be an opportunity to address the question of the coordination of hydrological, meteorological and climate observing networks and of data exchange for mutual benefit.

22. The cooperation activities in progress in relation with WMO, European Union, UK, China, ACMAD, AFD, CICOS which have been mentioned above and other possible relevant similar initiatives will be taken into account in the design of the project in order to build synergies and to avoid overlaps. The objective in terms of observation will be to obtain a consistent and operational system from these different contributions, more especially in relation with the observation network. The different projects may result in disparity in the types of hydromet stations with some implications related to the telecommunication, concentration and processing schemes. Synergies will also be sought concerning training.

ii) Strengthen the Quality Management Systems to raise standards and quality control/verification procedures across the institutions

23. In accordance with the requirements of the Convention on Civil Aviation and its annexes a Quality Management System (QMS) will be designed and implemented by MettelSat which will be focused as a priority on the services which must be delivered to aviation. A QMS is a collection of business processes focused on consistently meeting customer requirements and enhancing their satisfaction. It is the organizational structure, policies, procedures, processes and resources needed to implement quality management. A QMS workshop will be organized for MettelSat, followed immediately by deployment of an expert to assist Mettelsat in the implementation of QMS and documentation of processes. This will be done through a twinning arrangement between the DRC (Mettelsat) and the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA). Building on this development, QMS will also be designed and implemented for EWS and Agriculture. As of 15 November 2012, the QMS requirement became a standard practice for the meteorological services to aviation, supplemented by a set of recommendations on the conformity of the QMS with the International Organization for Standardization (ISO) 9000 series of quality assurance standards. For these reasons, priority in time will be given to QMS for services to aviation, followed by services for early warning systems and agriculture.
24. By setting and monitoring standards at all levels, the QMS may be subsequently extended to other main applications and ultimately cover all MettelSat activities, functioning as a management tool and plan for achieving the quality requirements within meteorology. The design of the QMS will build on the previous draft QMS, the MettelSat Strategic and Action Plan and international experience. It will include the upgrading of standard operating procedures (SOP) and protocols on aspects such as standards for data collection (equipment and routines,



WMO standards etc.); upgrade to easy-use manuals for data collection, O&M, weather forecasting and climate data management; and assigning clear lines of responsibilities in delivering quality services. Definition and enforcement of protocols and manuals on data standards and on data sharing are also particularly critical for MettelSat as they could greatly benefit from the surface observations done, among others, by RVA and RVF.

iii) Implement a long-term and on-demand capacity development and training program for staff

25. Because human resources are a significant challenge to maintaining and expanding services, this subcomponent will look at ways to motivate staff and to upgrade its qualification. Building on collaboration with national universities and training institutes such as the ISTA (*Institut Supérieur De Techniques Appliquées*) will be necessary because MettelSat is not entitled to give the academic degrees which are required by ICAO. ISTA currently offers trainings in agrometeorology and hydrometeorology but has a very low number of graduates in these fields. It has not had any graduates in the field of meteorology since the academic year 2011-2012, in which only nine students graduated.¹⁰ Some support to these institutions and to in house training facilities will be considered, for instance for equipping training facilities or inviting trainers. Collaboration will be pursued with international institutions such as WMO, ACMAD and SADC as well as twinning arrangements with other hydromet services.
26. Staff capacity is a key priority. Training needs are huge, because ageing personnel is retiring and all observation, forecasting and service delivery activities need to be modernized and developed. In addition, new requirements are appearing. The qualification requirements for aviation meteorological forecasters in the WMO Technical Regulations will become a standard practice for all countries on 1 December 2016. Consequently, weather services will need to ensure that the level of qualification of the operational personnel making forecasts for aviation follows the WMO qualification standard, i.e., to be compliant with the relevant sections of the Basic Instruction Package for Meteorologist (BIP-M). Skills are needed at all levels, from basic operation and maintenance of meteorological or hydrological stations to processing complex data streams, operating forecasting models, climate services, early warning systems and management. The project will undertake at its beginning an assessment of the staffing needs. The Staffing assessment will outline the necessary staff/skills needed at different critical functional levels according to the Strategy and Action Plan, and draw up solutions to meet staffing needs. A long-term training plan will then be designed, taking into account the fact that MettelSat has just hired 146 staff in order to replace departures of senior staff and that new staff will be continuously hired. This plan is expected to be updated annually based on staff evolution and emerging needs. Training will be considered in technical areas including maintenance of weather, climate and hydrological observation instruments and networks, early warning systems (EWS), information and communications technology (ICT), operational hydrology, climatology, agro-meteorology,

¹⁰ For more information see: « Présentation De L'institut Supérieur De Techniques Appliquées ISTA/Kinshasa »



aviation meteorology, general weather forecasting and climate services. Options for training will include, for instance, courses with visiting lecturers, participation to WMO training activities, south-south cooperation opportunities and online learning courses. Workshops will be organized on each subject in order to share the knowledge among the staff. Technical training should also be included in the procurement process of meteorological or ICT equipment. A sufficient number of study trips will also be sought in order to improve skills on specific fields.

Inclusion of gender in Component A:

27. The DRC received one of the lowest Human Development Index (HDI) ratings in the world in 2015: 176 out of 188. The country was ranked at the same level of the HDI Gender Inequality Index¹¹ (GII); at 176 out of 188 countries. The Human Development Report of 2015 noted a mean of 9.8 years of schooling throughout the country. There are huge differences in literacy between men and women, with differentials in access and completion of secondary and tertiary education. Women representation in the public administration, public offices, and formal private sector enterprises is among the lowest in the world. As a consequence, women are not represented at decision-making level and their agency is low, including in regards to early warning systems.
28. Furthermore, although women's livelihood activities outnumber men in agriculture and trade¹², there is little awareness at ministerial level of their role and their capacity to cope with climate risks. It is thus important to build capacity in mainstreaming gender into services and procedures of hydro-meteorological services as such services trigger early warnings where women are the main beneficiaries in certain sectors.
29. Women are often not represented in environmental governance processes; in other words, their concerns as the primary beneficiaries are not included in policy design or implementation. Similarly, women's voices are often unheard in labor unions, especially in large utility and hydromet sectors dominated by males. This increases the likelihood of poorly targeted reforms and negative impacts, such as higher and gender-differentiated safety impacts (see World Bank, 2013). With flooding impacting mainly livelihoods in urban areas (trade, services, mainly occupied by women) and landslides affecting agricultural work, capacity building in gender awareness, along with quota for training and including more women in hydro-meteorological services, are strongly recommended for this component.

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

¹¹ A composite measure reflecting inequality in achievement between women and men in three dimensions: reproductive health (maternal mortality), empowerment and the labor market.

¹² "Women's agricultural work, which revolves largely around market gardening, involves tedious planting, tending and harvesting, while men's work is usually limited to clearing the field with machetes and cutting down trees. Women often work in the fields from early morning until sunset, and then walk long distances with heavy head loads of produce to sell in a local market. They lack access to the tools and machines that some men have, including bicycles. They also carry water and firewood, soak and dry manioc so it is not poisonous, and pound grain manually for many hours" USAID, DRC Gender Assessment, 2012.



30. Component B will invest in the reinforcement and rebuilding of the basic networks for observation and forecasting, as well as in infrastructure needed for provision of services by MettelSat. A highly focused approach to investments is required in the DRC considering the current status of hydromet services, and allocation of investment will have to be made based on priority sectors/user-groups being served, core-capacity for observation and forecasting and the long-term ability to operate and maintain the services.

31. The basic technical specification information for equipment should comply with the recommendations of WMO as they appear in the *WMO Guide to meteorological instruments and methods of observation*, the *WMO Guide to climatological practices*, the *WMO Manual on stream gauging*, the *WMO Manual on the Global observing system*, the *WMO Manual on codes*, the *WMO Manual on telecommunication systems* and the *WMO Manual on the WMO Information system (WIS)*.

32. Investments under component B will focus on:

i) Hydrological and meteorological monitoring networks (small-scale rehabilitation of priority stations and installation of new sensors):

33. This activity will finance the optimization of the hydro-meteorological observation network, targeting an overall operational system (i.e. observation- transmission- forecasting and service delivery) sustainable after the end of the project. At that time, it is expected that the data from 60 meteorological synoptic automatic stations, 20 hydro-meteorological automatic stations and one radio-sounding station (donated and to be installed at N'djili airport by the Government of China) are received on a reliable and regular basis at the central forecasting office of MettelSat in Kinshasa/Binza and posted in due time on the GTS. The measurements taken by the synoptic stations should include at least temperature, barometric pressure, humidity, wind speed, wind direction, and precipitation amounts. Those data should arrive at the headquarters at least every three hours at synoptic times and at least every 30 minutes locally when the station is on an aerodrome, without interruption. The synoptic data should be accessible on the central system in Binza within a few minutes after measurement. Automatic stations on aerodromes will need additional observations like cloud basis height and visibility which will be provided by observing personnel. The measurements made by automatic hydro-meteorological stations will include at least river gauging and rainfall and shall also comply with WMO specifications. Data from automatic hydro-meteorological stations should be available at the central system at sufficiently close intervals and within a delay of a few minutes after measurement.

34. The network considered here includes:

- a. The 22 aerodrome stations which were installed by 2008 under the PMURR project in cooperation with RVA
- b. The integration of the data received from the stations donated by the Government of China, which will also provide for their installation (20 classical stations, 8 automatic stations and one radio-sounding station)



- c. The three DCP and six hydromet stations provided by HYCOS still to be installed
 - d. Automatic stations operated by partners such as CICOS, INERA , RVF or CVM, whose data would become available to MettelSat on an operational basis
 - e. The revival of one radio-sounding station at Kinshasa airport
 - f. The purchase and installation of complementary stations in order to fulfill the objective of a total of 60 synoptic and 20 hydromet stations over the country. Technical specifications of new synoptic, hydrological and climate stations will be defined.
35. Prior to the implementation, an inventory with a cartography and detailed description of the stations linked to the project (synoptic, hydrological, agro-meteorological, climate) will be made, and a workshop on observation networks organized with the major hydromet and climate data providers and users. The operational observation network management, operations and maintenance procedures will be defined and the procedures for quality control and validation of observation data (hydrological, meteorological and climate) will be specified. The operation costs of the network according to different scenarios will be identified.
36. It must be understood that over the project duration the cost of telecommunication (both equipment and transmission cost) and of logistics (infrastructures, access to the sites, spare parts, maintenance, personnel, vehicles, missions, gasoline, etc.) may be important in comparison to the costs of the bare stations' equipment. The necessary equipment, including vehicles, will be provided to the central observation network maintenance and calibration unit and to the six regional observation installation and maintenance units. The project will contribute to covering telecommunications costs between stations and the central facility and missions costs of observation and maintenance teams, so that the stations may be visited at least once a year for preventive maintenance or repair. Indeed most of the 22 automatic stations which were installed generally in 2008 or 2009 were never visited by a maintenance technician since then.
37. Transmission of data from stations is presently made using SSB (High Frequency Single Side-band) either manually or automatically for a few synoptic stations. A plan will be designed in order to obtain a cost effective, reliable and efficient transmission scheme from the automatic stations to the central facility. Possibilities of using SSB, mobile phones, VSAT, Internet or other technologies will be considered, taking into account cost of operation and reliability aspects.
38. The investments made are expected to allow a nominal operation of these observations during at least five years after the end of the project, and to demonstrate the capacity of MettelSat to manage an observation network.



ii) Transmission, data management and data dissemination hardware;

39. The transmission of data from the MettelSat hydro-meteorological stations is discussed in section B(i). The central facility must be designed in order to accept and process these observations, but it must also be fully inserted into the WMO Information System (WIS), which means being capable to manage in real time many other data streams, including the data from the WMO GTS, data from EUMETCast and data from foreign forecasting centers accessible through high speed Internet. A priority is to provide full access to the WMO GTS, which should be made available through the connection with Regional Telecommunication Center of Brazzaville.

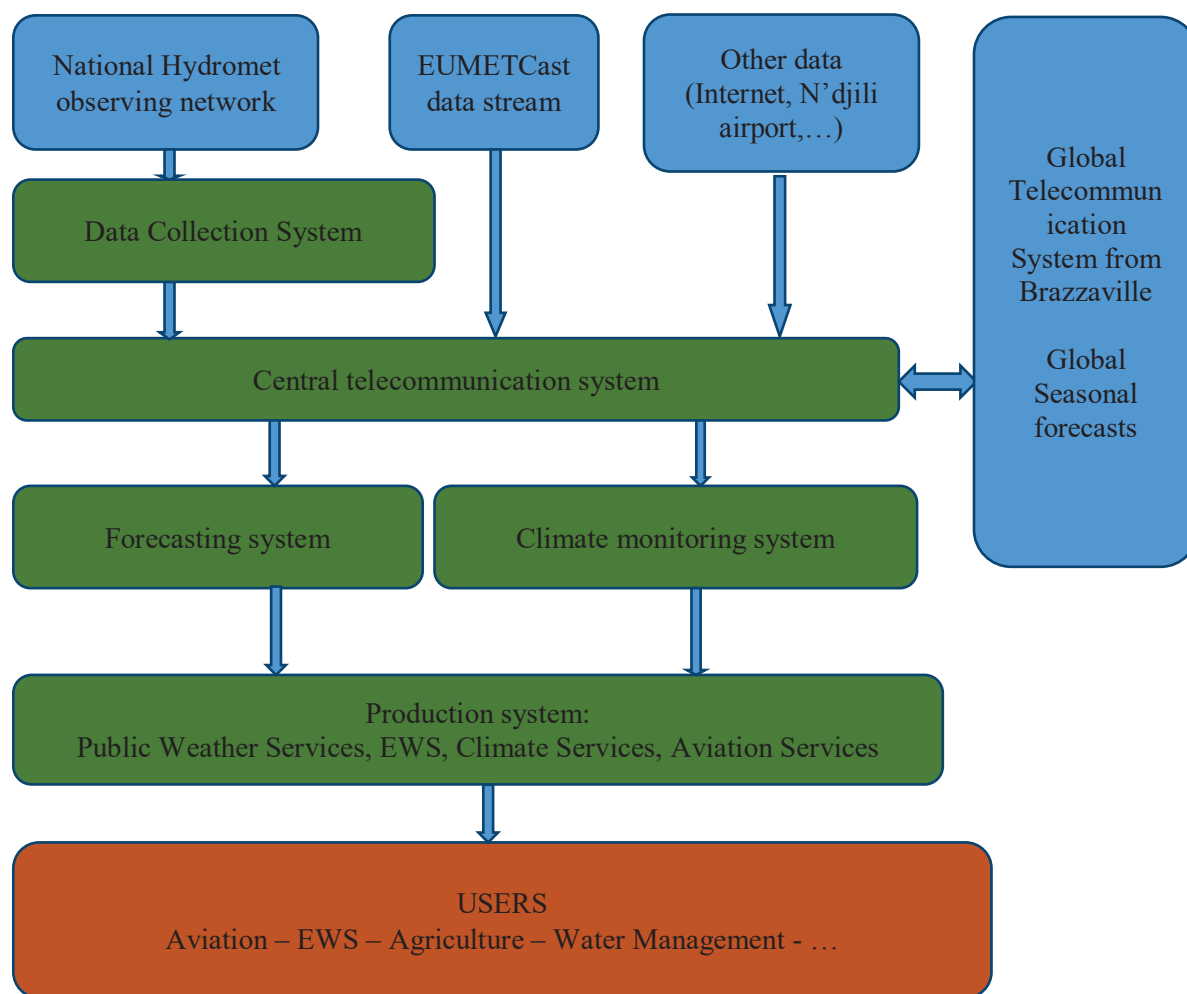


Figure 3: Block diagram of the DRC central forecasting system

40. Currently:
- (a) The VSAT liaison between N'djili airport and Brazzaville is functioning but does not reach the MettelSat headquarters and the central forecasting unit



- (b) The central telecommunications system is an outdated MESSIR-COM system complemented with manual entry of data from non-automatic stations and observations
 - (c) The forecasting system is based on the PUMA station
 - (d) There is no climate monitoring system
 - (e) There is no production system
41. The project will aim at installing a comprehensive and reliable system. To improve the transmission of data coming in and out of MettelSat, this activity will finance data management improvements which include: ICT infrastructure to improve connectivity (such as reliable and hazard proof network internet/ GPRS/ fiberoptic connections to manage high volumes and fast data flows; as well as servers, licenses and soft/hardware); necessary ICT equipment including modems, routers, power supply and data collection systems; and tools to verify/clean data records.
42. The observations Data Collection System which allows the reception of the information sent by the stations, whether they are automatic or manual, will be modernized. It should allow the reception of all the national hydromet data of interest for MettelSat and their handling so that they may be used by the central forecasting and the climate monitoring systems.
43. The quality of the forecasts will depend first of all on the data received from abroad, mainly foreign numerical models results and satellite data. It will be necessary to support MettelSat in upgrading and complementing its current data central communications system, which at present relies basically on the PUMA station provided by the EU. This system will have full access to the WIS, including GTS, EumetCast and high speed Internet. Taking this into account, a new central Data Telecommunication System will be specified, procured and installed.

iii) Refurbishment of facilities needed to support the services

44. Because of a lack of financial resources, the headquarters of MettelSat are in a very poor condition. It has three main dilapidated buildings that have water infiltration due to poor waterproofing of terraces. Paint, floors and electricity are also in poor condition, and the rooms are generally not air-conditioned. Electrical breakdowns are frequent and it will be necessary to install a generator and uninterruptible power supply (UPS) equipment to ensure the continuity of service required for the headquarters of a national hydromet service. The furniture and basic office equipment is also in bad condition. In order to ensure the safety of equipment and well-being of staff a full rehabilitation of the premises is urgently needed.
45. Measures will be taken to renew the central infrastructure, beginning with a national expertise for determining the priorities in the MettelSat HQ buildings' refurbishing. The specification of the refurbishment will then be defined and the Project will contribute to the refurbishing of HQ buildings of MettelSat, to the technical integration of the ICT equipment described in other activities and to the improvement of furniture and basic office equipment such as computers.



