

# COUNTRY HYDROMET DIAGNOSTICS

Informing policy and investment decisions for high-quality weather forecasts, early warning systems, and climate information in developing countries.



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## Chad Peer Review Report

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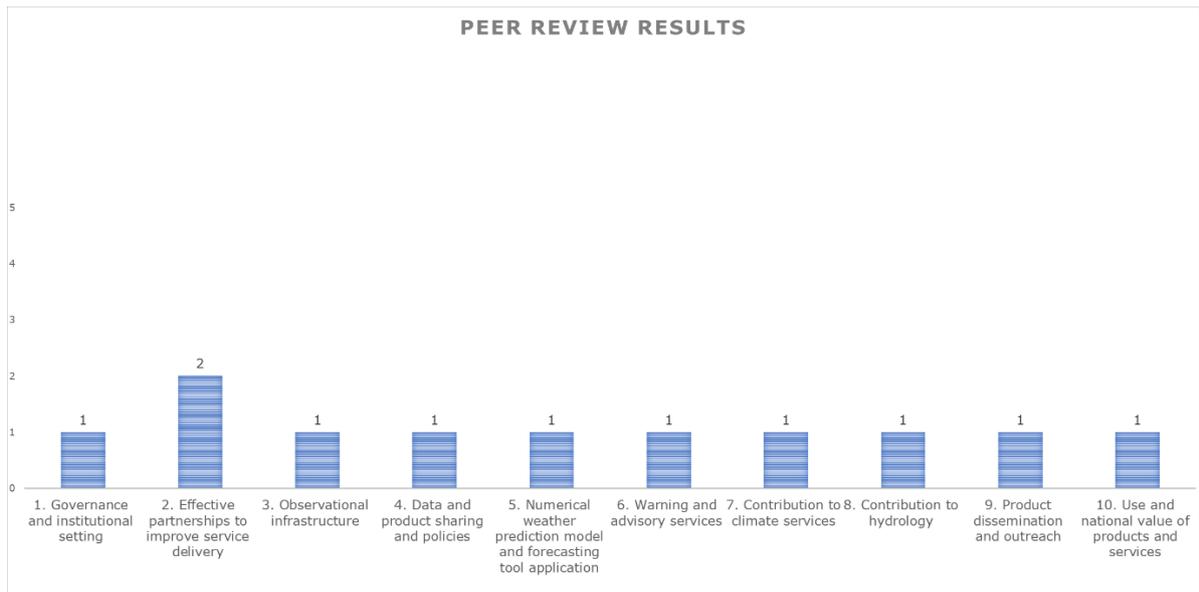
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## Executive Summary

The Agence Nationale de la Météorologie (ANAM – National Meteorological Agency) is the national meteorological service of the Republic of Chad, existing in its current form based on the presidential decree of 2015. ANAM is under the responsibility of the ministry of National Civil Aviation and Meteorology. ANAM provides limited service to different sectors in Chad, for example to the civil protection department, the agricultural sector, the water resources sector.

The main challenges and obstacles currently faced by ANAM are as follows:

- a) A formal mandate – Although both a decree and a law exist, they are very generic. It is therefore highly recommended to enact additional legislation that clearly defines the role and responsibilities of ANAM;
- b) General lack of resources (human, technological and financial) – adequate resources are needed to enable ANAM to deliver efficient and high-quality services. For example, the professional core of ANAM (25 people, 10 of which are in management positions) is insufficient to cope with the full amount of basic activities a modern NMS should be responsible for. There is a significant shortage of both personnel, infrastructure and technical support in general. Forecasters, observers, station operators and IT technicians are not in a position to perform the daily activities due to a lack of staff, competences and training. For example, at present, ANAM has a team of only two forecasters. With such a low number of forecasters, 24/7 forecasting and warning services are not possible.
- c) Limited observations network in parts of the country – through the National Adaptation Plan, a recent major project of United Nations Development Programme (UNDP), ANAM has been provided with a state-of-the-art network of 54 Automatic Weather Stations (AWSs), which will be increased to 70 by end of September 2023, when the project ends. ANAM currently does not possess the capacities to further maintain this network when the operational responsibility is finally transferred to the institution. Besides the expected issues with sustainability of operations, the new network does not cover the whole territory of Chad. All the newly installed stations are in the south and the centre of the country. As there is very poor and insufficient infrastructure in the north (road as well as physical connectivity), a network buildup there will require, first, a thorough assessment of feasibility.
- d) Inadequate operational facilities - ANAM is lacking office and storage space as well as adequate IT infrastructure. Although the new World Bank Project, PILIER, is planning the implementation of a new operational centre, this would still require that the government identifies an adequate facility to rehabilitate. While the World Bank could proceed and plan the implementation in due course, the government has not yet been in a position to provide an adequate location.
- e) Limited collaboration with other governmental entities – ANAM does not have sufficient exchange with other government entities like Agriculture, Civil Protection and Water Resource Division.



