**Strengthening climate information and early warning systems in Eastern and**

**Southern Africa for climate resilient development and adaptation to climate change – Global**

**Programme completion report**

**December 2019**

1. **Basic Information**

 Project ID: 00087832

Period: From January/02/2014 to December/31/2019

MIE: UNDP

Total Project Cost: 3,760,000.00

Project Cycle Management Fee Charged by the Implementing Entity: 376,000.00

Amount of Financing Requested: 4,136,000.00

1. **Key Milestones**

|  |  |
| --- | --- |
| **Project Document Signature:** | January/02/2014 |
| **Date of first Disbursement:** | January/31/2014 |
| **Terminal Evaluation Date:** | December/2019 |
|   | **Project Operational Closure:** | December/2019 |

1. **Project overview and description**

Recognizing their need for good quality hydromet information to support their development and implementation of effective adaptation plans, LDC partner countries requested donor support. In response these requests, the LDCF in 2014 approved $50 million for assistance to improving hydromet services in 11 African LDCs (see Figure 2) through approval of national climate information and early warning projects. UNDP, under instruction of the LDCF, initiated CIRDA to provide global technical support to these countries in the form of highly technical expertise and technology transfer.

The LDCF, under request of the 11 partner countries, specifically charged CIRDA with promoting innovative, sustainable approaches that would empower the NMHSs to carry out several critical functions. These included enabling the NMHSs to not only make local hydromet observations, but also combine such observations with model output and satellite observations to produce and deliver to users high-quality hydrometeorological and climatological analyses, skillful weather forecasts, credible seasonal to interannual climate outlooks, and timely early warnings.

In delivering this charge, the goal of the GEF LDCF was to move the development program from a traditional narrow focus on acquiring and deploying yet more hardware, to one that emphasized identifying and meeting the needs of end users, particularly those of the poorest and most vulnerable. The objective was to respond to immediate needs while building the capacity to support effective climate change adaptation in the longer term.

A CIRDA support team of experts - meteorologists, hydrologists, engineers, economists, administrators, and private sector advisors – worked closely with the NMHS staffs for the duration of the program. The technical experts all had extensive prior hands-on experience in selecting and deploying hydromet monitoring equipment in local- and national-scale observing networks, as well as applying the resulting data streams to the development, production, and delivery of useful products and services. The CIRDA team supplied expertise in management of funds, procurement actions, and arrangement of all aspects of annual CIRDA workshops and other meetings. The existence of a single (multi-lingual) technical team with exceptional experience and credentials allowed for a high level of support and information sharing across the 11 CIRDA countries. A project director was also employed in each country to assure full-time, locally based consultations with country officials, civil society, and the private sector, and coordination with the technical and administrative teams.

