IGAD Climate Prediction and Application Centre (ICPAC)

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The African Networks of Centres of Excellence on Water Sciences PHASE II (ACE WATER 2)

INCEPTION REPORT

July 2018

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LIST OF ABBREVIATIONS

ACE-WATER-2	African Networks of Centres of Excellence on Water Sciences PHASE II
AU-NEPAD	African Union - NEw Partnership for Africa's Development
BNB	Blue Nile Basin
CEANWATCE	Central-Eastern Africa Network of WATer Centers of Excellence
CHG	Climate Hazard Group
CHIRPS	Climate Hazards Group Infrared Precipitation with Station
CoEs	Centres of Excellence
CORDEX	Coordinated Regional Downscaling Experiment
CRU	Climate Research Unite
EU	European Union
ICPAC	IGAD Climate Prediction and Applications Centre
IGAD	Inter-Governmental Authority on Development
JRC	Joint Research Centre
LVB	Lake Victoria Basin
SPEI	Standardized Precipitation Evapotranspiration Index
SPI	Standardized Precipitation Index
UNESCO	United Nations Educational, Scientific and Cultural Organization
WEFE	Water-Energy-Food-Ecosystem

1 INTRODUCTION

The project "*The African Networks of Centres of Excellence on Water Sciences PHASE II (ACE WATER 2)*" aims at fostering sustainable capacity development at scientific, technical and institutional level in the water sector. The project supports twenty (20) AU-NEPAD African Network of Centres of Excellence in Water Sciences and Technology (CoEs) organized in three regional networks, in conducting high-end scientific research on water and related sectors, in order to provide effective scientific and educational support to governments. The project is implemented in partnership between UNESCO, in charge of the human capacity development component, and the JRC that coordinates the scientific component and leads the project.

In the framework of the project scientific component, the CEANWATCE (Central-Eastern Africa Network of WATer Centers of Excellence) identified, by means of collective sharing, the Blue Nile Basin (BNB) and the Lake Victoria Basin (LVB), as sub-catchments of the Nile being very relevant for the development of common research undertakings. These basins pose many challenges from a perspective of Water-Energy-Food-Ecosystem (WEFE) nexus, including, among others, hydropower, reservoir multipurpose optimization and release management (in particular the BNB), rain-fed and irrigated agriculture development, impact of land use and agricultural practices (including livestock and fisheries), role of ecosystem services (natural parks, wetlands), pressures on resources due to population increase and climate variability/change and extreme events risks (drought and flooding).

This project addresses WEFE nexus interdependences and evaluates sustainable bridging-gap solutions, based on state-of-the-art reviews and scientific analysis. Building on the discussions with CEANWATCE and the Inter-Governmental Authority on Development (IGAD), specific actions are to be implemented, taking into account scientific competencies of both CoE and JRC, and in view of an effective cooperation with other key regional stakeholders, towards the development of a dynamic web African Atlas on Water Cooperation, supporting decision making processes through scenarios-based-analysis.

Based on IGAD strategies and priorities and supported by AMCOW (declaration GA/10/2016/Dar/14) in the frame of the ACEWATER2 project, the following areas of scientific investigation relevant to WEFE nexus analysis have been identified:

1. Climate variability and extreme events
2. Hydrology, water balance and hydropower
3. Water and livelihood: agricultural water, health, quality, access, resilience

1.1 GENERAL OBJECTIVES

To Assess WEFE interdependencies across the Nile River Basin, with a particular focus on the Blue Nile Basin and the Lake Victoria Basin. The specific objectives to be addressed by the IGAD Climate Prediction and Applications Centre (ICPAC) on climate variability and extreme events are;

1.1.1 Specific Objectives

1. Gather and collect data in a regional Hydro Climate Database (i.e. rainfall, temperature, including remote sensed datasets, ground stations and related time series).

2 Perform Climate Variability (CV) analysis, to assess extremes and seasonal anomalies and frequencies, and climate risk assessment on extreme events (droughts, floods), based on analysis of relevant indicators (i.e. SPI, SPEI, SFI) and state of the art methodologies, at both regional and BNB/LVB scales.

1.2 INCEPTION PHASE OF THE PROJECT

Project Implementation started in July 2018. The component of climate variability and extreme events of the project is implemented by ICPAC, which will feed into the analysis by the Khartoum University, Makerere University, and Addis Ababa University. The expert assigned to this activity under ICPAC is Mr. Zachary Atheru (Head of Climate Diagnostic and Prediction), e-mail: zatheru@icpac.net, and is now fully registered as an expert in the EU portal.

