

# PROGRAMME TO MODERNIZE AND EXTEND HYDRO-METEOROLOGICAL INFRASTRUCTURE AND PROVIDE SERVICES APPROPRIATE TO USERS' NEEDS



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## Foreword

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This project note has been prepared in connection with CTCN technical assistance provided at the request of the Ministry of the Environment, Water and Forestry of the Republic of Guinea.

Apart from national economic development policies (Poverty Reduction Strategy Paper, Five-Year Development Plan, etc.), the Republic of Guinea Conakry has put together a series of policies to improve people's resilience in the face of the harmful effects of climate change. These include the National Adaptation Plan of Action (NAPA), the Initial National Communication and, more recently, the Intended Nationally Determined Contribution (INDC). This contribution provided an opportunity for Guinea to highlight the fundamental importance of taking account of climate change adaptation in the country's development process. The INDC stresses that adaptation is essential to anticipate the impacts of climate change and thereby reduce the costs and damage they cause. It also pointed out to the international community the huge efforts that Guinea needs to make to cope with the negative effects of climate change, as well as to shoulder its responsibilities in relation to the vulnerability of the West African sub-region. Implementation of the project ideas and strategies is, however, still very limited due to lack of the expertise needed to put together "bankable" projects that can be financed by climate donors.

This is the background to the request for technical assistance made by the Republic of Guinea, through the National Environment Department, to the CTCN (Climate Technology Centre and Network) to overcome this barrier to access to finance for adaptation projects.

This assistance has helped to support a community of "champions" to come up with consolidated project ideas. The present project, relating to **Modernization and extension of hydro-meteorological infrastructure and provision of services appropriate to users' needs**, is one of the five projects/programmes with strong climate change adaptation potential selected by the national authorities.

This concept note aims to present the broad lines of the project and enable potential funders to assess the relevance of the project with regard to the expected impacts and its own strategic orientations. The next step will be to determine the procedure for putting together a complete project file, taking account of the specific access requirements of each international donor.

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The **Climate Technology Centre and Network (CTCN)** fosters technology transfer and deployment at the request of developing countries through three core services : technical assistance, capacity building and scaling up international collaboration. The Centre is the operational arm of the UNFCCC Technology Mechanism, it is hosted and managed by the United Nations Environment Programme and the United Nations Industrial Development Organization (UNIDO), and supported by more than 260 network partners around the world.

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## Summary presentation of the programme

<b>Name of the programme</b>	<b>Modernization and extension of hydro-meteorological infrastructure and provision of services appropriate to users' needs</b>
<b>Programme area</b>	The programme is located throughout the territory of the Republic of Guinea.
<b>Main programme stakeholders</b>	Ministry of the Environment, Water and Forestry; Ministry of Transport; Ministry of Energy and Hydraulics; Ministry of Agriculture, Ministry of Planning and Co-operation; Ministry of the Budget, Ministry of Higher Education and Scientific Research; Private sector.
<b>Summary</b>	The five-year programme aims to establish appropriate, sustainable conditions for the Meteorology and Hydraulics Departments to meet the urgent needs of users, whose number is increasing day by day, and to boost climate resilience based on high-quality information from reliable national databases. Rehabilitation of infrastructure to create a decent working environment, optimization of the hydro-meteorological networks and local capacity-building through training (of all kinds), together with coverage of the financial needs relating to the operations over the long term (operation, servicing and maintenance), are therefore key programming priorities in supplying services appropriate to users' needs, ensuring resilient development and climate change adaptation in Guinea.
<p><b>Goal:</b> Encourage climate change adaptation in Guinea and the West African sub-region by developing and sustainably strengthening the systems and capacities of the National Meteorology and Hydraulics Departments with a view to making appropriate hydro-meteorological and climatological services available to users.</p> <p><b>Specific objectives:</b>  <b>SO1</b> - Rehabilitate, modernize and extend the meteorological and hydrological observation networks.  <b>SO2</b> - Ensure sustainable, long-term collection of hydro-meteorological, piezometric and climatological data.  <b>SO3</b> – Offer high-quality hydro-meteorological services appropriate to users' needs, enabling a wide range of players (government departments, private sector, communities and farmer organizations) to improve their decision-making processes in respect of adaptation strategies.</p>	

**SPECIFIC OBJECTIVE 1 :**

**Result 1: The meteorology and hydrology services' observation networks are extended and modernized.**

**Principal activities planned:**

**R1A1** – Drawing up an inventory of the hydro-meteorological networks.

**R1A2** - Acquisition of technical and specific data collection equipment for the meteorological and hydrological stations and establishment of a piezometric network.

**R1A3** - Upgrading of computer and on-line systems capable of managing hydro-meteorological databases.

**SPECIFIC OBJECTIVE 2 :**

**Result 2: Local and central State services enjoying working conditions that enable them to carry out their tasks appropriately and sustainably (maintenance, data collection, etc.)**

**Principal activities planned:**

**R2A1** - Rehabilitation of the reception infrastructure of the meteorology and hydrology services at central and local level.

**R2A2** - Acquisition of means of transport for the operation of the hydrology and meteorology networks.

**SPECIFIC OBJECTIVE 3 :**

**Result 3: The national departments produce robust, reliable data and are able to provide appropriate services to users.**

**Principal activities planned:**

**R3A1** - Capacity-building for all the senior staff of both services.

**R3A2** – Launch of a forum for all stakeholders to discuss the economic model of the hydrology and meteorology services.

**R3A3** - Consultation workshops bringing together the two Departments and users to identify needs and propose appropriate services.

<b>Total project term</b>	<b>5 years</b>
<b>Budget estimate</b>	<b>USD28 million</b>

# 1 Programme description

## 1.1. Programme background and issues

### 1.1.1. Colossal gaps in recording and analysis of hydro-meteorological observations

☞ **Infrastructure for the acquisition of meteorological, climatic and hydrological data has become obsolete and inadequate, despite some ad hoc improvements**

Acquisition and processing of meteorological, climatic and hydrological data are primarily handled by two administrative services: the National Meteorology Department (DNM) and the National Hydraulics Department (DNH).

The **National Meteorology Department** is one of the oldest administrative services in Guinea. According to the archives, the first climatic observations by this service date back to March 1897, in Beyla prefecture. The Department's mission is to provide all users with appropriate meteorological and climatological information with a view to contributing to the security of persons and property, socio-economic and cultural development, environmental preservation and operation of the basic meteorological infrastructure essential for service provision.