46. Efforts will also be deployed to improve the infrastructures of the most critical hydro-meteorological stations and to provide up to six regional centers with improved buildings, the necessary means for transportation and for receiving and utilizing products from the central facility.

iv) Technical systems and software for performing meteorological, hydrological and climate modelling and forecasting

47. Specification, procurement and installation processes will be implemented for a new central weather forecasting system, a new central climate monitoring system and a new central hydrological monitoring system.
48. With the GTS, EUMETCast and high speed Internet connections working, MettelSat will have access to international numerical weather prediction models operating 24 hours a day which will be useful both for extending its forecasting range and for EWS. In addition, with the data received from the national observing network it will be possible to run finer scale meteorological models. This will allow MettelSat to benefit from the WMO “Cascading Forecasting Process” which links Global Products Centres, Regional Centres and national hydromet service and allows that global products of the major numerical forecast centers may be fully utilized. MettelSat would always have access to the most advanced products and could focus using this information on its alerting and warning services.
49. The specifications of the Central Forecasting System will take these options into account, and software may be obtained through bilateral cooperation with universities or other meteorological services. The central facility will:
- (a) Integrate and archive all type of meteorological information data according to specific data policies defined according to forecaster’s requirements and standards.
 - (b) Offer an easy access to all data making research and retrieval of any meteorological information a simple process.
 - (c) Provide high processing capacities allowing to run numerical weather prediction models or other computation tasks.
 - (d) Simplify the forecaster work by automating operational tasks: from data control to specific daily processing (such as but not limited to satellite processing) or Numerical Weather Prediction model runs, allowing to create and schedule various meteorological tasks.
50. A Central hydrological monitoring system will be specified and procured in order to process the hydrological information. Hydrological models will be developed over a few selected catchments, where digital elevation models and geographic information tools are available. Modeling software for analyzing data and forecasting floods may be obtained freely from universities or public hydrological institutes.
51. The new Climate Monitoring System will offer the following main functions:



- (a) Collect and safely store all climate data (historic as well as real time data).
 - (b) Allow an extensive management of metadata making the climate database richer and more accurate, particularly with the implementation of a Climate Data Management System including training
 - (c) Ensure an efficient quality control of the data to ensure that data series are precise and relevant
 - (d) Provide a flexible and scalable production system in order to add value to the raw data and deliver standard climatological reports and statistics, as well as customized products (graphs, charts, maps, etc.) especially elaborated to fulfill the needs of specific end-users
 - (e) Enable easy access to the data and share the national data heritage worldwide according to the data policy and WIS recommendations
52. These developments will need the presence of well-trained staff, capable of adapting the models' parameters to the local conditions, interpret correctly the results, and maintain the software. This will imply a specific training program, which will take time and should begin at the start of the project.
53. Twinning actions will be sought with advanced centers in order to implement a Local Area meteorological Model (LAM), a downscaling climate model and to receive supply of Data Flow from leading NMHS or modeling centers.
54. The project will contribute to the operation cost of the central system for up to three years.

Inclusion of gender in Component B:

55. In the DRC a large gap exists between the perceived roles of government and civil society¹³. According to the USAID-led gender assessment (2012), officials at territory, district and provincial levels consistently noted that their first responsibility was "control". A major responsibility of government is collecting, compiling (usually manually), and forwarding data (usually not sex disaggregated) from territory to district, province and ultimately to the national government. Officials other than senior provincial administrators are apparently not expected to analyze these data, share or discuss information with leaders of other sectors, engage in strategic planning, or prepare budget recommendations related to observable trends.
56. Hydromet services in DRC are provided mainly by MettelSat, which monitors and forecasts weather, water and climate and is responsible for remote sensing, operational hydrology, thematic cartography, hydrological observation and forecasting. It is interesting to notice how so few women are employed by this sector and/or water-sector agencies or utilities more comprehensively. According to USAID (2012) only 28 percent of rural households have improved water sources, including two percent that have water piped into their residences: as a result 43

¹³ This appears to reflect the pattern established under the colonial regime: government was primarily responsible for control of the population and provision of roads and rails for transporting goods to the market, and churches took care of education and health care.



million women are thus compelled to carry water, often for significant distances, for all household needs. Hydrological observation and forecasting should involve more women, especially in decentralized areas. At all levels, from remote sensing, to data transmission and management, not to mention equipment maintenance, women are not involved in hydrological and climate risk information. Equipment purchase should also take into account literacy level of the rural population, and limited resources for consumables such as batteries.

Component C. Improvement of Hydromet information service delivery

i) - Define requirements and develop feedback mechanisms with different user groups (in line with the National Framework for Climate Services)

57. Component C will focus on the delivery of more accurate, timely and relevant information to users and decision-makers. In agreement with selected users, and through pilot and tailored information for target audiences, MettelSat will try, modify and develop appropriate formats and timings of Hydromet information. The focus will be the definition of Hydromet information requirements for end users. In line with recommendations from the Global Framework for Climate Services (GFCS) this is expected to be a long-term process, with a continuous user feedback mechanism, including in the aftermath of major events. This component will target beneficiaries with a gender-disaggregated approach. Within this context, the delivery of information to the media (radios, TV, newspapers) should also be strengthened. This is essential in promoting the image of Hydromet services to the public and decision-makers as well as generating new sources of revenues.

ii) - Develop customized products and services made available to user groups through dedicated interfaces

Central Production System

58. In order to assist the forecasters in making different products tailored to the users' needs, a Central Production System will be specified, procured and installed, using Numerical Weather Prediction and all available data to provide cutting edge products for public weather services, for early warning systems, as well as for climatology and other climate services. Climate data rescue, digitization and integration of non-electronic records will be also taken into account. This system should be able to:
- (a) Ingest raw weather data provided by other information systems, such as PUMA, the Central Forecasting System and the Central Climate System and process them with optional human validation
 - (b) Design and generate customized meteorological outputs such as weather alerts or business-oriented weather products



- (c) Disseminate customized meteorological products in a timely manner, in the most adapted format and through the most suited channel according to the type of end-user you are targeting

59. The new climatological database and central production system which will be built progressively will also allow MettelSat to apply the standards of the WMO Global Framework for Climate Services and to respond efficiently to users' growing number of needs.

Application to flash flood warning

60. Services and procedures for optimal use of hydro-meteorological services for the triggering of early warnings for flooding on six to 10 urban zones prone to floods will be specified and developed in agreement with civil protection. Synergies will be sought with local activities of already ongoing development projects. In the urban sector, the World Bank is undertaking the Urban Development Project and its additional financing (P129713) which covers six communities with a total financing of US\$200 million. UNDP also supports activities relating to disaster risk reduction: national DRR strategy, early warning strategy and the constitution of a database on disasters. A pilot project in Kinshasa is being defined to anticipate flood risk and another project on landslides in South Kivu has started in May 2015. In Kinshasa there is a plan to reduce the vulnerability of people who have been evicted several times. This activity should build on hydrological modeling and include the identification of specific thresholds for selected hazards in the urban high-risk zones to be jointly determined, in order to enable the utilization of the hydro-meteorological information for the activation of warnings by competent authorities. The urban zones subject to Hydromet risks will be selected and for each of these zones a process will be implemented with stakeholders such as local authorities, local communities, Civil Protection and NGOs in order to define pilot products useful for disaster prevention and warning. A specific user interface for Civil Protection will be specified, procured and installed, and training will be provided. Services and procedures may also be designed in order to respond to specific requirements expressed by user groups from the civil protection and humanitarian communities.
61. Hydrometeorological hazards, including flash floods, landslides, and urban flash flooding are major causes of the human losses and property damages in DRC. It is anticipated that intensity and frequency of the flash flood events across the globe and in the region may increase due to climate variability and change. Flash floods are caused by heavy rainfall with short duration associated mostly with convective and tropical storms. The DRC is located in a flash flood prone region where flash floods are due to strong tropical convection. Within the scope of WMO Flood Forecasting Initiative, the Flash Flood Guidance System (FFGS) with Global Coverage has been jointly developed by the World Meteorological Organization (WMO) and the Hydrologic Research Center (HRC), with the support of the National Oceanic and Atmospheric Administration (NOAA) and the United States Agency for International Development (USAID) to mitigate the impacts of flash floods by enhancing early warning capabilities at regional and national levels. It currently covers fifty two countries and more than two billion people saving lives and decreasing economic losses.



62. Within the scope of this World Bank project, the Flash Flood Guidance System could be developed and implemented in six to 10 urban pilot sites chosen by the project for flash flood warning, in close collaboration with WMO. Flash Flood Guidance System is a state of art of the hydrometeorological modelling that ingests satellite, in-situ, high resolution mesoscale Numerical Weather Prediction (NWP) precipitation data as well as geomorphological data to produce flash flood warning products such as soil moisture, flash flood guidance, and flash flood threats. Its advance capabilities such as Urban Flash Flood Early Warning, Landslide Susceptibility maps, and Riverine Routing may be applied for the further enhancement of the hydrometeorological early warnings in DRC.

Application to agriculture

63. It appears that presently only two MettelSat operational products are of value to agriculture, the 24 hours forecast bulletin and the 3-month climate seasonal prediction. In accordance with the users, and building over the project's results, MettelSat will consider issuing additional products. Hydro-meteorological information is commonly communicated via radio, TV or mobile phones. The project will involve the design, implementation and evaluation of pilot information for weather forecasts (seasonal, medium and short term) for three sites to be selected. Present World Bank projects in the agricultural sector in the DRC include the Western Growth Poles Project (P124720 US\$114.7 million, 2013-2019) in the province of Bas-Congo, the Agriculture Rehabilitation and Recovery Support Project (P092724 US\$130 million, 2010-2017) in the Equateur Province and the Regional Great Lakes Integrated Agriculture Development Project (P143307, in the pipeline for an indicative amount of US\$154.79 millions) in the province of South Kivu. Many other agencies also have activities in this sector. Pilot areas could also be considered around the areas undergoing pilot projects with support from INERA (cassava, maize, rice, groundnuts, beans, soy) that could benefit from the presence of NGOs (Caritas, World Vision, etc.). If the number of rain gauges appears not to be sufficient, it would be possible to add some field instruments. Outreach could be organized in collaboration with community radios. A user interface for agriculture will be specified and developed, and training sessions for users will be organized. The products will be defined and evaluated in cooperation with the users, such as local communities or organizations, NGOs, or other development projects in progress. Their dissemination will be done through the most appropriate channels, such as radio, mobile phones or other. The action will be implemented in relation with the Ministry of Agriculture and the national and local radio stations. The improvement of the capacities for climatology and for climate services should enable MettelSat to issue decadal climatological bulletins and other products useful to agriculture. In addition to the decadal bulletins, some capacities to develop 3-5 days forecast could assist with optimal use of inputs and pesticides and reduce post-harvest. Some rolling seminars on agro-meteorology could be customized to the needs of DRC. Interoperability of networks (synoptic, agro-meteorological) could be supported.

Inclusion of gender in component C:



64. With women occupying agriculture and trade in high numbers, gender awareness will inform the way hydrometeorological information is customized for end-users. However, there is a risk that only formal and unionized sectors will be taken into consideration. If some sectors are male dominated, like for example transport and mining, women are typically a minority in these labor forces, their specific concerns (e.g., safety, health and childcare services) are often neglected. Therefore it is important to consult women and women's organizations during project design and monitor project implementation.
65. Gender and considerations for literacy differentials need to be mainstreamed into these five sites. According to the USAID gender assessment (2012) **women perform 70 percent of agricultural labor and marketing of produce in DRC**. Substantial disparities exist between wealth quintiles in women's literacy: 28 percent were literate in the poorest quintile, 33 percent in the second, 41 percent in the third, 56 percent in the fourth, and 89 percent in the highest quintile.
66. Women-farmers use age-old techniques, while men benefit more from mechanized agriculture. Agricultural and grazing land is usually considered traditional tribal property, which excludes women from any claim to ownership, even though the state is also the legal owner of the land. Agricultural work, in its present form of traditional crop sharing or leasing one or two hectares of land, is not generally considered employment, since it is mostly reserved for women and the poor for subsistence purposes.
67. Women could learn from evening radio broadcasts, which could provide hands-on instruction, encouragement, and follow-up (USAID, 2012). The following steps are recommended: i) execute critical gender analysis early, ensuring balance among the needs and interests of women, men, girls, and boys, and make sure it is comprehensively applied in detailed planning and implementation of all activities; ii) demand the gathering and use of sex-disaggregated statistics in all phases of work, and ensure prompt adjustments in response to intermediate results to promote better outcomes. Early and penetrating gender analysis will lead to more effective and sustained results. Rather than generating expensive and relatively inapplicable data, sex-disaggregated gender analysis will facilitate adjustments to guide implementation to best promote the interests of women and men, and girls and boys; and iii) build a solid and robust Monitoring and Evaluation System.

Component D. Project Management

i) - Coordination and technical implementation support

68. This sub-component will finance the following:
 - (a) Steering Committees
 - (b) Preparation of the ToRs for the Management firm (design, monitoring and evaluation)



- (c) Preparation of the ToRs for the Observation, ICT and Logistical firms
- (d) Support to execution two months/year during three years including technical management of firms
- (e) Assistant to the coordinator
- (f) Monitoring and evaluation
- (g) Other operating costs

ii) - Fiduciary and safeguard aspects and audit

69. This sub-component will finance the following activities:

- (a) Financial management
- (b) Procurement
- (c) Accounting
- (d) Environmental and social management framework (ESMF)
- (e) Environmental and social safeguards
- (f) Operations manual
- (g) Internal audit
- (h) External audit



Annex 2: Implementation Arrangements

Project Institutional and Implementation Arrangements

1. Successful project implementation requires people with different skills and functions to work together to achieve mutually agreed goals to meet the project objectives. This also requires effective and timely coordination between various line ministries and entities.
2. The implementing agency will be MettelSat, defined in a decree of 2012 as the official national Hydromet agency, a public technical and scientific service with legal personality and financial autonomy under the Ministry of Transportation and Communication Channels and supported by the State Subsidiary Budget. MettelSat is responsible for the monitoring and forecasting of weather, water and climate, and provision of geographical information system services. MettelSat has a significant workforce of 483 staff, among which 330 are in Kinshasa and 153 in the provinces. Mettelsat will be responsible for the overall financial management of the grant. However, it has not direct experience in Bank fiduciary procedures. Reliance on Mettelsat to implement the grant is subject to the completion of its financial management system on a base acceptable for the Bank, and to development of procurement, safeguard and M&E capacities.
3. The Ministry of Finance with support of the sectorial ministries will be responsible for:
 - a. Ensuring the attainments of outcomes by facilitating coordination amongst the governmental agencies and institutions participating in the implementation and by addressing coordination issues as they arise;
 - b. Reviewing progress reports as submitted by the Project Coordinator and take action thereon if needed; and
 - c. Providing guidance as needed.

Project administration mechanisms

4. Since so many other agencies and ministries have a stake in Hydromet information generation, dissemination and use, a National Steering Committee will be established by the Minister in charge of Transportation to coordinate project activities and ensure that they are harmonized with related activities of other government stakeholders. The role of the project National Steering Committee will be to provide overall policy direction on project implementation resolving any policy hurdles, inter-ministerial barriers or policy conflicts. The NSC will be responsible to approve overall implementation plan and annual project budget, and will meet as often as needed but at least every quarter to review and follow up on project progress. The NSC will ensure that adequate staffing arrangements in MettelSat are in place. Within three months following effectiveness, the NSC will ensure that an Internal Audit Department is set up and adequately staffed with an internal auditor whose terms of reference will cover all activities under the project. MettelSat will provide secretariat services to the NSC.



5. The Chair of the Steering Committee will be designated by the Minister in charge of Transportation. The committee will include the following members:
 - (i) The Project Coordinator
 - (ii) Representative of RVF (waterways authority)
 - (iii) Representative of RVA (airways authority)
 - (iv) Representative of CVM (maritime transportation authority)
 - (v) Representative of INERA (Institut national pour l'Etude et la Recherche Agronomique)
 - (vi) Representative of ISTA (Institute of Applied Technologies)
 - (vii) Representative of SNEL (Société Nationale d'Electricité)
 - (viii) Representative of the Civil Protection Department in the Ministry of Interior.
 - (ix) Representative of the Ministry of Agriculture
 - (x) Representative of the General Secretariat of Environment
6. To facilitate project implementation a Project Implementation Cell (PIC) will be established within MettelSat, bringing together the required expertise from across the organization, and strengthening its capacity with consultants, where needed. The PIC will perform day-to-day project implementation activities and will also function as a Secretariat for the Steering Committee.
7. The team will comprise of the following:
 - (i) Project Coordinator – the Director General of MettelSat
 - (ii) Deputy Project Coordinator – the Deputy Director General of MettelSat
 - (iii) Assistant to the Project Coordinator – to be recruited
 - (iv) Financial Management Consultant – to be recruited
 - (v) Procurement Consultant – to be recruited
 - (vi) Environmental Safeguards Officer – to be identified
 - (vii) Social Safeguards Officer – to be identified
 - (viii) Internal Auditor – to be recruited
8. The main responsibilities of the PIC will be to (a) prepare annual implementation plans for the project activities, as well as the annual budget, for National Steering Committee approval; and (b) carry out all work related to fiduciary functions including procurement, financial management, disbursement, audit, reporting and monitoring and evaluation. The PIC will be responsible for the overall project's fiduciary management and procurement in compliance with World Bank's regulations. The PIC will be responsible for processing all the International Competitive Bidding (ICB) and selected National Competitive Bidding (NCB) contracts and payments. In addition, the PIC will interact with relevant stakeholders, including NGOs and municipalities, to guide them in the implementation process where necessary.
9. The PIC will be responsible for organizing all state level training programs involving the concerned state level line ministry, national and international research and development institutions, including NGOs operating in the country. The PIC will also be responsible for the recruitment of national and international consultants for the project, strictly per the guidelines and instructions



of the World Bank, and invariably involving the line ministries in their selection and day to day functioning as per the details provided in the Project Operational Manual. A Project Implementation Manual will be developed and disseminated (prior to effectiveness), to take into account current institutional configurations and detail roles and responsibilities.