1. **Results and key outcomes**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of Indicator** | **Indicator** | **Baseline** | **Progress since inception** | **Target for Project End** |
| **Project Objective: To ensure that all****components of the****climate monitoring,****forecasting and early warning systems in each country participating in the****multi-country programme are able to deliver timely****information and****warnings, utilizing****appropriate****technologies and****scientific knowledge in a sustainable manner** | Level and quality of technical support and backstopping provided is adequate and has significantly contributed to the delivery of the multi country programme as measured through the capacity assessment scorecard. | Limited or no technical support and backstopping currently accessible to countries. | During the project’s lifetime considerable support was provided by the CIRDA team in identifying potential partners to enhance CI/EWS systems and their sustainability, developing tailored trainings to countries in data assimilation, integration, digitalization. CIRDA exports worked with all 11 partner countries in assessing their needs for met equipment, identifying suitable options and in developing procurement tools in the form of LTAs to meet these challenges. Regional workshops where held in an annual basis and their usefulness and relevance was consistently evaluated, training modules where developed and available for not only national partners but for countries in general. Missions by team experts where deployed to all 11 national partners and knowledge management in the form of regional market studies and lessons learned where developed. This enhanced the scope of achievement of national projects. Capacity scorecard results per final PIRs* Benin- Capacity reported as enhanced for national institutions this was confirmed in the project’s TE however a score card score was not explicitly provided.
* Burkina Faso- 176 (baseline 74 and target was 161)
* Ethiopia: Terminal evaluation rated this achievement as satisfactory
* Liberia: Capacity assessment score rating was not used however credible evidende in both Terminal Evaluation and PIR regarding capacity enhancement of all NHMS team in equipment maintenance and forecasting through training missions and expert support.
* Malawi: The capacity scorecard rating has increased from a baseline of 72 across men and women from the project start to an average scorecard of 143 which has exceeded the targeted 121
* Sao Tome- Capacity reported as considerably enhanced both in training to NHMs and stakeholders and in equipment procured working and integrated to national systems.
* Sierra Leone- 161 (baseline 45)
* Tanzania- capacity scorecard rating not assessed rather achievement measuring was based on overall assessments of project interventions and progress made toward achieving the project outcomes. These indicate enhanced the capacity of Tanzania’s Meteorological Agency and Ministry of Water and Irrigation to monitor (and forecast) droughts and floods and advocate for effective use of hydro-meteorological and environmental information for making early warnings and long-term development plans in project pilot districts (namely Liwale and Arumeru) through access to enhanced observation equipment and monitoring capacity.
* Uganda: Capacity of Agencies to produce early warning information has increased from 92% in 2017 to 99% in 2018(50.5 out of target 51) attributed to quality assurance of weather services, bench-marking exposure visits to the South Africa Weather Services and various in house training; The capacity to package information increased slightly from 89% in 2017 to 92 (35 out of target of 36) again due to in house training of Uganda National Meteorological Authority (UNMA) and Directorate of Water Resources Management (DWRM) staff by suppliers of weather equipment, and Quality Management Expert from the Kenya Meteorological Department; capacity to disseminate information has remained at 100% (target of 36 out of 36) for UNMA, and did not change for the DWRM as installation of the hydrological stations were completed a month to end of the project ; and capacity of legislative and governance has slightly increased from 81% in 2017 to 85% in 2017 (15 out of 16
* Zambia: There has been capacity increase from 80 to 156 per the capacity scorecard, which represents 91% increase since the inception of the project
 | Each country has receivedsignificant and useful technicalsupport. |
| **Outcome 1:Enhanced capacity to monitor and forecast extreme weather,****hydrology and climate****change** | 1. Average percentage of national coverage of weather/climate and hydrological monitoring infrastructure across all countries | Average percentage national coverage ofweather/climate and hydrological monitoring network at the beginning of the project | National project PIRs indicate an improvement in coverage across all 11 country partners. * Benin: Specific target regarding coverage was not listed however national coverage is listed as expanding due to procured equipment
* Burkina Faso: increase 100% NHMS optimal monitoring arrangement (baseline 25% and target was 75%)
* Ethiopia: terminal evaluation listed achievement as moderately satisfactory with coverage increasing to 57% but not hitting target
* Liberia: Coverage percentage not listed however project procured and installed all of target equipment for coverage. In case of AWS it was 11 (target 9) stations. All hydro and met stations providing real time and continuous monitoring. Using CIRDA LTA an an Integrated Water Resource Management System (IWRMS) for Liberia was established.
