NIGERIA

CRe-AIT CLIMATE AND HEALTH: COUNTRY PROFILE

COUNTRY CONTEXT

Nigeria has a diverse environment that faces significant challenges from climate change, which exacerbates the existing burden on health systems.

Coastal and southern regions are increasingly affected by heavy rainfall, leading to frequent flooding. These floods not only heighten the risk of waterborne and infectious diseases but also disrupt access to clean water, sanitation, healthcare, and other essential services. Additionally, central and eastern parts of Nigeria are experiencing a rise in landslides, driven by the intensifying rains.

Nigeria also faces rising temperatures and increasing droughts, particularly in the northern Sudano-Sahelian States. These conditions adversely affect agriculture and water resources, compounding food and water insecurity. Rising temperatures contribute to heat-related illnesses such as heat exhaustion, while also impacting cardiovascular health, maternal health, and diabetes.

Despite these challenges there is very little dedicated funding available for Climate and Health. These compounded stressors underscore the urgent need for climate-resilient health systems across Nigeria.

KEY COMPONENTS

1. RAINFALL
1.1 Precipitation
1.2 Flooding
1.3 Landslide
1.4 Access to Healthcare
1.5 Food Insecurity due to Flooding

2. HEAT
2.1 Temperature
2.2 Heat Related Deaths

3. FINANCE
3.1 Climate and Health Landscape
3.2 Funders and Projects

4. ADAPTATION
4.1 Key Adaptation Actions

RAINFALL

1.1 PRECIPITATION

In Nigeria, total rainfall is more abundant in the southern regions. According to NASA data, the number of days with very heavy rainfall—defined as days with at least 20 mm of precipitation—is expected to increase from 22 to 33 between 2026 and 2027, representing an additional 11 days. These intense rains could trigger floods with severe impacts on health, social well-being, and the economy *(Figure 2)*.

KEY STATISTIC

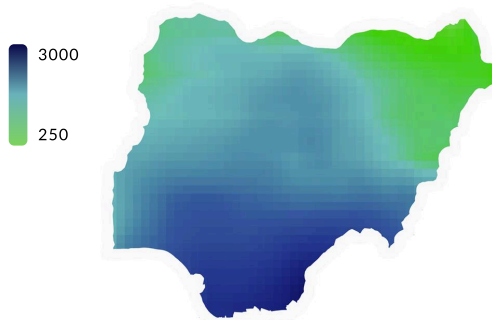Nigeria is expected to experience 11 additional days of very heavy rainfall between 2026 and 2027

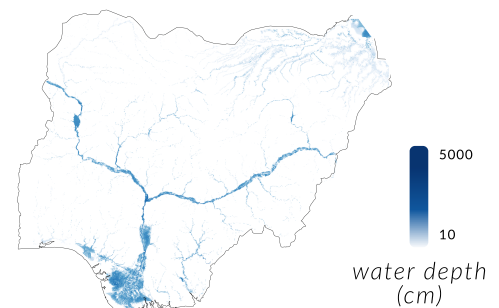

Figure 1: *Precipitation in Nigeria in 2024 (mm/year)*

Figure 2: *Flood risk areas of Nigeria - with probability of occurring every 2 years*

1.2 FLOOD

Flooding is one of the most significant climate-related challenges in Nigeria, with severe implications for health and well-being. Floodwaters create ideal conditions for the proliferation of waterborne and vector-borne diseases. Stagnant water left in the aftermath of floods provides breeding grounds for mosquitoes, increasing the risk of diseases such as malaria and dengue fever.

The WHO projects that in Nigeria by 2070, more than 400 million people could be at risk of contracting malaria

Additionally, floodwaters often contaminate drinking water sources with pathogens and waste, leading to outbreaks of diarrhoea diseases such as cholera. According to UNICEF, the prevalence of diarrhea in Nigeria is 18%. Each year, diarrhea accounts for over 16% of child deaths, approximately 150,000 deaths, mainly among children under the age of five. With the increase in very heavy rainfall, these figures are likely to worsen.

According to the WHO, if climate change continues at its current pace, approximately 9.8% of the additional 76,000 deaths from diarrhea among children under 15 years old in 2030 will be attributed to climate change

The impacts of floods are far-reaching, they can also cause population displacements, increasing exposure to diseases such as tuberculosis. Overcrowding exacerbates the rapid spread of such diseases. They can also lead to malnutrition by destroying agricultural crops. The list of repercussions is not exhaustive but highlights the challenges posed by floods.