Element	Maturity level score
1. Governance and institutional setting	1
2. Effective partnerships to improve service delivery	2
3. Observational infrastructure	1
4. Data and product sharing and policies	1
5. Numerical weather prediction model and forecasting tool application	1
6. Warning and advisory services	1
7. Contribution to climate services	1
8. Contribution to hydrology	1
9. Product dissemination and outreach	1
10. Use and national value of products and services	1

*Fig 1: Review results based on the 10 elements of CHD*

# Chapter 1: General information

## Introduction

### Chad

The Republic of Chad is a landlocked country in Central Africa. It lies between latitudes 7° and 24°N, and longitudes 13° and 24°E. It is the fifth largest country in Africa with a territory of 1,248,000 square Kilometres and a population of more than 18 million, mostly concentrated in the central and southern regions, while the northern area has a very scarce population. Chad is surrounded in the north by Libya; in the east by Sudan; in the south by the Central African Republic and Cameroon and in the West by the Nigeria and Niger. The country has gained its independence from France in 1960. Its capital and largest city is N'Djamena with a rapidly increasing population of 1,6 million. N'Djamena is both the administrative and economic center of the country.

### Inform Risk index

The country has an Inform risk index of 7,9 (scale 0-10, 0 is optimum) and is thus positioned in the risk class "very high". This means that the country is at substantial risk of a humanitarian crisis in case of natural or man-made disaster. The coping capacity of the country is extremely low (see [DRMKC-Inform](#) then **INFORM Risk Index 2023**)

Hazard and exposure: 7,2 [0-10]

Vulnerability: 7,9 [0-10]

Lack of coping capacity: 8,8 [0-10]

### Topography

The dominant physical structure is a wide basin bounded to the north and east by the Ennedi Plateau and Tibesti Mountains, which include Emi Koussi, a dormant volcano that reaches 3,414 metres above sea level.

### Climate

Each year a tropical weather system known as the intertropical front, crosses Chad from south to north, bringing a wet season that lasts from May to October in the south and from June to September in the Sahel. Variations in local rainfall create three major Climatological zones (See Fig 2). The Sahara, covering 47% of the total territory, lies in the country's northern third. Yearly precipitations throughout this area are under 50 millimetres with a very wide temperature spread.

The Sahara gives way to a Sahelian belt in Chad's centre, covering additional 43% of the total territory; precipitation there varies from 300 to 600 mm per year. The third area is the East Sudanian savannah in Chad's Sudanese zone, covering 10% of the total territory. Yearly rainfall in this belt is over 900 mm.



The Meteorological Service of Chad was founded after the country's independence in 1960 and is hosted by the "Ministère of the Aviation Civile et de la Météorologie Nationale" (MACN), which translates as the "Ministry for Civil aviation and National Meteorology". Until 2015, the Meteorological and hydrological services were unified under the "Direction générale de la météorologie nationale" ("Direction des Ressources en Eau" (DRE), in English "Directorate for Water Resources"). In 2017, ANAM becomes a separate entity, under the "Ministère de l'Environnement, de l'eau et de la pêche" (the "Ministry of the environment of the water and the land").

ANAM's official mandate is to provide services to the different public sectors. Only for the aviation sector ANAM does not have the mandate to provide services as they are currently outsourced to the private company, "Agence de la Sécurité de la navigation aérienne en Afrique et au Madagascar" (ASECNA)". Despite its broader mandate, ANAM can offer solely limited services due to the small number of trained meteorologists available in the country. Moreover, ANAM has insufficient physical facilities to perform the daily operations, with the clear example of lacking an operational centre. This situation is nowadays gradually improving thanks to the "Climate Risk and Early Warning Systems" (CREWS) and the "Projet Intégré de Lutte contre les Inondations Et pour la Resilience urbaine " (PILIER) projects.

## CHD methodology

This report is the one of the results of a much wider-scope project, coordinated by the Systematic Observation Funding Facilities (SOFF) secretariat under the World Meteorological Organization (WMO). SOFF aims at creating a sustainable process to enhance and strengthen the National Surface and Upper-Air observational networks and to bring them closer to the Global Basic Observations Network (GBON) criteria. In addition, the SOFF initiative is now a part of a much larger imitative, again led by WMO, namely the Early Warnings for all (EW4all) initiative, targeted at providing early warning of weather and climate to everybody on Earth by 2027. This report will be used later on for the implementation phase of the SOFF initiative in Chad by GeoSphere Austria in collaboration with the World Food Program (WFP).

This report has been prepared using the methodology described in the [2022 update of the Country Hydromet Diagnostics \(CHD\)](#). An initial desktop review was performed, using information supplied from the Chad National Meteorological Agency (ANAM), the [World Meteorological Organization \(WMO\)](#), and other partners. Two in-country visits were then undertaken, followed by report revision and approval. The in-country visit included meetings in the capital N'djamena, as well as a regional survey of the stations, located all the way from N'Djamena to Sarh in the south-west, together with meetings with local stakeholders, especially from the local communities

The 10 elements of the Diagnostic are defined as follows:

1. Governance and institutional setting - The level of formalization of the NMHS mandate and its implementation, oversight, and resourcing.
2. Effective partnership to improve service - The level of effectiveness of the NMHSs in bringing together national and international partners to improve the service offering
3. Observational infrastructure - The level of compliance of the observational infrastructure and its data quality with prescribed standards.
4. Data and product management, sharing, and policies - The level of data and product sharing on a national, regional and global level.