* Malawi: Installation of 10 automatic weather stations has increased the network coverage from 33% to 72%. National coverage of operational surface manual hydrological stations with Department of Water Resources (DWR) has increased from a baseline of 52% at the start of the project to 65% and surface manual has increased from a baseline of 85% at project start to 90%. National coverage of automatic hydrological stations has increased from a baseline of 19% to 60%.
* Sao Tome: increase to 60% (target) national coverage from baseline of 20%
* Sierra Leone: Target has been achieved. The National coverage which was based on number of district has increased to 66% hitting the target of 60% as nine out of the then 12 districts have optimal monitoring arrangements. At baseline it was two district.
* Tanzania reached 75% coverages of all national territory has been covered by an automated network, and the target has been met. Baseline stood at 30%.
* Uganda: national coverage of the operational weather stations has reached 47% (100% of project target). In terms of national coverage under 1.2,, 46% (52 out of the 112 districts in the country) have weather stations. And, under 1.3, the status of national coverage for rain gauges/manual stations has remained at 26%. (Baseline 10%, 9% and 1% respectively).
* Zambia: The project has been able to deliver on its targets on the provision of 28 AWS equivalent to 39% of the districts against the target 29%, contributing a total of 41% of the country’s total AWS network. Further the project facilitated the rehabilitation of all 39 manual stations in the country representing 54% against 37% of the target. The network is fully functional and provides real time data since 2015 except for the Kafulafuta that was installed in early 2017. The increased network has resulted in ZMD producing timely and accurate weather and climate information which is disseminated nationally and internationally (See: www.zmd.gov.zm).
 | Increase of at least 10% averagenational coverage of functional CI/EWS system |
|  | 2.Average frequencyand timeliness ofclimate-related dataavailability | Average frequency of datatransmission and collection at thebeginning of the project.. | National project PIRs indicate an improvement in transmission in all 11 partner countriesBenin: Water level of main rivers is transmitted daily tto EWS server as per target (baseline monthly)Burkina Faso: Daily data transmission increased from baseline monthlyEthiopia: every 15 mins (beyond daily target)Liberia: Real time data is being provided with information from new station being continuously sent. Malawi: The Department of Climate Change and Meteorological Services (DCCMS) is now making hourly Observation in all 58 AWS, 4 times observations in all 21 Conventional stations. The DCCMS is also able to make hourly Observation in all 63 AWS, 4 times observations in all 21 Conventional stations.Sao Tome: Daily data transmission (target achieved) done automatically every 15 mins. This has resulted in updated forecasting at 6 hour intervals. Sierra Leone: Daily data transmission frequency now in operation in comparison to monthly transmission at baseline. Tanzania: stations are connected to server in Dar es Salaam, Mtwara and Moshi and transmission of data to TMA is made after every one hour through GPRS system overreaching target. Uganda: Information is being provided in real time. This has resulted in Seasonal forecasts have been provided with a lead time of one week. Agro-met stations are giving reliable information for ten days (dekadal) weather information as well as bi-weekly and monthly advisories.Zambia: Real time data is provided online (see above indicator) baseline stood at daily recordings but integrated by ZMD with a larger time lag. | Average frequency of datatransmission and collection at theend of the project. |
| **Outcome 2:Efficient and effective use of hydrometeorological information for generating early warnings and supporting long term development plans** | 1 Percentage of population with access to improved climate information and flood and drought warnings | Currently low levels of access to improved CI and drought/flood warnings | National project final PIRs state: Benin- % increased not assessed however there is evidence cited in PIR and in terminal evaluation that target was reached due to targeted agro alerts, flooding EWS targeting all flood prone population and use of media such as radio and television alerts. Burkina Faso: increased to 50% (target) from baseline (5% women and 10% men)Ethiopia: terminal evaluation listed as moderately satisfactory with increased overage but not monitored consistently to have percentage Liberia: an Integrated Water Resource Management System (IWRMS) for Liberia has been established for general use. Furhter, A new weather website has been developed and was launched on July 22, 2018. This website, hosted and managed by the Ministry of Transport, publishes weather information for public consumption.Malawi: According to the 2017 comprehensive baseline study of early warning systems in Malawi, 42.74% of the population has access to improved climate information and warnings (7,265,800 people); 83.37% of the population get warnings in time (baseline 10%). Should be noted that not all of this achievement can be attributed to the CI/EWS project. Sao Tome: 80% of the population with access to improved climate information and flood, drought, strong wind and coastal warning (target 50% and baseline 30% men and 20% women)Sierra Leone: Target has been achieved with 50% men - 50% women currently accessing improved climate information is achieved from a 0 baseline. Tanzania: Over 70% of residents in the targeted areas benefited from improved climate information and early warnings (baseline 30%)Uganda: About 10% (83.3% of target) of men and 8% (66.7% of target) of women now have access to weather and climate information nationwide. This represents an average of 75% achievement against the end of project target (baseline was 3%)Zambia: 100 % of men and 100 % of women in target areas from a 0% baseline.  |  Percentage increase in population who have access to improvedEWS/CI |
| 2 Number of development frameworks that integrate climate information in their formulation | currently few development frameworks incorporate climate change information | Benin- no information cited on this indicatorBurkina Faso: 2 of the PRSP policy briefs now incorporate analyses of risk maps and/or climate change projections influencing long-term planning proposals. These are the National Social and Economic Development Program (PNDES) and National Adaptation Plan – both of which take into account analyses of climate risk maps.Ethiopia: Listed in the TE as satisfactory with the objective and outcome targets of the project have been incorporated in the pillars of NMAandHWQD sector-specific GTPs. NMAs GTPIIis aligned with global and regional perspectives including the Integrated African Strategy on Meteorology (IASM). HWQDs GTPIIaims to upgrade all hydrology stations with telemetry. Ethiopia’s second National GTP (2015-2020) incorporates targetsfor delivery of meteorological forecasting and early warning services including: “preparation and dissemination of short duration weather forecasting reports twice a day; midterm weather forecast on daily basis; 1-5 days cities weather forecast which could be updated daily as well as regional midterm weather forecast which could be updated yearly”.Liberia: The partnerships have been established to movize and better awareness has been made. However, target was not reached during project lifetime (PIR reporting)Malawi: The first ever National Disaster Risk Management Policy of 2015 and Climate Change Management Policy are in in place. A first ever Meteorology Policy was finalized and awaits Cabinet approval.  2 District Development Plans have integrated Climate information and these have even been supported at urban council level, which has never been the case before as focus has been on rural areas. Sao Tome: Sectorial strategies and plans integrate now the risks associated to CC (no number is cited). In order to add some quality and celerity to the CONPREC communication system, the project has developed a "Standard Operational Protocol of Communication” which will be made operational in 2019.Sierra Leone: Progress towards the target of at least 2 (target set) of the PRSP policy briefs incorporate analyses of risk maps and/or climate change projections influencing long term planning proposals is achieved with the development of the hazard profile, land policy and the drafted Climate Change Strategy and Action Plan by the Environment Protection Agency of Sierra Leone.Tanzania: project has improved the integration of climate information into early warning systems and short and long-term plans in the pilot districts (Liwale and Arumeru). The project has developed guidelines for updating local land use plans, district strategic development plans and district budget plans in light of emerging climate information, flood forecasts and economic scenarios for Liwale and Arumeru Districts. The guidelines were used to update local land use plans, district strategic development plans and district budget plans in light of emerging climate information, flood forecasts and economic scenarios.Uganda: 3 sectors have been able to integrate climate and early warning information in their policies and plans that are at different stages of review or development. These include Ministries of Water and Environment; Agriculture, Livestock and Fisheries and Office of Prime Minister. The policies and strategies include: Water policy and Act; the National Environment Policy and Act; Disaster Preparedness and Management Policy and Bill; and Climate Change Bill under development; and Agriculture Sector Development Investment Plan and Climate Smart Agriculture Strategy.Zambia: At the national level, climate change has been integrated into all pillars of the 7NDP which is the key policy document for the Government in implementing the national agenda. One of the major transformation in the use of weather and climate information at the district level is the weather related impact actions. At the district level the project facilitated the organization of the multi-sectorial District Disaster Coordinating Committee (DDCC). The weather and climate information produced supports policy and planning among the different sectors represented in the DDCC. Further the DMMU focal points in the districts use the weather and climate information to update the disaster risk reduction activities  | At least 3 sectoral development frameworks (at national, subnational and sector level) incorporate analyses of risks based on climate change projections andtake into account costs and benefits of adaptation. |