The main activities of the DNM are geared towards observation of atmospheric phenomena, analysing, interpreting and forecasting the latter, research, archiving and applications in the various sectors of socio-economic life, including transport, agriculture, energy, health, housing, etc., and studying the climate and its variability and changes.

To carry out its mission, the DNM has a central department in Conakry and local State services in Conakry and the various prefectures in the country. The Meteorology Department in Conakry comprises three divisions (each with three sections) and an administration and financial service (SAF).

The local services comprise meteorological observation and telecommunications stations structured as follows: 12 synoptic stations, 23 climatological stations, six agro-meteorological stations, 1 atmospheric radiosonde station, 1 maritime station in Conakry and 33 classic rainfall stations.

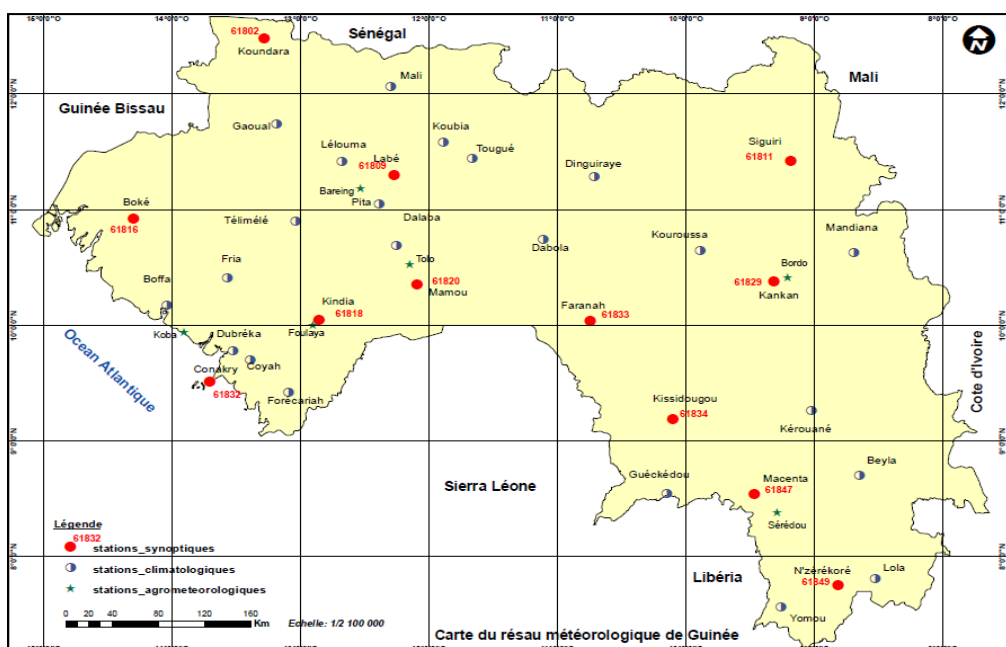


Figure 1 Current map of Guinea's meteorological observation network

Total staffing is 202 as against the 316 shown in the organization chart, of which 159 are men and 43 are women. There are 132 engineers, 53 engineering assistants and 17 technical staff. So far, 44 members of staff have left the service. Some newly recruited young managers have been retrained in the basics of meteorology and their skills are essential.

The National Meteorology Department has inherited buildings from the colonial era, which are used as offices and accommodation, as well as land and instrument parks at the observation stations. Overall, this meteorological infrastructure is in a state of advanced decay. The meteorological observation areas lack fencing, exposing the equipment to acts of theft and vandalism of all kinds and damage from wandering animals. These sites of some meteorological stations are no longer representative, as the land has been overrun by local communities and in some cases taken over or threatened with expropriation by the local authorities. It should be noted that rehabilitation of infrastructure has been programmed for around 15 years and some activities have been undertaken, but contractors have had to give up in the absence of payment.

To carry out its task of implementing national water resource management policy (Evaluation, Regulation and Planning), the National Hydraulics Department (DNI) has a central service based in Conakry and local services (regional departments) established in the regional administrative centres. The Hydrology Division deals with evaluation of water resources through the regional departments. The Division is responsible for the quantitative and qualitative inventories of surface and underground water. The DNI has 187 members of staff, of which 122 are in Conakry and 65 in the interior.

The first limnometric observations began at the beginning of last century at Kouroussa station (1909). The number of stations continued to grow after 1954, reaching a maximum in 1983 (63 operational stations). Between 1990 and 2007, the number of stations monitored has varied from one year to the next (between 31 and 60 stations depending on year, with an average of 46). Since 2008, the number of operational stations has gone down continually, reaching 18 stations in 2013. Most are in poor condition due to lack of maintenance and monitoring.

As regards reception infrastructure, the DNI has offices at central level, in a state of advanced decay requiring rehabilitation and extension. At local level, four out of seven regional departments have reception infrastructure in a very advanced state of decay; the three other departments only have the land.

➡ ***The structural resources to ensure continuous data collection and service are lacking despite growing needs: reinvention of the economic model of the observation and analysis services is essential***

The absence of operating funds for the DNI and DNI and their local services hinders the implementation of their operational programmes. Generally speaking, all the stations' various operating expenses come out of the managers' wages.

As regards the National Meteorology Department, the operation of the network depends on the acquisition and maintenance of observation, telecommunications, data processing and distribution equipment. All the equipment in the observation network is imported and generally funded by donations. It is over 25 years' old and of various brands, making it difficult to source spare and service parts. The lack of consumables is one of the main day-to-day difficulties in operating the stations. Many gauges are inoperative for want of loggers. Throughout the network, there is an appalling absence of wind and actinometry apparatus; barometers and thermometers are not calibrated due to lack of calibration instruments and standards. The barometer calibration centres

(pressure measurement) are very often established outside the country. The telecommunications network is inoperative between stations in the interior of the country and the capital (lack of transmission apparatus, lack of permanent electricity supply, batteries, acid, etc.). The service currently uses text messaging between stations. The link to transmit meteorological information between Conakry and the Regional Telecommunications Centre (CRT) in Dakar has been broken for more than a decade due to the renewal of the installations at the regional centre that the country did not follow up.

The only present possibility is to use the AMHS system for sending operational meteorological data in connection with aeronautical meteorology alone; although in use, this system is not adequate for meteorology where information exchange is more restrictive.

In addition, logistics for inspections and emergency action to maintain equipment are non-existent. The workshop to maintain classic and electronic equipment lacks genuine specialists and work tools. The SIOMA observation systems and data from the SADIS global meteorological data and product processing and distribution centres acquired in connection with the security and safety project for Conakry airport are beginning to display defects due to lack of financial resources to purchase spare parts.