10. The PIC Director shall take steps to strengthen the overall sustainability of the project, building upon strong commitment of the Government. The Director will review all the factors that are critical to the sustainability of the project and take steps to address through adequate M&E procedures carried out. Counterpart financing of US\$800,000 is included in the provisional budget of MettelSat, US\$200,000 per year. These funds will cover bonuses paid to civil servants working on this project to ensure a high level of motivation and commitment to the project. This will improve the capacity of staff to operate and maintain the system.



11. The ongoing cooperation activities supported by UNDP (United Nations Development Programme), WMO (World Meteorological Organization), the European Union, the African Development Bank, SADC (Southern African Development Community), ACMAD (African Center Meteorological Applications for Development), and the People's Republic of China have been taken into account in the project design in order to build synergies and to avoid overlaps. The objective will be to obtain a consistent and operational system from these different contributions, especially in relation to the observation network. The different projects may result in disparity in the types of Hydromet stations with some implications related to the telecommunication, concentration and processing schemes. Synergies will also be sought concerning training.

Financial Management, Disbursements and Procurement

Financial Management

12. The World Bank and other donors' assessments notably, the CFAA (Country Financial Accountability Assessment), PER (Public Expenditures Review), and PEFA (Public Expenditure and Financial Accountability) 2008 and 2012 have shown an unsatisfactory economic and financial



control environment including weak budgeting preparation and control, financial reporting, external audit and human resources. As a result, the overall country fiduciary risk is still considered high. The repeated PEFA, concluded at the end of 2012, took stock of the areas of progress and revised the existing PFM strategy plan accordingly. The new project “Strengthening PFM and Accountability” (P145747), effective since May 2014, will strengthen the Public Financial Management system both at the central and some provinces levels. The outcomes of the use of the country national PFM systems assessment report which had been undertaken in April 2013 will be gradually implemented for the Bank-financed projects. Concerning internal and external audits, discussions will be engaged with the Government to organize the working environment of the General Finance Authority (“Inspection Générale des Finances”, IGF) and the Court of Audit (“Cour des comptes”).

13. The proposed project will be entrusted to MettelSat as main implementing agency. Given MettelSat’s limited project implementation experience, its capacity to carry out some tasks will be strengthened through the recruitment of consultants. These consultants will be responsible for carrying out the procurement and financial management functions in the first year of the project, but also to train MettelSat staff in the PIC, so that they can gradually take over these functions and be fully proficient to carry out these functions themselves by the end of the first year.

Risk Assessment and Mitigation Measures

14. The Bank’s principal concern is to ensure that project funds are used economically and efficiently for the intended purpose. Assessment of the risks that the project funds will not be so used is an important part of the financial management assessment work. The risk features are determined over two elements: (i) the risk associated to the project as a whole (inherent risk), and (ii) the risk linked to a weak control environment of the project implementation (control risk).

Risks and Mitigation Measures

| Risks | Risk Rating | Risk Mitigating Measures | Residual Risk Rating |
|---|--------------------|--|-----------------------------|
| Inherent Risk | | | |
| Country Level: Poor governance and slow pace of implementation of PFM reforms that might hamper the overall PFM environment. | H | Some PFM reform programs are currently ongoing through IDA-financed projects Enhancing Governance Capacity (P104041), and Establishing Capacity for Core Public Management (P117382), in addition to the project “Strengthening PFM and Accountability” (P145747) approved on January 2014 by the World Bank’s Board. These reforms will address | H |



| | | | |
|---|---|--|---|
| | | the key new challenges the country is facing. | |
| Entity Level: Lack of prior experience with World Bank financed projects | S | Reinforce the existing fiduciary arrangements. Provide Technical Assistance to MettelSat by rolling out the fiduciary training plan which aims at strengthening the capacity of MettelSat fiduciary staff. | S |
| Project Level | M | | M |
| <i>Overall Inherent Risk: S</i> | | | |
| Control Risk | | | |
| Budgeting: Weak budgetary execution and control inducing budgetary overspending or the inefficient use of funds. | M | Annual work plan and budget will be prepared for each year. The project FM Manual of Procedures will define the arrangements for budgeting, budgetary control and the requirements for budgeting revisions. Annual detailed disbursement forecasts and budgets will be required. Interim Financial Reports (IFRs) will provide information on budgetary control and analysis of variances between actual and budget. | M |
| Accounting: Risk of an increase of the FM team's workload leading to delays in the submission of the required reporting. | S | Appropriate accounting procedures are in place for the bookkeeping of the transactions such as advances and fixed assets. The members of the financial team to be recruited must have experience and qualifications acceptable to the Bank. | S |
| Internal Control: Weak compliance with FM manual of procedures and risk of circumventing internal control systems. | S | (i) Regular internal audit missions will be conducted during the project implementation with a focus on fraud and corruption risk; (ii) update the work-program of the current Internal Audit Unit to reflect the new project specificities; and (iii) the current manual of procedures will be upgraded. | S |
| Funds Flow: MettelSat has no direct experiences with management of IDA funds; (i) Risk of misuse of funds allocated to the census, (ii) Weak capacity in IDA disbursement procedures which could affect the disbursement rate for the components | S | <ul style="list-style-type: none"> - Organize frequent controls in each involved actor in order to help to prevent and mitigate the risk of diversion of funds. - Payment requests will be approved by the Coordinator and the financial management specialist prior to disbursement of funds. - Require the FM team to ensure monthly submission of the withdrawal application. - Perform external audit. | S |



| | | | |
|--|----------|---|----------|
| under INS responsibility. | | | |
| Financial Reporting: Delay in the submission of Interim Un-audited Financial Reports (IFRs) to IDA due to weak capacity of the FM team. | M | Computerized accounting system- Purchase appropriate accounting software and customized to generate the financial reports of the project. | M |
| Auditing: External audit arrangements are not defined and lack of capacity of public institutions of control to assure the external audit of the project. | M | Recruitment of independent external auditor based on agreed ToR developed in line with International Accounting Standards (including fraud and corruption). | M |
| <i>Overall Control Risk</i> | <i>S</i> | | <i>S</i> |
| <i>Overall FM Risk</i> | <i>S</i> | | <i>S</i> |
| The overall risk rating is deemed Substantial. | | | |

15. **Governance and anticorruption considerations.** The country political situation has weakened the governance and corruption environment. In the context of the project, the following governance and anti-corruption measures will contribute to enhance transparency and accountability during the project implementation : (i) an effective implementation of the fiduciary mitigation measures should contribute to strengthen the control environment, (ii) the TOR of both the internal audit unit and the external auditor will comprise a specific chapter on corruption auditing, (iii) the FM manual of procedures will include anti-corruption measures with a specific safety mechanism that will enable individual persons and NGOs to denounce abuses or irregularities, (iv) measures to improve transparency such as providing information on the project status to the public and to encourage participation of civil society and other stakeholders will be strengthened during project implementation and (v) finally, an anti-corruption action plan will be prepared in addition to the robust FM arrangements designed to mitigate the fiduciary risks.
16. **Staffing and Training.** The current financial management staffing arrangement under MettelSat will be reinforced to implement the project. From the perspective that the project generates a workload, this FM team should be reinforced through the recruitment of a chief financial officer, an accountant, and an internal auditor. The work-program of the Internal Audit Unit will be revised within three months after the project effectiveness to take into consideration the new project specificities. The team will have the overall FM responsibility for budgeting, accounting, reporting, disbursement, internal control and auditing. The project will recruit two financial management consultants that will be responsible for financial management and accounting in the first year of the project. These consultants will also be responsible for training MettelSat staff in the PIC, who will progressively take over this function as they become more familiar with World Bank Financial Management procedures and standards.



17. **Budgeting.** The budgeting arrangements will include an annual work plan and budget to be prepared for each year. The project FM Manual of Procedures will define the arrangements for budgeting, budgetary control and the requirements for budgeting revisions. Annual detailed disbursement forecasts and budgets will be required. IFRs will provide information on budgetary control and analysis of variances between actual and budget. Current budget mechanisms will be revised to incorporate the new project specifics.
18. **Accounting Policies and Procedures.** The accounting systems, policies, and administrative and financial procedures designed for the project will be drafted by an independent consultant and reviewed before approval. This manual of procedures will be revised to include the new project's specifics. An accounting software will be used after its configuration for reflecting the new project specificities. Appropriate accounting procedures will be implemented for the bookkeeping of the transactions such as advances and fixed assets. The members of the financial team to be recruited, must have experience and qualifications acceptable to the Bank.
19. **Internal Control and Internal Auditing.** The work-program of MettelSat's internal audit unit will be revised to take into account the new project specificities. The internal auditor to be recruited will report directly to the Coordinator (and/or Steering Committee). He will undertake periodic assessments on the strengths and weaknesses of the internal control system at all levels. All control deficiencies or circumvented practices identified will be communicated in a timely manner to the overall senior management of the project for immediate corrective action as appropriate. These reports will also be communicated to the Bank. The internal auditor will prepare relevant manuals and guidelines. In line with the DRC's Use of Country System Report to fully rely on General Finance Authority (IGF) for the project's internal audit, the current project's internal control system could be strengthened by establishing a channel of collaboration between IGF and the current project's internal audit unit to agree on the project's risk mapping and work program.

20. Key Weaknesses and Action Plan to Reinforce the Control Environment

| Issue | Remedial action recommended | Entity Responsible | Deadline for Completion | Effectiveness conditions |
|-------|--|---------------------------------|--|--------------------------|
| 1 | Open a designated account in a financial institution acceptable to the Bank | MettelSat/ DRC Government | Not later than one month after effectiveness | N |
| 2 | Implement a customized Excel spreadsheet for bookkeeping in line with the minimum disclosure requirements necessary to accompany satisfactory manual book keeping. | MettelSat/ DRC Government | Not later than one month after effectiveness | N |



| | | | | |
|---|---|---------------------------------|---|---|
| 3 | Current financial procedure guidelines must be upgraded into a full manual so as to take into account the grant specificities, as well as the Bank's Financial Management guidelines. | MettelSat/ DRC Government | Not later than two months after effectiveness | N |
| 4 | Recruit a Financial Management Specialist, | MettelSat/ DRC Government | Not later than two months after effectiveness | N |
| 5 | Recruit an Accountant, | MettelSat/ DRC Government | Not later than two months after effectiveness | N |
| 6 | Recruit an internal auditor | MettelSat/ DRC Government | Not later than two months after effectiveness | N |
| 7 | Recruit an external auditor | MettelSat/ DRC Government | Not later than two months after effectiveness | N |

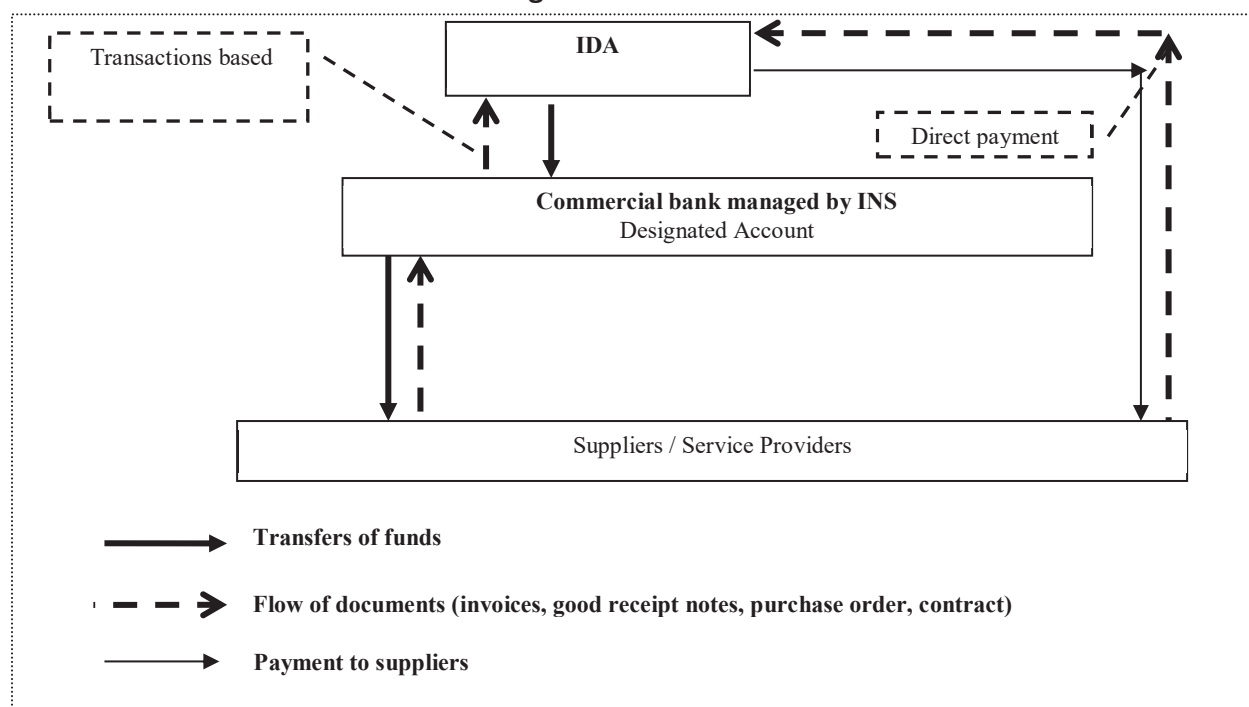
Disbursements

21. **Funds Flow and Disbursement Arrangements.** One Designated Account (DA) will be opened in a reputable commercial bank. This account will be held in US\$. The Designated Accounts will receive cash advances to pay project expenses eligible for IDA financing. Any interest earned on funds deposited in the Designated Account shall be deposited into the project account. Payments will be made in accordance with the provisions of the manual of procedures (i.e. joint signatures by the METELSAT Director General and Chief Financial Officer).
22. **Disbursement arrangements.** The transaction-based disbursement method will be applied for the Designated Account (DA) which will receive an initial advance (Ceiling) of US\$200,000 (GFDRR) and US\$350,000 (LDCF). The DA will be used for all payments less than twenty percent of the Ceiling and replenishment will be submitted as often as possible. Funds flows for the DA are as follows:
23. **Disbursement of Funds to other Service Providers and Suppliers:** MettelSat will make disbursements to service providers and suppliers of goods and services in accordance with the payment modalities, as specified in the respective contracts/conventions as well as the procedures described in the project's Manual of Administrative, Accounting, and Financial. In addition to these supporting documents, the Project will consider the findings of the internal audit unit while approving the payments. MettelSat, with the support of its internal audit unit, will reserve the right to verify the expenditures ex-post, and refunds might be requested for non-



respect of contractual clauses. Misappropriated activities could result in the suspension of financing for a given entity.

Flow of Funds and Disbursement Arrangements



24. **Disbursements by category:** Expenditure categories to be financed by the Grants take into account the prevailing country financing parameters for DRC in setting out the financing levels except for local expenditures which will be financed at 100 percent excluding local taxes. In accordance with Bank standard procurement requirements, contracts will continue to be approved “all taxes included” for local expenditures. The project will however, claim invoiced amounts excluding taxes. The Government will take appropriate steps to cover the tax portion of contracts signed by the project with contractors and suppliers of goods and services.
25. **Financial Reporting and Monitoring:** The manual of procedures will indicate provisions for quarterly and yearly financial reporting, including physical progress. The quarterly reports will include a table on budget execution. The format of this report will include (i) the statements of sources and used funds, and utilization of funds per category, (ii) an updated procurement plan, (iii) the physical progress and, (iv) the summary of missions of internal audit, as well as implementation status of the recommendations of internal or external audit and supervision missions.
26. **External Auditing:** The project financial statements and internal control system managed by MettelSat will be subject to annual audits by an independent external auditor which will be renewed every two years. The audit will include the activities under implementation by the private firm. The Bank will pursue the policy dialogue with MettelSat with the view of having the



project external auditors as MettelSat contractual auditor. This will strengthen the existing weak external auditing arrangements in place at MettelSat. The external auditor will give an opinion on the annual financial statements in accordance with auditing standards of the International Federation of Accountants (IFAC). In addition to audit reports, external auditor will also produce a management letter on internal control to improve accounting controls and compliance with financial covenants under the financing agreement. The project will be required to submit, not later than June 30 of each fiscal year, the annual audited financial statements. In line with the new access to information policy, the project will comply with the disclosure policy of the Bank of audit reports (for instance making available to the public without delay after receipt of all reports final financial audit, including audit reports qualified) and place the information on its official website within one month after acceptance of final report by IDA. The project will be required to produce a final audit report no later than six months after closing of project. In compliance with the DRC Use of Country Systems Report, the DRC's Supreme Audit Institution (Cour des Comptes) could start being involved in the process of the external auditors' selection and reviewing their reports. In line with the new access to information policy, the project will comply with the disclosure policy of the Bank of audit reports (for instance making available to the public without delay after receipt of all reports final financial audit, including audit reports qualified) and place the information on its official website within one month after acceptance of final report by IDA.

27. **Implementation support Plan:** FM implementation support missions will be consistent with a risk-based approach, and will involve a collaborative approach with the project team. A first implementation support mission will be performed six months after project effectiveness. Afterwards, the missions will be scheduled by using the risk based approach model and will include the following: (i) monitoring of the financial management arrangements during the supervision process at intervals determined by the risk rating assigned to the overall FM Assessment at entry and subsequently at each Implementation Status and Results (ISR) report; (ii) integrated fiduciary review on key contracts, (iii) review the IFRs; (iv) review the audit reports and management letters from the external auditors and follow-up on material accountability issues by engaging with the task team leader, Client, and/or Auditors; the quality of the audit (internal and external) also is to be monitored closely to ensure that it covers all relevant aspects and provide enough confidence on the appropriate use of funds by recipients; (v) physical supervision on the ground; and (vi) assistance to build or maintain appropriate financial management capacity.
28. **Conclusions of the FM Assessment:** The overall residual FM risk at preparation is considered Substantial. The proposed financial management arrangements for this project are considered adequate to meet the Bank's minimum fiduciary requirements under OP/BP10.00.