1. **Lessons learned**

During the years the UNDP CIRDA Programme was active in the 11 countries, the technical and administrative teams learned several lessons that should be considered by all groups attempting to address the challenges that faced this program.

1. **It takes a continued and near constant effort to form partnerships**. For example, aiding Sub-Saharan NMHSs and associated government agencies in the adoption of innovative technologies and techniques requires the building of effective partnerships between the government, NMHS, private weather companies, cell phone companies, and other partners, public and private. Frequent face-to-face discussions over a period of months appear to be a necessary early step in most cases. Building these partnerships among the many stakeholders needs extensive effort; a sustained effort over a decade or more may be required. A complicating factor is that each NMHS is unique, so what works in one country may not work elsewhere. The senior administration and the technical staff in NMHSs can change during the development of such relationships. This may necessitate starting over and explaining rationale and arrangements for working with the private sector.

In this sense, the country partners of the UNDP CIRDA Programme can claim several accomplishments. Perhaps the most important of these was the introduction to many in the middle and senior management levels of the NMHSs of the notion of end-to-end systems planning, with fully integrated hardware, data processing, and communications, as opposed to the purchase of bits and pieces of hardware and software, with limited support for overall integration. This concept is now increasingly part of more recent donor funded projects as reflected in recent proposals to the Green Climate Fund.

In several of the 11 countries, with the technical support of the CIRDA team, the NMHS started viewing cell phone service companies as key partners for the collection of observations and other data and the delivery of services. The CIRDA team facilitated the dialogue between NMHSs and cell phone companies to discuss hydromet services. Cell phone companies were invited to participate in CIRDA workshops, and a representative of the international cell phone association, the GSMA, participated in a CIRDA program at the meetings of the UN Framework Convention on Climate Change in Morocco in December 2016.

CIRDA held workshops that facilitated linkages between NMHSs and a 3-2-1 free dialing service in Africa developed by a nonprofit NGO, Human Network International (HNI, now a for-profit venture, Viamo) . Some of the cell phone services, particularly those in competitive markets, began to see that hydromet products could be a competitive advantage for the company, making possible a mutually beneficial arrangement with the NMHSs. Such an arrangement, however, requires the NMHS to routinely generate a high-quality product suite suitable for delivery by cell phone to farmers, fishermen, herdsmen, and others, which will drive paying customers to the cell phone service.

1. **Cost efficiency**. Having multiple countries procure the same equipment had the advantage that experiences could be shared, some training could be conducted in a large multi-country group format, and teams from one country could assist another in initial installation. In addition, the CIRDA technical team became expert in troubleshooting installation and communication problems with equipment provided under the LTA. Because of these results, the CIRDA Programme significantly increased the functional observing infrastructure in several countries. Hence, the CIRDA approach to providing multi country assistance to 11 national projects proved to be successful and an important input in helping national projects achieve individual project goals.

Long Term Agreements (LTAs) for both meteorological and hydrological needs were established through open competitions among numerous potential suppliers. In addition to hardware and software, they included options for both technical and training support, and assistance with installation and operation. The procurement of hardware, software, and services through a UNDP LTA was very different from the traditional series of single purchases, each requiring development of an RFP, conducting a bidding process, and other procedures. The development of the RFP that produced the surface-based observing systems LTA was a significant technical challenge and a major early task for the CIRDA technical and administrative teams. After an open, competitive bid process, only two firms were found to have submitted fully qualified proposals, Earth Networks and Ubimet. Subsequent similar processes resulted in additional LTAs covering hydrologic observations. The CIRDA team also arranged for use of an LTA approved previously for a World Food Programme project that allowed for procurement of more traditional AWS from ADCON. However, the impact of these procurement tools where significant in helping accelerate procurement while ensuring that quality from providers was consistent and appropriate to national needs and capacities. While not required, NMHSs had an incentive to use the LTAs because delivery of the procured equipment and services was greatly simplified and much faster. A procurement could be implemented with reduced administrative and technical demands on the NMHS and UNDP country office staff.

Nonetheless , an important challenge in the procurement of equipment was the inability to have a team of experts in place before projects were initiated. The realities of international development assistance require that financial arrangements need to be finalized before staff can be hired; consequently, team members were unable to assist with the initial program plans. Ideally, experts would assist with project preparation from the very beginning identifying gaps and potentials. A second best option is for a sequence in which national assessments of the capabilities of participating countries would be done first to tailor programs to meet country needs. For example, it might be better to focus on professional and technical training and external data services than on deploying yet another hard-to-sustain surface observing network. Such an assessment was done in Uganda by a U.S. supported project and provided the CIRDA team with a helpful baseline (UNDP, 2016).

