

# Impacts of climate change on water supply and sanitation in Nigeria

## An assessment study

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# Objectives of the study

- *Determine the real and potential impacts of climate variation on water supply and sanitation services in urban, slum areas, and rural areas in Nigeria.*
- *Determine the capacity of water supply and sanitation utilities in Nigeria to respond to potential impacts of climate change.*
- *Determine the vulnerability of water supply and sanitation utilities in Nigeria to potential impacts of climate change.*
- *Determine the potential impacts of climate change to access to safe drinking water supply and sanitation service in Nigeria.*
- *Determine the available mitigation and adaptation strategies open to water related institutions and users/consumers of WSS services to ensure sustainable access to safe drinking water and sanitation services in a changing climate.*



# Contents of the report

- **120 page report, 10 page executive summary**
- **Five chapters, featuring twenty one (21) tables and four maps.**
- **Twenty Case studies**
- **Two hundred recommendations**
- **Chapter 1: Introduction**
- **Chapter 2: Climate change, water supply and sanitation**
- **Chapter 3: Methodology**
- **Chapter Four: Adaptive capacity of Nigeria's WSS sector to climate change**
- **Chapter Five: Recommendations**



# Methodology

- Desk review of existing literature
- Field visits
- 20 Case studies
- Quantitative survey was carried out to gather information on the adaptive capacity, sensitivity, and general vulnerability of water supply and sanitation service providers and users to climate variability.
- Thirty nine (39) questionnaires were administered on water supply and sanitation agencies throughout Nigeria, and two hundred and six (206) questionnaires administered on water supply and sanitation users mainly in Lagos, Anambra, Osun states and the Federal Capital Territory, Abuja.
- Technical meetings were also held with stakeholders in four focus states: Lagos, Anambra, Osun states and the Federal Capital Territory, Abuja.

<b>Climate hazard</b>	<b>Impact</b>	<b>Vulnerable system</b>	<b>Effects</b>
Increase heavy precipitation	Flooding	Water supply (groundwater) Wastewater Water supply (reservoirs)	Equipment failure
			Flooding of Intake systems
			Risk of infiltration increase due to pressure reductions
			Flooding of pump stations
			Pollution of service reservoirs
			Flooding of taps and float valves increase risk of contamination
			Flooding of essential unit process
			Performance of utility adversely affected by poor raw water quality
			Increased demand for emergency supplies from areas adjacent to flooding
			Solids deposited in Inundated surface water sewers
Foul water, Overflow of Sewers, floodwaters contaminated			

Climate hazard	Impact	Vulnerable system	Effects
Increase heavy precipitation	Enhanced zooplankton blooms	Hygiene//Human health	<p>Water related diseases such as Gastroenteritis, Hepatitis, and Respiratory and intestinal influenza.</p> <p>Transport of viruses from faecal and wastewater sources</p> <p>Gastroenteritis, Stomach &amp; duodenal ulcer, Pneumonia, Cholera</p> <p>Wound infections, otitis and lethal septicemia, gastroenteritis, respiratory dysfunctions, allergic reactions</p> <p>Increase protozoa: Gastroenteritis Meningoencephalitis, Keratitis, blindness</p>



<b>Climate hazard</b>	<b>Impact</b>	<b>Vulnerable system</b>	<b>Effects</b>
Increase heavy precipitation	Flooding	Water supply (groundwater) Wastewater Water supply (reservoirs)	Equipment failure
Decreased precipitation	Water scarcity	Hygiene//Human health	<p>Malnutrition and increase in waterborne diseases</p> <p>Falling groundwater levels low flows in surface waters</p> <p>Deterioration of water quality.</p> <p>Low availability causes problems for hygiene and cleaning.</p> <p>Salinity of groundwater affects water supplies.</p> <p>Sewage in rivers becomes less diluted causing contamination issues.</p> <p>Increase algal growth.</p> <p>Insufficient water makes flush sanitation system redundant.</p> <p>Colonization of resource waters by opportunistic invader species</p>

<b>Climate hazard</b>	<b>Impact</b>	<b>Vulnerable system</b>	<b>Effects</b>
Sea level rise	Saltwater intrusion	Wastewater	
Higher temperatures	Reduced water oxygen concentrations	Water supply (lakes/reservoirs)	Reduced water quality for example through algal blooms, increase in treatment requirements
Higher temperatures	Increase in bacterial and fungal content of water	Water supply infrastructure	Increase in treatment requirements to remove odour and taste



# Real Impacts- Case studies

- Case study 1: Salinisation in Lagos state
- Case study 2: Water scarcity and water related diseases in Maiduguri
- Case study 3: Groundwater reduction in Osun state
- Case study 4: Water scarcity and water related diseases in Jos
- Case study 5: Water shortages in Oyo state
- Case study 6: Infrastructural damage in Anambra state
- Case study 7: Pollution of the Niger Basin
- Case study 8: Shrinking of dams in Osun state
- Case study 9: Water shortages in the Komadugu-Yobe River Basin
- Case study 10: The shrinking of Lake Chad
- Case study 11: Erosion and Water pollution in Imo state
- Case study 12: Onchocerciasis in Dadin Kowa Dam and Upper Imo River Basin
- Case study 13: Collapse of Gorokyo dam, Sokoto state
- Case study 14: Over flooding of Kanji dam 1998
- Case study 15: Collapse of Gusau dam, Zamfara state, 2006
- Case study 16: Evaporation of Zobe and Tiga dams
- Case study 17: Salinization in Bakolori dam
- Case study 18: Siltation in Kano City Water Supply
- Case study 19: Over flooding of Lagdo dam and River Benue drainage basin
- Case study 20: Over flooding of Kanji dam