Procurement

29. **Applicable guidelines:** Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines including: (i) Procurement of Goods, Works and Non-



Consulting Services under IBRD Loans and IDA Credits" dated January 2011, revised July 2014; (ii) Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" dated January 2011, revised July 2014; (iii) Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants (October 15, 2006 and revised in January 2011); and (iv) the provisions stipulated in the Financing Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Grants, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The procurement plan would be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

30. **Reference to the National Procurement Regulatory Framework:** For all contracts awarded through NCB method, the Bank may authorize the use of the national institutions and regulations that comprise the law including its texts of application, the institutions set up for the control and regulation and the institutions responsible for procurement activities implementation. The NCB procedures currently in force in DRC deviate slightly from the World Bank Procurement Guidelines NCB procedures for procurement of Works, Goods and services (other than consultants services); thus, they have been already reviewed and appropriate modifications have been proposed to assure economy, efficiency, transparency, and broad consistency with the provisions included in Section I and paragraphs 3.3 and 3.4 of the Bank Procurement Guidelines (refer to the paragraph below).
31. **Requirements for National Competitive Bidding (NCB):** The procedures to be followed for NCB shall be those set forth in the Recipient's Procurement Code of April 27, 2010, as revised from time to time in a manner deemed acceptable to the Association, subject, however, to the modifications described in the following paragraphs required for compliance with the Procurement Guidelines:
 - a. **Standard Bidding Documents:** All standard bidding documents to be used for the Project under NCB shall be found acceptable to the World Bank before their use during the implementation of Project;
 - b. **Eligibility:** Eligibility of bidders and acceptability of their goods and services shall not be based on their nationality and/or their origin; and association with a national firm shall not be a condition for participation in a bidding process. Therefore, except for the ineligibility situations referred to in paragraphs 1.10(a) (i) and 1.10(a) (ii) of the Procurement Guidelines, the eligibility of bidders must be based solely on their qualification, experience and capacity to carry out the contract related to the specific bidding process ;
 - c. **Advertising and Bid Preparation Time:** Bidding opportunities shall be advertised at least in a national newspaper of wide circulation and on the website of the Recipient's Procurement Regulator (Autorité de Régulation des Marchés Publics) and bidders should be given at least 30 days from the date of invitation to bid or the date of availability of



the bidding documents, whichever is later;

- d. **Criteria for Qualification of Bidders:** Qualification criteria shall only concern the bidder's capability and resources to perform the contract taking into account objective and measurable factors. Such criteria for qualification of bidders shall be clearly specified in the bidding documents;
- e. **Bid Evaluation and Contract Award:** A contract shall be awarded to the substantially responsive and lowest evaluated bidder provided that such bidder meets the qualification criteria specified in the bidding documents. No scoring system shall be allowed for the evaluation of bids, and no "blanket" limitation to the number of lots which can be awarded to a bidder shall apply. The criteria for bid evaluation and the contract award conditions shall be clearly specified in the bidding documents;
- f. **Preferences:** No preference shall be given to domestic/regional bidders; to domestically/regionally manufactured goods; and to bidders forming a joint venture with a national firm or proposing national sub-contractors or carrying out economic activities in the territory of the Recipient.
- g. **Publication of Contract Award:** Information on all contract awards shall be published in at least a national newspaper of wide circulation or in the Recipient's Procurement Regulator (Autorité de Régulation des Marchés Publics) web-site;
- h. **Fraud and Corruption:** In accordance with the Procurement Guidelines, each bidding document and contract shall include provisions stating the World Bank's policy to sanction firms or individuals found to have engaged in fraud and corruption as set forth in the Procurement Guidelines;
- i. **Inspection and Audit Rights:** In accordance with the Procurement Guidelines, each bidding document and contract shall include provisions stating the World Bank's policy with respect to inspection and audit of accounts, records and other documents relating to the bid submission and contract performance;
- j. **Requirement for administrative documents and/or tax clearance certificate:** The bidding documents shall not require foreign bidders to produce any administrative or tax related certificates prior to confirmation of awarding a contract;
- k. **Modifications of a Signed Contract:** Any change in the contract amount which, singly or combined with all previous changes, increases the original contract amount by fifteen (15) percent or more must be done through an amendment to the signed contract instead of signing a new contract.

Items to be procured and the methods to be used

32. **Advertisement:** General Procurement Notice (GPN), Specific Procurement Notices (SPN), Requests for Expression of Interest, and results of the evaluation and contracts award should be published in accordance with advertising provisions in the following guidelines: "Guidelines: Procurement under IBRD Loans and IDA Credits" dated January 2011, revised July 2014; and



"Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated January 2011, revised July 2014. For this purpose, the MettelSat will prepare and submit to the Bank a General Procurement Notice (GPN). Specific Procurement Notice (SPN) for all goods, non-consulting services and works to be procured under International Competitive Bidding (ICB) and Requests for Expressions of Interests for all consulting services costing the equivalent of US\$200,000 and above will be published in "Dg Market", on the Bank's external website, and in the national press, in addition to other media with wide circulation. All other specific procurement notices and other requests for expression of interest shall be published at a minimum in the national press with wide circulation.

33. **Procurement of goods, and non-consultancy services:** goods and non-consultancy services procured under this project will be done either under ICB using Bank procurement rules that include the related SBD or under NCB using National Standard Bidding Documents agreed with or satisfactory to the Bank. Small value goods may be procured under shopping procedures. Direct contracting may be used where necessary if agreed in the procurement plan in accordance with the provisions of paragraph 3.7 to 3.8 of the Procurement Guidelines.
34. **Procurement of works:** works procured under this project will be done under NCB using National Standard Bidding Documents agreed with or satisfactory to the Bank. Small value works may be procured under shopping procedures. Direct contracting may be used where necessary if agreed in the procurement plan in accordance with the provisions of paragraph 3.7 to 3.8 of the Procurement Guidelines.
35. **Selection and employment of Consultants:** consultancy services required for the project will be procured using the selection method Quality and Cost Based Selection (QCBS) whenever possible. Contracts for specialized assignments estimated to cost less than US\$200,000 equivalent may be contracted through Consultant Qualification (CQ). The following additional methods may be used where appropriate: Quality Based Selection (QBS); Selection under a Fixed Budget (FB); and Least-Cost Selection (LCS). Short lists of consultants for services estimated to cost less than the equivalent of US\$100,000 per contract for ordinary services and US\$200,000 for design and contract supervision may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. However, if foreign firms express interest, they will not be excluded from consideration. Single Source Selection (SSS) may be employed with prior approval of the Bank and will be in accordance with paragraphs 3.8 to 3.11 of the Consultant Guidelines. All services of Individual Consultants (IC) will be procured under contracts in accordance with the provisions of paragraphs 5.1 to 5.6 of the Guidelines.
36. **Operating Costs:** Operating costs shall consist of operations and maintenance costs for vehicles, office supplies, communication charges, equipment, utility charges, travel expenses, per diem and travels costs, training costs, workshops and seminar and associated costs, among others. Operating costs will not include salaries of civil servants.
37. **Training and Workshops.** Training and workshops will be based on capacity needs assessment. Detailed training plans and workshops activities will be developed during project



implementation, and included in the project annual plan and budget for Bank's review and approval.

Procurement Implementation Arrangements

38. **Guiding principles of the implementation of the procurement:** The Government and the World Bank agreed to mainstream the implementation of the project into the existing legal entity and structure and will be framed by the following principles: (i) MettelSat will be made more responsible and accountable in project implementation with a focus on strengthening country systems; (ii) equity; and (iii) performance-based agreements which make providers accountable for delivering specific results. Procurement activities of the project will be carried out by the procurement unit (Cellule de Gestion des Projets et des Marchés Publics – CGPMP) within MettelSat that will report to the General Director of the said institution. Since its creation by the decree N°12/040 on October 2, 2012 MettelSat didn't put in place its CGPMP according to the procurement law. In addition to this MettelSat didn't carry out procurement activities. Therefore it has no capacity and experience to carry out procurement activities for this project. As a contracting authority MettelSat has to carry out its procurement activities according to the decree N°12/040 on October 2, 2012 of its creation and to the procurement law. This is why MettelSat will urgently liaise with ARMP to officially set up its CGPMP.

Assessments of the Procurement risks and the related mitigation measures

39. An assessment of the capacity of MettelSat to implement procurement actions for the project was carried out by a World Bank procurement team in April 2016. The assessment found that MettelSat has no procurement unit and no capacity and experience to implement procurement activities for this project. The World Bank procurement team recommended MettelSat as a contracting authority to set up urgently its CGPMP according to the procurement law. The project will recruit a procurement consultant that will be responsible for procurement in the first year and gradually transfer responsibilities to a selected procurement officer within MettelSat. The consultant will be responsible for both carrying out the necessary procurement procedures, but also to train the designated MettelSat procurement staff.
40. The key issues and risks concerning procurement for implementation of the project have been identified and include:
- a. The administrative system as it operates in practice creates opportunities for informal interference in the procurement process by senior officials – creating opportunities for waste, mismanagement, corruption, collusion and fraud;
 - b. Government officials likely to be involved in project procurement through tender committees and the national control system ensuring that the rules are respected and able to handle complaints from bidders may not be familiar with procurement procedures according to World Bank guidelines and rules;



- c. Control and regulation mechanism according to the provisions of the Country procurement law and its application procedures could delay the procurement process if mandatory reviews are required;
- d. MettelSat does not have a formal established procurement unit according to the procurement law. It will set up a CGPMP with no experience to implement procurement activities for this project;

41. **The overall unmitigated risk for procurement is High.** Proposed corrective measures which have been agreed to mitigate the risk are summarized in the following table.

42. Action plan corrective measures

| Ref | Tasks | Responsibility | Due date |
|-----|--|----------------|------------------------------|
| 1 | Set up a formal procurement unit (CGPMP) within MettelSat | MettelSat | By effectiveness |
| 2 | Prepare a management guide that will include procurement methods to be used in the project along with their step by step explanation as well as the standard and sample documents to be used for each method. | MettelSat | By effectiveness |
| 3 | Recruit a procurement consultant with strong experience in World Bank procurement procedures who will provide technical assistance to the CGPMPs. His/her main role will be to support, train and coach the CGPMP. | MettelSat | 3 months after effectiveness |
| 4 | Organize a launch workshop involving all stakeholders | MettelSat | 3 months after effectiveness |
| 5 | Identify the root cause of procurement delays at national level and propose appropriate solutions (global) | MettelSat | At project mid-term review |

43. **Frequency of Procurement Supervision:** In addition to the prior procurement review carried out by the Bank, the procurement specialist recommends at least one mission every six months for the first two years and one mission every year for the next years to provide support to the implementation of procurement activities. This support will include not only the organization and functioning of the procurement unit but also the implementation of procurement activities listed in the procurement plan. One post-review of procurement activities will be carried out every year. As agreed with the Government, contracts will be published on the web. Annual compliance verification monitoring will also be carried out by an independent consultant and would aim to: (a) verify that the procurement and contracting procedures and processes followed for the project were in accordance with the Financing Agreement; (b) verify technical compliance,



physical completion and price competitiveness of each contract in the selected representative sample; (c) review and comment on contract administration and management issues as dealt with by the implementation entity; (d) review capacity of the implementation entity in handling procurement efficiently; and (e) identify improvements in the procurement process in the light of any identified deficiencies.

44. **Contract Management and Expenditure Reports:** As part of the Procurement Management Reports (PMR), MettelSat will submit contract management and expenditure information in quarterly reports to the World Bank for the project. The procurement management report will consist of information on procurement of goods, works and consultants' services and compliance with agreed procurement methods. The report will compare procurement's performance against the plan agreed at negotiations and as appropriately updated at the end of each quarter. The report will also provide any information on complaints by bidders, unsatisfactory performance by contractors and any information on contractual disputes if any. These contract management reports will also provide details on payments under each contract, and will use these to ensure no contract over-payments are made or no payments are made to sanctioned entities.
45. **Procurement planning:** The Borrower has prepared a Procurement Plan for the first 18 months of the project implementation which provides the basis for the procurement methods. This plan was agreed between the Client and the Bank during negotiations. It will also be available in the project's database and on the Bank's external website. The Procurement Plan will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.
46. **Thresholds for procurement methods and prior review**

| Expenditure Category | Contract Value Threshold (US\$) | Procurement Method | Contracts Subject to Prior Review (US\$) |
|----------------------|---------------------------------|---------------------------|--|
| 1. Works | ≥10,000,000 | ICB | All |
| | <10,000,000 | NCB | All contracts ≥ 5.000.000 |
| | <200,000 | At least three quotations | None |
| | All amount | Direct contracting | All ≥ 100.000 |
| 2. Goods | ≥1,000,000 | ICB | All |
| | <1,000,000 | NCB | All contracts ≥500,000 |



| | | | |
|--|------------|--|--|
| | <500,000 | Shopping from all major brands of vehicles dealers or distributors of petroleum products | Shortlist of: (i) vehicles dealers; and (ii) distributors of petroleum products. The technical specifications of vehicles. |
| | <100,000 | Shopping | None |
| | All amount | Direct contracting | All ≥ 100.000 |
| 3. Services | | | |
| Firms | ≥200,000 | | All |
| | <200,000 | CQ | None |
| | All amount | SSS | All ≥ 100.000 |
| Individual Cons. | ≥200,000 | IC | All |
| | <200,000 | IC | None |
| | All amount | SSS | All ≥ 100.000 |
| All TORs regardless of the value of the contract are subject to prior review. All justifications for Direct contracting/SSS included the estimated amount of contract are subject to prior review. | | | |

Note: (ICB: international competitive bidding; NCB: national competitive bidding; CQ: Consultants qualification; SSS: Single source selection; IC: individual consultant.

Environmental and Social (including safeguards)

47. At the national level, the DRC has a legislative and regulatory framework which is conducive to good environmental and social management. In addition, the DRC has signed a number of international treaties and conventions. The Government of the DRC has experience with the Bank's Safeguard Policies due to Bank-funded projects across different sectors. However, implementation capacity is weak. Environmental policies and their compliance are governed by the Ministry of Environment, Conservation and Sustainable Development (*Ministère de l'Environnement, de la Conservation de la Nature et Développement Durable*, MECNDD). The MECNDD has three departments in charge of environmental monitoring and management: i) the national agency for the environment (*Agence Congolaise de l'Environnement*, ACE), the former *Groupe d'études environnementales du Congo* (GEEC); ii) the *Centre National d'Information sur l'Environnement* (CNIE); and iii) The *Cellule Réglementation et Contentieux Environnementaux* (CRCE). The ACE is responsible for safeguards compliance of all projects in the country, but with emphasis on environmental category A projects. This agency is also familiar with the safeguard instruments such as the Environmental and Social Management Framework (ESMF), the Resettlement Policy Framework (RPF), and the Indigenous Peoples Policy Framework (IPPF). The ACE is understaffed and has limited capacity. Despite several donor-funded capacity building



initiatives, the unit still largely relies on donor funds to carry out its field supervision duties. At the provincial level, government agencies (including those attached to the Ministry of Environment) often do not have the equipment necessary to monitor social and environmental impacts, their staff lacks training, and management capacity is very thin.

48. The Project Coordinator will ensure that the Project carries out the following duties and responsibilities such as:
- database design and tool development;
 - preventive and corrective measures that can help improve the environment;
 - the preparation of environmental testing protocols;
 - conduct an environmental audit of the equipment;
 - prepare the guidelines, procedures and methods to ensure the laws and rules of environmental protection are met.

Monitoring & Evaluation

49. The PIC will also be responsible for the overall coordination of M&E activities, their consolidation, and the preparation of periodic fiduciary and M&E reporting, including impact and output indicators as well as the annual audit of the project's financial statements. The project M&E system will be based on the agreed Results Framework and implementation arrangements. PIC will bear the responsibility of data collection on the ground for each component's agreed indicators following procedures and methods established within each involved Ministry. Under the M&E plan, units of measurement, baseline values, targets, frequency, data source/methodology and responsibility for data collection will be defined for each Project Development Objective (PDO) level outcome indicator and each intermediate level indicator. The data is expected to inform semi-annual implementation support missions to track project progress in terms of outcomes in the implementation status and results (ISRs) reports, and for the final evaluation of the project in the implementation completion and results (ICR) report. Reporting and use of M&E data as well as assessment of capacity will be described and rated in the ISRs, and will be reviewed at project mid-term. The additional staff to be recruited for PIC (procurement specialist, financial management specialist, environmental safeguard specialist, and monitoring and evaluation specialist) shall be recruited after effectiveness.
50. The PIC will take steps to build M&E capacity utilizing resources allocated under the project. This will include technology, equipment, training on data collection, content management, information updates and basic system troubleshooting and maintenance. The M&E specialist of the PIC may be supported with a consultant if necessary during the first year of the project. Efforts will be made to fully empower national institutions in the M&E of the project outcomes, ensuring that it is strongly linked to the national M&E system. The PIC will be responsible for producing timely and pertinent information that will become key management tool for decision makers.
51. The Results Framework (Annex 4) will be used to monitor achievement of the PDO and the outcome indicators. Project monitoring will take place on an annual and/or trimestral function



and will include reviews/audits, reporting of outputs, and maintaining progressive records. Broad thematic areas that will be supervised and monitored include:

- a. **Indicators at the project level.** This includes monitoring the number of Quality Management Systems established, the installation of equipment to centralize data, operational forecasts, climatology and production, and the population benefitting from improved services and/or new services.
- b. **Strengthening of institutional and governance capacities.** This includes monitoring the number of professionals having participated in trainings and the number of MoUs having been developed or revised with other institutions using and/or providing hydro meteorological services.
- c. **Modernization of observation, forecast, alert and response infrastructures.** This includes monitoring the number of stations feeding the central online data platform on time and the number of stations rehabilitated or improved by the project.
- d. **Improvement of service delivery to users.** This includes monitoring the number of views on the online data platform, the number of hazards for which warning or monitoring forecasts bulletins have been produced, and the number of user groups having shared their needs and a resulting action plan to address them.
- e. **Project Management.** This includes monitoring the number of on time submissions of procurement, financial management, and technical reports including monitoring and evaluation (M&E).