At the same time, requests for hydrological, meteorological and climatological information have become more numerous and demanding and involve a wider range of users (contractors, energy and mining operators, tourists, researchers, etc.).

Special attention is paid to the development of renewable energy, which is one of the priorities in Africa these days.

#### ☞ ***Limited human capacities in a context of growing complexity of uses***

With the exception of the Niger watershed, the number of hydrometric stations is very far from sufficient. The situation is exacerbated by many errors and failings at each stage in the process, from the collection of data in the field through to its processing and storage. The status of the national hydrological observation network is therefore particularly worrying. The lack of material and operating resources is generally blamed but the main problem is now the notorious lack of qualified staff.

### **1.1.2. Increased needs due to the current and future demands of the fight against climate change**

#### ☞ ***Essential information to ensure resilient, low-carbon development in Guinea as well as the entire West African sub-region***

In Guinea, climate surveillance activities began more than a century ago and atmospheric phenomena have been systematically observed. The results of these observations have made a considerable contribution to the socio-economic development of both Guinea and other countries in the sub-region. All major works have been undertaken with precious backing from meteorological data.

This applies for example to hydroelectric schemes, which have made a huge structural contribution, not just in Guinea but the whole sub-region.

Water control in West Africa is one of the keys to securing agricultural production and electricity generation. Many major West African rivers (Niger, Senegal, Gambia, etc.) have their source in Guinea, giving that country the nickname "West Africa's water tower". The abundant water resources emanating particularly from the Fouta Djallon Mountains and the Guinean Ridge are of national interest, but also a major component of regional development. For instance:

- Three quarters of the water coming into the inner Niger Delta (in Mali) originates from the upper Niger watershed in Guinea and Mali (75% in Guinea) and the flow downstream through to the Nigerian border is heavily dependent on this;
- Water resources from the upper basin of the Senegal River in Guinea have enabled the construction of the Manantali dam in Mali and the supply of electricity in Senegal, Mali and Mauritania. New dam projects are under way or planned (Félou, Gouina);
- Etc.

The effect of climate change, however, means that the flow in water courses is likely to be reduced by more than 50% of the current daily average by 2100. It is expected that the flow of the Niger River may be reduced everywhere by 16 - 28% (sensitivity 2.5°C) and by up to 23 – 54% (sensitivity 4.5°C). These reduced flows have already been observed since the 1970s, in direct correlation with the reduction in average rainfall (Figure 2).

Given Guinea's strategic location upstream of the main West African catchment basins, choices in water resource management are bound to have impacts downstream beyond the Guinean borders. These international implications give Guinea even greater responsibility to ensure sound management of its resources in the current context of climate change<sup>1</sup>.

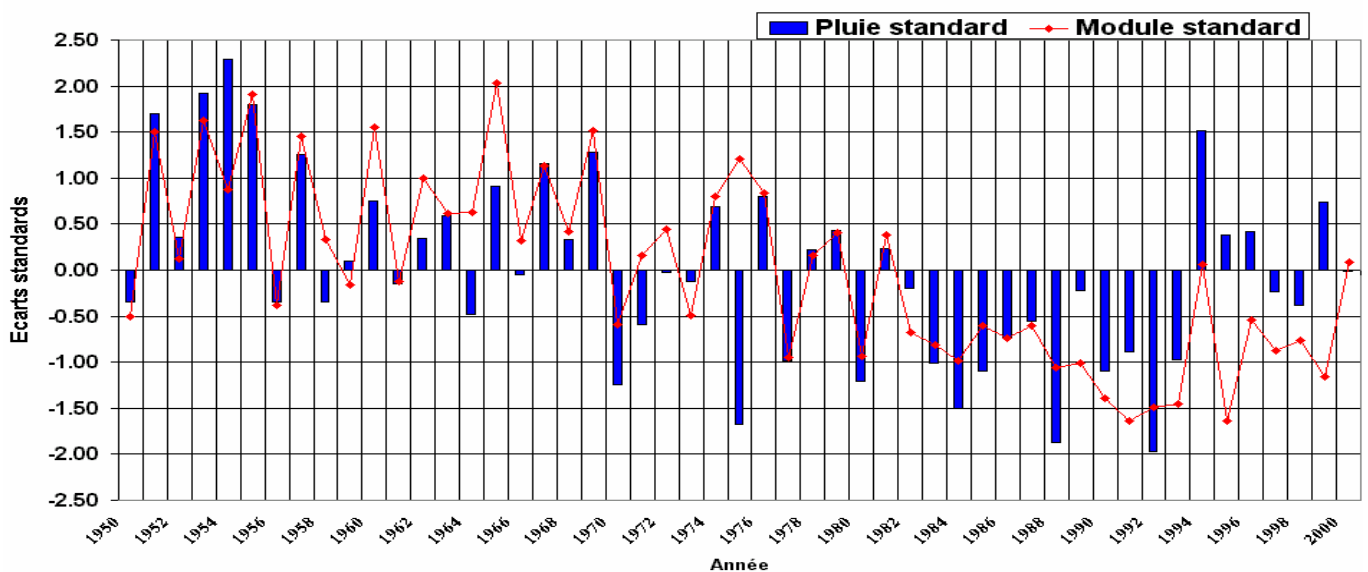


Figure 2: Standard rainfall and module of the Niger at Kouroussa

Exploitation of water resources requires good knowledge of hydrological regimes and especially flow characteristics on which to base decisions that are very often irreversible (construction and size of dams). This knowledge also relates to the distribution of water in time and space, helping to improve management of storage structures, the operation of the system and the study of the effects of man-made changes on the natural pattern of this distribution. It is of vital importance for both Guinea and its neighbouring countries (and even countries further afield such as Niger or Nigeria along the banks of the Niger River). Climate change increases the need for the most comprehensive, good-quality information throughout the national territory.

<sup>1</sup> Source: INDC of the Republic of Guinea, 2015

### ☛ **Guinea's essential contribution to the global observation network**

At global level, data collection is organized by a vast planetary programme known as World Weather Watch (WWW), which presently comprises a dozen or so meteorological satellites, more than 10,000 synoptic and climatological stations, 7000 volunteer weather ships, 900 high-altitude observation stations, 350 automated stations and more than 60,000 rainfall stations around the world. The Guinean meteorology service presently has 12 synoptic stations, 33 agro-climatic stations, one high-altitude observation station, one maritime station and around a dozen rainfall stations spread across the national territory.

Although the network is low-density, it enables Guinea to take part in global exchanges of meteorological information, the activities of the Intergovernmental Panel on Climate Change (IPCC) and so on.