RAINFALL

1.2.1 HISTORICAL AND FUTURE FLOODS

Nigeria is exposed to various natural disasters, with floods being among the most frequent and impactful *(Figure 3)*. Historical data shows that floods displace thousands of people each year *(Figure 4)*. For future floods, it is possible to create flood hazard maps using topographic models. The extent of flood-prone areas depends on the frequency of the flood: the rarer the flood, the more severe it is, meaning it would impact a larger area.

We utilized the flood hazard map for a 2-year recurrence interval to evaluate the exposure of health facilities to potential water heights. Subsequently, we analyzed floods with recurrence intervals of 2, 10, and 25 years to identify which health facilities are most vulnerable to recurrent flooding. Facilities that experience flooding every 2 years require a different level of intervention priority compared to those flooded only once every 25 years. Additionally, we incorporated landslide susceptibility to determine whether any facilities are located in areas prone to landslides. Although we did not find any, this could be attributed to the incompleteness of our data.

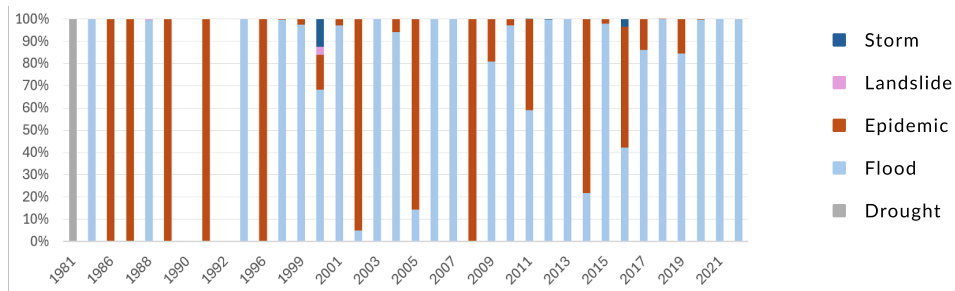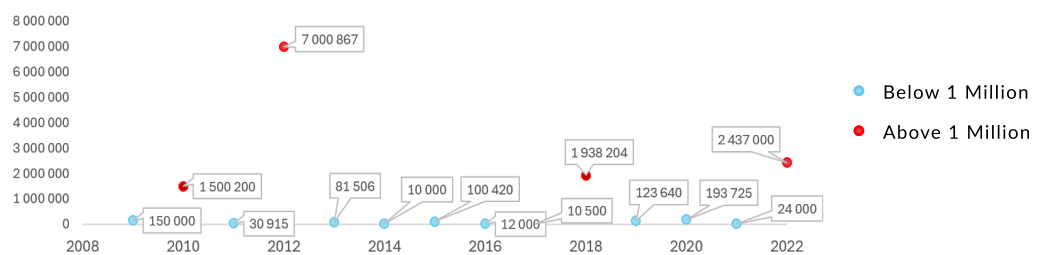Figure 3: *Distribution of Natural Hazards by Type*

Figure 4: *Population Displaced due to Floods*

1.3 LANDSLIDE

Nigeria is also vulnerable to landslides, particularly in the central and eastern regions. These landslides, triggered by heavy rainfall, can cause significant damage during intense precipitation events. They often lead to substantial economic losses, as they can destroy everything in their path in a very short period of time.