The inception workshop was held in Kampala, Uganda from 7th to 9th of February, 2018, with the participation of representatives from Makerere University, Addis Ababa University, Khartoum University, JRC, UNESCO, and ICPAC (represented by Mr. Jully Ouma and Dr. Mohammed Hassan). The workshop focused on explaining the rationale and strategy of the project to all stakeholders, presenting project implementation procedures and discussing roles and responsibilities of each partner and opportunities for partnership during project implementation.

Goals and objectives, methodology and basic planned results as well as annual work plan and meetings for 2018/2019 were presented by the representative of JRC. Challenges and technical solutions for obtaining hydrological data from Tanzanian and Rwanda were presented and discussed. The 2018 work plan was revised after the inception workshop, it was then agreed by the all members that the implementation of the project activities will commence after the submission of the inception.

1.3 CONCEPTUAL FRAME WORK

Climate change presents new challenges in terms of climate variability, extremes such as drought and floods thus affecting the livelihood within the Lake Victoria and Blue Nile basins. This analysis asserts that the extent of risk prone areas will increase owing to the anticipated changes in climate. Figure 1 illustrates the steps that will be taken in this study to assess the variability in climate and expected changes. The data and maps will be made available online for use by other centers as well as the public with no access credentials required.

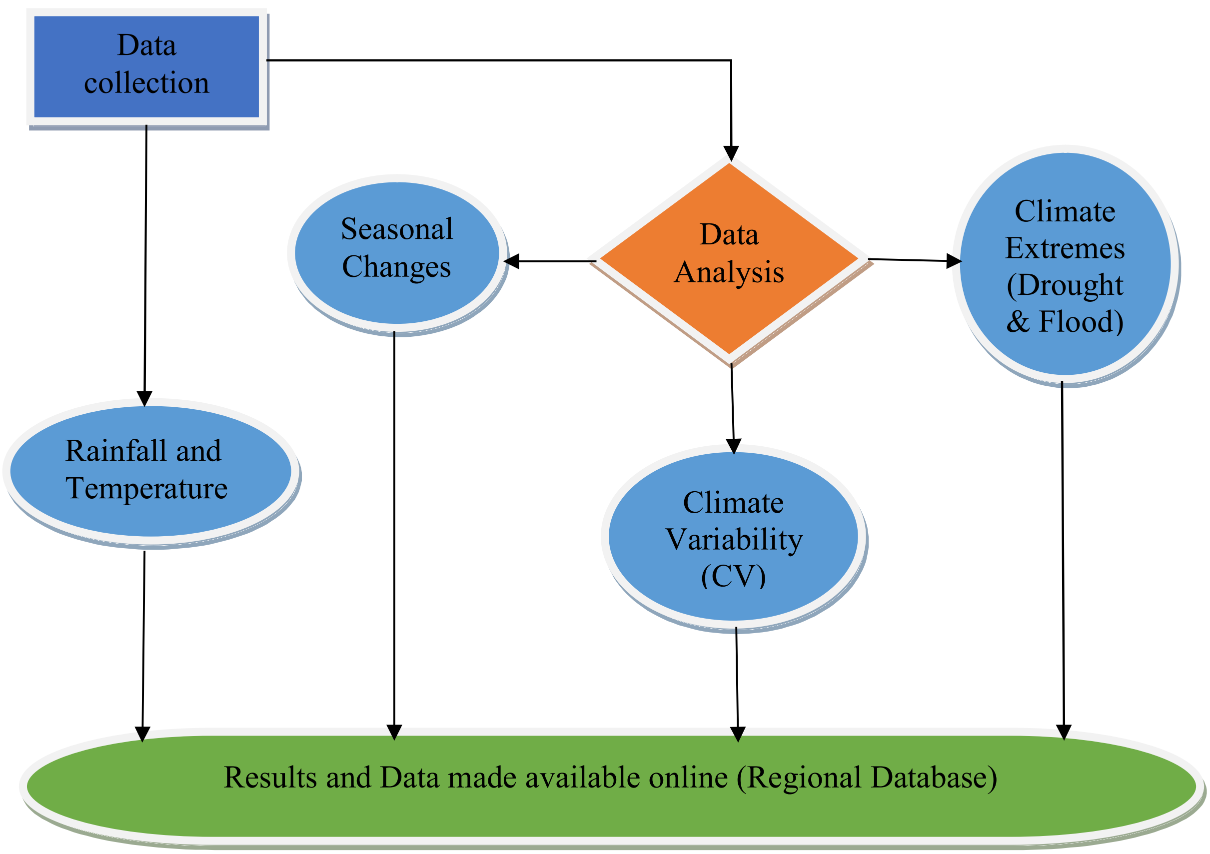

Figure 1: The research model demonstrating the research conceptual framework

2 DATA AND METHODS

Atmospheric observed/satellite data (rainfall and temperature) will be obtained from ICPAC, Climate Hazard Group (CHG), and the Climate Research Unite (CRU) data library of the University of East Anglia will be used in this assessment. Station data from 1961 to 2017 from ICPAC will be used together with the Climate Hazards Group Infrared Precipitation with Station from CHG which is mainly satellite based data at a resolution of 0.05^0 and a temporal resolution of one month from 1981 to 2017 (Funk et al., 2014; Katsanos et al., 2016). Monthly CRU data (rainfall and temperature) at a spatial resolution of 0.5^0 will also be used from 1901 to 2017 (Harris et al., 2014) to determine how climate has changed in the past. Climate Change data from the Coordinated Regional Downscaling Experiment (CORDEX) will be used to assess the scenarios of the future (Osima et al., 2018) over the region with specific focus over the basins. The model picked for analysis based on statistical procedures will be made available in NetCDF format to other centers for their use in the respective basins.

Proposed methods to be used in this analysis are: Standardized Precipitation Index (SPI) for assess abnormal wet and dry conditions using precipitation only (Tsakiris, & Vangelis, 2004; Türkeş & Tatlı, 2009) adopted by the World Meteorological Organization (WMO); the Standardized Precipitation Evapotranspiration Index (SPEI) which was developed in 2010 and has wide been used by studies related to hydrology and climatology (Vicente-Serrano et al., 2010; Beguería et al., 2014; Stagge et al., 2015); R-Programming for statistical analysis; and ArcGIS based tools for spatial analysis.