Guinea joined the World Meteorology Organization on 23 March 1959. The aim of this specialist United Nations institution is to:

- facilitate global co-operation with a view to the establishment of networks of stations carrying out meteorological observations, as well as hydrological observations and other geophysical observations relating to meteorology, and encourage the establishment and maintenance of centres responsible for providing meteorological and related services;
- encourage the establishment and maintenance systems for rapid exchange of meteorological and related information;
- encourage the standardization of meteorological and related observations and ensure the uniform publication of observations and statistics;
- encourage the application of meteorology to aviation, maritime navigation, water problems, agriculture and other human activities;
- encourage activities in the field of operational hydrology and foster close co-operation between meteorology and hydrology services; and
- encourage research and education in meteorology and, depending on need, related fields and contribute to co-ordination of the international aspects of these activities.

Guinea has also signed agreements and conventions with other United Nations institutions such as the International Civil Aviation Organization (ICAO), Food and Agriculture Organization (FAO) and United Nations Environment Programme (UNEP). In this regard, the National Meteorology Department has a mandate to fulfil the provisions of these agreements through exchanges of data and products and the contribution of Guinean officials to the activities of those organizations.

## 1.2. Direct and indirect beneficiaries

The main benefits expected from the project will of course fall to the user community. In addition to the National Meteorology and Hydraulics Departments, the other participants in the project include the environment, energy, agriculture, livestock, fisheries, mines and (air, land and maritime) transport services, the farmers' federations, decentralized local authorities, research centres, universities, NGOs and scientific partners at national and regional level.

### 1.3. Internal and external programme consistency

The Initial Nationally Determined Contribution of the Republic of Guinea, submitted to the United Nations Framework Convention on Climate Change before COP21, sees the gaps with regard to reliable, robust climate data, as well as all statistical data relating to natural resource management, as a priority cross-cutting issue. Apart from Guinea's commitments vis-à-vis the rest of the world, better knowledge will encourage enlightened decision-making. In this regard, several initiatives have been launched in recent years, but have not succeeded in remedying the shortcomings on a long-term basis.

#### 1.3.1. Meteorology and climatology services

At national level, this project fits in with the concerns of the Guinean government which clearly states, in the letter of assignment sent to the Minister of Transport (No. 122/CAB P/2016 of 11 March 2016), that one of the key objectives of that department is to make appropriate meteorological and climate information available to all users as a contribution to the security of persons and property for the sake of the country's socio-economic and cultural development and preservation of the environment. The flagship activity will be to strengthen and modernize the meteorological data collection, transmission and processing network.

Internationally, following the 3<sup>rd</sup> World Climate Conference in 2009, it was decided at the highest level to set up a Global Framework for Climate Services (GFCS), which aims to enhance the production, accessibility, supply and operation of climatological services and forecasts based on scientific data. This global framework seeks to help people, especially the groups most vulnerable to climate uncertainties, to improve management of the risks and opportunities connected with climate variability and change. To achieve this objective, scientifically based data and forecasts need to be developed which can be incorporated in planning processes, policy-making and specific activities.

To meet the challenges, the Guinean government has developed several initiatives in co-operation with its development partners, including the UNDP, to improve the supply of reliable meteorological and climatological information to users, but these are unfortunately partial and limited whereas what is really needed is a kind of "Marshall Plan".

<b><i>"Enhancing the resilience and adaptation to the negative effects of climate change of vulnerable coastal areas in Guinea - RAZC" Project – Building the capacities of the National Meteorology Department</i></b>	In its National Adaptation Plan of Action (NAPA), the Republic of Guinea identified its areas of vulnerability in the face of climate change and set out adaptation measures. These observations showed that the coastal zone faces the biggest threat. To counteract the threat and reverse the current trend, the national meteorology service must play a leading role in putting together an environmental watch or early warning system. The project therefore commissioned a study to assess the capacities of the services responsible for producing meteorological and climatological data in Guinea with a view to reducing climate risks in the coastal zone. The results of this study led to a number of operational activities all designed to build the capacities of the National Meteorology Department through the purchase of meteorological equipment. In 2013, five (5) Automated Weather Stations (AWS) were purchased and installed in Boké, Boffa, Dubréka, Conakry (CERESCOR) and Forécariah. The data collected at these stations help to improve the weather forecasts provided to the public and meet the demands made by the various users.
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<p><b><i>"Enhancing the resilience of the livelihoods of farming communities in the Gaoual, Koundara and Mali prefectures in the face of climate change - REMECC-GKM" Project</i></b></p>	<p>In implementing component 2 of the project, which aims to set up a climate change information system to guide climate change-resilient agro-forestry practices, the DNM purchased five Automated Weather Stations (AWS) in 2016 and installed them in Gaoual, Koundara, Mali, Labé and Fria. In 2017, it is planned to purchase one AWS and three mini-AWSs comprising three gauges (temperature, humidity and rain).</p>
<p><b><i>"Adaptation based on ecosystems targeting vulnerable communities in the Upper Guinea Region – (AbE/HG)" Project.</i></b></p>	<p>To implement components 1 and 2 which deal with enhancing the resilience of communities vulnerable to climate change, the DNM is to purchase five Automated Weather Stations on behalf of the Project for the Faranah, Kissidougou, Kouroussa, Kankan and Mandiana prefectures. The programme is expected to launch in 2017.</p>
<p><b><i>WMO Data-Rescue Programme</i></b></p>	<p>In connection with implementation of the Global Framework for Climate Services (GFCS) of the World Meteorology Organization (WMO), the National Meteorology Department has received technical assistance from Finland via the WMO to speed up the rescue of Guinea's historic climate data from 1897 to date. This assistance, under the WMO data rescue programme, has enabled the purchase of a database server, computers to archive digitized data, digital cameras for reprographics, modern scanners and multifunction printers, etc.</p>
<p><b><i>MESA Programme</i></b></p>	<p>The DNM has purchased a PUMA 2015 satellite data reception system commonly known as MESA (Monitoring for Environment and Security in Africa). The aim of the MESA programme is to enhance capacity in respect of information management, decision-making and planning of African continental, regional and national institutions with responsibility for the environment, climate and food security. In terms of climate change adaptation, relevant information will be provided to policymakers, managers and planners on climate trends based on modelling to help put together appropriate strategies and build climate change-resilient societies and economies. This reception system was installed in September 2016 at the National Meteorology Centre (CMN) at Conakry's Gbessia airport.</p>

Past efforts have been very localized and the national meteorology service has received limited technical assistance. Operation of the equipment acquired in connection with these projects suffers from a lack of regular monitoring due to inadequate financial resources and logistics. No provision has been made for maintenance of the meteorological equipment. In addition, network coverage is restricted to the project areas. Areas which are just as vulnerable as others that were seen as a priority have been neglected, which is why this programme to modernize and extend hydro-meteorological infrastructure is the right solution to plan resilience to climate shocks.