5. Numerical model and forecasting tool application - The role of numerical weather prediction model output and other forecasting tools in product generation. Whether local modelling is sustainably used to add value to model output from WMO Global Data processing and Forecasting System (GDPFS) centres.
6. Warning and advisory services - NMHS' role as the authoritative voice for weather-related warnings and its operational relationship with disaster and water management structures.
7. Contribution to climate services - NMHS role in and contribution to a national climate framework according to the established climate services provision capacity.
8. Contribution to hydrology - NMHS role in and contribution to hydrological services according to mandate and country requirements.
9. Product dissemination and outreach - The level of effectiveness of the NMHS in reaching all public and private sector users and stakeholders. D. User and stakeholder interaction.
10. Use and national value of products and services - Accommodation of public and private sector users and stakeholders in the service offering and its continuous improvement.

For each value cycle element, a limited number of standardized indicators is used, and each indicator uses explicitly defined data sources. The assessment of these critical elements of the National Meteorological Service should lead to their maturity level. Note that Level 5 is the highest attainable maturity level in the CHD assessment.

This report is presented along the ten most critical elements of the hydromet value cycles with an indication of their respective maturity level and some high-level recommendations to help lift up that maturity level, and as abovementioned, with a special emphasize on monitoring, forecasting, climate projection and warning systems for climate-related hazards, across timescales.

ANAM is currently the only NMHS, which had participated also in the pilot stage of the CHD, back in 2021 (it was performed then by the consultant of the current mission, Mr. Abdoulaye Harou) and thus might serve as a good example for a comparison between the two CHD versions, also reflecting changes happening during the two years since the prior CHD.

## Chapter 2: Country Hydromet Diagnostics

### Element 1: Governance and institutional setting

#### 1.1 Existence of Act or Policy describing the NMHS legal mandate and its scope

ANAM, as mentioned above, is under the Ministry of Civil Aviation and National Meteorology. ANAM is acting according to the [Law \(Portant creation d'une Agence Nationale de la Meteorologie \(ANAM\)\)](#)<sup>1</sup> from 2015, which was further implemented by a [presidential decree](#)<sup>2</sup> two years later. However, the law is very generic and covers only a few of the responsibilities of a modern NMS. It considers the design and implementation of the governmental meteorological policy for Chad, ensuring the monitoring of the development of climate in Chad as well providing public and private users with meteorological and climatological data. However, there is no mentioning of natural hazards and Disaster Risk Reduction, for example. Moreover, the law does not establish any official mandate of ANAM as the national provider of forecasts and warnings, nor does it address the resources required for these efforts, which should be provided by the government.

#### 1.2 Existence of Strategic, Operational and Risk Management plans and their reporting as part of oversight and management.

A Strategic plan is currently under development through the support from the CREWS-Tchad project. The first draft is expected to be ready at the end of July 2023 and will cover 5 years from 2024. The plan will subsequently be introduced to the government and, once accepted, it will become the basis for the further development and positioning of ANAM. This plan includes as well a risk management plan.

#### 1.3 Government budget allocation consistently covers the needs of the NMHS in terms of its national, regional, and global responsibilities and based, among others, on cost-benefit analysis of the service. Evidence of sufficient staffing to cover core functions

The current budget of ANAM consists of 738,000 \$ per year (according to the 2023 budget). Around 70% of the budget goes to the salaries of its' staff members, another 20% goes to the physical maintenance of the facilities at the headquarters and another 10% for additional investments. As a meteorological agency, ANAM is however not yet able to generate sufficient external revenue for its development and for the much-needed technical maintenance of its equipment. A cost benefit analysis was never performed by or for ANAM.

Hence, ANAM leans on internationally-funded projects to help cope with some of the operational costs. The existing staff allocation is far away from the minimum levels required to cover core functions and 24/7 operations (as for example, currently there are only two forecasters, whereas the minimum for 24/7 should be, at least, seven employees).

#### 1.4 Proportion of staff (availability of in-house, seconded, contracted- out) with adequate training in relevant disciplines, including scientific, technical, and information and communication technologies (ICT). Institutional and policy arrangements in country to support training needs of NMHS.

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<sup>1</sup> Portant creation d'une Agence Nationale de la Meteorologie (ANAM) is available at : [https://observatoire.td/upload/files/dt\\_61597321564.pdf](https://observatoire.td/upload/files/dt_61597321564.pdf)

<sup>2</sup> The Presidential Decree is available at: <https://meteotchad.org/wp-content/uploads/2021/12/2017-05-Decret-creation-ANAM-Tchad.pdf>

The professional core of ANAM is very limited and consists of just 5 meteorologists and 8 meteorological technicians. In addition, there are 10 people belonging to the management and others. No staff for climatology, IT, too little staff for Agrometeorology and station maintenance. As for gender representation, only 3 of the 23 employees are females.