Figure 5: *Landslide Susceptibility*
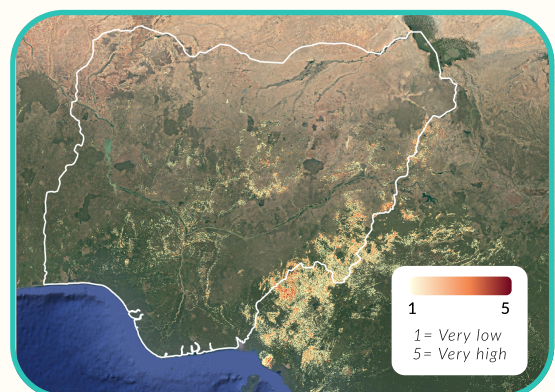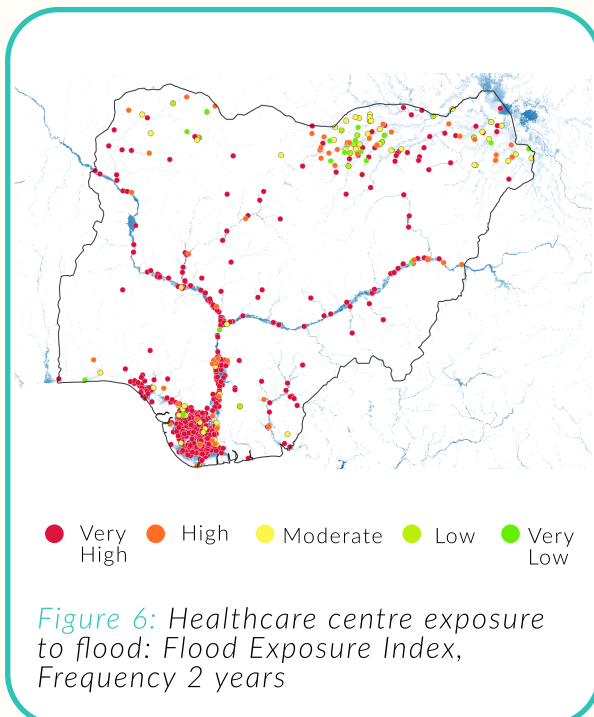
💧 RAINFALL

1.4 HEALTHCARE

🩹 KEY STATISTIC

In Nigeria, floods occurring every 2 years could affect access to healthcare for around 17 million people

Many aspects of the health system are vulnerable to climate change. Nigeria's Climate Change and Health National Vulnerability and Adaptation Assessment reports that health systems in many states across the North West and North East zones exhibit the highest levels of vulnerability, particularly in the central and southern areas of the North West.

1.4.1 ACESS TO HEALTHCARE: FLOODING

Our evaluation of healthcare facilities exposed to floods with a 2-year probability reveals that 885 facilities are at risk. Based on potential water heights that could impact these facilities, they were categorized into five classes forming the Flood Exposure Index, ranging from Very High to Very Low.

● Very High ● High ● Moderate ● Low ● Very Low

Figure 6: Healthcare centre exposure to flood: Flood Exposure Index, Frequency 2 years

885 facilities, which represents 5% of all facilities, are at risk where there is a likelihood of flooding every 2 years

The distribution of the exposure index is as follows:

- Very High (water heights exceeding 50 cm): 719 facilities
- High (water heights between 30 and 50 cm): 61 facilities
- Moderate (water heights between 10 and 30 cm): 68 facilities
- Low (water heights between 5 and 10 cm): 18 facilities
- Very Low (water heights less than or equal to 5 cm): 19 facilities

The database used for health infrastructures is incomplete, meaning the number of facilities exposed to floods with a 2-year return period could be higher than reported. Facilities exposed to significant water heights are those most likely to become inaccessible during floods.

Analysing the population served within a 5 km radius of facilities classified with a very high exposure index shows that approximately 17 million people could be affected by floods every 2 years. This underscores the urgent need to address the exposure of healthcare facilities to flooding.

