



NEPAD WEST AFRICAN WATER CENTRES OF EXCELLENCE

INCEPTION REPORT ON

PROPOSED SCIENTIFIC CONTRIBUTIONS FOCUSED TOWARDS WEFE
NEXUS ASSESSMENT

BY

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1.0 BACKGROUND

Water resources in Africa and in particular western Africa is strongly challenged by a series of issues which include climate variability and amplification of climatic processes, water scarcities and degradation of ecosystem. Due to changes in the already high variability in rainfall and river flows and changes to the geographical distribution of water resources, some areas are becoming drier, whilst others becoming wetter. Complex challenges such as these dictate a critical need to properly manage and conserve water resources in western Africa. Thus, concerted management of water resources is essential for the development of West African sub-region which has several transboundary basins. The AU-NEPAD African Network of Centres of Excellence in Water Sciences and Technology (CoEs) has taken the initiative to conduct an analysis of Water-Energy-Food-Ecosystem (WEFE) nexus interdependences and evaluates sustainable bridging-gap solutions, based on state-of-the-art reviews and scientific analysis in the western African sub-region. In this perspective, the Niger River Basin (NRB) which is the second wider hydrological basin in Africa (after Nile), is proposed as the basin case study area for the Western Africa Network of Water Centers of Excellence (WANWATCE) in the framework of AU/NEPAD ACEWATER2 project, in consideration of both its relevance, spatial extension (more than 2 million km²) and former/ongoing baseline characterization and modeling activities.

NRB poses many challenges from a perspective of Water-Energy-Food-Ecosystem (WEFE) nexus, including, among others, hydropower production, reservoir multipurpose optimization and release management, rain fed and irrigated agriculture development, impact of land use and agricultural practices (including livestock and fisheries), role of ecosystem services (natural parks, wetlands; delta region), pressures on resources due to population increase, climate variability/change and related extreme events risks (drought and flooding).

Due to transboundary nature of the NRB, the AU/NEPAD ACEWATER2 project aims to evaluate issues at sub-basins level relating to climate variability and extreme events, hydrology and reservoir management, agriculture and water, in order to provide

baseline information on WEF assessment in Northern Nigeria. Therefore, this study aims to focus on “Sustainable Use of Water Resources in Sokoto-Rima River Basin for Intensified Agriculture, Food Security and Poverty Alleviation”. The Sokoto-Rima River Basin is a sub-basin of the NRB that is situated within the Niger North Hydrological Area in the semi-arid region of Northern part of Nigeria. Due to its similarities, this area could be a representative of the entire northern part of Nigeria.

1.1 Justification for Selecting Sokoto Rima River Basin

The Sokoto Rima River basin is one of the largest sub-basins in northern Nigeria that is situated on the Niger basin. Many of the existing dams within the sub-basin are now experiencing declining storage capacities and spread of aquatic weeds with increased downstream flood hazard due to poor reservoir management practices. Water quality in most of the rivers supplying water to the reservoirs tends to diminish especially in the dry season. Recently, high turbidity level and proliferation of algae was observed at Bakolori Reservoir which is an indication of pollution of the water source. Soil fertility has been declining due to continuous cropping and poor irrigation management. Poor water delivery and excessive water use on poorly structured sandy soil of the basin has caused water logging, salinization and destruction of crops. Also, pattern of groundwater fluctuation was observed in some boreholes locations within the basin. Although, Sokoto Rima River Basin is not the only sub-basin contributing to the Niger basin in northern Nigeria however characteristics of the sub-basin are similar to that obtain in most of the sub-basins in that part of country.

1.2 Scope

The study will focus on Sokoto-Rima River Basin which is a sub-basin of the NRB. Research work will be based mainly on desk reviews and will cover the northern Nigeria in general.

2.0 OBJECTIVES

The main objective of the study is to investigate issues relating to sustainable use of water resources in Sokoto-Rima River Basin for intensified agriculture, food security and poverty alleviation.

Specifically, the study aims to:

- Investigate factors triggering climate variability/change and their impact on the water resources of the sub-basin and indicate vulnerable or prone areas;
- Review and evaluate the geological and hydrogeological data for groundwater potential appraisal with regards to Fadama water use in dry condition irrigation in the study area;
- Identify and map out monitoring network of river gauging stations and selected boreholes and wells within the study area;
- Characterize water quality of selected boreholes, wells and surface water in view of the lead pollution that occurred in the areas associated with gold mining and its consequences on agricultural sustainability and poverty reduction in the study area;
- Examine water availability and demand within the entire sub-basin by considering watershed characteristics and the demography of the basin system;
- Assess key on-farm water management constraints in major irrigation schemes within the sub-basin;
- Disseminate findings and conclusion through workshop and seminar presentation.