1. **Long term sustainability of project objectives.** The implementation of a PPP- and services-based approach by an NMHS was identified as a potential solution to address the constant lack of budgets by NHMS. As this would ideally lead to the provision of commercial-grade tailored services to the various weather-, water-, and climate-impacted sectors of the national economy. Such customized services would be provided on a user pay basis. This would result in a revenue stream that could offset in part the annual cost of NMHS operation and help ensure that high-quality products and services remain freely available to the general public. This PPP model is in line with the ambits of the WMO resolution 40, as well as national conventions in most countries that require government departments/agencies to be more commercially oriented to cover operating costs. Similar programs will benefit from identifying and promoting transnational opportunities for greater regional cooperation and collaboration for multiple benefits, especially on rivers and lakes that are national boundaries. They should also identify and promote regional collaboration on early warnings of HIEs, since these events, especially thunderstorms and tropical cyclones, may track long distances, crossing several international boundaries.

Budget limitations for the maintenance of national project equipment and services were a consistent challenge and included a lack of sufficient funding to cover operational costs and related expenses, and a lack of authority for retaining revenue. While LTAs negotiated through the support of the UNDP CIRDA Team provided possibility of cost sharing opportunities and ensured negotiated prices, these where often too high for continued maintenance by NHMS themselves pointing to a key structural challenge in LDCs. In some countries, for example, aviation fees for weather support go back to the government’s general budget. In addition, NMHS staff are generally not trained with the business development skills necessary to develop revenue-producing arrangements with private sector companies

CIRDA supported a first-of-a-kind market assessment to identify potential for tailored weather information products, and the local markets for them, in each country (Mills et al., 2016; UNDP, 2018). The assessment (and a subsequent update) points to numerous opportunities for revenue sharing with potential to put NMHSs on a more sustainable financial footing, provided they can deliver quality products and services on an agreed upon schedule. Moreover, the outreach and new arrangements required to generate revenue are not readily achievable by many of the African NMHSs. Interest in public private partnerships and revenue sharing has grown steadily since the 2016 CIRDA report A New Vision, with subsequent reports (Usher et al., 2018) and proposals for new policy directions within WMO (WMO, 2018b).

1. **Knowledge management matters**. The period during the design and initiation of the CIRDA Programme corresponded with a significant evolution in attitudes among hydromet experts toward engagement with private weather companies. As past failures, including some with considerable donor support, were acknowledged, PPPs came to be seen as worthy of further consideration despite legal, regulatory, and contractual challenges. A knowledge network brought together an expert team with staff from the 11 CIRDA countries on a regular basis to exchange experiences and address common problems, with specialized training and clinics.

More recently, WMO documents and officials (Thorpe, 2016) have referred to engagement with private weather companies as not only desirable but also perhaps essential for the survival of NMHSs in LDCs, leading to adoption of a Policy Framework for Public-Private Engagement (WMO, 2018b). Of some relevance to the CIRDA Programme, this Framework notes: “There are numerous case studies and practices present in various parts of the community today and examples from other sectors that can inform best practices for effective PPE to mitigate these risks.” WMO also now has an Executive Assistant for Public Private Partnerships to advise the Secretary General. Formal consideration of the issues associated with private sector engagement with NMHSs is planned for the 18th World Meteorological Congress in June 2019. The World Bank also expressed support for a full services approach and collaboration with the private sector in a 2019 publication, Weathering the Change: How to Improve Hydromet Services in Developing Countries. The results and lessons from UNDP’s efforts are thus particularly timely and relevant as WMO and other international organizations move toward consideration of new approaches and policies for cooperation with private weather information vendors.

1. **Online resources**

<http://undp-cirda.blogspot.com>

<https://www.adaptation-undp.org/projects/programme-climate-information-resilient-development-africa-cirda>