There is no official or actual institutional policy in place regarding the training needs of the ANAM staff. Those are partially met through internationally-funded projects and initiatives or through personal engagement. The strategic plan will include a training plan.

### **1.5 Experience and track record in implementing internationally funded hydromet projects as well as research and development projects in general.**

ANAM is the beneficiary, directly or indirectly, of the following projects:

- a. CREWS -Tchad - led by WMO and the World Bank (WB), which aims at implementation of early warning. A long-term project, currently in full progress with the current phase to finish at 2025.
- b. PILIER – led by the WB (begins in summer 2023, which plans at rehabilitating and equipping an operational centre as soon as the government will identify an existing facility.
- c. FSRP-2 (Food Safety and Resilience Program – 2<sup>nd</sup> phase) – led by the WB (begin in fall 2023, which offers potential support for the maintenance of AWS).
- d. PNA (Program National d’Adaptation)– led by the UNDP, that is installing AWS (up to 70 by end of September 2023) in the southern and central parts of the country.
- e. ProPad (Projet de renforcement de la Résilience et de la Productivité Agricole Durable) – led by the WB. A project of the WB together with the ministry of Agriculture and Rural Development. As part of the project, the coordinators are highly interested in obtaining real-time meteorological data and hence are ready to provide support for some of the AWSs of ANAM, located in areas of relevance for the project.
- f. PDRLIAT (Projet de Développement de la Résilience et de Lutte contre l’Insécurité Alimentaire – led by the IADB (Inter-American Development Bank). To some respect, quite similar with the previous mentioned ProPad, but with different areas of interest.

It is important to note that all of the abovementioned projects address only specific development issues without including a research component and often lack a sustainable long-term perspective.

The institutional memory resides within a very small group of staff members, who are aware of past and present projects and retain most of the available knowledge and information. This small number of essential staff members constitutes a major corporate risk.

### **Summary score and recommendations for Element 1**

The CHD Element 1 score for the “Governance and Institutional Setting” assessed as Maturity Level 1 on the CHD scale, reflecting “Weakly defined mandate; serious funding challenges; essential skills lacking; little formalized governance and future planning”.

Recommendations:

- a) To update the law to make it more comprehensive and concrete, with a focus to provide and define a stronger and clearer mandate to ANAM making it the national provider of Meteorological Services for the chadian society.
- b) To increase the budget of ANAM in order to enhance its capacity to employ additional professional staff, and to procure suitable equipment and ensure its basic maintenance. It needs to be noted that, without recruiting a substantial number of new trained meteorologists and meteorological technicians, ANAM does not have the possibility to even provide the basic services any NMS should. The authors of this report regard this as the main critical problem facing ANAM.

- c) To spend more efforts in strengthening ANAM's official and actual cooperation with the francophone international training centres in the region (Niamey, Casablanca, Oran, etc.), which is necessary due to the lack of knowledge of English in the country. There is no other entity in Chad that is able to provide sufficient training for the present and future employees of ANAM.

## Element 2: Effective partnerships to improve service delivery

### **2.1. Effective partnerships for service delivery in place with other government institutions.**

ANAM entertains collaborations through GTP (Groupe Technique Pluridisciplinaire) with a number of governmental entities such as the Ministries of Agriculture, Interior (civil protection) and Water Resources.

### **2.2. Effective partnerships in place at the national and international level with the private sector, research centres and academia, including joint research and innovation projects.**

The only major effective partnership ANAM maintains with the private sector is with the ASECNA – the agency for air navigation security in Africa and Madagascar, which provides general services for the airports of Chad, including meteorological services. ANAM operational desk is located at the ASECNA Operational Centre in N'Djaména, which is shared by the aviation forecasters of ASECNA itself.

With the Academy, the partnerships are only temporarily, on an ad-hoc basis, which clearly does not facilitate knowledge transfer and the build-up of any pool of expertise.

### **2.3. Effective partnerships in place with international climate and development finance partners.**

There are several long-term projects, in which ANAM is a major participant, among which are: CREWS (WB and WMO), PNA (UNDP), and a project with the Food and Agriculture Organization (FAO - see section 1.5 for details).

### **2.4. New or enhanced products, services or dissemination techniques or new uses or applications of existing products and services that culminated from these relationships.**

The PNA has installed a Media room in addition to the deployment of AWS. However, the media room is currently not in use for the dissemination due to the lack of trained personnel. No other national or private potential partner, including ASECNA, has any vested interest in making use of this room. The only possible relevant partner can come from the group of international Organizations working in the country or region.

## **Summary score, recommendations, and comments for Element 2**

The CHD Element 2 score for the "Effective partnerships to improve service delivery" assessed as Maturity Level 2 on the CHD scale, reflecting " Limited partnerships and mostly excluded from relevant finance opportunities".