3.0 STUDY AREA

The Sokoto Rima Basin is located between latitude 11°N to 16°N and longitude 3.3°E to 10°E of the meridian in North-Western part of Nigeria (see Figure 1). The entire Basin covers a total catchment area of 131,600km² and is drained by many rivers which include River Tarka (upstream of Goronyo Dam), River Kaba, River Tagwai, River Maradun, River Bunsuru, River Gagare, River Sokoto, River Zamfara and River

Ka. The Sokoto-Rima extends from parts of Katsina, the entire part of Sokoto, Kebbi, Zamfara and covers a small portion of Kaduna and Niger States. Major dams in the basin are the Bakolori and Goronyo dams. The capacities of the dams are 942 and 450 million m³ respectively, with planned irrigation area of 69,000ha for Bakolori and 30,000 ha for Goronyo.

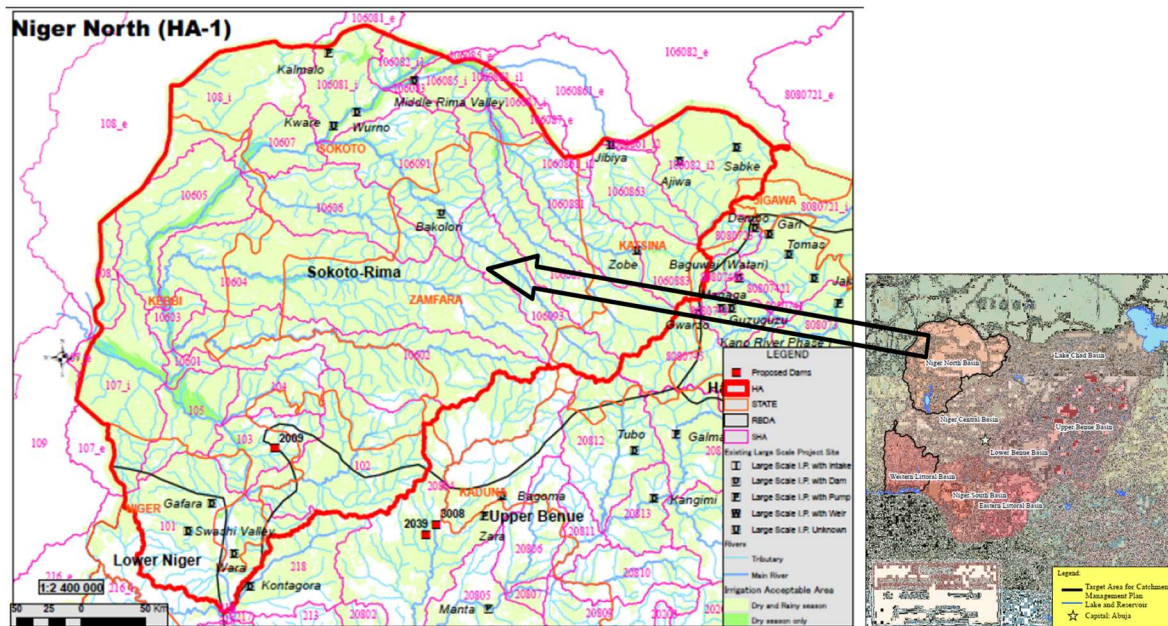


Figure 1: Map of Nigeria showing Sokoto Rima Basin

4.0 RESEARCH METHODOLOGY/SCIENTIFIC ACTIVITIES

4.1 Climate Variability and Extreme Events Studies

- In order to examine and better understand climate related issues in the sub-basin, a review of existing studies will be undertaken. Studies and data relating to climate, hydrology, water demand and use that are readily available will be sourced and accessed;
- Scenarios for variability/change in climatic and hydrological factors (precipitation, temperature, stream flow etc) will be developed and examined;
- The information generated will provide baseline for analysis and prediction of effect of variability/change on water resources;

- Mapping of vulnerable or prone areas within the study location.

4.2 Geological and Hydrogeological Studies

- Review of geological and hydrogeological data to assess the groundwater potentials and abstraction especially the use of tube wells and boreholes for water supply;
- Production of relevant maps and suggested groundwater utilization for irrigation, livestock use and other purposes.