### **1.3.2. Hydrology services**

The programme to modernize the hydrometric network and improve the hydrological database in order to develop reliable information to aid decision-making will fill a gap in a country which has one of the lowest levels of access to water supply and energy services, inhibiting prospects for developing economic activities, supplying basic social services and combating poverty.

It should be noted in this connection that the National Hydraulics Department (DNH), with support from the Development Research Institute (*Institut de Recherche pour le Développement - IRD*), has recently put together a detailed project proposal to improve the country's hydrological network and the management of the national database (BDH). This four-year project, with a total budget of €1.18 million, is mainly based on capacity-building activities and would include the following:

- Evaluation of the **technical, human and financial resources** needed for the programme, together with the potential risks, assumptions and sustainability factors over the five-year period;
- Analysis of the **necessary stages to come up with an optimum hydrometric network configuration** which could meet users' needs;
- Evaluation of the **institutional configuration needed** for the exploitation/operation of the hydrological network;
- Evaluation of **training needs and preparation of an action plan** for diploma courses and tailor-made and on-the-job training;
- Taking **steps to specify the necessary equipment** required to modernize the hydrological network and lay the foundations for a hydrological monitoring system;
- Specification of **activities to raise awareness** of the importance of collecting and processing hydrological data for the administration and authorities concerned.

As this project is currently at the fundraising stage, clear synergies are possible to avoid dissipating effort. A special partnership is therefore planned with the IRD in connection with this programme. The Institute had planned to co-fund the DNH project to the tune of €1 million by providing technical expertise.

## 1.4. Programme content

### 1.4.1. Strategic vision

This programme's strategic vision is to create appropriate, sustainable conditions for the Meteorology and Hydraulics Departments to meet the urgent needs of the ever-growing numbers of users and to boost climate resilience based on high-quality information from reliable national databases. Rehabilitation of infrastructure to create a decent working environment, optimization of the hydro-meteorological networks and local capacity-building through training (of all kinds), together with coverage of the financial needs relating to the operations over the long term (operation, servicing and maintenance), are therefore key programming priorities in supplying services appropriate to users' needs, ensuring resilient development and fostering climate change adaptation in Guinea.

This integrated vision implies not only "classic" investments, but also requires in-depth thinking about the economic model of the hydrology and meteorology services. In this regard, workshops for the highest level decision-makers will be organized as soon as the programme gets under way, in order to identify the most solid avenues for ensuring the sustainability of the activities (including a stronger State budget commitment, public-private partnerships, particularly with telecommunications companies, added-value service provision, increasing the autonomy of services producing information, etc.).

#### 1.4.2. Goal and specific objectives

The goal of the "Modernization and extension of the hydro-meteorological infrastructure and provision of services appropriate to needs" programme is to foster climate change adaptation in Guinea and the West African sub-region by developing and sustainably strengthening the systems and capacities of the National Meteorology and Hydraulics Departments in order to make appropriate hydro-meteorological and climatological services available to users.

##### Specific objectives

Specifically, the programme aims to:

**SO1** - Rehabilitate, modernize and extend the meteorological and hydrological observation networks.

**SO2** - Ensure sustainable, long-term collection of hydro-meteorological, piezometric and climatological data.

**SO3** – Offer high-quality hydro-meteorological services appropriate to users' needs, enabling a wide range of players (government departments, private sector, communities and farmer organizations) to improve their decision-making processes in respect of adaptation strategies.

##### Expected results

**R1** - The meteorology and hydrology services' observation networks are extended and modernized;

**R2** - Local and central State services enjoying working conditions that enable them to carry out their tasks appropriately and sustainably (maintenance, data collection, etc.);

**R3** - The national departments produce robust, reliable data and are able to provide appropriate services to users.

#### 1.4.3. Activities

In view of the expected results of the Programme to modernize and extend the hydro-meteorological infrastructure, the activities to be carried out are:

**R1A1** - Drawing up an inventory of the hydro-meteorological networks

*This inventory will be carried out at the start of the programme by an independent service provider, under the guidance of the national meteorology and hydraulics departments respectively. It will highlight the priorities, procedures and timetable for implementing the infrastructure component of the programme in accordance with existing systems and the needs identified (type of equipment, geographical cover, partnerships with the private sector, etc.).*

**R1A2** - Acquisition and installation of technical and specific data collection equipment for the meteorological and hydrological stations and establishment of a piezometric network.

*This activity will be undertaken throughout the five years of the programme according to the timetable drawn up during the initial inventory. Mobilization of the local communities right from this installation stage will be key to ensuring the sustainability of the investments.*

**R1A3** - Upgrading of computer and on-line systems capable of managing hydro-meteorological databases

*Management of the databases and production of hydro-meteorological information require the acquisition of high-performance hardware and software. Nevertheless, efforts will be made to avoid installing overly sophisticated hardware and software which would involve an excessive technological "leap" in relation to current capacities. The initial inventory will help to determine the most realistic*

and efficient options. Upgrading will be carried out according to a timetable established at the start; in any case, it must be done relatively quickly to limit the risks of hardware incompatibility.

**R2A1** - Rehabilitation of the reception infrastructure of the meteorology and hydrology services at central and local level

*This activity consists of rehabilitating the reception buildings at central and local level (renovation of offices and accommodation, fencing, purchase of office equipment). Any contract exceeding an envelope of GNF 300,000,000 (US\$35,000) must be the subject of an open call for tenders published in a local newspaper*

**R2A2** - Acquisition of means of transport for the operation of the hydrology and meteorology networks

*The essential means of transport for operations will be purchased (17 4x4 vehicles and 66 motorcycles) and management procedures put in place to ensure they are used properly.*

**R3A1** - Capacity-building for all the senior staff of both services.

*Upgrading of staff means organizing in Guinea or arranging participation in tailor-made diploma courses (internationally) and mobilizing specialists to contribute to ongoing training and short training courses. This activity will therefore not only involve taking an inventory of capacity-building needs and establishing personalized training plans, but also require resources to bring in external expertise and meet logistical requirements (registration fees, international travel, etc.).*

**R3A2** - Launch of a forum for all stakeholders to discuss the economic model of the hydrology and meteorology services

*This activity will take place right at the start of the programme and consist firstly of holding awareness-raising sessions for decision-makers at the highest level and, secondly, organizing workshops for all stakeholders to determine the most relevant scenarios to ensure coverage of the services' recurrent costs on completion of the programme. In addition, trials may be conducted as part of this activity to assess the relevance of the selected scenarios.*

**R3A3** - Consultation workshops bringing together the two government departments and users to identify needs and propose appropriate services.