Recommendations:

- a. To strengthen the collaboration with the Ministry of Agriculture and Rural Development and with the Ministry of interior, particularly with the Direction de la protection civile (DPC).
- b. To foster a stronger and institutionalized cooperation with the different universities and academia, especially with the N'Djamena Intitute of sciences.

## Element 3: Observational infrastructure

### **3.1. Average horizontal resolution in km of both synoptic surface and upper-air observations, including compliance with the Global Basic Observing Network (GBON) regulations.**

In the last two years, 54 AWS were installed, through an international project led by UNDP, NAP, in different locations in Chad and their number should increase to 70 by end of September 2023. However, all of the newly deployed stations cover only the Southern and Central parts of Chad, thus leaving the north (around 35% of total territory of the country) almost with no stations. The average horizontal resolution in the Southern and Central parts of Chad is around 150 kms, whereas the GBON low-resolution requires a resolution of 200 kms.

However, there are big concerns regarding the future operations and maintenance of these new stations. As the NAP project is approaching its end in September 2023, maintenance of the newly deployed stations will fall under responsibility of ANAM. Currently, ANAM does not have the financial or technical capacities necessary to ensure operational continuity of this network, let alone that it can ensure the continuous maintenance and repair.

As for upper-air stations, ANAM does not operate such. Nevertheless, ASECNA has two stations (at the airports of N'Djamena and Sarh, about 700 kms apart), which are currently not operational due to technical reasons as well as lack of consumables. Work is underway to ensure these stations can operate and transfer data once a day. This does, however, not fulfil the GBON low-resolution requirements, that foresee that at least six upper-air stations send data at least once a day, according to a spatial resolution of 500 kms.

### **3.2. Additional observations used for nowcasting and specialized purposes.**

None.

### **3.3. Standard Operating Practices in place for the deployment, maintenance, calibrations and quality assurance of the observational network.**

Currently none of standard operating practices for the development, maintenance, calibrations and quality assurance of the observational network exist. However, through a budget remaining from the UNDP PNA Project, three technicians should be sent for a training on basic maintenance of the new stations, that can be held at the facilities of ANAM itself. Regardless of this training action, these then-trained personnel may not be able to apply their newly acquired knowledge due to a lack of spare parts, vehicles or budget for fuel.

### **3.4 Implementation of sustainable newer approaches to observations.**

None.

### **3.5. Percentage of the surface observations that depend on automatic techniques.**

Almost the entire network is currently automatic.

### **Summary score, recommendations, and comments for Element 3**

The CHD Element 3 score for the "Observational Infrastructure" assessed as Maturity Level 1 on the CHD scale, reflecting "No or limited basic surface observations and no upper air observations".

Recommendations:

- a. The SOFF initiative, in collaboration with other projects such as the FSRP-2, should consider providing the necessary training, spare parts, vehicles and additional human resources required. The main concern is to try to keep as many of the newly installed stations as possible functional and running for the years to come.

- b. To establish, in collaboration with the Global Information System Centre (GISC) Casablanca, a method for the transmission of data internationally. Although Data from the AWS are available on a server at ANAM, they are currently not transmitted to the WMO Information System (WIS).
- c. In the longer term, the SOFF initiative should consider assisting with the identification of suitable locations of AWS in the northern part of the country, and with their subsequent installation.

## Element 4: Data and product sharing and policies

### **4.1. Percentage of GBON compliance – for how many prescribed surface and upper-air stations are observations exchanged internationally. Usage of regional WIGOS centres.**

At present, the percentage of compliance is zero. Most of the above mentioned newly installed stations do transmit data to ANAM, but, due to technical reasons (related to IT) data from these stations are not shared internationally through WIS. The issues are being looked after by an expert from the GISC Casablanca (Morocco) and planned to be addressed and resolved soon.

As for the upper-air stations, they are operated under the responsibility of ASECNA. This Agency also encountered a number of technical issues (hydrogen generator leaking and a lack of consumables). A real-time data exchange mechanism between ASECNA and ANAM would facilitate the sharing of these data internationally.

### **4.2. A formal policy and practice for the free and open sharing of observational data.**

There is no formal policy and practice for the free and open sharing of observational data.

### **4.3. Main data and products received from external sources in a national, regional and global context, such as model and satellite data.**

The forecasters have limited access to external sources due to a lack of operational systems (workstations, telecommunication systems). As the ANAM forecaster desk is placed in the operational centre of ASECNA, it has access to ECMWF, Meteo France and UKMet data. This access is also available through their respective websites. It is to be noted, nevertheless, that the old Synergie PUMA System is still unstable.

## **Summary score, recommendations, and comments for Element 4**

The CHD Element 4 score for the "Data and Product Sharing and Policies" assessed as Maturity Level 1 on the CHD scale, reflecting "observational data is shared internationally, either because not available to be shared or due to the lack of data sharing policies or practices, or the existing infrastructure does not allow data sharing".