RAINFALL

1.4.2 ACESS TO HEALTHCARE: FLOOD AND LANDSLIDE

By considering all health facilities exposed to at least 50 cm of water during floods with recurrence intervals of 2, 10, and 25 years, alongside their susceptibility to landslides, it is possible to classify them based on intervention priority, which represents another way to establish a composite exposure index. Health facilities exposed to water heights exceeding 50 cm every 2 years (high exposure index) are deemed more critical for restoration or reconstruction compared to those flooded every 25 years (low exposure index). Furthermore, if the facility is located in an area prone to landslides, this further increases its priority level.
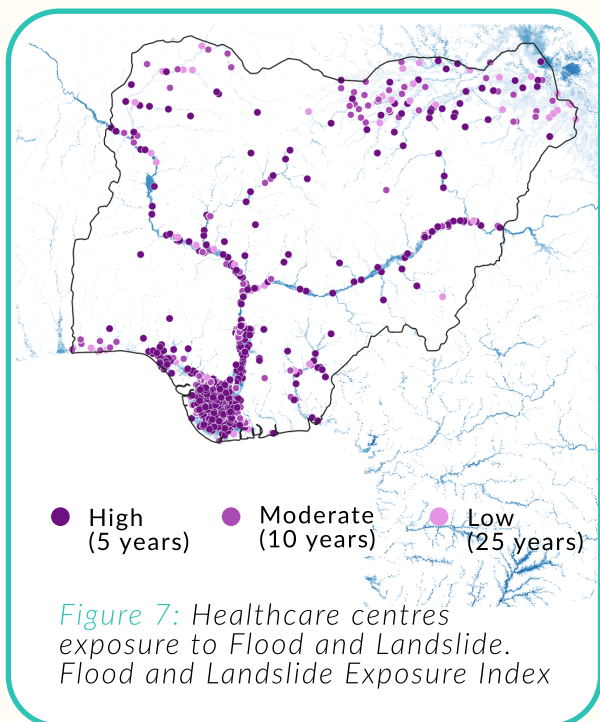

High (5 years) Moderate (10 years) Low (25 years)

Figure 7: Healthcare centres exposure to Flood and Landslide. Flood and Landslide Exposure Index

There are 719 health facilities, requiring urgent intervention

Based on the available data, here is the distribution of health facilities according to their exposure index:

- **High:** 719 health facilities, requiring urgent intervention.
- **Moderate:** 196 facilities, requiring moderate intervention as they are flooded and blocked every 10 years.
- **Low:** 63 facilities, requiring low-priority intervention as they are flooded and blocked every 25 years.

Regarding landslides, we did not identify any health facilities located in landslide-prone areas. This is likely due to the incompleteness of our public database.

1.5 FOOD INSECURITY DUE TO FLOODING

16,692.5 km² of agricultural land are at risk of flooding every 2 years

Floods can devastate fields and destroy crops by submerging plants. According to 2-year flood frequency data and land cover information, approximately 16,692.5 km² of agricultural areas are at risk of being flooded. This could lead to severe economic and social consequences and potentially cause famine.

It is predicted in Nigeria that the changing climate will increase malnutrition from 2.6 m in 2020 to almost 2.85m in 2030.
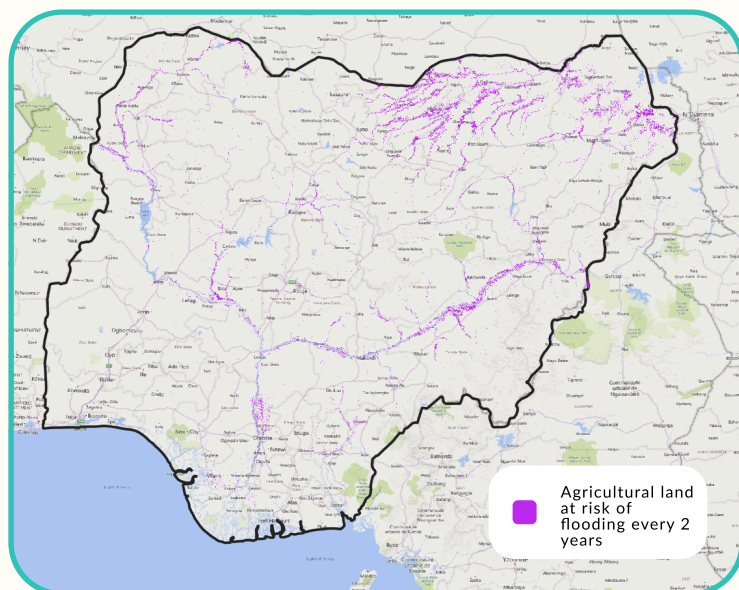

Agricultural land at risk of flooding every 2 years

Figure 8: Agricultural land at risk of flooding every 2 years

HEAT

2.1 TEMPERATURE

Climate change is projected to raise the average annual temperature and amplify the intensity and frequency of heat waves, increasing the number of individuals at risk for heat-related health issues. Those most vulnerable include the elderly, children, individuals with chronic illnesses, socially isolated populations, and certain occupational groups exposed to heat risks.