*This activity will take place right at the start of the programme and consist of mobilizing stakeholders and users to identify precise needs for hydrology and meteorology services. These consultations will be organized not only at central level but also in the regions, to provide an optimum response to the needs of the most vulnerable people. They will feed into thinking about the economic model.*

## 1.5. Programme steering

The precise steering procedures will be determined during the consolidation phase of the project note. Nevertheless, a preliminary outline would include the aspects described below.

The programme will be co-steered by the:

- Ministry of the Environment, Water and Forestry;
- Ministry of Transport;
- Ministry of Energy and Hydraulics;
- Ministry of Agriculture;
- Ministry of Planning and Co-operation;

- Ministry of the Budget; and
- Ministry of Higher Education and Scientific Research.

A cross-cutting technical team dedicated to programme implementation will be organized at central and regional level (steering and technical co-ordination of the programme, technical and financial reporting, monitoring and evaluation). Implementation of the programme activities will be preceded by the preparation of a detailed work schedule for each national department on a quarterly, half-yearly and annual basis. Once validated, this plan will be forwarded to the programme steering committee.

Given the cross-cutting nature of the programme, joint monitoring mechanisms will be put in place, i.e.

- A programme monitoring committee tasked with monitoring the process of acquiring hardware and equipment. A monthly review meeting will be held at central level. The heads of the regional synoptic stations and directors of the regional bases of the Ministry of Hydraulics will be responsible for monitoring at local level.
- The steering committee is made up of the secretaries-general of the ministries concerned, the representative of the Ministry of Economy and Finance, the representative of the technical and financial partners and two representatives of the National Departments concerned. The steering committee will meet at least every three months throughout the programme to review strategic choices and arbitrate if necessary on the following aspects:
  - validation of budget trade-offs;
  - validation of choices and essential stages with planning of key dates;
  - validation of the programme's strategic orientations and a proactive approach to project orientations;
  - communications regarding the programme.

The chair of the monitoring committee will attend to report on project implementation status.

## 2. Expected programme impacts

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### 2.1. Future coverage of the observation network

The **meteorological observation network** will eventually comprise 17 synoptic stations, 17 climatological stations, 6 agro-meteorological stations, 5 maritime stations, 3 aerological stations and around 50 rainfall stations.

The national hydrological observation network will be made of 82 hydrometric stations distributed across the national territory. The first phase of the rehabilitation of these 82 stations will consist of repairing or reinstalling the limnigraphic scales as well as checking their adjustment in relation to the markers on the ground.

Amongst these 82 stations, 47 will be equipped with automatic gauges (limnigraphs).

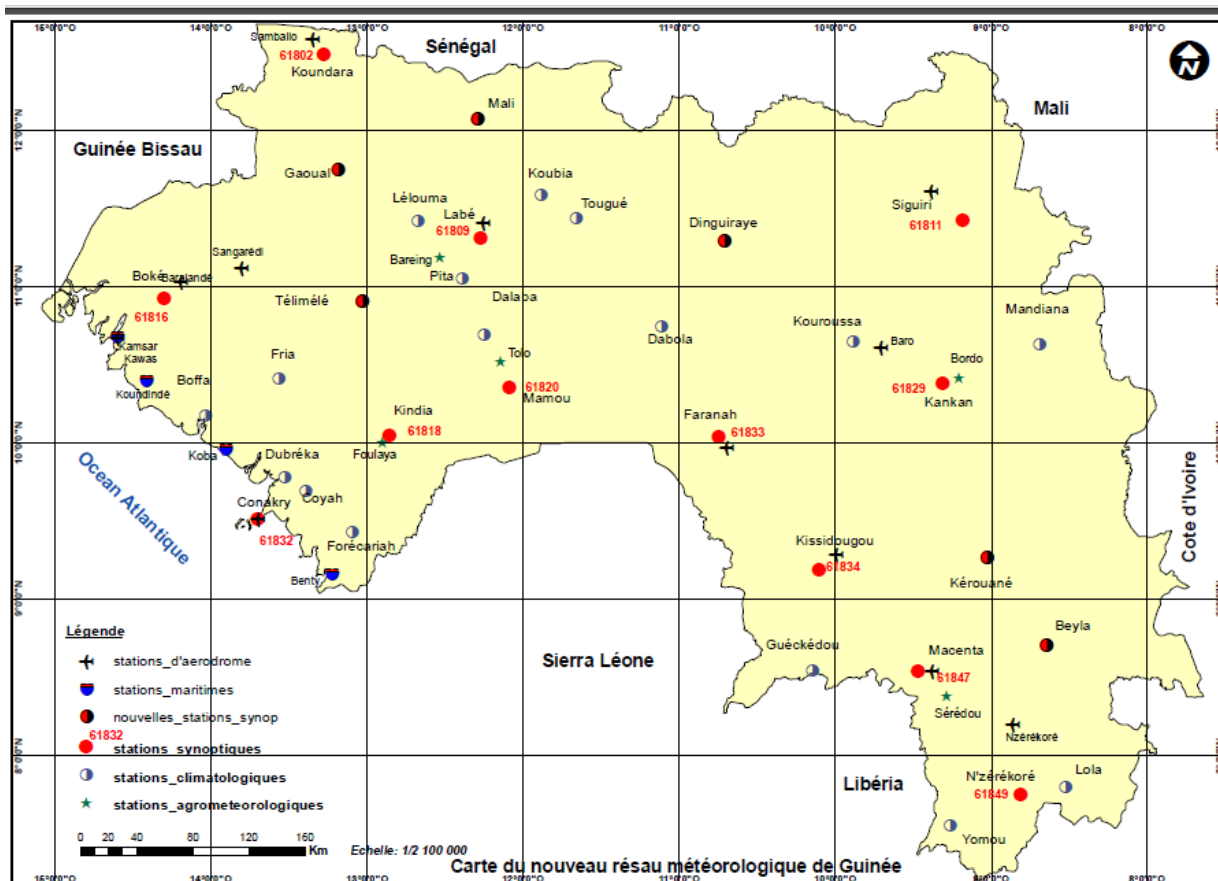


Figure 3: Projected map of the national meteorological network on completion of the programme

