COMMISSION DU BASSIN DU LAC TCHAD **LAKE CHAD BASIN COMMISSION**

TECHNICAL SUPPORT PROJECT FOR THE RESTORATION OF THE ECOLOGICAL AND ECONOMIC FUNCTIONS OF THE LAKE CHAD BASIN (PARFEBALT)

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TERMS OF REFERENCE

Recruitment of a Technical Assistance for the Establishment of an Early Warning System in the Lake Chad Basin

(Assessment of the hydrometeorological station network in the sub-basins; development of flood and drought early warning models; updating of the Water Resources Planning and Allocation model; development of an interactive geospatial tool for monitoring projects and programmes across the basin area)

Non objection from AfDB received by email from Task Manager on Thursday 2nd April 2026. (See folio 1). DT 2/4/26

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I. Background and Rationale

The Lake Chad Basin Commission (LCBC) was established by the Fort Lamy Convention (now in N'Djamena), signed on 22 May 1964 by the Heads of State of the four countries bordering Lake Chad: Cameroon, Chad, Niger, and Nigeria. In 1994, the Central African Republic joined the Commission, bringing the number of member states to five; Libya joined in 2008, increasing the total to six. Sudan was admitted as a member in 2000; however, having not ratified the Convention, it became an observer in 2010, as did Congo and the Democratic Republic of the Congo (DRC).

The Lake Chad Basin covers **2,355,000 km²**, while the area under the jurisdiction of the LCBC, referred to as the **conventional basin**, extends over **967,000 km²**, corresponding to the hydrologically active part of the basin. It includes the sub-basins of the Chari-Logone, Komadougou-Yobe, Ngadda, Yedseram, and El Beid.

This basin, shared by several countries in Central and Sahelian Africa, is strategic for **food security, water availability and socio-economic stability.** However, it is highly exposed to hydrometeorological risks, including recurrent flooding, prolonged droughts, and the impacts of climate change. These phenomena impact:

- Water resources (declining lake levels, pressure on groundwater, and conflicts over use);
- Livelihoods (rain-fed agriculture, fisheries, and livestock systems vulnerable to climate variability);
- Community resilience (forced displacement, food insecurity and social tensions).

In response to these challenges, the establishment of an **integrated early warning system** is essential to:

- **Anticipate extreme events** (floods, droughts) and reduce their impacts;
- **Improve water resources planning** in a transboundary context;
- **Strengthen community resilience** and support regional cooperation.

This system will need to rely on **a robust hydrometeorological network, reliable forecasting models**, and an **interactive geospatial tool** for basin-level project monitoring and decision-making.

II. Objectives

- Assess the existing network of hydrometeorological and hydrogeological stations in the sub-basins;
- Design and establish an early warning model for floods and drought in the basin;
- Update the Water Evaluation and Planning (WEAP) model by integrating the MODFLOW model;
- Develop an interactive geospatial tool to monitor projects and programmes across the basin.

III. Expected Outcomes

The implementation of the planned activities is expected to deliver tangible results that strengthen the resilience of the Lake Chad Basin to hydrometeorological risks:

1. **The hydrometeorological network is optimised**
   - Comprehensive mapping of existing stations and identification of uncovered areas;
   - Assessment of the operational status (functionality) of hydrometeorological and hydrogeological stations;
   - Recommendations for modernising and expanding the network.
2. **The early warning system is operational**
   - A reliable model for forecasting floods and droughts;
   - Integration with communication systems to rapidly disseminate alerts to communities and authorities.
3. **The water resources planning model is updated**
   - Optimised scenarios for the sustainable allocation of water resources using the WEAP model integrated with MODFLOW;
   - A decision-support tool for transboundary water resources management.
4. **The interactive geospatial platform is functional**
   - A GIS interface enabling the monitoring of projects/programmes and performance indicators;
   - Training of local stakeholders in the use and updating of data.
5. **Institutional and community capacity strengthening is achieved**
   - Transfer of skills to ensure the sustainability of the system;
   - Development of guidelines and protocols for alert management and resource planning.