Annex 3: Implementation Support Plan

Strategy and Approach for Implementation Support

1. The Project Implementation Manual (PIM) will present the main implementation modalities and institutional arrangements to support those modalities. The PIM and its adoption is considered as standard operating procedures for the project. The strategy of the Implementation Support Plan (ISP) has been developed according to the nature and the characteristics of the project, as well as its risk profile. The strategy focuses on the principal risks identified and the agreed risk mitigation measures described in the SORT. It will also provide the technical advice necessary to facilitate achieving the PDO. The ISP also identifies the minimum requirements to meet the Bank's fiduciary obligations.

Implementation Support Plan

2. Collaboration with other key stakeholders and the government is a central factor for Project implementation. The Government has developed several key policies and has created and/or strengthened national institutions that are directly linked to decentralization, poverty reduction, and local development planning. The main elements of the Implementation Strategy are as follows:
3. **Technical support:** Technical support will be provided to the participating agencies, in general, and the PIC, in particular. This will ensure compliance with different agreed modalities and procedures. On the other hand, experts of the PIC will provide regular inputs to the agencies in each of these activities.
4. The Bank will provide continuous extensive technical support through participating in the implementation support missions, Mid Term Review (MTR) and ad hoc advisory services. The GEF and GFDRR have provided budget to the World Bank team for such support, which is crucial to the identification of the main factors that may hinder the proper implementation of the activities. The support will include a continuous assessment of risks (outlined in the SORT), fiduciary requirements and inputs, and safeguards. The Bank team will also support the implementation of the agreed Governance and Anti-corruption Plan, and provide guidance in resolving any issues identified.
5. **Procurement:** Implementation support will include the following elements: (a) providing training; (b) reviewing procurement documents and providing timely feedback to the Procurement staff; (c) providing detailed guidance on the Bank's Procurement Guidelines to the Procurement Committee; and (d) monitoring procurement progress against the detailed



Procurement Plan.

6. **Financial Management.** Support will include the provision of training to the concerned financial management consultants, and reviewing the project financial management system (on a semi-annual basis), including accounting, reporting, and internal controls. The current financial management staffing arrangement under MettelSat will be reinforced to implement the project. As the project is likely to generate a significant workload, this FM team should be reinforced through the recruitment of a chief financial officer, an accountant, and an internal auditor. The work-program of the Internal Audit Unit will be revised within three months after the project effectiveness to take into consideration the new project specificities. The team will have the overall FM responsibility for budgeting, accounting, reporting, disbursement, internal control and auditing. The project will recruit two financial management consultants that will be responsible for financial management and accounting in the first year of the project. These consultants will also be responsible for training MettelSat staff in the PIC, who will progressively take over this function as they become more familiar with World Bank Financial Management procedures and standards.
7. **Safeguards:** Support to environmental and social safeguards will need staffed missions to project sites twice a year. Support will include capacity building on safeguards requirements, and Environmental and Social Management Plan (ESMP) implementation. Implementation support for safeguards team in the immediate term will include recruiting a part-time Environmental and Social Safeguards consultant for approximately one year, to support the preparation and implementation of the project, assist with training and capacity building for the PIC, help the establishment of a partnership with the Ministry of Environment through the ACE (for the approval of studies and external monitoring). The consultant will support the performance of the PIC, to ensure that full environmental and social functions are carried out in a timely and effective manner, including:
 - Ensure the PIC takes ownership over the implementation of the environment and social management;
 - Ensure that companies respect the environmental commitments laid out in the ESMF;
 - Carry out site visits of construction sites to ensure social and environmental measures are addressed;
 - Intervene urgently to any incident or accident that requires verification and monitoring;
 - Notify any breach of the commitments to environmental and social management;
 - Inform affected communities and NGOs of their right and obligation regarding the implementation of the project;
 - Ensure that the complaints of the population are identified and properly addressed;
 - Ensure that national regulations and safeguard policies of the World Bank are respected in the phases of preparation and during the work.



8. The project should make provisions to ensure consultants are available to complete the Environment and Social Management Plan and make sufficient budget allocations. In addition, it is suggested to carry out technical inspections of the safety of the infrastructure through the regular monitoring, supervision and evaluation of the project. Support will also be provided to strengthen the environmental and social capacities of members of the Project Steering Committee by organizing awareness sessions and training on environmental and social safeguard documents.
9. To ensure documents are shared and backed-up as necessary, the project will organize a training workshop and capacity building for stakeholders involved in environmental and social management of the project. Furthermore, the workshop will help participants understand the environmental and social challenges of the project and potential impacts, environmental regulations applicable to the project; guidelines and backup tools from the World Bank; the provisions of ESMF, the procedure for selection and environmental responsibilities in the implementation of good environmental and social practices; environmental monitoring of construction sites and environmental monitoring.
10. M&E capacity support under the project will include technology, equipment, training on data collection, content management, information updates and basic system troubleshooting and maintenance. The M&E specialist of the PIC may be supported with a consultant if necessary during the first year of the project. Efforts will be made to fully empower national institutions in the M&E of the project outcomes, ensuring that it is strongly linked to the national M&E system. The PIC will be responsible for producing timely and pertinent information that will become key management tool for decision makers. An indicative budget of US\$100,000 is made available under component 3 for the M&E specialist, the definition of the detailed baseline and methodology for estimation of indicators, and implementation of regular surveys to update the results framework annually.
11. **Overall project management:** The Task Team Leader (TTL), with the support of the Country Office, will provide regular supervision of all operational aspects, as well as coordination with the client and among Bank team members. It is projected that a total of three supervision missions will be required the first year of implementation, and two supervision missions per year thereafter over the project period. The PIC will undertake mid-term independent audits. The ISP will be reviewed at least once a year to ensure that it continues to meet the implementation support needs of the project.



| Time | Focus | Skills Needed | Resource Estimate | Partner Role |
|---------------------|--|---|-------------------|--|
| First twelve months | Preparation of detailed specification for procurement packages | Quality management, institutional, observation, forecasting, early warning, service delivery | US\$150,000 | WMO, ICAO and ASECNA are expected to participate to identify experts and provide guidance. |
| 12-48 months | Monitoring of works and acquisitions; training of staff | Contract management, quality management, institutional, observation, forecasting, early warning, service delivery | US\$350,000 | WMO, ICAO and ASECNA are expected to participate to identify experts and provide guidance. |

Other

Skills Mix Required

| Skills Needed | Number of Staff Weeks | Number of Trips | Comments |
|---------------------------|-----------------------|-----------------|----------|
| Task Team Lead | 40 | 12 | |
| Contract management | 10 | 5 | |
| Quality management | 10 | 5 | |
| Institutional development | 10 | 3 | |
| Agro-meteorology | 10 | 3 | |
| Observation | 20 | 5 | |
| Forecasting | 20 | 5 | |
| Early warning | 25 | 6 | |
| Service delivery | 40 | 8 | |

Partners

| Name | Institution/Country | Role |
|---|--|---|
| World Meteorological Organization (WMO) | International Organization based in Geneva | Provide guidance on norms, standards, protocols and expertise in relation |



| | | |
|---|--|--|
| | | with observing, forecasting, early warning and service delivery |
| International Civil Aviation Organization (ICAO) | International Organization based in Montreal | Provide guidance on norms, standards, protocols and expertise in relation with aviation quality management system (QMS) and cost-recovery from aviation services |
| Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA) | International Organization based in Dakar | |



ANNEX 4. RESULTS FRAMEWORK AND MONITORING

Results Framework COUNTRY : Congo, Democratic Republic of Strengthening Hydro-Meteorological and Climate Services

Project Development Objectives

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

Project Development Objective Indicators

| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-----------|--|------------------------------------|
| Name: Improved hydromet service delivery to key user groups, measured by the number of operational Quality Management Systems to different sectors | | Number | 0.00 | 3.00 | Annual | Verification of the systems' existence and of their operational implementation | MettelSat |

Description: A Quality Management Systems (QMS) is a collection of business processes focused on consistently meeting customer requirements and enhancing their satisfaction. It is the organizational structure, policies, procedures, processes and resources needed to implement quality management. With enhanced QMSs in place MettelSat, RVA, RVF, CVM, and INERA's capacities to provide hydromet services to the key sectors will be improved. The main sectors considered are:

- aviation
- fluvial and lake navigation
- civil protection
- agriculture and food security



| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-----------|---|------------------------------------|
| Name: Operational observation, forecast and modelling capacities improved (composite index) | | Number | 1.00 | 4.00 | Annual | MettelSat annual report reflecting equipment for data centralization, operational forecast, climatology and production, as well as for access to data from secondary networks. | MettelSat |
| <p>Description: This will be measured using an 4-level index based system to accurately measure the improvement of MettelSat technical capacities to provide basic services:</p> <ul style="list-style-type: none">- Level 1: operational forecast is produced on paper on a daily basis for 24 hours- Level 2 : strengthened use of remote sensing; forecast bulletins are updated every 6 hours to deal with extreme weather- Level 3 : operational forecast is performed numerically and experimentally by crosscutting data from other stations, from remote-sensing and from other global and regional models- Level 4 : operational forecast is performed numerically and systematically by crosscutting data from other stations, from remote sensing and from other global and regional models. | | | | | | | |
| Name: Direct project beneficiaries | ✓ | Number | 0.00 | 2978690.00 | Annual | During the project this indicator will be calculated based on surveys undertaken each year by MettelSat. The assumptions were used in calculating the targets for each user group are further explained in Annex 6 on project beneficiary considerations. | MettelSat |



| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|----------------|------|-----------------|----------|------------|-----------|--|------------------------------------|
| | | | | | | <p>The following beneficiary groups are considered:</p> <p>Internet users as MettelSat's data is centralised and website is improved. Aviation passengers, as MettelSat aviation service delivery is enhanced. Television users, as MettelSat broadcasting capacity is enhanced and the accuracy of forecasting is improved. Since the number of beneficiaries in this category is very broad and the benefit is substantially less significant than for air-traffic safety, improved farming decisions, or flash flood warnings, the number of beneficiaries is divided by a factor of 10. Population in pilot provinces: Extreme weather bulletins will be broadcast by MettelSat to 6 to 10 pilot urban municipalities, therefore the population of these municipalities will benefit from such</p> | |



| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-----------|---|------------------------------------|
| | | | | | | warnings.Farmers in 3 or more pilot rural areas will benefit from improved information services allowing them to make decisions accordingly | |
| Female beneficiaries | ✓ | Percentage | 0.00 | 43.00 | | | |
| Description: Direct beneficiaries are people or groups who directly derive benefits from an intervention (i.e., children who benefit from an immunization program; families that have a new piped water connection). Please note that this indicator requires supplemental information. Supplemental Value: Female beneficiaries (percentage). Based on the assessment and definition of direct project beneficiaries, specify what proportion of the direct project beneficiaries are female. This indicator is calculated as a percentage. | | | | | | | |

Intermediate Results Indicators

| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-----------|--|------------------------------------|
| Name: Number of professionals having participated in trainings | | Number | 0.00 | 360.00 | Annual | Total number of professionals having passed the training courses (some courses are delivered each year; verification: signature and instructor validation on the presence sheet) | MettelSat |



| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-----------|---|------------------------------------|
| | | | | | | MettelSat | |
| <p><i>Description:</i> Improvement of the staff capacities of MettelSat, RVF, RVA and other institutions producing hydro meteorological services to contribute to:</p> <ul style="list-style-type: none">- instruments and observation networks maintenance- early warnings- information and communication technologies- operational hydrology- climatology- agro-meteorology- aviation forecasts- meteorological forecasts- delivery of climatic services | | | | | | | |
| Name: Number of memorandums of understanding (MoUs) having been developed or revised | | Number | 0.00 | 8.00 | Annual | Number of implemented MoUs reported by the Board (Conseil d'Administration) | MettelSat |
| <p><i>Description:</i> Institutional capacity of MettelSat to collaborate in the long-term with producers and users of hydro meteorological services:</p> <ul style="list-style-type: none">- Régie des Voies Aériennes (RVA)- Régie des Voies Fluviales (RVF)- Congolaise des Voies Maritimes (CVM)- Centre de Recherche en Géophysique (CRG)- Institut Supérieur des Techniques Appliquées (ISTA)- Commission Internationale du bassin Congo-Oubangui-Sangha (CICOS)- Civil Protection | | | | | | | |



| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-------------|--|------------------------------------|
| <ul style="list-style-type: none">- Agriculture Ministry- Société Nationale d'Electricité (SNEL)- Institut National pour l'Etude et la Recherche Agronomiques (INERA)- Régie de distribution d'eau (REGIDESO)- Centre Africain pour les Applications de la Météorologie pour le Développement (ACMAD)- Ministère de l'Environnement | | | | | | | |
| Name: Number of stations feeding the central online data platform on time | | Number | 0.00 | 80.00 | Trimestral | Automatic count integrated to the online central data platform | MettelSat |
| Description: Increase in <ul style="list-style-type: none">- Operational network density- Quality of telecommunication for data centralization- Number of easily accessible data- Secured data storage | | | | | | | |
| Name: Number of stations rehabilitated or improved by the project | | Number | 0.00 | 40.00 | Trimestrial | MettelSat annual report reflecting on the state of the observation network | MettelSat |
| Description: Repair of existing equipment to reach back to original equipment purposes or to bring additional functionalities (e.g. telemetry) on existing stations | | | | | | | |
| Name: Number of consultations of the online | | Number | 0.00 | 5000.00 | Trimestrial | Automatic count by the internet provider for online | MettelSat |



| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|--|------|-----------------|----------|------------|-----------|--|------------------------------------|
| data platform | | | | | | visitors to the website | |
| Description: Increase in usage of MettelSat products by institutions and the general population | | | | | | | |
| Name: 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 | 4.00 | Annual | Verification of the existence of operational procedures and their implementation | MettelSat |
| Description: Improvement of MettelSat capacities to anticipate extreme events <ul style="list-style-type: none">- droughts- winds- rains- fog- flash floods- river floods | | | | | | | |
| Name: Number of user groups having expressed their needs and developed a resulting action plan to address them | | Number | 0.00 | 4.00 | Annual | Annual report of MettelSat reflecting the needs of user groups | MettelSat |
| Description: Improvement of MettelSat capacities to adapt its production under the form of a national framework for climate services. Proposed user groups are: | | | | | | | |



The World Bank

Strengthening Hydro-Meteorological and Climate Services (P159217)

| Indicator Name | Core | Unit of Measure | Baseline | End Target | Frequency | Data Source/Methodology | Responsibility for Data Collection |
|----------------|----------------------|-----------------|----------|------------|-----------|-------------------------|------------------------------------|
| - | aviation (with RVA) | | | | | | |
| - | civil protection | | | | | | |
| - | agriculture | | | | | | |
| - | food security | | | | | | |
| - | hydrology (with RVF) | | | | | | |
| - | energy | | | | | | |
| - | health | | | | | | |



| Target Values | | | | | | | | |
|--|----------|-------|-----------|-----------|------------|------------|------------|--|
| Project Development Objective Indicators | | | | | | | | |
| Indicator Name | Baseline | YR1 | YR2 | YR3 | YR4 | YR5 | End Target | |
| Improved hydromet service delivery to key user groups, measured by the number of operational Quality Management Systems to different sectors | 0.00 | 1.00 | 1.00 | 2.00 | 3.00 | 3.00 | 3.00 | |
| Operational observation, forecast and modelling capacities improved (composite index) | 1.00 | 1.00 | 2.00 | 3.00 | 3.00 | 4.00 | 4.00 | |
| Direct project beneficiaries | 0.00 | 0.00 | 355000.00 | 847900.00 | 2707900.00 | 2978690.00 | 2978690.00 | |
| Female beneficiaries | 0.00 | 0.00 | 35.00 | 38.00 | 42.00 | 43.00 | 43.00 | |
| Intermediate Results Indicators | | | | | | | | |
| Indicator Name | Baseline | YR1 | YR2 | YR3 | YR4 | YR5 | End Target | |
| Number of professionals having participated in trainings | 0.00 | 10.00 | 110.00 | 210.00 | 310.00 | 360.00 | 360.00 | |
| Number of memorandums of understanding (MoUs) having been developed or revised | 0.00 | 1.00 | 3.00 | 5.00 | 7.00 | 8.00 | 8.00 | |
| Number of stations feeding the central | 0.00 | 0.00 | 0.00 | 10.00 | 60.00 | 80.00 | 80.00 | |



| Indicator Name | Baseline | YR1 | YR2 | YR3 | YR4 | YR5 | End Target |
|---|----------|------|-------|--------|---------|---------|------------|
| online data platform on time | | | | | | | |
| Number of stations rehabilitated or improved by the project | 0.00 | 0.00 | 20.00 | 30.00 | 40.00 | 40.00 | 40.00 |
| Number of consultations of the online data platform | 0.00 | 0.00 | 0.00 | 500.00 | 2000.00 | 5000.00 | 5000.00 |
| Number of hazards for which warning or monitoring forecast bulletins have been produced with sufficient lead-time for preparedness and early response | 1.00 | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 4.00 |
| Number of user groups having expressed their needs and developed a resulting action plan to address them | 0.00 | 0.00 | 2.00 | 4.00 | 4.00 | 4.00 | 4.00 |



Annex 5: Detailed Economic Analysis

Hydromet modernization, early-warning and disaster preparedness in Congo DRC

1. An economic analysis estimating both costs and benefits of the proposed project has been undertaken to estimate the value of strengthening DRC's hydro-meteorological services. The objective of the benefit-cost analysis (BCA) is to verify the economic justification for the proposed project, position the value of DRC's Hydromet services in a wider sociopolitical context, and create a baseline against which progress can be compared.
2. The hydro-meteorological value chain, represented in Figure 1, shows that the economic and social values lay at the end of a process that starts with the observation of climate through to decision-making and outcomes. As such, the value of an accurate, timely and relevant forecast can only be realized if a beneficial value is achieved at the end of the process.



Figure 3: Simplified hydro-meteorological value chain. Source: WMO 2015.