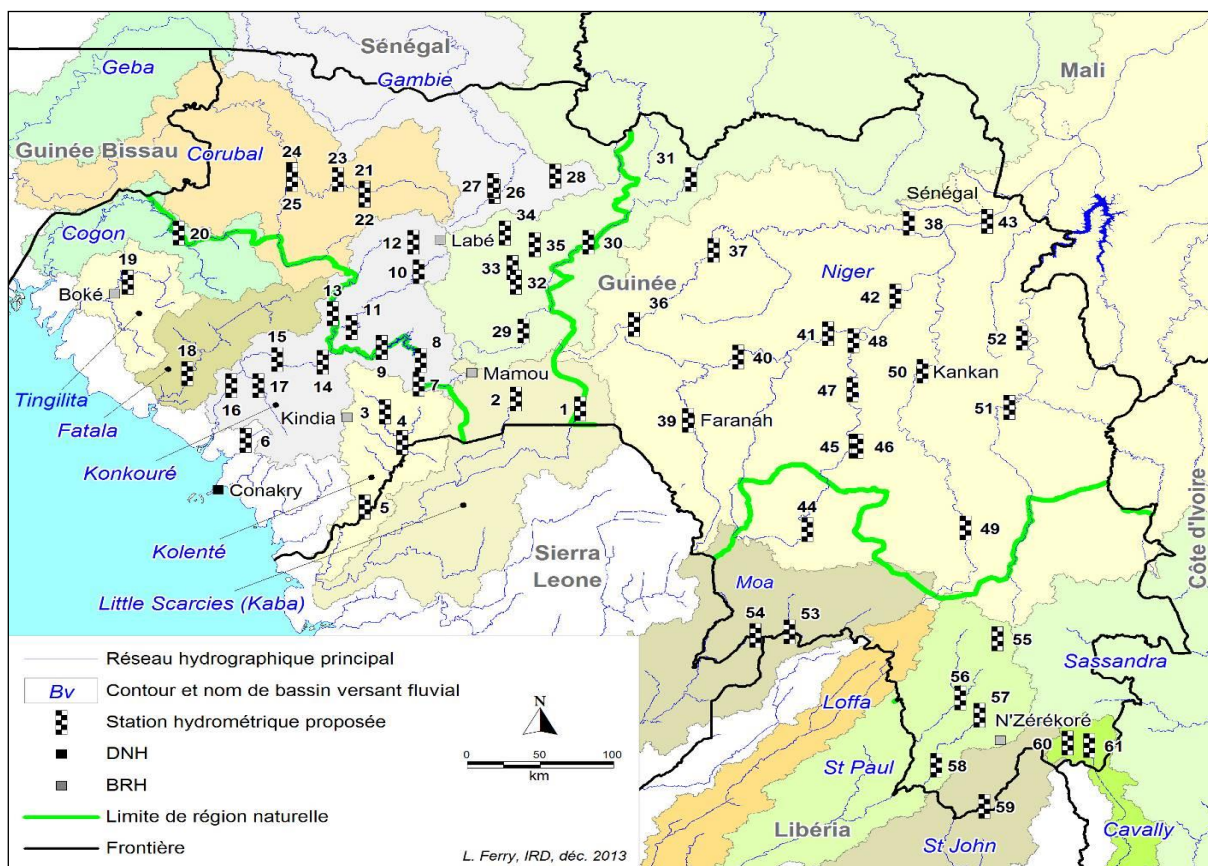


Figure 4: Projected map of the national hydrometric network on completion of the programme

## 2.2. Social and economic impacts

The main expected benefits of the programme relate first of all to the user community: the public authorities of the country, of course, but also the main operational partners (agriculture, transport, health, energy, etc.) and the general public.

The primary beneficiaries of the programme to modernize and extend the hydro-meteorological infrastructure are the country's citizens because the remit of the two services concerned involves providing high-quality services dedicated to the various end users (general public and economic operators). The availability of optimized, high-quality hydrological and meteorological information will contribute to the security of persons and property, improve both meteorological and hydrological forecasts during high- and/or low-water periods, reduce disaster risks, etc. Consequently, implementation of this programme will produce high-quality services whilst boosting climate resilience.

## 2.3. Programme risks and sustainability

<b>Risks relating to achievement of the programme's objectives</b>	<b>Seriousness of risk impact (high, medium, low)</b>	<b>Risk mitigation strategy</b>	<b>Unit responsible</b>
Disturbance of civil and social peace and political instability	High	Good governance; Maintaining peace through awareness-raising; Instigation of policy dialogue	Government
Inadequate government financial contribution to programme implementation	Medium	Mobilization of additional resources	Ministry of Transport (DNM)/Ministry of Energy and Hydraulics (DNH)
Inadequate commitment by leading partners	Medium	Good governance	Programme team
Cumbersome public and donor administrative procedures	Medium	Better knowledge of procedures and regular monitoring.	Programme team and donors
Brain drain and high staff turnover (mass retirement of staff and slow replacement rates)	Medium	Recruitment together with commitment by the employee; age limit required.	Programme team

In the interests of programme continuity, implementation of the identified activities will improve service provision by the two Departments through the supply of high-quality information. Adding value to this climatological and hydrological information by monetizing services, particularly in the private sector, is an option which would help to ensure the sustainability of these major investments by increasing the autonomy of the hydrology and meteorology services.

### 3. Human and financial resources required by the programme

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The following paragraphs contain a summary presentation of the main estimated needs in terms of both operation and investment. A more detailed estimate will be made during the phase of putting together the full programme file.

#### 3.1. Human needs

##### ➤ Programme management

The programme is steered by several technical sections backed by the two technical departments (Meteorology and Hydraulics). A sectoral programme management unit to be set up will organize the necessary human resources to carry out the following tasks at central and regional level: steering and technical co-ordination of the programme, technical and financial reporting, monitoring and evaluation activities.

Preliminary estimates include the following needs at central level as a minimum:

National co-ordination	
One co-ordinator	One Administration and finance officer
One programme officer	One accountant
One monitoring/evaluation officer	One secretary

These resources will be complemented by permanent regional teams.

##### ➤ Technical expertise

Complementary technical expertise will be needed to help with the following:

- Management of the climatological and hydrological databases;
- Digital weather and seasonal climate forecasting;
- Enhancing the value of climate products and services (marketing and monetization of services).

#### 3.2. Equipment and infrastructure (investments)

The hydro-meteorological observation network has equipment comprising measuring instruments, satellite reception and data processing and distribution systems. Most of this equipment is now obsolete and of varied brands, making sourcing of spare parts and maintenance difficult. Such equipment as is in working order is located in inappropriate sites exposed to acts of theft and vandalism of all kinds.