IV. Expected Deliverables

No.	Deliverables	Expected Content
1.	**Inception Report**	Understanding of the assignment; Methodology ; Schedule ; Experts' mobilisation plan, etc.
2.	**Report on the assessment of the hydrometeorological and hydrogeological station network**	Comprehensive diagnosis of the hydrometeorological and hydrogeological station network; • Complete mapping of existing stations (with geographical coordinates); • Analysis of spatial coverage and identification of uncovered areas; • Technical assessment: operational status, data reliability, and modernisation needs; • Recommendations for optimising and expanding the network, including identification of suitable locations for the installation of new stations; • Annexes: technical data sheets of stations, photographs, diagrams.
3.	**Operational early warning model (floods and drought)**	Operational system for floods and droughts: • Description of critical hydrological and meteorological parameters; • Forecasting algorithms for floods and droughts (with technical documentation); • User interface for visualising alerts;

No.	Deliverables	Expected Content
		• Integration protocols with communication systems at regional, national and local levels (SMS, radio, web platforms); • User guide and operator manual.
4.	**Updated Water Resources Planning and Allocation Model**	Updated version for water resources allocation: • Analysis of hydrological and socio-economic data; • Optimised scenarios for the sustainable allocation of surface and groundwater resources using the WEAP model integrated with MODFLOW; • Decision-support tool (tables, graphs, indicators); • Methodological report explaining assumptions and simulations; • Strategic recommendations for transboundary water resources management.
5.	**Interactive Geospatial Tool (GIS Platform)**	Interactive platform for monitoring projects and programmes: • Web-based or desktop interface for visualising projects/programmes; • A geospatial database of socio-economic infrastructure, such as water points, schools, health centres, agricultural infrastructure, etc.; • Attribute data for each infrastructure (location, type, depth, flow rate, type of materials, number of classrooms, number of pupils, etc.); • Functionalities: dynamic mapping, filters, automated reporting; • User manual and technical guide for data updating; • User training (practical sessions and training materials).
6.	**Final Report Including Strategic Recommendations**	• Summary of outcomes achieved; • Presentation of the expected impacts of the early warning system on production systems and populations ; • Sustainability and capacity transfer plan ; • Annexes: protocols, guidelines, and full technical documentation.

Note: All deliverables shall be provided in both English and French.

V. Duration

Estimated total duration: **18 months**

VI. Required Profile

A. Profile of Consulting Firm

The firm must have:

- **At least 10 years of experience** in water resources management and planning, development of natural resource management tools, and the establishment of early warning systems for hydrometeorological risks (floods, droughts);
- **At least two (2) experiences** in the implementation of early warning systems for hydrometeorological risks (floods, droughts);

- **At least one (1) experience** in the development of interactive geospatial platforms for monitoring projects/programmes;
- **At least two (2) previous assignments** on similar projects in the Sahelian region or in areas with high climate variability, including transboundary water resources management or coordination with multiple States and regional institutions;
- **Experience in capacity building** (organisation of workshops and training for local institutions, and transfer of skills to ensure system sustainability);
- **Technical capacity:** availability of specialised tools and software (GIS, hydrological and hydrogeological modelling, climate forecasting).

B. Required Experts and Detailed Profiles

1. Head of Mission

- **Education:** Master's degree in hydrology, hydrogeology, environmental sciences, geography, climate change or a related field;
- **Experience:** Minimum of 10 years of experience in the management and coordination of hydrological and environmental projects, the establishment of early warning systems for hydrometeorological risks, and water resources planning and allocation in transboundary contexts.
- **Key Competencies:**
  - In-depth knowledge of early warning systems and hydrological models;
  - Proficiency in water resources planning tools (WEAP, MODFLOW);
  - Ability to supervise multidisciplinary teams (hydrology, climatology, GIS, environment);
- **Other Skills:**
  - Excellent skills in multidisciplinary coordination and management of complex projects;
  - Strong communication skills with stakeholders, donors and local institutions;
  - Ability to develop climate risk management strategies;
  - Leadership and organisational skills to meet deadlines and deliverables.

2. Hydrological Modelling Expert

- **Education:** Master's Degree in Hydrology, Hydraulic Engineering, Water Sciences or a related field;
- **Experience:** At least 7 years of experience in hydrological modelling and watershed analysis, development of flood and drought forecasting models, and use of specialised hydrological simulation software.
- **Key Competencies:**
  - Analysis of hydrometric data and model calibration;
  - Development of algorithms for forecasting extreme events (floods and droughts);
  - Integration of hydrological models into early warning systems;
  - Development of flood and drought prediction models;
  - Analysis of hydrometric datasets;
  - Proficiency in software such as HEC-RAS, SWAT and MIKE SHE;

- **Other Skills:**
  - Ability to work in multidisciplinary and transboundary contexts;
  - Ability to train and transfer skills to local institutions;
  - Strong communication skills with stakeholders for data and scenario validation.

3. **Meteorology and Climatology Expert**

- **Education:** Master's Degree in Meteorology, Climatology or Atmospheric Sciences;

- **Experience:** At least 7 years of experience in climate forecasting and early warning systems, including climate prediction, design of early warning systems, analysis of meteorological and climate data, and integration of satellite and ground-based data for modelling.

