



Cooperation in International Waters in Africa (CIWA) (AF-2)

Terms of Reference

Meteorologist/Rainfall Forecast expert (1 International Position)

1. BACKGROUND

The Nile Basin Initiative (NBI) is an intergovernmental partnership of ten Nile Basin states (Burundi, D.R. Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda) established to develop the river cooperatively; reduce poverty and environmental degradation; share substantial socio-economic benefits, and promote regional peace and security. The NBI is guided by a Shared Vision which envisages achieving “*sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources*”. NBI member countries launched a Strategic Action Program with two sub-programs: the basin-wide Shared Vision Program (SVP) that aimed at building confidence, capacity and knowledge base (now phased out), and two Subsidiary Action Programs (the Eastern Nile and the Nile Equatorial Lakes Subsidiary Action Program – ENSAP and NELSAP) that initiate concrete joint investments and action on the ground at sub-basin levels.

The NBI constitutes the ‘development track’ in Nile Basin cooperation. The countries have also launched a ‘political-legal track’ aiming at an inclusive Cooperative Framework Agreement (CFA).

The Eastern Nile Subsidiary Action Program (ENSAP) was launched by Egypt, Ethiopia and the Sudan (South Sudan joined in 2012 following its independence) to initiate concrete joint investments in the Eastern Nile (EN) sub-basin. ENSAP is governed by the Eastern Nile Council of Ministers (ENCOM) and implemented by the Eastern Nile Technical Regional Office (ENTRO) headquartered in Addis Ababa, Ethiopia. ENSAP is funded by the four member countries and bilateral and multilateral Development Partners.

The Integrated Development of the Eastern Nile (IDEN) was the first ENSAP project agreed by the member countries in 2002. IDEN consisted of a first set of seven subprojects aiming at tangible win-win gains in watershed management; flood

preparedness and early warning; irrigation and drainage; power supply interconnection and regional power trade; planning model along with the Joint Multi-Purpose development Project (JMP) of the Eastern Nile and Baro-Akobo-Sobat Multipurpose Water Resources Development Study Projects.

Currently, ENTRO is implementing its 2nd, 2014-2019, Strategic Plan. The Strategic Plan which is oriented in four strategic directions (i.e. Facilitating Cooperation, Promoting Water Resources Management and Planning, promoting Water Resources Development and Power Trade, and Institution Building) strives to position ENTRO for effective pursuance of its focus on Investment.

The EN Flood Protection and Early Warning Project (FPEW) has been one of the earliest successful IDEN Projects. The Project aims to reduce human suffering caused by frequent flooding, while preserving the environmental benefits of floods. The project emphasis on enhancing regional collaboration and national capacity in flood risk management, including flood mitigation, forecasting, early warning systems, emergency preparedness, and response. The FPEW project that ran until 2010 operated in Egypt, Ethiopia, and Sudan.

After the completion of FPEW project ENTRO initiated with Eastern Nile countries and created a regional Flood Forecast and Early Warning (FFEW) system under the Eastern Nile Planning Model project (ENPM) and the FFEW activity continued under the current Nile Cooperation for Result project (NCORE). The FFEW, since its establishment, has been an important part of ENTRO's activity that continuously been conducted for the last six year flood season (June – September). The FFEW has helped the Eastern Nile countries in reducing the loss of life and money by preparing flood forecast bulletins for the Lake Tana (Blue Nile -Ethiopia), the Blue Nile-Main Nile (Sudan) and Baro-Akobo-Sobat(BAS) sub-basins flood prone areas. The FFEW activity have strengthened national offices in terms of capacity and overall reduced the risk of flood devastation for 2.2 million people in the region.

2. RATIONALE

The current FFEWS has gaps on coverage of all flood prone areas in the basin, robustness of the system and model, limited capacity in enhancing the system to up-to-date forecast standard. The current FFEW system use different models for the different flood prone areas in the basin which makes it time consuming and hard to update whenever there is a new version of model is available. Thus, there is a need to have a single robust unified flood forecasting and early warning system for the entire EN basin that include some parts of the basin were no prior work is done like flood prone areas like Tekeze – Setite-Atbara(TSA)sub- basin.

The other challenge is to ensure continued relevance of this vital program, forecast communication and dissemination need to be more easily accessible to rural communities and other important stakeholders. Thus, there is the need for further in-depth

understanding of most vulnerable communities, their socio-economic characteristics in order to design fit-for-purpose response and preparedness mechanisms.

3. Objective

The objective of this project is;

- To ensure a robust forecasting, issuing and warning system that effectively minimize loss of life and damage by enhancing, expanding and developing a unified Flood Forecast and Early Warning (FFEW) system for EN basin
- To support other studies under FFEW that contribute in addressing flash flood, stakeholder analysis and flood related DSS development.