Recommendations:

- a. To address the issue of transmitting the surface stations data of ANAM to WIS, with the help of the experts of the GISC Casablanca.
- b. To create a stable and effective data exchange mechanism between ANAM and ASECNA.
- c. To implement an operational centre with adequate equipment, at a rehabilitated facility, to be identified by the government of Chad.
- d. And last, but not least, to hire and train new forecasters and other related experts. Without this action, nobody will be available to practically use the excellent products coming from abroad.

## Element 5: Numerical model and forecasting tool application

### **5.1. Model and remote sensed products form the primary source for products across the different forecasting timescales.**

As mentioned in the element 4, the forecasters can access some products from Regional and global centres of WMO both through the Synergie Workstation (albeit only while visiting the offices of ASECNA, as there is no ANAM operational centre) and through websites of these centres. Information consulted are essentially charts and meteograms.

### **5.2. a) Models run internally (and sustainably), b) Data assimilation and verification performed, c) appropriateness of horizontal and vertical resolution.**

No models are run by ANAM.

### **5.3. Probabilistic forecasts produced and, if so, based on ensemble predictions.**

The forecasters of ANAM neither produce nor use probabilistic forecasts.

## **Summary score, recommendations, and comments for Element 5**

The CHD Element 5 score for the "Numerical Weather Prediction Model and Forecasting Tool Application" assessed as Maturity Level 1 on the CHD scale, reflecting "Forecasts are based on classical forecasting techniques without model guidance and only cover a limited forecast time range".

Recommendations:

- a. As already stated in element 4, Recommendation (c), to establish a well-equipped operational centre - without such a centre, the forecasters of ANAM will have to continue relying on the facilities of ASECNA.
- b. To hire and train forecasters - Without forecasters, there will not be a good use of models.
- c. To consider training on the interpretation of regional and global models' outputs to maximise quality predictions instead of trying to invest in running its own models.

## Element 6: Warning and advisory services

### **6.1. Warning and alert service cover 24/7.**

As already mentioned, the operational staff of ANAM included only two trained forecasters, which is not a sufficient number to run a sustained 24/7 operations. Moreover, without an adequate operational centre with proper working stations, no service of this kind could be provided.

### **6.2. Hydrometeorological hazards for which forecasting and warning capacity is available and whether feedback and lessons learned are included to improve warnings.**

Currently, no warnings are issued by ANAM. As for forecasts, there are only forecasts of major systems approaching, but they are issued only during daytime working hours.

### **6.3. Common alerting procedures in place based on impact-based services and scenarios taking hazard, exposure and vulnerability information into account and with registered alerting authorities.**

There are no alerting procedures in place.

## **Summary score, recommendations, and comments for Element 6**

The CHD Element 6 score for the “Warning and Advisory Services” assessed as Maturity Level 1 on the CHD scale, reflecting “Warning service not operational for public preparedness and response”.

Recommendations:

- a. Same as recommendations a) & b) of element 5 above. Without them, no actual basic progress would be made.

## Element 7: Contribution to Climate Services

### 7.1. Where relevant, contribution to climate services according to the established capacity for the provision of climate services.

Though, officially, ANAM should provide advisory and consultation for the government on climate and climate change issues, its actual capabilities of doing so, are quite limited, as will be elaborated later.

Climate services might be divided, roughly, into services based on past climate (observations) and those based on future climate (model forecasts and predictions).

As for past climate, the ANAM has a limited-scale historical data archive, which is now about to pass a full digitization, together with an improved storage capability for the paper archives (CREWS-Tchad activity). However, with a lack of climatologists at ANAM, no climate products can be produced. The only related basic climatic services are provided by the agrometeorological sector, through agrometeorological bulletins. However, even in this case, the communication with the agricultural sector is mostly one-sided, due to lack of staff, as well lack of traveling funds, in order to meet the local communities.

As for future climate, ANAM is providing seasonal forecasts, based on global models: However, discussion with farmers indicated that, due to their late issuance, they are currently of limited use only. No longer-term climatic predictions are produced at or for ANAM.

Due to the lack of climatologists, there is no current or planned capacity building or training plans. No evaluation of the socioeconomic benefits of climate services was ever performed by or for ANAM.

### Summary score, recommendations, and comments for Element 7

The CHD Element 7 score for the “Contribution to Climate Services” assessed as Maturity Level 1 on the CHD scale, reflecting “Less than basic Capacity to provide Climate Services”.

Recommendations:

1. To hire and train an additional trained climatological staff – without people, who can perform data quality checks and data manipulation, climatological data does not have too much of an added value.
2. To fully digitize data on paper –Digitization will ensure safety for the data, but also an easier access and with the addition of some basic statistical tools, an enhancement of the usefulness of this asset.
3. To reconsider the timing of the issuance of the seasonal forecasts – the timing should strike a proper balance between availability and accuracy on the one hand and the needs of users on the other hand (such as proximity to the main sowing and plantation periods).

In the modern world, where forecasts become much more accessible and can be freely and openly obtained from multiple sources, climate services become more and more important for NMHSs. With the three recommendations above implemented, ANAM could much enhance its capacities also to provide improved services and products for hydrologists, forecasters and external end-users. ANAM could also strengthen its positioning as the main voice in the country on issues of climate change.