KEY STATISTIC

"Temperatures across Nigeria are expected to rise by 1.0 to 1.1°C by 2050 under moderate climate scenarios, with an increase of at least 3.0°C under extreme scenarios"
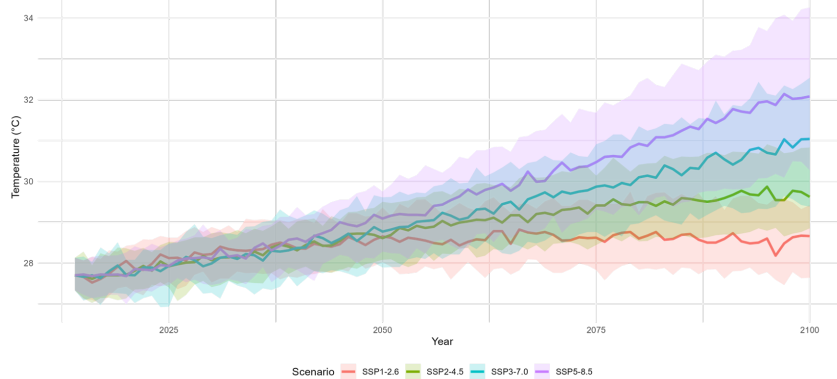
Projected Mean Average Surface Temperature

Figure 9: Projected Mean Average Surface Temperature in Nigeria under different climate scenarios

2.1 HEAT RELATED MORTALITY

According to WHO, under a scenario of high greenhouse gas emissions, heat-related mortality among the elderly population (65 years and older) is expected to rise significantly, reaching nearly 80 deaths per 100,000 people by 2080. This is a stark contrast to the baseline estimate of approximately 3 deaths per 100,000 annually observed between 1961 and 1990.

However, a swift and substantial reduction in emissions could drastically reduce this impact, limiting heat-related deaths among the elderly to fewer than 15 deaths per 100,000 by 2080.
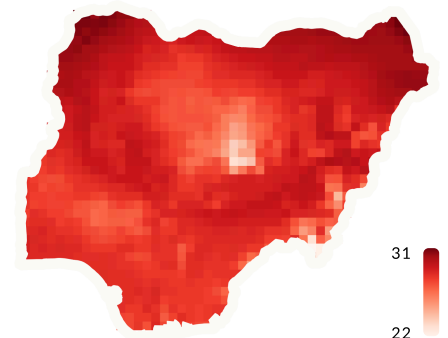
Figure 10: Average Temperature (°C) in Nigeria in 2024

Nigerias Climate Change and Health National Vulnerability and Adaptation Assessment Reports *"Cardiovascular diseases to rise to 4.5 million cases by 2030; Diabetes cases to grow to 450,000 by 2030 due to rising temperatures; and Mental Health cases will rise by 3.1 million cases by 2030 "*

FINANCE

3.1 CLIMATE AND HEALTH LANDSCAPE

Nigeria faces a significant gap in financing mechanisms dedicated to climate and health initiatives. At both the state and federal levels, there are no specific financial allocations or targeted budgets for addressing climate and health adaptation or mitigation efforts. This absence of structured funding underscores the challenges Nigeria faces in building resilience to climate-related health impacts.

KEY STATISTIC

"Nigeria relies on foreign loans, aid and grants to finance more than 50% of its climate adaptation and mitigation activities"

3.2 FUNDERS AND PROJECTS

The financing Nigeria has accessed has been from international aid and various multilateral climate funds, though primarily as part of regional or global initiatives. This data is from 2010 onwards.

3.2.1 INTERNATIONAL AID

From 2017 to 2020, Nigeria received USD 332.3 thousand in grants from France, Japan, and the United States for climate and health-related projects. These grants supported health policy initiatives, food assistance, and the solarization of a health facility. Most of these projects were cross-cutting in nature, addressing both mitigation and adaptation, with the food assistance program being solely adaptation-focused.

3.2.2 MULTILATERAL FUNDS

Green Climate Fund (GCF)

Nigeria has not received direct funding from the GCF but is a participant in six regional funding initiatives (2018–2024), five of which are Africa-specific. These projects focus on:
- Three were for agriculture (adaptation-focused).
- Two were for Productivity and large water systems (cross-cutting).

The total funding allocated for these regional projects is USD 794 million, with financing provided through a mix of grants, loans, and equity.