3. 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 need to be employed to determine the economic benefits resulting from hydro-meteorological systems' improvement projects, such as benchmarking and benefit transfer methods.
4. In this analysis the assumed benefits derived by different economic sectors are estimated through benefit transfers methods. The analysis follows the overall structure of the "Triple Dividend of Resilience" framework¹⁴. The framework suggests to consider 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. For

¹⁴ Tanner, T.M., Surminski, S., Wilkinson, E., Reid, R., Rentschler, J.E., and Rajput, S. (2015) The Triple Dividend of Resilience: Realising development goals through the multiple benefits of disaster risk management. Global Facility for Disaster Reduction and Recovery (GFDRR) at the World Bank and Overseas Development Institute (ODI), London. www.odi.org/tripledividend.



example, enhancing forecast accuracy and timeliness can produce co-benefits to a number of actors, including households.

5. The costs in the BCA calculation are those associated with the proposed project's investments. The BCA includes sensitivity analysis of a number of key parameters (including discount rates, benefits realization and degrading of benefits due to lack of maintenance) and explication of reasonable and identifiable omissions, biases and uncertainties. Although the implementation period for the project is estimated at five years, the benefits can in theory be derived far beyond 2022 provided adequate repair, upgrade and maintenance. Therefore, the analysis considers a timeline of 15 years from project starting (2032).
6. In addition to the proposed project's BCA, the analysis investigates the benefits and costs of improving Mettelsat's weather observation and forecast, with a specific focus on the DRC's aviation sector and its potential for cost-recovery of Mettelsat activities.

Proposed Project's benefits

7. The proposed project's benefits are estimated for each dividend of resilience. The selection of sectoral benefits is limited by data availability and reliability constrains. Therefore, the total benefit is reasonably assumed a conservative figure of its real value.
8. In this analysis, the first dividend considers how improved forecasting and early warning systems reduce national asset and livelihood losses. The second dividend includes how increased risk awareness and forecasting accuracy increases agriculture productivity, through efficiency gains; for example, in knowing better when the optimal planting and harvesting period is. It also includes the benefits of reducing weather related risk for the aviation sector, through route optimization and landing. The third dividend includes the co-benefits to households through a WTP study transferred from Mozambique.
9. In order to build confidence and robustness of this cost-benefit analysis, a transparent and "conservative" approach is undertaken¹⁵. All assumptions and their supporting analysis are reported here. Further, where a range of potential assumptions are generated, the most conservative values are taken, meaning that for a range of potential benefits the lowest value is used. This results in the analyzed net present value and benefit/cost ratio representing the lowest threshold of expected economic effectiveness; most likely the truly realized economic efficiency will be greater than what is herein reported.
10. Because of the project's characteristics and baseline conditions of NMHS in the DRC, the project's benefits are considered as 10 percent of the total benefits assigned to improved hydro-meteorological services. This is a conservative assumption in line with the approach of this analysis. It is assumed that the marginal benefits of the project follow a concave curve up to the maximum value (i.e. 10 percent after five years). The time frame of the analysis is 15 years from the project's start and the analysis assumes that the project's benefits are

¹⁵ Kull, D., Mechler R. and Hochrainer, S. (2013). "Probabilistic Cost-Benefit Analysis of Disaster Risk Management in the Context of Development Assistance." *Disasters*, 37(3) (2013): 374-400.



constant after project completion.

11. **Benefits transfer analysis on the reduction of flood economic impacts derived an annual average national value of improved forecast and warning of US\$1.73 million at project completion.** According to the EM-DAT database, the most frequent disaster in the DRC is flooding. During the period 1960-2016, flood events also caused the largest number of fatalities (407). Currently, the only product related to flood hazards provided by Mettelsat is a daily weather forecast, disseminated within Governmental Agencies. No Early Warning Systems against flooding are currently in place and Mettelsat does not provide any specific service or targeted information to the Civil Protection. Considering the stochastic nature of disasters, common practice for cost-benefit analysis of disaster risk management projects is to determine the reduction in average annual losses from natural hazards. This represents the averaging of potential losses over time to quantify the expected economic burden per year. Average Annual Loss (AAL) is calculated as the area under the loss frequency curve, which is a common metric indicating the Exceedance Probability of the full potential range of losses per year. The Aqueduct Global Flood Analyzer (WRI)¹⁶ provides EP curves for urban damages and affected GDP in the DRC. The tool is able to provide current and future (2030) AAL and Average Annual Population affected (AAP) (Table 2). Future estimates include increased impacts due to socio-economic development and climate change.

| | Population affected (thousand) | Urban Damage (mil US\$) | GDP (mil US\$) |
|--|-----------------------------------|----------------------------|-------------------|
| Current AAP – AAL | 240.3 | 43 | 83.8 |
| <i>Increase due to socio-econ dev</i> | <i>150.9</i> | <i>206.4</i> | <i>389</i> |
| <i>Increase due to climate change</i> | <i>110.9</i> | <i>48.6</i> | <i>88.5</i> |
| 2030 AAP – AAL | 502 | 298 | 561.3 |

Table 3: Current and future (2030) Annual Average affected Population (AAP) and Annual Average Loss (AAL). The table includes the contribution of socio-economic development and climate change to the increase of impacts. Source: Aqueduct - Global Flood Analyzer, WRI.

12. Improved extreme weather forecast capacity and alert through Early Warning Systems (EWS) can consistently reduce flood impacts. Global experience indicates a conservative overall range of 5-8 percent potential reduction of impacts. For example, a reduction of 8.5 percent was estimated in Russia¹⁷ and 10 percent for flooding in southeastern Europe¹⁸, while Subbiah et al (2009)¹⁹ reported an overall potential reduction due to early warning of 3.6 percent of total damages. In line with the conservative approach set out for this analysis, the

¹⁶ World Resource Institute, The Aqueduct Global Flood Analyze (<http://floods.wri.org/>).

¹⁷ World Bank (2005). Russian Federation Hydromet Modernization Project. Project Appraisal Document, Report No. 3 1465-RU, Washington, D.C.

¹⁸ World Bank, UNISDR, WMO & FMI (2008). Strengthening the Hydrometeorological Services in South Eastern Europe. South Eastern Europe Disaster Risk Mitigation and Adaptation Programme.

¹⁹ Subbiah, A.R., Bildan, L., Narasimhan, R. (2009). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank-UN Project on the Economics of Disaster Risk Reduction, GFDRR, Washington.



lower end of the range of global experience is considered (five percent). The proposed project's contribution to the reduction of impacts is 10 percent, i.e. 0.5 percent. The benefits of the project are considered both in terms of avoided annual average flood urban damages and GDP losses. To avoid double counting and overlapping, the total loss considers 100 percent of the urban damage plus 60 percent of GDP loss. Under the assumptions considered in this analysis, the proposed project's cumulative benefits in terms of avoided flood economic impacts amount to 30.93 million US\$ over 15 years and 3.71 million US\$ over project time (five years) (undiscounted values). The project reduces cumulative affected population by 27.09 thousand people over 15 years and 4.17 thousand people over project time (5 years).

13. **Benefits transfer analysis of agriculture output improvement attributable to weather and climate information derived an annual total national sector value of improved forecasts of US\$19.90 million at project completion.** Globally, modern hydro-meteorological services provide useful information and product to the agriculture sector. In the DRC, the agriculture sectors accounts for 21.2 percent of total GDP (World Bank, 2104). It is estimated that the enhancement of early warning and weather forecast services could benefit the 70 percent of the Congolese population living in rural areas and working in the small-scale agriculture sector. Currently, the support of Mettelsat to the agriculture sector is quite limited. Mettelsat produces a 10 days and a seasonal forecast and agrometeorological bulletin in four selected areas that are part of the Project PANA²⁰ (in the sites of Gimbi, Kiyaka, Ngandajika and Kipopo). The information is delivered to the farmers, typically for crop selection. Based on the value added of the agriculture sector in the country, and an annual average growth rate of three percent (World Bank) the benefits of improved hydro-meteorological services are estimated. According to other experiences and the current conditions of agrometeorological products, it is assumed that the total benefits of improved hydromet services in the DRC could reach 1 percent of total value added (0.1 percent attributable to the proposed project). Under the assumptions considered in this analysis, the proposed project's cumulative benefits in terms of increased agriculture production amount to US\$59.78 million over 15 years and US\$9.95 million over project time (5 years) (undiscounted values).
14. **Benefits transfer analysis of air traffic route optimization and landing attributable to improved weather and climate information derived an annual total national sector value of improved forecasts of US\$0.98 million at project completion.** The aviation industry, and airlines specifically, rely heavily on weather observation and forecast for their operations. In particular, they use meteorological information to optimize daily operations, flight routes and flight planning. In addition, meteorological information is important for the security and safety of ground and air operations. In the DRC, the products provided by NMHS to the aviation sector are quite limited compared to safety standard requirements, both in terms of quality and quantity. According to the National Statistics annual report the sector carries a

²⁰ Programme d'Action National d'Adaptation (PANA) au changement climatique en République Démocratique du Congo. Project funded by the GEF, UNDP and Congolese Government (<http://www.pana.cd/tag/Mettelsat/>).



total of around 1.3 million passengers per year (2013), almost equally divided between international and domestic. Von Gruening et al. (2014)²¹ analyzed the impact of weather forecast on the amount of extra fuel carried on inbound flights in Switzerland. The amount of extra fuel is larger if adverse weather is forecasted at the airport of destination, to better deal with weather-related extensions of flight time. Without this additional fuel, the risk that the flight has to deviate or land at another airport is higher. Von Gruening estimated the benefits of improved meteorological information in terms of trade-off between the cost of carrying additional fuel and the cost of deviation. The study found that the average economic benefits of improved forecast capacity amount to US\$78 to US\$1906 depending of flight duration (from 3h to more than 10h). To estimate the benefit of improved forecast to the aviation sector, Swiss estimations are transfer to the DRC. In line with the conservative approach, the lower end of the range is considered (78 US\$) for each flight movement. The proposed project's contribution is assumed as 10 percent of the overall benefit, i.e. US\$7.8 per movement. A total number of movements is estimated at around 104,000, based on 2009 figures and an annual growth rate of 4.7 percent per year (IATA). The total cumulative benefits of the project are estimated at around US\$2.2 million after five years and US\$15 million after 15 years from project starting.

- 15. Benefits transfer analysis of value for households shows that the annual benefits of moderately improved forecasts and warning are approximately US\$0.12 million at project completion.** In the DRC, households receive very limited weather and climate information. The information provided is limited to a 24h precipitation and temperature forecast. State preferences methods can provide an estimation of the economic value of improved services for households. Lazo (2015) carried out a state preference survey on Mozambique households' willingness-to-pay (WTP). In his survey, Lazo employed both a stated choice method with discrete choices and a contingent valuation method (Lazo, 2015). The discrete choice experiments identified the value of the actual service provided in Mozambique as US\$8.33 per household, while the households' willingness to pay for significantly improved forecasts was estimated at US\$0.09 per household. The contingent valuation experiment (based on single improvements compared to discrete choices) highlighted a WTP of US\$1.16 per household for improved forecast. To estimate the economic value to households, Lazo's study is transferred to the DRC context, assuming a 10 percent contribution of the proposed project to the overall benefit. The outcomes show that the cumulative benefits of the proposed project reach approximately US\$1.70 million using the stated choices method and US\$21.43 million using the contingent valuation method after 15 years from project start.

Proposed Project's Costs

- 16. The costs associated with the proposed project amount to a total of around US\$8 million.**

²¹ Von Gruening et al. (2014). Economic value of meteorological services to Switzerland's airlines: the case of TAF at Zurich Airport. Weather, Climate and Society. Vol6.



During and beyond implementation, costs will be incurred for operation and maintenance (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. A present value of US\$17.65 million of costs is estimated using a three percent rate of discount.

Aggregated Costs and Benefits of the proposed project

17. Table 4 below summarizes the key variable for the benefit-cost analysis including timing of benefits and costs and the discount rate. For all calculations, real values were applied that do not factor in inflation or potential changes in exchange rates. A discount rate of three percent was applied as a lower discount rate will give more weight to the social benefits side (the sensitivity analysis was re-run with 1-10 percent).

| Key Variables | Value |
|---|--------------|
| First year of costs | 2017 |
| Annual cost of initial investment (Million US\$) | 1.64 |
| Timeline of initial investment (Years) | 5 |
| Annual maintenance and repair (% of initial investment plus Gov of China investment of US\$6 mil) | 10% |
| Timeline of increasing operation and maintenance costs (start after investment starts) (Years) | 5 |
| First year of benefits | 2017 |
| Last year of benefits with ongoing support (5 years) | 2022 |
| Last year of benefits without ongoing support (15 years in total) | 2032 |
| Assumptions | |
| Contribution of the proposed project to the overall benefits from improved hydromet | 10% |
| Discount rate | 3% |
| Discount rate - range for sensitivity analysis | 1-10% |

Table 4: key variables of the analysis.

18. **A present value of total projects' costs of US\$17.65 million is estimated** using the 15-year timeline, the basic assumptions, and a three percent rate of discount.

19. **The net present value of the proposed project of US\$112.27 million is estimated, with a benefit-cost ration of 7.36 to-1** using the baseline assumptions and a three percent rate of discount. Table 10 shows the results of the benefits cost analysis with a discount rate of three percent. A benefits' present value of over US\$129.92 million is estimated, as the sum of the dividends of resilience provided by the project. The table also shows an overall benefit-cost ratio (BCR) of 2.39 after project completion.

| | | | | |
|--------------------------|----------------------|--------------------|------------|---------------|
| Summary table BCA | Present value | Net Present | BCR | BCR 15 |
|--------------------------|----------------------|--------------------|------------|---------------|



| | | (mil US\$) | Value (mil US\$) | 5yrs | yrs |
|----------------------------|---------------------------------------|---------------|---------------------|-------------|-------------|
| Costs (million US\$) | | 17.65 | | | |
| Benefits - First Dividend | Avoided flood losses | 30.93 | | | |
| Benefits - Second Dividend | Agriculture production | 119.56 | | | |
| | Aviation – optimization of operations | 14.99 | | | |
| Benefits - Third Dividend | Household benefits | 1.69 | | | |
| Total benefits | | 129.92 | 112.27 | 2.39 | 7.36 |

Table 5: Summary table of the proposed project BCA.

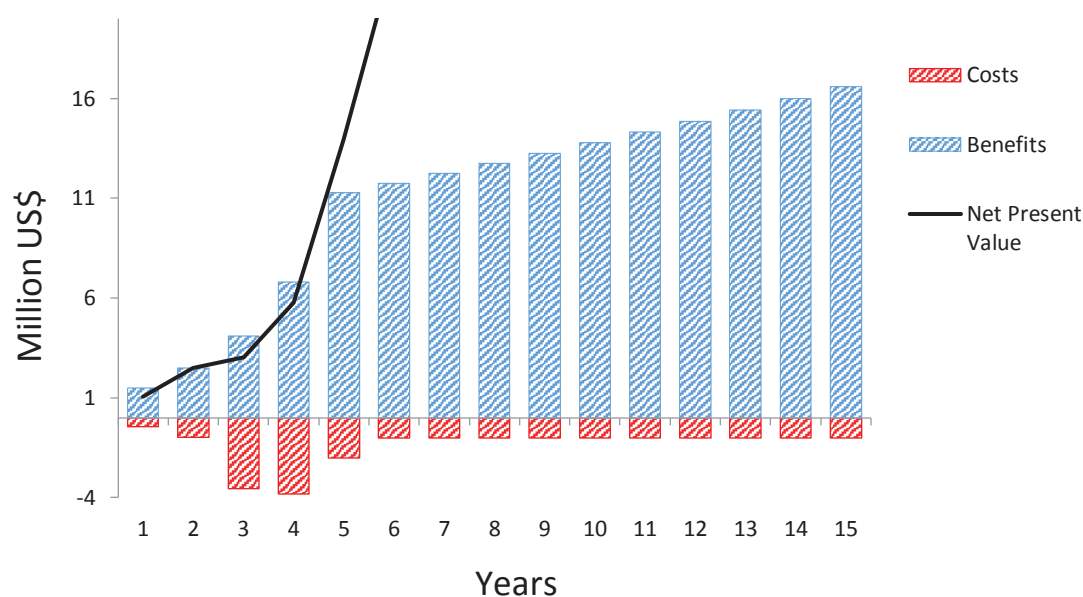


Figure 4: Cumulative costs and benefits of the proposed project, including the NPV curve over the time duration of the analysis.

Sensitivity analysis on key parameters

20. The sensitivity analysis suggests the need for better evaluation of parameters for project evaluation. A basic sensitivity analysis is done with respect to assumptions on the discount rate, potential improvements in forecast quality and ongoing support from the DRC Government or other unidentified agencies to Mettelsat. Results are relatively insensitive to the discount rate and the same policy recommendation emerges whether using a one percent, three percent or 10 percent rate of discount.



21. If the improvements in forecasts are less than assumed in the baseline BCA, a significant reduction in NPV is expected. Assuming only five percent rather than 10 percent of project's contribution to the potential benefits of improved hydromet services, the overall NPV falls by more than 50 percent and the BCR to 3.81. Finally, if there is no budget increase for the relevant agencies to support project operation and maintenance, the NPV estimates fall precipitously. In this case, while potentially having a positive NPV due to the short term benefits, it is assumed to generate no benefits after the system degrades again to pre-project levels within a few years.

| Sensitivity Analysis | Parameter Value | Overall NPV | BCR 5 yrs | BCR 15 yrs |
|--|-----------------|-------------|-----------|------------|
| Baseline | 3.00% | 112.27 | 2.39 | 7.36 |
| Discount Rate | 1.00% | 133.69 | 2.40 | 7.79 |
| Discount Rate | 10.00% | 64.66 | 2.34 | 6.07 |
| Percent improvement in forecast ¹ | See Footnote 1 | 49.57 | 1.42 | 3.81 |
| Failure to support budget for long-term operation, maintenance, and repair ² | See Footnote 2 | 25.28 | 2.39 | 2.43 |
| ¹ The benefit of the project are assumed 5% (instead of 10%) of the potential overall benefit of improved hydro-meteorological systems. | | | | |
| ² Assumes that there is no spending on operations maintenance and repair above and beyond the initial investment. Assumes that the benefits realized in the first five years then degrade proportionally over the following 5 years as the system returns to current (prep-project) status. | | | | |

Table 6 – Sensitivity analysis of the proposed project BCA.