## Element 8: Contribution to hydrology

### **8.1. Where relevant, standard products such as quantitative precipitation estimation and forecasts are produced on a routine basis according to the requirements of the hydrological community.**

The Estimated amount of precipitations (QPE) from the satellites as well as the available model outputs (QPF) are shared with the Direction des Ressources en Eau (DRE). As for general forecasts, ANAM's precipitation forecasts are quite basic, providing only general location and timing of rain events.

### **8.2. SOPs in place to formalize the relation between Met Service and Hydrology Agency, showing evidence that the whole value chain is addressed.**

Despite the fact that ANAM and the Hydrological service headquarters share the same location and, although until a few years ago, they were actually parts of the same Ministry, there is currently no Memorandum of understanding between these services.

### **8.3. Data sharing agreements (between local and national agencies, and across international borders as required) on hydrological data in place or under development.**

Such agreements do not currently exist.

### **8.4 Joint projects/initiatives with hydrological community designed to build hydrometeorological cooperation.**

None.

## **Summary score, recommendations, and comments for Element 8**

The CHD Element 8 score for the "Contribution to Hydrology" assessed as Maturity Level 1 on the CHD scale, reflecting "No or very little meteorological input in hydrology and water resource management".

Recommendations:

- a. To strengthen cooperation between ANAM and DRE - The Hydrological Service has even a lower capacity than ANAM. Without a considerable strengthening of the capacities of ANAM, there would be no possibility of any collaboration or cooperation.
- b. ANAM and DRE to develop a mechanism enabling data sharing between them. This would be facilitated by the implementation of a Hydrometeorological operational centre planned by PILIER.

## Element 9: Product dissemination and outreach

### **9.1. Channels used for user-centred communication and ability to support those channels (for example, does the NMHS operate its own television, video or audio production facilities? Does it effectively use cutting-edge techniques?).**

Some staff members show presence on the national radio and TV stations and some general information is also shared through the website of ANAM (which is, however, quite rudimentary). However, still large parts of the population are not able to enjoy or use these broadcasts, due to limited to no access to these media channels. The staff also participates in multi-sectorial seminars, multi-agency platforms (especially together with FAO and WFP) and word of mouths. ANAM has a TV Studio installed by the PNA (UNDP). but it currently does not have the personnel to use it properly

### **9.2. Education and awareness initiatives in place.**

None. The only initiatives taking place are performed through some of the international Organizations, without the participation of ANAM or with a minor role for it.

### **9.3. Special measures in place to reach marginalized communities and indigenous people.**

None, it should be added also that the population of Chad speaks around 100 languages and dialects, whereas the official languages are French and local dialect of Arabic, which are not spoken by the entire population. Here, again, there are some initiatives of international Organization in existence, but with a very limited participation of ANAM or even without it.

### **Summary score, recommendations, and comments for Element 9**

The CHD Element 9 score for the "Product Dissemination and Outreach" assessed as Maturity Level 1 on the CHD scale, reflecting "Dissemination using only limited traditional channels such as daily newspapers and the national broadcaster and with little control over messaging and/or format".

Recommendations:

- a. In a collaboration with international Organizations, to try and foster a closer communication with the different communities, mostly using "information agents", such as local governmental officials, leaders of communities as well as Canton Chiefs, priests, and imams (who are in general more educated than most of the population and enjoy a well-accepted authority). These agents should be trained in understanding and translating meteorological information for their communities.

## **Element 10: Use and national value of products and services**

### **10.1. Formalized platform to engage with users in order to co-design improved services.**

No such platforms exist, though ad-hoc meetings do happen from time to time.

### **10.2. Independent user satisfaction surveys are conducted, and the results used to inform service improvement.**

None

### **10.3. Quality management processes that satisfy key user needs and support continuous improvement.**

None. The country does not have a standards institute, that can support an implementation of a QMS or furthermore ISO procedures.

### **Summary score, recommendations, and comments for Element 10**

The CHD Element 10 score for the "Use and National Value of Products and Services" assessed as Maturity Level 1 on the CHD scale, reflecting, "Service development lacks any routine stakeholder feedback practice".

Recommendations:

- a. To establish a weekly meeting of the management of ANAM, together with relevant additional staff, in which, among other issues, updates regarding participation in different external meetings should be addressed.
- b. To establish a monthly meeting with the director General, the relevant staff of the ANAM and representatives from other ministries and international Organizations to discuss and foster mutual issues and plans.
- c. To create a yearly survey to be sent to the different users of the products of ANAM.