4.3 Water Availability and Demand Evaluation

- Review and collate data from all accessible sources on water availability (in terms of surface and groundwater flows) water demands and use for hydro power, irrigation and water supply;
- Information generated will be utilized in the Water Evaluation and Planning tool (WEAP) for analysis and testing of options for matching water availability and demands. The WEAP model will be used for scenario analysis and recommendation only.

4.4 Water Quality Characterization

- Review of water quality studies in the study area and determination of suitability of water sources (surface and groundwater) for irrigation, human consumptions and other purposes.
- Development of water quality suitability maps for both water supply and irrigation in the sub-basin.

4.5 Assessment of Key On-Farm Water Management Constraints

- Review and collate information from organizations active on on-farm water management activities in the study area;
- Identify constraints relating to on-farm water management and compare findings with best practices;
- Develop capacity development plan to address identified gap(s).

4.6 Evaluation of Hydro Power Potential within the Sub-basin

- Conduct hydrological river routing to determine reservoir storage;
- Examine flow duration-curve to help estimate the firm power (minimum power).
- Assess hydropower potentials of available dams in the study area.

5.0 RESEARCH OUTCOME

The following are expected as outputs from the study:

- Detailed description of the climate variability, extreme events hydrological and hydrogeological characteristic including reservoir assessment and management of the sub-basin provided;
- Maps and baseline information on probable climate impact on water resources for the sub-basin developed;
- Options for matching water availability, demands and use developed;
- Water quality suitability maps for both water supply and irrigation in the sub-basin developed;
- Key on-farm water management constraints identified and capacity development plan to address identified gap(s) developed;
- Hydro power potential of major dams within the Sub-basin provided.

Generally, the work to be implemented include CLIMATE VARIABILITY AND EXTREME EVENTS, HYDROLOGY and RESERVOIR MANAGEMENT, AGRICULTURE and WATER, in order to provide a report, and baseline database and WEFE assessment in North Nigeria and capacity building activities based on skill gaps identified during the skill gap studies.

6.0 HUMAN CAPACITY DEVELOPMENT

The following workshops have been identified from the capacity building assessment to be organized by JRC in collaboration with AU NEPAD WANWATCE, AMCOW experts

and the SRRBDA, the training content in wish participants capacity will be developed. This include:

1. Capacity development training AU NEPAD WANWATCW, AMCOW and experts from CoE on flood and drought Assessment and mitigation in northern Nigeria in collaboration with sokotot rima river basin development authority.
2. Regional training workshop in Groundwater exploration and exploitation in the Basement and Sedimentary Areas.
3. Training workshop on water treatment techniques, Operation and Maintenance as well as quality monitoring.
4. Training workshop on water quality, Sewage and Solid assessment and Management.
5. Training workshop on Integrated Water Resources Management for reservoir management with interest in Hydrological, climatic and Agricultural of northern Nigeria.

7.0 PROJECT Workplan and activities

The is the proposed workplan (Table 1) with activities for the project as included in this inception report. In it, is the reporting pattern to make easy tracking of advancement in various stages of the project. Also Included is the activities as highlighted in the terms of reference and the overall work plan.

Table 1: NWRI Workplan/Activities

			Programme (Weeks)																																					
1			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30	31	32	33						
2	Milestone/Task	Description / Week																																						
3		Stage 1 (Reports)																																						
4	Milestone 6.	1 Inception Meeting	█																																					
5		2 Conceptual Frame Work Draft	█																																					
6		3 Inception Report Draft		█	█																																			
7		4 Final Inception Report		█	█	█																																		
8	Milestone 7	5 Data Collection				█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█																	
9		6 Progress Report																																						
10		7 Draft Report on WEFE Assessment.																																						
11		8 Final Report on WEFE Produced																																						
12		Stage 2 (Tasks and Deliverables)																																						
13	WA. WEFE 1.	9 Baseline Database on Climatic variability																																						
14		10 Baseline Database on Hydrology and sector water demand																																						
15		11 Baseline Database on Reservoir Management																																						
16		12 Baseline Database on Agricultural Best Practices																																						
17		13 Baseline Database on WEFE interlinks and implications																																						
18		Stage 3 (Capacity Development)																																						
19	Capacity Buidling	14 Training Material on Baseline Databases Analysis Developed																																						