Omission, biases and uncertainties

22. Few economic studies can consider all of the potential benefits and costs of a specific project, especially with respect to all of the potential indirect effects and co-benefits. This analysis only considers a few sectoral benefits; hence the proposed estimates should be considered on the conservative side.

23. The potential value of climate information from longer and more reliable climate record for the DRC as a result of the project would benefit longer term planning for infrastructure such as dams and water resources, energy and transportation facilities, and critical uses of climate information to build resilience against climate extremes. In particular, given DRC's potential for hydropower production and the foreseen investments in the sector (e.g. the Gran Inga dam project) long term planning could consistently benefit from more accurate climate records and prediction.

24. The potential value of increased in-country capacity from the project's investment into development of human capital, improved training and education, and improved management systems among other anticipated outcomes, may all have secondary and tertiary benefits to the agencies as well as to the country as a whole.



25. The potential value of contribution to global weather forecasting data would help strengthen global forecasting models as they are based on data input from all areas of the globe at a range of spatial and temporal scales across all measures of hydro-meteorological characteristics. The skill and value of global forecast models is presumably a non-decreasing function of the quality of the data inputs. As DRC has been a data sparse area, the project will potentially provide useful data to global data modeling efforts. Benefits could be accrued both globally and eventually back to the DRC.

BCA analysis of Mettelsat improvement in relation to the aviation sector

26. To estimate the value of improving Mettelsat operations, a basic and Mettelsat specific BCA is performed. Given the direct relation between the aviation sector and weather services, the analysis estimates the NPV and BCR of improving Mettelsat capacity to deliver products to the aviation sector.

27. The current budget of Mettelsat operations is estimated at around US\$600,000 on salaries and US\$200,000 on operations. RVA budget for weather services is estimated at US\$240,000. The current levies to the aviation sector in the DRC is assumed at around US\$40 million. An almost negligible part of this revenue is delivered to Mettelsat. The analysis assumes that the value of weather services is around 10 percent of the value paid by aviation sector to national aviation authorities. The time-frame of the analysis is 15 years.

28. The analysis considers two benefits and cost scenarios: i) with Mettelsat improvement of weather forecast and, ii) without Mettelsat improvement.

29. The first scenario assumes that Mettelsat will reach a total budget of US\$4.2 in five years (2022). This figure is based on local expert elicitation and it is considered a reasonable overall budget compared to the size, economy and population of the country. The main items of the assumed annual budget include: US\$600,000 of investments, US\$1.2 million of operations and maintenance, US\$2.4 of salaries. It is expected that the improvement of the service will deliver expected benefits up to 10 percent of the actual value of weather services to the aviation sector (i.e. currently US\$4 million) in five years (2022). From the 6th year benefits will remain constant, with an annual growth rate of the sector of 4.7 percent (IATA). Costs will increase linearly up to US\$4.2 million in five years and then remain constant.

30. There is the possibility that from 2017 on, the DRC aviation infrastructure will fall under ICAO sanctions on deficiencies of air and land operations safety, unless immediate improvements are put in place in weather monitoring and forecast. Therefore, the second scenario investigates a reduction in air traffic. The scenario assumes that a 20 percent drop in the value of weather forecast for the aviation sector will occur in 2017. Afterwards, a yearly two percent drop is assumed for the remaining period of analysis. This scenario assumes a constant US\$1 million cost of the service, associated to an initial US\$1 million benefit, which reduces according to the assumptions mentioned above.

31. A present value of the costs to improve Mettelsat weather forecast capacities is estimated at US\$15.15 million, using the 15-year timeline, the analysis assumptions, and a three percent



rate of discount.

32. A net present value of Mettelsat improvement of US\$74.90 million is estimated, with a benefit-cost ratio of 2.59 to-1 using the baseline assumptions and a three percent rate of discount. Given the incremental approach considered, the benefit-cost ratio is 1.08 after five years.

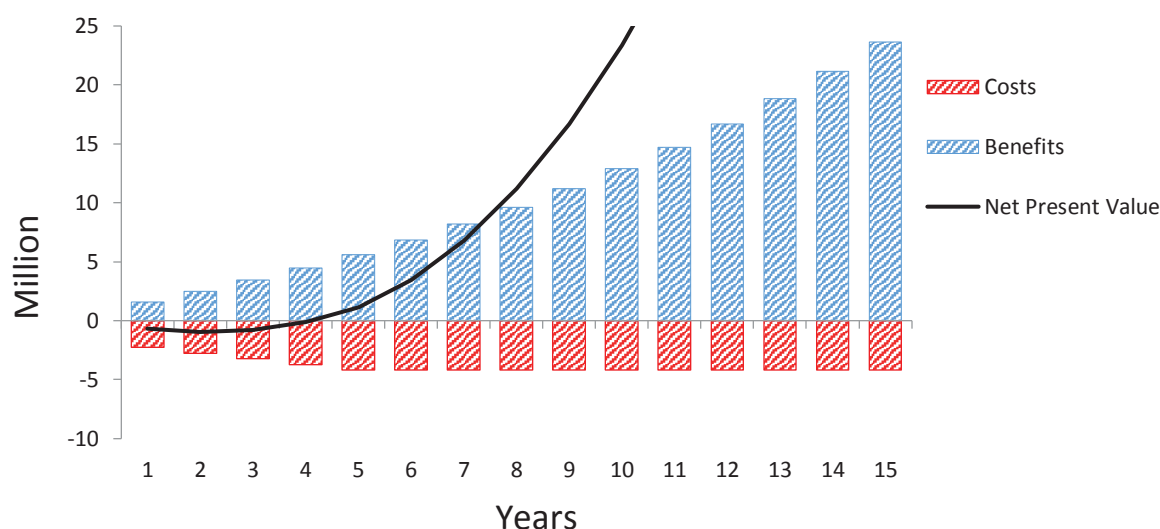


Figure 5: Cumulative costs and benefits of Mettelsat improvement (only for the aviation sector), including the NPV curve over the time duration of the analysis.

33. A present value of the costs to maintain Mettelsat weather forecast capabilities at current levels is estimated at US\$12.29 million, using the 15-year timeline, the basic assumptions, and a 3 percent rate of discount.

34. A net present value of maintaining Mettelsat's performances of US\$-7.32 million is estimated, with a benefit-cost ratio of 0.4 to-1 using the baseline assumptions and a three percent rate of discount. The benefit-cost ratio is estimated at 0.63 after five years.

35. This analysis only considers the sectoral benefits to aviation; hence the proposed estimates should be considered on the conservative side. It is clearly evident that investing in Mettelsat operations produces a positive Economic Return of Investment.

36. Benefits transfer analysis on the reduction of air accidents due to weather conditions and forecast derived an annual total national value of statistical lives (VSL) saved (1 statistical lives per year) of US\$2.45 million. DRC is considered one of the most dangerous countries to fly in the world, because of its poorly maintained infrastructure and air safety conditions. The total fatalities for air accidents in the period 1984-2014 amounted to 1,074 persons, i.e. 36 fatalities per year. Based on the literature, the cause of accidents normally attributed to weather related pilot errors and weather conditions account to around 28 percent of the total, i.e. 10 fatalities per year. The value of improved weather services and forecast is assumed to contribute by 10



percent to this figure. From an extensive body of literature, a common point estimate is a US\$6 million VSL. For DRC, the VSL (i.e., value or reducing risk of loss of one life) was scaled to US\$2.45 million. This value was then multiplied by the expected reduction in loss of life (1) for an annual benefit of US\$2.45 million.



Annex 6: Least Developed Countries Fund (LDCF) Additional Cost Reasoning

Context

1. The Democratic Republic of Congo (DRC) is located in west equatorial Africa and is endowed with an abundance of natural, forest and water resources found across its 2.3 million square kilometers. DRC's climate is equatorial (warm and moist) in the center of the country, and tropical in the south and north. Despite its rich natural resources, the DRC has often been associated with political instability and poverty, and rebellions are presently ongoing in the east of the country. With a per capita Gross National Income of US\$380 (World Bank, 2014), DRC's population – estimated at about 74.88 million (World Bank, 2014) – is among the most vulnerable in the world. Food insecurity remains pervasive and a majority of people lack access to basic health. DRC's major vulnerabilities include a clear deficit in relation with its infrastructure, with a conjunction of geographic challenges, lack of investment and conflicts. Such deficit has repercussions on the country's capacity to address weather related hazards and climate change, leading to an increased vulnerability of economic sectors and populations to weather and climate related shocks. Rapid and unplanned urbanization process make urban areas increasingly vulnerable to flooding.

A. Key facts on vulnerability to climate change

2. Rising temperatures in the DRC are predicted to cause a surge in crop diseases such as cassava mosaic virus, and droughts will cause major disruption to the agricultural calendar, resulting in failure of both food and cash crops, and intensifying food insecurity and poverty. Climate simulations for the region indicate that rainfall will become more intense and more destructive over the coming years, bringing floods, landslides and soil erosion, especially in the region of the central Congo basin. Torrential rains are already causing loss of lives and damage to infrastructure in peripheral urban areas. By contrast, the rainy seasons will become shorter in the south, which is largely made up of the dry savannah belt and accounts for 80 percent of the rural population. These effects are already being felt, and it has been predicted that the Katanga region will see its rainy season shorten by at least two months by 2020 (DFID, DRC Talks Climate). DRC already experiences extreme weather and climate variability, resulting in high exposure to floods and droughts. The impacts of climate change are projected to increase both the frequency and severity of these events.
3. In this context of vulnerability to climate change, an effective capacity to monitor and forecast hydro-meteorological (hydromet) conditions and transfer improved knowledge into decision making and planning is critical to increasing the DRC's adaptation ability and resilience. For instance, systematic meteorological and hydrological data collection is needed to establish early warning systems for wind storms, floods, drought and other hazards, hence preventing losses of human lives, delivering reliable information to farmers, and increase accessibility and reliability of agriculture insurance products. Globally, recorded economic losses linked to extreme hydro-



meteorological events have increased nearly 50 times over the past five decades, while the global loss of life has decreased significantly, by a factor of about 10. This can mainly be attributed to advancements in monitoring and forecasting, early warning, and emergency preparedness and response planning at the national and local levels.

B. Project Development objective

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

C. Alignment with relevant national priorities for development and climate change adaptation

5. The project is aligned with and contributes to relevant DRC's national strategies, policies and plans, notably the Poverty Reduction Strategy Paper (PRSP-2) adopted in 2012, which, through Pillar Five entitled "Provide Balanced and Sustainable Development", calls for "Environmental Protection and Combatting Climate Change". In particular, the Government seeks to build resilience against the impact of climate change on agriculture, water resources and vector-borne diseases. In that perspective, understanding hydromet and climate risks would help assess social and economic impacts and develop adequate policy responses to support the country's sustained development. A number of economic sectors in the DRC could specifically benefit from more accurate, relevant and timely hydromet information, warning and services. In particular, these sectors include: (i) airfreight and aviation, (ii) early warning, disaster reduction and civil protection, and (iii) agriculture investment and food productivity. In line with the PRSP-2, greater understanding, monitoring and forecasting of severe weather and weather events could result in reduced loss of life and property, economic gains and prevention of losses, and most importantly, improved adaptation capacity within sectors having to adapt to the negative impacts of climate variability and change.
6. The proposed Project also aligns with the Country Assistance Strategy (CAS) for DRC (FY13-FY16), which calls for the essential need to build the capacity to monitor and forecast hydromet in the DRC and transfer this improved understanding of current and future climate to decision-making and planning as a way to build adaptation and resilience. The Project would especially support the CAS-principle of mainstreaming climate change as a cross-cutting theme and be beneficial to a range of sectors. The Project would align with future IDA priorities in the DRC, including food security and disaster risk reduction.
7. Furthermore, the Project is also a critical element of the UN-World Bank joint commitment of US\$1 billion, announced in May 2013, to the "Peace, Security and Cooperation Framework for



the DRC and the Great Lakes Region” in collaboration with the region's governments, SADC and the African Union. Of relevance, this new framework includes financing for hydroelectric power plants, roads, and agricultural infrastructure that depend on adequate hydrological and meteorological information.



D. Linkages to the National Adaptation Program for Action (NAPA)

8. Improved weather and climate information is required from the national level down to the household level so that government, communities and the private sector can better plan for and adapt to these projected changes in climate. Hydromet and early warning services act as a key enabler for a broad range of adaptation decisions, ranging from the agriculture sector, urban development, infrastructure, disaster risk management, and others. In areas of infrastructure development, hydromet information will inform the resilient design of relevant works such as bridges, culverts, and erosion protection. In terms of agriculture and food security, reliable hydromet information assists farmers in deciding which agricultural technologies and adaptation mechanisms may be most useful in responding to weather variability and climate change. Private companies and businesses also need and rely on the hydromet data to make investment decisions related to climate risk mitigation for their operations.
9. Under the framework of the UNFCCC, the LDCF was established in recognition that Least Developed Countries (LDCs) do not have the means to deal with adaptation to climate change. In COP7 (2001), an LDC-work program was agreed, which specifically included: “Strengthening of the capacity of meteorological and hydrological services to collect, analyze, interpret and disseminate weather and climate information to support implementation of NAPAs”. The NAPA for the DRC was completed in 2006 and prioritizes strengthening the national meteorological services, management of reservoirs and navigable waterways as options for adaptation.

E. Linkages to the Intended Nationally Determined Contributions (INDC)

10. The project is fully aligned with DRC’s planned national contribution to the United Nations Framework Convention on Climate Change (UNFCCC) for the period 2021–2031. The contribution aims for a national reduction of 17 percent of CO₂, CH₄ and N₂O gasses altogether via both adaptation and reduction measures, targeting the agriculture, forest and energy sectors. The INDC document raises concerns towards the vulnerability of cultivated lands, water resources and coastal areas to climate change, resulting in food security and health risks. It also highlights DRC’s population vulnerability to heavy rains, coastal erosion, floods, heat waves, and seasonal droughts. To protect vulnerable populations from the consequences of these risks, ranging from destructions in urban areas to contracting water-borne related illnesses, the national contribution identifies three main priorities for adaptation, namely, i) securing subsistence and lifestyles of urban and rural communities; ii) rational management of forests, and iii) protecting and preserving vulnerable ecosystems in the coastal areas. The Project closely relates to the first priority, as it plans to i) provide farmers in pilot rural areas with improved agro meteorological information services allowing them to make decisions accordingly, and ii) provide populations of pilot urban municipalities with extreme weather bulletins helping them to deal with heavy rains and resulting flooding, which is predicted to further intensify with climate change in the future. The Project also aligns with the INDC’s concern regarding the lack of climatic data availability at the national level, as it will improve MettelSat’s capacity to produce and deliver weather and climate forecasts. Finally, additional linkage to the INDC lies in the project’s plan to consider using



pilot sites common to those selected by the government for its national contributions to the UNFCCC - via the PANA projects implemented by UNDP.²²

F. Linkages to Other GEF-funded activities

11. The Project will be implemented in close synergy with other GEF-funded activities in DRC, which support optimal utilization of climate information at the level of (i) pilot rural households in Kipopo, Kiyaka, Ngandajika and Ngimbi (GEF-4 Building the Capacity of the Agriculture Sector in DR Congo to Plan for and Respond to the Additional Threats Posed by Climate Change on Food Production and Security and GEF-5 Improving Women and Children's Resilience and Capacity to Adapt to Climate Change in the Democratic Republic of the Congo) and (ii) coastal households (GEF-5 Resilience of Muanda's Communities from Coastal Erosion, Democratic Republic of Congo). The Project will further strengthen operational linkages between the agriculture and meteorological sectors at the national level, learning from the experience of other GEF-funded activities at the local level. In addition, the Project will support MettelSat's capacity to produce and deliver improved meteorological and agro-meteorological services, which in turn will reach beneficiaries of other GEF-funded projects.

G. Linkages to LDCF Strategies

12. This is a fully blended project where GFDRR and GEF/LDCF resources are being brought together cohesively to enable a set of activities that will improve DRC's resilience to natural hazards through i) Institutional and regulatory strengthening and capacity-building of MettelSat, the national agency in charge of producing hydrometeorological observation and forecasts; ii) Modernization of MettelSat's equipment, facilities and infrastructure for basic observation and forecasting; and iii) Improvement of MettelSat's capacity to deliver hydromet information services.
13. The added value of the LDCF funds will specifically be achieved through i) improving the implementing agency's physical, technical, and human capacity to produce and deliver weather and climate forecast services adapted to sectors and users' needs, and ii) improving the implementing agency's cooperation with other relevant institutions to improve data sharing and accessibility of information in a timely manner. The nexus between the project and the LDCF strategies is particularly evident in that with the knowledge gained from better weather and climate foresight, these institutions, sectors and users can provide information that can increase the adaptation capacity in key economic and social sectors – thereby adding value to baseline investments (e.g., for air and river-transport, agriculture, and urban development). In addition,

²² The document on DRC's national contribution to the United Nations Framework Convention on Climate Change (UNFCCC) indicates that government priorities have materialized via the PANA projects, implanted by UNDP. PANA-ASA, or « Building the Capacity of the Agriculture Sector in DR Congo to Plan for and Respond to the Additional Threats Posed by Climate Change on Food Production and Security », initiated in 2010 and closed in 2014, focused on the resilience of the agriculture sector. It is now continuing as PANA-AFE (2015-2020), supporting more specifically women and children in the same initial pilot zones. Another project, PANA-Costal Areas (2015-2020) aims to equip communities of the coastal areas to fight erosion and establish an early warning systems.



flood risk management in urban areas will better integrate the likely impacts of climate change to improve the sustainability of short-term investments and the design of medium and long-term investments. The LDCF Grant will also support sustainable land management practices via crop selection based on climate information, contributing both to enhanced agricultural resilience in the rural areas and reduced flood risks in the urban areas. The project fully aligns with Objectives 1 and 2 of the GEF-6 LDCF Strategy (see Table 1 below).