The dataset used in this study and the maps/reports will be shared though the online data portal available at ICPAC for ease of access (http://geoportal.icpac.net). This data portal is public with no login credentials required to download data, documents, and maps. The data portal is divided into sections and the ones that will be used here are; GIS Datasets (for spatial data storage e.g. Shapefiles data) and Documents/Maps for storing raster time series, .xlsx files, maps and reports).

3 RESULTS AND DISCUSSION

Results obtained will be presented and discussed under this section. The results and outputs will be made available for download to other centers as discussed in section 2 above. The portal that will be used to share this outputs and information is publicly available with no registration required (http://geoportal.icpac.net/documents). Expected output and results are;

- Rainfall and temperature data for the basins (Observed and Projections) in raster format
- Climate extreme maps (Flood/Drought-SPI)
- Seasonal Changes maps
- Climate Variability (CV) maps
- Future climate scenario maps for the GHA and the Basins (Flood/Drought)

4 REFERENCE

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5 ANNEXES

5.1 ANNEX1: ISSUES, CHALLENGES, AND POSSIBLE SOLUTIONS

The table below covers the expected issues and challenges with possible solutions based on the current conditions:

Objectives/ Output	**Issues & challenges**	**Possible solutions**
Specific objectives: To gather and collect data in a regional Hydro Climate Database (i.e. rainfall, temperature, including remote sensed datasets, ground stations and related time series); and to perform Climate Variability (CV) analysis, to assess extremes and seasonal anomalies and frequencies, and climate risk assessment on extreme events (droughts, floods).	Official start of the project was delayed. This reduced the expanse of time allocated for the implementation of the planned activities.	This will not have negative impact on the quality of outputs as we have planned to achieve the objective within the given time.
Output 1: Regional (IGAD region) meteo-climate datasets (remote sensed datasets, ground based stations and related time series) and indices maps, relevant to CV and CC analysis and extreme events risks assessment.	Provision of Rainfall and Temperature station data to the public will be a challenges as we are not allowed to do so based on our MoU with the member states.	The possible solution to this is the provision of satellite blended dataset (satellite with station) generated by ICPAC. This can be made available with no restrictions.

5.2 ANNEX 2: PROJECT ACTIVITIES

2018 Project work-plan

Activities	2018												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Inception workshop													
EU-Portal Registration and Contact Signing													
Inception report													
Data Collection (Rainfall and Temperature)													
Climate Variability Analysis (at monthly and seasonal scales)													
Extreme Climate Analysis (Drought and Floods)													
Data and Maps upload on the regional data portal.													
Report writing and submission													

INTERGOVERNMENTAL AUTHORITY ON DEVELOPMENT

IGAD

AUTORITÉ INTERGOUVERNEMENTALE POUR LE DÉVELOPPEMENT