Additionally, in 2022, Nigeria was included in a global water and sanitation project valued at USD 880 million, also financed through a combination of grants and equity.

Disbursement Status:

- For the regional African projects, USD 43 million has been disbursed to date.
- For the global water and sanitation project, USD 33.3 million has been disbursed.

As these projects are ongoing, determining the exact amount of funding received by Nigeria remains challenging.

FINANCE

Global Environment Facility (GEF):

From 2017 to 2024, Nigeria was pledged USD 205 million for country-specific agricultural projects funded through a mix of grants, in-kind contributions, loans, equity, public investment, and cash funding. Additionally, Nigeria participated in a 2015 African Regional Agricultural project with a proposed funding of USD 805 million, financed through a combination of grants, in-kind contributions, cash, loans, and equity. In 2019, Nigeria was included in a global agricultural project valued at USD 3.04 billion, funded through similar mechanisms (grants, loans, equity, and in-kind investments).

All GEF projects have been cross-cutting, involving both mitigation and adaptation actions.

Due to incomplete documentation, it is unclear how much of the funding for GEF projects has been disbursed, so this information has not been included.

3.2.3 TRENDS

Figure 11: Number of Projects Involving Nigeria by Sector (2010–2024)
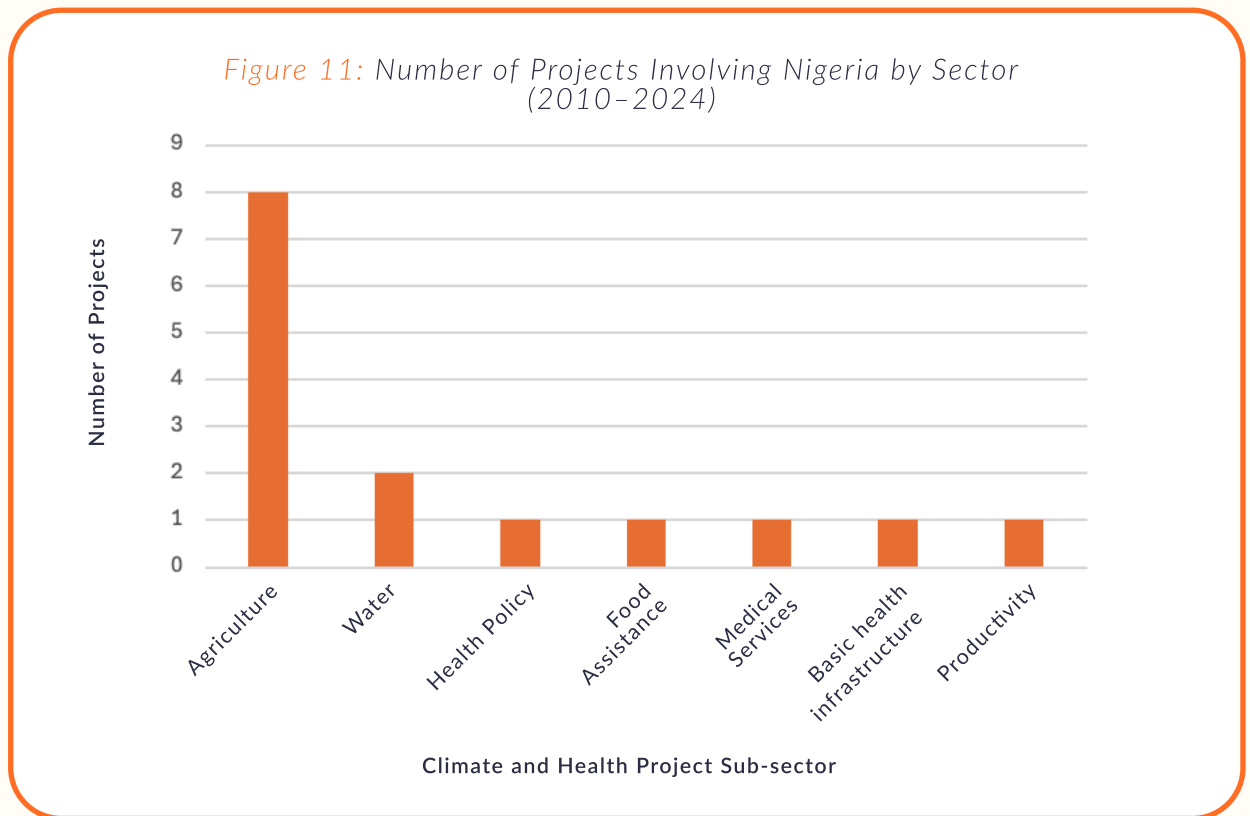
Figure 11: Note: Total funding by sector has not been provided as for the regional projects money proposed or dispersed per country is not always available.