Programme implementation will help to rehabilitate the equipment and reception infrastructure and protect the observation sites, most of which are threatened with expropriation by the local authorities.

#### 3.3. Organizing events

The specific feature of this integrated programme lies in its awareness campaigns and advocacy vis-à-vis policymakers, seeking to make data acquisition and exploitation a national priority. In this regard, provision is made for resources to organize events in synergy with other programmes. This could include the organization of open days and celebration of World Water Days.

In addition, specific media campaigns will be conducted to raise the awareness of elected representatives and citizens of the role of climate forecasting.

Finally, other awareness-raising activities, for example, with members of the National Assembly, may be organized upstream of the vote on the State budgets.

### 3.4. Operating resources of the PMU

The Programme Management Unit must be responsible for programme management decisions. It plays a key role in monitoring and evaluating the programme and using the evaluations as a way of improving performance. The PMU must include stakeholder representatives to direct and supervise the programme.

In order to operate, it needs financial resources to facilitate its members' mobility at consultation meetings, to pay for international travel in connection with events or training, etc.

### 3.5. Provisional budget estimate

Expected results	Activities	Amount (USD)
<b>Expected Result 1:</b> The meteorology and hydrology services' observation networks are extended and modernized..	Drawing up an inventory of the hydro-meteorological networks	58 000
	Acquisition of technical and specific data collection equipment for the meteorological and hydrological stations and establishment of a piezometric network	9 172 000
	Upgrading of computer and on-line systems capable of managing hydro-meteorological databases.	1 085 000
<b>Sub-total Expected Result 1</b>		<b>10 315 000</b>
<b>Expected result 2:</b> Local and central State services enjoying working conditions that enable them to carry out their tasks appropriately and sustainably (maintenance, data collection, etc.)	Rehabilitation of the reception infrastructure of the meteorology and hydrology services at central and local level	12 985 000
	Acquisition of means of transport for the operation of the hydrology and meteorology networks.	1 174 000
<b>Sub-total Expected Result 2</b>		<b>14 159 000</b>
<b>Expected result 3:</b> The national departments produce robust, reliable data and are able to provide appropriate services to users	Capacity-building for all the senior staff of both services.	2 474 000
	Launch of a forum for all stakeholders to discuss the economic model of the hydrology and meteorology services	944 000
	Consultation workshops bringing together the two Departments and users to identify needs and propose appropriate services	253 000
<b>Sub-total Expected Result 3</b>		<b>3 671 000</b>
<b>TOTAL</b>		<b>28 145 000</b>

## Appendices

### Logical framework

Hierarchy of objectives (Summary, operational logic)	Performance indicator	Monitoring mechanism (Means of verification, sources of information)	Assumptions and risks
<b>Goal:</b> Encourage climate change adaptation in Guinea and the West African sub-region by developing and sustainably strengthening the systems and capacities of the National Meteorology and Hydraulics Departments with a view to making appropriate hydro-meteorological and climatological services available to users.	Number of users (public services, private individuals, NGOs, researchers, universities, etc.) requesting hydro-meteorological information appropriate to their needs.	Information bulletins and progress reports from the technical department; Statistical table of requests satisfied.	Disturbance of civil and social peace and political instability.
<b>Specific objectives (SOs)</b>			
<b>(SO1)</b> Rehabilitate, modernize and extend the meteorological and hydrological observation networks.	Number of meteorological, limnimetric and piezometric stations rehabilitated, modernized and created	Field visit report; Evaluation report. Equipment acceptance report. Hardware and equipment installation report.	Inadequate government contribution to project implementation; Weak support from technical and financial partners.
<b>(SO2)</b> Ensure sustainable, long-term collection of hydro-meteorological, piezometric and climatological data.	Amount of data transmitted; Existence of a hydro-climato-piezometric database.	Progress reports of the synoptic and climatological stations and regional hydrology bases; Delivery notes, observation notebooks, GSM transmission records.	Inadequate government contribution to project implementation.

<b>(OS3)</b> Offer high-quality hydro-meteorological services appropriate to users' needs, enabling a wide range of players (government departments, private sector, communities and farmer organizations) to improve their decision-making processes in respect of adaptation strategies.	Number of requests met; number of information sheets and publications produced.	Progress reports of the technical departments.	Inadequate government financial contribution to programme implementation; Weak support from technical and financial partners.
<b>Results (R)</b>			
<b>(R1)</b> The meteorology and hydrology services' observation networks are extended and modernized.	Number of meteorological, limnimetric and piezometric stations rehabilitated, modernized and created.	Field visit report; Evaluation report. Equipment acceptance report Hardware and equipment installation report.	
<b>(R2)</b> Local and central State services enjoy working conditions that enable them to carry out their tasks appropriately and sustainably (maintenance, data collection, etc.)	Amount of data transmitted; Existence of a hydro-climato-piezometric database.	Progress reports of the synoptic and climatological stations and regional hydrology bases; Delivery notes, observation notebooks, GSM transmission records..	
<b>(R3)</b> The national departments produce robust, reliable data and are able to provide appropriate services to users.	Number of requests met; number of information sheets and publications produced.	Progress reports of the technical departments.	

Expected results	Activities
<p><b>R1:</b> The meteorology and hydrology services' observation networks are extended and modernized.</p>	<p><b>R1A1</b> - Drawing up an inventory of the hydro-meteorological networks.</p>
	<p><b>R1A2</b> - Acquisition and installation of technical and specific data collection equipment for the meteorological and hydrological stations and establishment of a piezometric network.</p>
	<p><b>R1A3</b> - Upgrading of computer and on-line systems capable of managing hydro-meteorological databases.</p>
<p><b>R2:</b> Local and central State services enjoy working conditions that enable them to carry out their tasks appropriately and sustainably (maintenance, data collection, etc.)</p>	<p><b>R2A1</b> - Rehabilitation of the reception infrastructure of the meteorology and hydrology services at central and local level.</p>
	<p><b>R2A2</b> - Acquisition of means of transport for the operation of the hydrology and meteorology networks.</p>
<p><b>R3:</b> The national departments produce robust, reliable data and are able to provide appropriate services to users.</p>	<p><b>R3A1</b> - Capacity-building for all the senior staff of both services.</p>
	<p><b>R3A2</b> - Launch of a forum for all stakeholders to discuss the economic model of the hydrology and meteorology services.</p>
	<p><b>R3A3</b> - Consultation workshops bringing together the two Departments and users to identify needs and propose appropriate services.</p>