Table 1: LDCF Objectives and Expected Outcomes relevant to the Project

| LDCF Objectives | Expected Outcomes |
|--|---|
| Objective 1: Reduce the vulnerability of people, livelihoods, physical assets and natural systems to the adverse effects of climate change | Outcome 1.3: Climate-resilient technologies and practices adopted and scaled up |
| Objective 2: Strengthen institutional and technical capacities for effective climate change Adaptation | Outcome 2.3: Access to improved climate information and early-warning systems enhanced at regional, national, sub-national and local levels |

H. LDCF additional cost reasoning

Baseline Scenario

14. The baseline scenario considers a total baseline financing of US\$32.7 million through the Strengthening Hydro-Meteorological and Climate Services project (US\$2.7 million), the related DRC Urban Development project (P129713, US\$20 million) and the Western Growth Poles project (P124720, US\$10 million).
15. The Strengthening Hydro-Meteorological and Climate Services project aims to enhance the capacity of the Government of the DRC to produce and deliver hydromet observation and forecast services, focusing on priority target end-users involved in (a) agro-meteorological information services, (b) food security; (c) civil protection emergency and contingency plans; and (d) aviation. The ultimate aim is to reduce the increasing negative impacts of hydro-meteorological events, exacerbated by climate change and climate variability (particularly excessive rainfall, flashfloods and widespread flooding), on DRC's natural, urban, and agricultural lands and economic sectors.
16. The LDCF resources will complement GFDRR's funding for each component of the project and the overall adaptation benefits will be reflected in improved and more sustainable agriculture practices resulting in enhanced food security, as well as in resilience to extreme hydro-meteorological events such as floods and storms.



17. In relation to the baseline scenario, the additional resources from LDCF are fully justified, as the project will impose on the country 'additional costs' over 'business as usual-related costs' (or baseline costs). The project's Development Objective to improve the quality of the Government of the DRC's hydro-meteorological and climate services in selected sectors is fully consistent with the LDCF's focus on reducing vulnerability by promoting climate change adaptation interventions in key sectors.
18. The proposed LDCF project will further support the baseline development objectives of the project to improve the quality of the Government of the DRC's hydro-meteorological and climate services in selected sectors by adding significant resources. As such, it will increase the sustainability of the project, the resilience of the DRC's population in the face of climate change and will improve long term climate resilience practices in the targeted regions. The proposed funding has enabled this project to provide support to a range of different MettelSat user groups that are particularly vulnerable to environmental stress and climate patterns. Overall, the added value of the LDCF funds is to assist the government cope with the poor quality of meteorological services to (i) aviation, (ii) maritime navigation, (iii) fluvial navigation, (iv) urban flood risk management, (v) agriculture and (vi) food security.
19. The Strengthening Hydro-Meteorological and Climate Services project has been designed based on the DRC's Poverty Reduction Strategy Paper (PRSP-2) adopted in 2012, which prioritizes Climate change as a development challenge and calls in Pillar Five entitled "Provide Balanced and Sustainable Development", for "Environmental Protection and Combatting Climate Change". While GFDRR resources will support all activities of the project, LDCF's funding will dominate for all components, making it essential to its implementation, on all aspects of the project. As such, the LDCF resources are expected to support institutional and regulatory strengthening and capacity-building of MettelSat; modernization of MettelSat's equipment, facilities and infrastructure for basic observation and forecasting; and improvement of MettelSat's capacity to deliver hydromet information services in select areas that will be common to those of existing Bank projects in the DRC, namely the Urban Development Project (P129713) and the Western Growth Poles Project (P124720).
20. LDCF funding to the Strengthening Hydro-Meteorological and Climate Services Project will allow to materialize complementarities with the DRC Urban Development Project (P129713) that the baseline only would not satisfy. The objectives of the Urban Development project (P129713) are to (a) strengthen institutional performance of targeted cities; and (b) increase access to basic infrastructure, services for the inhabitants of targeted cities. LDCF funding will allow the hydromet project to support MettelSat's capacity to produce and deliver early warning alerts in some of the nine cities already benefiting from the Urban Development project activities, via cooperation with the local governance institutions that will as such be strengthened to protect their populations from the effects of heavy rains, such as flash floods and erosion.
21. LDCF funding to the Strengthening Hydro-Meteorological and Climate Services Project will also allow to materialize complementarities with the Western Growth Poles project (P124720) that



the baseline alone would not be able to satisfy. The project aims to increase agriculture productivity and employment in the selected value chains of targeted zones. MettelSat's production and delivery of agrometeorological information in the areas of the Western Growth Pole project will benefit the cooperatives, farmer networks, and multi-services platforms there so that the agriculture production adapts to climate hazards and change. Agro-meteorological information is expected to have a positive impact on agricultural productivity, for instance on the seeding and harvest time frames to limit losses linked to early seeding and inadequate post-harvest drying.

LDCF Additionality: By Project Components

22. The baseline project has five inter-related components supporting the project development objective: (i) Institutional and regulatory strengthening, capacity building and implementation support; (ii) Modernization of equipment, facilities and infrastructure for basic observation and forecasting; (iii) Improvement of hydromet information service delivery, and (iv) Project Management. The LDCF funds provide financing to all the five components. The estimated cost of the Project is US\$8,029,452, including US\$2,700,000 from GFDRR and US\$5,329,452 from LDCF. LDCF's total funding contribution to the project is over 65 percent, compared to GFDRR's contribution. LDCF's resources will therefore contribute as a whole to all aspects of the project development objectives. Table 2 below, "Project financing and LDCF support" provides an indicative overview of the funds allocated by GFDRR and LDCF to each of the project's components and sub-components.
23. The selection of targeted vulnerable communities will take into account the communities already benefitting from the Urban Development Project (P129713) and the Western Growth Poles Project (P124720), funded by the LDCF to maximize the synergies between the respective projects. Some of the nine cities supported by the Urban Development Project could be used as the 6 to 10 urban pilot sites for the Strengthening Hydro-Meteorological and Climate Services Project's activity which aims to support MettelSat's capacity to produce and deliver early warning alerts that would help urban municipalities to be better prepared in the event of heavy rains and resulting flash floods. In addition, farmers and agriculture workers that are already benefitting from the Western Growth Poles Project (P124720) will be targeted in priority by the Strengthening Hydro-Meteorological and Climate Services Project's activity aiming to develop customized products and services. This will include the production and delivery of agro meteorological forecasts, development of an information platform and offer of weather and climate related trainings adapted to the needs of farmers.
24. Component A - Institutional and regulatory strengthening, capacity building and implementation support: This includes investing in the human and institutional resources that can implement and sustain hydromet observation and forecasting. The sub-components include:
25. Sub-component A.1 - Reinforce the legal and regulatory framework of MettelSat in order to develop partnerships and Standard Operating Procedures (SOPs) for delivery of service: This will



support an Institutional diagnosis, including a comparative review of the roles and mandates of the Régie des Voies Aériennes (RVA), the Régie des Voies Fluviales (RVF), the Congolaise des Voies Maritimes (CVM), the Civil Security and the Ministry of Agriculture. Efforts will be also made towards the Ministère des Transports et Voies de Communication (MTVC) and the Ministry of Finance with the objective of raising the level of the government financial contribution to MettelSat. A Strategy and an Action Plan will be defined for MettelSat, which will identify the main actions in order to increase cooperation and avoid overlap between agencies, ensuring an efficient development of hydrometeorology in DRC.

26. Sub-component A.2 - Strengthen the Quality Management Systems to raise standards and quality control/verification procedures across the institutions: A Quality Management System (QMS) will be designed and implemented by MettelSat which will be focused as a priority on the services which must be delivered to aviation. Building on this development, QMS will also be designed and implemented for EWS and Agriculture.
27. Sub-component A.3 - Implement a long-term and on-demand capacity development and training program for staff: Because human resources are a significant challenge to maintaining and expanding services, this subcomponent will look at ways to motivate staff and to upgrade its qualification. Building on collaborations with national universities and training institutes such as ISTA will be necessary because MettelSat is not entitled to give academic degrees which are required by ICAO. Some support to these institutions and to in house training facilities will be considered, for instance for equipping training facilities or inviting trainers. Collaboration will be pursued with international institutions such as WMO, ACMAD and SADC as well as twinning arrangements with other hydromet services.
28. Component B - Modernization of equipment, facilities and infrastructure for basic observation and forecasting: Component B will invest in the reinforcement and rebuilding of the basic networks for observation and forecasting, as well as in infrastructure needed for provision of services by MettelSat. A highly focused approach to investments is required in the DRC considering the current status of hydromet services, and allocation of investment will have to be made based on priority sectors/user-groups being served, core-capacity for observation and forecasting and the long-term ability to operate and maintain the services. The sub-components include:
 29. Sub-component B.1 - Hydrological and meteorological monitoring networks (small-scale rehabilitation of priority stations and installation of new sensors): This activity will finance the optimization of the hydro-meteorological observation network, targeting an overall operational system (i.e. observation- transmission- forecasting and service delivery) sustainable after the end of the project. At that time, it is expected that the data from 60 meteorological synoptic automatic stations, 20 hydro-meteorological automatic stations and one radio-sounding station (donated and to be installed at N'djili airport by the Government of China) are received on a reliable and regular basis at the central forecasting office of MettelSat in Kinshasa/Binza and posted in due time on the GTS.



30. Sub-component B.2 - Transmission, data management and data dissemination hardware: To improve the transmission of data coming in and out of MettelSat, this activity will finance data management improvements which include: ICT infrastructure to improve connectivity (such as reliable and hazard proof network internet/ GPRS/ fiberoptic connections to manage high volumes and fast data flows; as well as servers, licenses and soft/hardware); 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, will be modernized. It should allow the reception of all the national hydromet data of interest for MettelSat and their handling so that they may be used by the central forecasting and the climate monitoring systems.
31. Sub-component B.3 - Refurbishment of facilities needed to support the services: Measures will be taken to renew the central infrastructure, beginning with a national expertise for determining the priorities in the MettelSat Hq buildings refurbishing. The specification of the refurbishment will then be defined and the Project will contribute to the refurbishing of Hq buildings of MettelSat, to the technical integration of the ICT equipment described in other activities and to the improvement of furniture and basic office equipment such as computers. Efforts will also be deployed to improve the infrastructures of the most critical hydro-meteorological stations and to provide up to 6 regional centers with improved buildings, the necessary means for transportation and for receiving and utilizing products from the central facility.
32. Sub-component B.4 - Technical systems and software for performing meteorological, hydrological and climate modelling and forecasting: Specification, procurement and installation processes will be implemented for a new central weather forecasting system, a new central climate monitoring system and a new central hydrological monitoring system. With access to the WMO Global Telecommunication System (GTS) and EUMETSAT EUMETCast, MettelSat will be able to use more optimally international numerical weather prediction models for improving forecasting capacities and for provision of early warning services.
33. Component C-Improvement of hydromet information service delivery: Component C will focus on the delivery of more accurate, timely and relevant information to users and decision-makers. The sub-components include:
 34. Sub-component C.1 - Define requirements, delivery and feedback mechanisms with different user groups (in line with the National Framework for Climate Services): In agreement with selected users, and through pilot and tailored information for target audiences, MettelSat will trial, modify and develop appropriate formats and timings of hydromet information. The focus will be the definition of hydromet information requirements for end users. This component will target beneficiaries with a gender-disaggregated approach. Within this context, the delivery of information to the media (radios, TV, newspapers) should also be strengthened.
 35. Sub-component C.2 - Develop customized products and services made available to user groups through dedicated interfaces: In order to assist the forecasters in making different products



tailored to the users' needs, a Central Production System will be specified, procured and installed, using Numerical Weather Prediction and all available data to provide cutting edge products for public weather services, for early warning systems, as well as for climatology and other climate services. Climate data rescue, digitization and integration of non-electronic records will be also taken into account. Specific attention will be paid to develop services for flash flood warning and application to agriculture.

36. Component D - Project Management. The sub-components include:

37. Sub-component D.1 - Coordination and technical implementation support: This sub-component will finance the following activities:

- Steering Committees
- Preparation of the ToRs for the Management firm (design, monitoring and evaluation)
- Preparation of the ToRs for the Observation, ICT and Logistical firms
- Support to execution two months/year during three years including technical management of firms
- Assistant to the coordinator
- Monitoring and evaluation
- Other operating costs

38. Sub-component D.2 - Fiduciary and safeguard aspects and audit. This sub-component will finance the following activities:

- Financial management
- Procurement
- Accounting
- Environmental and social management framework (ESMF)
- Environmental and social safeguards
- Operations manual
- Internal audit
- External audit

Table 2: Project financing and LDCF support

| Component, Sub-Component and indicative budget (US\$) | LDCF | GFDRR | Total |
|--|------------------|----------------|------------------|
| Component A - Institutional and regulatory strengthening, capacity building and implementation support | 1,178,000 | 400,000 | 1,578,000 |
| A(i) - Reinforce the legal and regulatory framework of MettelSat in order to develop partnerships and Standard Operating Procedures (SOPs) for delivery of service | 148,000 | | 148,000 |
| A(ii) - Strengthen the Quality Management Systems to raise standards and quality control/verification procedures across the institutions | 325,000 | | 325,000 |
| A(iii) - Implement a long-term and on-demand capacity development and training program for staff | 705,000 | 400,000 | 1,105,000 |



| | | | |
|--|------------------|------------------|------------------|
| Component B - Modernization of equipment, facilities and infrastructure for basic observation and forecasting | 3,047,000 | 1,415,000 | 4,462,000 |
| B(i) - Hydrological and meteorological monitoring networks (small-scale rehabilitation of priority stations and installation of new sensors) | 1,934,500 | | 1,934,500 |
| B(ii) - Transmission, data management and data dissemination hardware | 37,500 | 400,000 | 437,500 |
| B(iii) - Refurbishment of facilities needed to support the services | 900,000 | 465,000 | 1,365,000 |
| B(iv) - Technical systems and software for performing meteorological, hydrological and climate modelling and forecasting | 175,000 | 550,000 | 725,000 |
| Component C - Improvement of hydromet information service delivery | 481,000 | 775,000 | 1,256,000 |
| C(i) - Define requirements, delivery and feedback mechanisms with different user groups (in line with the National Framework for Climate Services) | 143,000 | | 143,000 |
| C(ii) - Develop customized products and services made available to user groups through dedicated interfaces | 338,000 | 775,000 | 1,113,000 |
| Component D - Project Management | 623,452 | 110,000 | 733,452 |
| D(i) - Coordination and technical implementation support | 432,452 | 74,000 | 506,452 |
| D(ii) - Fiduciary and safeguard aspects and audit | 191,000 | 36,000 | 227,000 |
| Total | 5,329,452 | 2,700,000 | 8,029,452 |

I. Coordination and complementarity with other projects

39. The National Steering Committee (NSC), chaired by a representative of the Minister of Transport and Means of Communication and composed of representatives of key ministries and institutions will ensure coordination and coherence between the project and i) national institutions having a stake in hydromet services, and ii) other relevant Bank-supported projects and programs funded by other development partners in the DRC.
40. The NSC will establish a mechanism, as part of its communication and outreach strategy, to promote coordination and complementarity among all relevant programs, projects and stakeholders, with the aim to avoid overlaps and duplication, facilitate data sharing across project coordinators and institution-beneficiaries, and maximize service delivery potentialities to users.
41. The project is directly complementary with two other Bank projects also co-funded by the LDCF, namely, the Urban Development (P129713) and the Western Growth Poles (P124720) project. LDCF resources will be used to increase the number of beneficiaries of these projects, as some of the nine cities supported by the Urban Development Project and its additional financing could be used as some for the six to ten pilot sites for early warning in urban municipalities in relation with heavy rains and resulting flash floods. In addition, farmers and agriculture workers that are already benefitting from the Western Growth Poles Project will be targeted in priority by the project in relation with provision of customized agro-meteorological products and services. This



will include the production and delivery of agro meteorological forecasts, development of an information platform and offer of weather and climate related trainings adapted to the needs of farmers.

J. Public Participation and Consultations

42. The success of any intervention requires the active involvement and participation of the different stakeholders. Key stakeholders for the project include (i) ministries, local governments and other public institutions implementing the project and/or benefiting from it, (ii) cooperating partners, NGOs, and Civil Society Organizations (CSOs) involved in direct support, and (iii) communities that are living in the targeted urban and rural areas, including the participation of potentially vulnerable groups such as women who may not have a voice in the decision-making processes. Stakeholder consultations are a necessary means to understand the views of the people who may be affected by a project or may have an interest in its outcome, as well as to inform them about changes that could affect them. Consultations are not only an important part of development process, but also a requirement of some Bank policies. In line with World Bank policies, broad-based community consultations as well as consultations with national, regional and local level authorities and CSOs were held for the project to identify potential environmental and social impacts, how such impacts could best be mitigated, whether there are design alternatives, and what could institutional arrangements look like, among other issues. The outcome of these consultations and resulting recommendations are reported in the project's Environmental and Social Management Framework (ESMF). A validation workshop of the ESMF was conducted to ensure ownership and support for the project and discuss program design. Participation of different stakeholders will continue throughout project implementation; as for instance affected communities and CSOs take part in the implementation and monitoring of the safeguards provisions.
43. Appropriate and transparent criteria will be established to promote public participation and for any activities requiring a selection process of organizations/groups/beneficiaries. The Project will implement a mechanism for addressing grievances and complaints starting at the local level to ensure quicker and pragmatic solutions to disputes.
44. The project promotes implementation of the National Policy on Gender aiming not only at implementing the constitutional principles of equity and respect of human rights, but also at activating the national and international government commitments for the promotion of equity and gender. Given the importance of the traditional participation of Congolese women in natural resource management and in assuring household food security during times of crises, rural and urban activities will explicitly support a gender-sensitive approach. To ensure compliance with these objectives the Project Implementation Units will have staff experienced in community participation and gender.



Annex 7: Map