- **Key Competencies:**
  - Development of forecasting algorithms for floods and droughts;
  - Proficiency in climate and hydrometeorological forecasting tools and software;
  - Integration of satellite data (e.g. Sentinel, MODIS) and ground observations;
  - Analysis of climate trends and variability for risk scenarios;

- **Other Skills**
  - Ability to work in multidisciplinary and transboundary contexts;
  - Ability to train and transfer skills to local institutions;
  - Strong communication skills with stakeholders for data validation.

4. **GIS and Remote Sensing Expert**

- **Education:** Master's Degree in Geomatics, Cartography, Remote Sensing or a related field;
- **Experience:** At least 5 years of experience in the development of interactive GIS tools, integration of hydrological and socio-economic data into geospatial systems, and design of geospatial platforms for monitoring projects/programmes...

- **Key Competencies:**
  - Design and deployment of interactive geospatial platforms (desktop or web-based);
  - Integration of hydrological and socio-economic data;
  - Proficiency in tools such as ArcGIS, QGIS, Python and WebGIS;
  - Integration of data from hydrometeorological stations, satellites and socio-economic databases;
  - Development of advanced functionalities (dynamic mapping, filters, automated reporting);

- **Other Skills:**
  - Ability to work in multidisciplinary and transboundary contexts;
  - Ability to train and transfer skills to local institutions;
  - Strong communication skills with stakeholders for data collection and validation.

5. **Water Resources Management Expert**

- **Education:** Master's Degree in Integrated Water Resources Management, Environmental Sciences or a related field;
- **Experience:** At least 7 years of experience in water resources planning and allocation;
- At least two (02) experiences in transboundary projects or in Sahelian contexts.
- **Key Competencies:**
  - Proficiency in hydrological and hydrogeological modelling tools (WEAP, MODFLOW);
  - Ability to analyse hydrological and socio-economic data for planning purposes;
  - Development of optimised scenarios for sustainable water resource allocation;
  - Knowledge of local and international policies and regulations related to water management;
- **Other Skills:**
  - Ability to work in multidisciplinary and transboundary contexts;
  - Ability to train and transfer skills to local institutions;
  - Strong communication skills with stakeholders.

6. **Hydrogeology Expert**

- **Education:** Master's Degree or higher in Hydrogeology, Applied Geology or a related field;

- **Experience:** At least 7 years of experience in groundwater resource assessment and management, hydrogeological modelling (including integration with MODFLOW or equivalent), and analysis of interactions between groundwater and surface water in transboundary basins;
- At least two (2) experiences in similar projects in the Sahelian region or areas with high climate variability.

- **Key Competencies:**
  - Proficiency in hydrogeological modelling tools (MODFLOW, FEFLOW);
  - Ability to use SWOT satellite data (various interfaces such as SWOT Viz and Hydroweb Next provide near real-time data on water levels in most lakes and rivers—these tools are essential for developing early warning systems);
  - Knowledge of early warning systems and integration of hydrogeological data into predictive models;
  - Ability to produce mapping of aquifers and recharge zones;
  - Use of GIS for integrating hydrogeological and socio-economic data;
  - Analysis of abstraction impacts and development of sustainable groundwater management scenarios;
- **Other Skills**
  - Good understanding of local policies and regulations related to groundwater management;

- Ability to work in multidisciplinary and transboundary contexts;
- Ability to train and transfer skills to local stakeholders.

7. Environmental Expert

- **Education:** Master's Degree in Environmental Sciences, Ecology, Natural Resource Management or a related field;

- **Experience:** At least 7 years of experience in environmental management, ecosystem conservation, environmental impact assessment of infrastructure and water management policies, and contribution to projects in Sahelian or lake environments.

- **Key Competencies:**
  - Knowledge of aquatic and terrestrial ecosystems in Sahelian and lake regions;
  - Environmental impact assessment of infrastructure and water management policies;
  - Contribution to the definition and monitoring of environmental indicators for integration into a GIS platform;
  - Proficiency in environmental assessment methods (EIA, audits);
  - Ability to propose mitigation measures and environmental management plans;

- **Other Skills**
  - Good understanding of local and international environmental policies;
  - Ability to work in multidisciplinary and transboundary contexts;
  - Ability to train and raise awareness among local stakeholders on environmental issues.

8. Communication and Capacity-Building Expert

- **Education:** Degree in communication, development studies or social sciences;
- **Experience:** At least 5 years of experience in awareness-raising and training.
- **Key Competencies:**
  - Development of training and educational materials ;
  - Organisation of workshops and training sessions ;
  - Design and implementation of alert dissemination strategies.

LAKE CHAD BASIN COMMISSION EXECUTIVE SECRETARY
COMMISSION DU BASSIN DU LAC TCHAD SECRETAIRE EXECUTIF

Amb. IBRAHIM BABANI
Executive Secretary