## Annex 1 Consultations (including experts and stakeholder consultations)

### ANAM

Name	Role
Sakine Youssouf Batchomi.	Director General
Idriss Abdallah Hassan	Directeur reseau d'observation et prévisions
Ousmane Tidjani	Deputy Director DRPOM
Mahamat Dicko	Chargé NA/MTO
Abdel Kerim	Chief MTO
Djergo Gaya	Chief AgroMet

### The Government of the Republic of Chad

Name	Unit	Role
Hissein Tahir Souguimi	MACMN	Minister
Mahamat Saleh Douga	MACN	SG
Dandjaye Jules	MACMN	IG/A
Nadjira Appolinaire	MITC	Deputy Director
Naradoum Toussaint	DRE	Hydrologist
Nassour Saleh Terda	DRE	Director
Djetoide Alexis	Agriculture	Agent
Allata Gueralbaye	Agriculture	Agent
Tesse Mbia Mabilo	DPC	Director

### Private Sector

Name	Unit	Role
Mahamat Adoum Oumar	ASECNA	Forecaster
Allara Judicael	ASECNA	Forecaster
Bomari Korndo Prosper	ASECNA	Chargé d'exploitation
Jean-Philippe Watrin	ADCON	Instructeur - Sales Engineer

### International Organizations

Name	Unit	Role
Kississou Etienne	WFP	Novam
Mesngar Denis	WFP	VAM/Mapping
Edgar Wabyona	WFP	Responsable VAM
Cecile Lorilou	WB	Disaster Risk Management Specialist
Sebastien Raphael Heinz	WB	Agriculture specialist
Ousman Mahamat saleh Youssouf	WB	FSRP Coordinator
Abdel-Latif Younous	WFP	Agriculture Specialist

### Meteorology and climate users

Masra Kouroua	Mandoul	Canton Chief Banda
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Tandji Nangside Ngardoum	Moyen Chari Region	Canton Chief - Baumba
Ouya Takene	GDM	Coordinator
Nanalbaye Narangar	EAT	Pastor
Mountoi Jacqueline	Women Farmers Association - young girls mothers	President
Binder Emile	EAT	Pastor
Pierrette Madjingar	Women farmers Association - Widows	President

## Annex 2 Urgent needs reported

As mentioned in the executive summary:

- a. A lack of a more comprehensive legal mandate.
- b. A insufficient governmental allocation without any real opportunities for cost-recovery services
- c. A big concern as for the future of the newly installed AWSs
- d. A severe lack of sufficient professional staff, especially forecasters and climatologists
- e. A lack of proper and adequate working facilities, especially for the operational staff

## Annex 3 Information supplied through WMO

WMO Global GBON gap Analysis  
WMO Monitoring System Data  
WMO EW4All Rapid Assessment for Pillar-2  
WMO Hydrology Survey  
Data from Checklist for Climate Services Implementation

## Annex 4 List of materials used

1. Country Hydromet Diagnostics, 2022
2. CHD Operational Guidance for SOFF, 2023
3. [CHD Road testing Report for Chad, 2021](#)
4. [Diagnostic des capacités nationales pour l'alerte multirisque au Tchad, 2021](#)
5. Loi No.35/PR/2015 portant creation d'une Agence Nationale de la Meteorologie (ANAM), 2015
6. Decret No.521 portant Organization et Fonctionnement de l'Agence Nationale de la Meteorologie (ANAM) (decree regarding the creation and function of the National Meteorological Agency), 2017.

## Annex 5 List of Abbreviations

Abbreviation	Full Name
ANAM	National Meteorological Agency
ASECNA	Agence de la Sécurité de la navigation aérienne en Afrique et au Madagascar - the agency for air navigation security in Africa and Madagascar
AWS	Automatic Weather Stations
CHD	Country Hydromet Diagnostics
CREWS	Climate Risk and Early Warning Systems
DPC	Direction de la protection civile – Directorate for Civil Protection
DRE	Direction des Ressources en Eau – Directorate of Water Resources
ECMWF	European Centre for Medium-range Weather Forecasts
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EW4all	Early Warnings for all
FAO	Food and Agriculture Organization
FSRP-2	Food Safety and Resilience Program – 2 <sup>nd</sup> phase
GBON	Global Basic Observing Network
GDPFS	Global Data processing and Forecasting System
GISC	Global Information System Centre
GTP	Groupe Technique Pluridisciplinaire – the group for multidisciplinary technique
IADB	Inter-American Development Bank
ICT	information and communication technologies
MACN	Ministry for Civil aviation and National Meteorology
NCAR	National Center for Atmospheric Research
NMHS	National Meteorological and Hydrological Service
NWP	Numerical Weather Prediction
PDRLIAT	Projet de Developement de la Résilience et de Lutte contre l'Insécurité Alimentaire - Resilience Development and Food Insecurity Project
PILIER	Projet Intégré de Lute contre les Inondations Et pour la Resilience urbaine - Integrated Flood Control and Urban Resilience Project
PNA	Program National d'Adaptation – The National Adapation Programme
ProPad	Projet de renforcement de la Résilience et de la Productivité Agricole Durable - Sustainable Agricultural Productivity and Resilience Strengthening Project
SOFF	Systematic Observation Funding Facilities
UNDP	United Nations Development Programme
WB	World Bank
WFP	World Food Programme
WIS	WMO Information System
WMO	World Meteorological Organization