# Key findings

- *Nigeria WSS sector lacks appropriate policy framework to response to climate change impacts as existing Federal and State water and sanitation policies and strategy papers examined are not climate change sensitive.*
- *While an WSS specific institutional structure exists at the national level for climate change adaptation in the WSS sector, most states are yet to set up governance structures for climate change adaptation to the WSS.*



# Key findings

- *Most WSS agencies have not started responding to climate change. Sixty seven (67%) per cent of the WSS sector agencies surveyed have not set up a desk office on climate change; and seven three per cent (73%) are yet to research into climate resilient water supply and sanitation technologies and systems as part of a climate change adaptation programme.*
- *Though there is a general awareness of climate change issues, in house staff are not technically competent to articulate a climate change adaptation strategy. A high seven six per cent (76%) of WSS utilities said they have never conducted in house training for relevant staff on climate change; sixty one per cent (61%) said their staff have never attended seminars/workshops/conferences on climate change and seventy four per cent (74%) said they have never conducted studies/researches on climate change as it affects their agency.*



# Key findings

- *There is a near absence of data and baseline information to effectively study climate change as it affects the water supply and sanitation sector as weather changes and its effects on stream flow, wastewater, infrastructural damage etc , though observes is not well documented and accurately recorded.*
- *WSS utilities, though viable, lack adequate resources to shoulder on climate change adaptation programmes. Only twenty six per cent (26%) of the utilities surveyed said they are financial solvent.*



# Key findings

- *Water supply and sanitation agencies see climate change as a threat more than an opportunity as it is negatively affecting service delivery. Eighty four per cent (84%) of the 32 agencies surveyed have observed drastic changes in stream flows, seventy eight (78%) have observed contamination of groundwater due to weather changes, ninety per cent 90% are experiencing leakages in distribution system due to infrastructural damage caused by extreme flooding*
- *Eighty six per cent 86% of WSS utilities have experienced increase cost of raw water treatment caused by increased contamination of water bodies.*



# Key findings

- *Consumers of water supply and sanitation services are also being negatively impacted. Our findings indicate that the most profound way consumers have felt the impact of climate change is through decrease in groundwater supplies noticeable in hand dug wells and boreholes; and increase in incidence of water borne diseases.*
- *Eighty one per cent (81%) of users surveyed said they have observed a decrease in groundwater supplies (borehole, hand dug wells etc) in recent years; fifty one per cent (51%) have observed increase in contamination (turbidity levels, pollutants) in water sources in recent years due to flooding, and another fifty three (53%) of those surveyed said that they have experienced increase cases of faecal pollution, water borne diseases or water related diseases such as malnutrition, cholera, dysentery, malaria, and depression .*



# Key Recommendations

- *The Federal Government should commission a study to assess the safety of dams in Nigeria and their vulnerability to weather extremes.*
- *State governments should support the creation of a state level integrated water resources management committee to drive climate change adaptation by water resources users.*
- *Local governments should introduce water supply and sanitation reform at the local level to include institutional reform, policy, and legal reform to enable it cope with climate variability.*
- *Federal and State Ministries of Environment should promote and facilitate coordination among various MDAs working on climate change.*
- *Federal and State Ministries of Health should carry out research on the ecology and epidemiology of infectious diseases that will probably be affected by climate change.*
- *Federal and State Ministries of Water Resources should lead development and implementation of a national/state programme for Integrated Water Resource Management (IWRM)*
- *River Basins Development Authorities should evaluate the design, safety criteria, and current status of river basins infrastructure.*



# Key Recommendations

- *Hydrological/Metrological agencies should ensure the availability and reliability of baseline data and historical data on water resources (e.g. water quality, river flow rates, precipitation data) to facilitate modelling of long-term climate risk and related factors. Including data on the adequacy, safety, affordability and continuity or regularity of water supply, and the safety, affordability and cultural acceptability of sanitation facilities.*
- *Water supply agencies should undertake vulnerability studies of existing water supply and sanitation system and ensuring that new systems are built to reduce vulnerability.*
- *Sanitation agencies should explore on site unconventional or modified climate resilient sanitation technologies which offer alternatives to water-borne sanitation, particularly in rocky areas or areas where there is too little water for waterborne sanitation systems*
- *Wastewater management agencies should evaluate the design, safety criteria and current status of current infrastructure.*
- *Private sector should partner with government to promote climate change adaptation and mitigation programmes.*
- *Consumers and users of WSS service should promote environmental greening and reduce pavement of the neighbourhood in order to encourage natural groundwater recharge.*



# Key Recommendations

- *Development partners should ensure adequate and flexible financing mechanisms to speed up investment in climate change adaptation in water and sanitation sector, with a particular focus on the most vulnerable communities.*
- *The UNDP should organise stakeholders workshop to robustly debate the findings of this study; disseminate the findings of this report locally and internationally; facilitate capacity building training workshops for key officials of state water supply and sanitation agencies on climate change issues; support the creation of governance structures for climate change adaptation in pilot LGAs in Nigeria; and support further research and investigation into critical issues raised in this study such as:*
  - *Safety of dams in Nigeria Vis a vis extreme weather events.*
  - *Seawater intrusion and salinisation of groundwater in Nigeria's coastal towns.*
  - *Development of implementation strategy for Nigeria's IWRM plan.*
  - *Ecology and epidemiology of infectious diseases that will probably be affected by climate change.*
  - *Climate change adaptation by Nigeria's River Basin Development Authorities.*





End