4. Scope of Work

The scope of the study is divided into two main Tasks. These Tasks are listed as follows;

4.1 Task 1: Flood Forecast System Enhancement:

- Review the current rainfall forecasting tools used at ENTRO and its linkage with flood forecast early warning system (Lake Tana and BAS flood prone areas). Identify key gaps including the capability of the rainfall forecast model
- Review best practice and methodologies currently available that can be adopted to Eastern Nile basin
- Identify compatible software and hardware for real time rainfall with available input data both observed and global (automated coupling of input data i.e. station and gridded data and other satellite/radar/ any other new technology products) and output dissemination including all necessary, software, hardware and web system in real time. Make sure the system can integrate all the flood prone area into one system
- Establishing the Quantitative Precipitation Estimate (QPE) and Quantitative Precipitation Forecasting (QPF) production system for the integrated to flood forecasting system using all observation data and the data from numerical weather prediction model(s).
- Compare results of different models to forecast high resolution climate data to increase the forecast lead time
- Compare results of different near real time satellite rainfall estimate datasets and develop operational bias correction method(s).
- Develop and calibrate weather forecast models
- Compiling and generating forecast products based on data made available from global models and localized weather forecast model developed for Eastern Nile basin at the basin scale to increase quality of the forecast for flood warning purposes

- Work with Senior FFEW expert to prepare scripts for compatibility of the developed weather forecast model output to hydrologic and hydraulic models for Eastern Nile Flood forecast models
- Prepare list of compatible globally available rainfall forecast models outputs for Eastern Nile basin and prepare linkage with hydrologic and hydraulic model
- Prepare a backup conceptual framework in case of the developed weather forecast models is not functional
- Work with the IT unit to work the linkage of the weather forecast model in the unified flood forecast system for easy dissemination of forecast results and warning messages
- Work with the flood team to do a test run
- Report writing
- Any other tasks requested by Senior FFEW Expert

4.4 Task 2: Capacity building

Throughout the study a continuous capacity building activity are going to be done in all tasks mentioned above and the team leader will work with ENTRO to facilitate and deliver this task which includes;

- Provide training in numerical data analysis and rainfall forecast
- Conduct validation workshop
- Participate in consultation workshop

5. DELIVERABLES

Table 1: Deliverable and targeted schedule

Deliverable	Description	Schedule after commencement	Payment
Task 1	Inception report on; <ul style="list-style-type: none"> • Review existing system • Proposed methodology, type of model, available best practice, etc... 	1 months	20%

Task 2	<ul style="list-style-type: none"> • Establishing the Quantitative Precipitation Estimate (QPE) and Quantitative Precipitation Forecasting (QPF) production system for the integrated to flood forecasting system using all observation data and the data from numerical weather prediction model(s). • Compare results of different models to forecast high resolution climate data to increase the forecast lead time • Compare results of different near real time satellite rainfall estimate datasets and develop operational bias correction method(s). • Develop and calibrate weather forecast models • Compile and generate forecast products based on data made available from global models and localized weather forecast model for Eastern Nile basin at the basin scale to increase quality of the forecast for flood warning purposes 	2-4 months	30%
Task 3	<ul style="list-style-type: none"> • Setup and test the weather forecast model at ENTRO workstation • Test the scripts for compatibility of weather forecast model output with other flood forecast models both hydrologic and hydraulic models • Test customized global weather forecast for Eastern Nile flood forecasting models • Test the weather forecast model with the forecasting system compatibility 	2-4 months	30%
Task 4	<ul style="list-style-type: none"> • Contribute a report on weather forecasting part on the gathered information, model development, etc... • Design and provide at least two necessary trainings and capacity development for sustainable operation of the flood forecast early warning system • Conduct at least one validation workshop • Support procurement process of necessary equipment and software, in collaboration with the other team members. 	4-8 months	20%

6. IMPLEMENTATION ARRANGMENT

This study requires a team of multi-disciplinary experts working in an integral manner and with extensive experience and deep and broad knowledge of flood forecasting and early warning. To successfully carry out the project the team of consultant will be led by Senior Flood Forecasting Expert who is responsible for delivering and overall coordination with the consultant and ENTRO. Each of the support consultants has specific tasks and activities assigned to him/she and will report directly to Senior Flood Forecasting Expert. Regular team meetings will be held throughout the project to focus individual efforts, collaborate and share ideas, and provide support to completing tasks and fulfilling the objectives of the consultancy.

In addition, the support consultants are expected to work with, and provide guidance to batches of interns/young professionals drawn from various EN ministries and universities and who will support in various stages of the project.

As a client ENTRO will assign a project Coordinator who will be responsible for overseeing the work and contract administration. ENTRO shall provide adequate support to the support consultants by facilitating gathering of data, access to relevant information and authorities, and by providing adequate office space and support facilities (such as internet) when the consultant is in Addis Ababa.

7. QUALIFICATIONS & EXPERIENCE

- At least Master level degree in meteorology or atmospheric sciences or related field.
- Three years' experience in weather forecasting and extensive experience using numerical weather prediction model(s)
- Excellent experience in statistical analysis, generation and verification of QPE and QPF
- Experience in setting up rainfall forecast models i.e WRF models required
- Experience on customizing meteorological and forecasting models for hydrological forecasting purposes will be an advantage
- Experience in programing language and scripting
- Very good command of written and spoken English

8. Level of Effort, Budget and Schedule

The Meteorologist consultants shall provide a total of one man-month a period of one year. During this period the consultant has to work at least 10 days at ENTRO and the rest will be from his/her home. The consultant will during this period, undertake at least one trips to ENTRO's offices located in Addis Ababa, Ethiopia.

Payment shall be effected upon submission of invoices to ENTRO as well as submission and acceptance of deliverables. Reimbursable expenses will include international travel

(economy class), accommodation and daily subsistence allowance at the ENTRO rate, in accordance with ENTRO policies.