Many of these priorities, such as agriculture and water, are already part of Nigeria's policy agenda, creating opportunities for alignment with broader initiatives. For example, Nigeria's "Zero Open Defecation" scheme aims to reduce contamination of water sources, ensuring safer drinking water and improved sanitation. This initiative could be effectively integrated with climate and health projects that address the impacts of heat or flooding on water safety and availability.

KEY IMPACTS

CLIMATE IMPACTS

RAINFALL   LANDSLIDE   HEAT

COMMUNICABLE DISEASE

Malaria

In Nigeria by 2070, more than 400 million people could be at risk of contracting malaria

Diarrhoea

By 2030, there will be 7600 excess diarrhoea-related deaths in children under 15

Tuberculosis

TB is forecast to increase from over 41,000 cases in 2020 to more than 52,000 in 2030

NON- COMMUNICABLE DISEASE

Mental Health

Mental health disorders will rise from 2.6m in 2020 to more than 3.1m by 2030

Malnutrition

Malnutrition will increase from almost 2.6m in 2020 to almost 2.85m by 2030

Heart Disease

Heart disease will increase by 10% to over 4.5m cases in 2030

Heat Deaths

Deaths from heat are expected to double, increasing from 2.5 to 5 per 100,000 people per year by 2080

Diabetes

Diabetes is predicted to increase significantly from 235,000 in 2020 to almost 450,000 in 2030

INFRASTRUCTURE

885 facilities, which represents 5% of all facilities, are at risk where there is a likelihood of flooding every 2 years; 719 health facilities are high risk and require urgent intervention from flooding

Damage to infrastructure limits access to healthcare, significantly impacting population health, especially during critical times

LACK OF ADEQUATE FINANCE

There is insufficient financing available for climate and health initiatives in Nigeria. Without a clear plan, securing funds for essential adaptation projects to protect the population will remain challenging

While funding has been received for agriculture, there are currently no health system-focused projects that address the system-level changes needed to effectively respond to the impacts of climate change

ADAPTATION

4.1 KEY ADAPTATION ACTIONS

1. FLOOD
- Establish an Early Warning System to predict and issue flood alerts
- Develop emergency response plans and train healthcare providers for natural disasters and related disease outbreaks
- Map flood-prone areas and facilities at risk, identifying those needing restoration
- Store essential medicines and equipment in waterproof or elevated cabinets
- Install robust drainage systems and sump pumps to channel and remove floodwaters
- Build new facilities in safe zones and ensure they are flood-resistant

2. LANDSLIDE
- Conduct hazard mapping to identify high-risk areas and guide safe development
- Implement soil conservation techniques like terracing, reforestation, and retaining walls to stabilise slopes
- Install drainage systems to prevent water accumulation
- Train communities in landslide-prone areas on preparation and emergency response

3. HEAT
- Set up systems to monitor and forecast heatwaves, issuing timely alerts
- Develop response plans, including distributing water and creating cooling centers
- Train staff and equip healthcare facilities to manage heat-related illnesses

4. FOOD
- Develop early warning systems for natural hazards to help farmers prepare
- Invest in water-efficient irrigation methods and rainwater harvesting
- Implement technologies to reuse wastewater safely for farming
- Adapt agriculture to natural hazards by planting flood-tolerant crops like deep-water rice or drought-resistant crops such as millet and sorghum

5. CLEAN WATER
- Improve access to clean drinking water and sanitation to prevent disease
- Implement a water quality monitoring system to quickly identify contaminated areas and determine where to install infrastructure to improve access to safe drinking water

6. COMMUNITY ENGAGEMENT
- Engage communities to report on-ground climate and health related issues, guiding authorities in decision-making

7. FINANCE
- Develop national and state level costed climate and health plans
- Secure international funding and partnerships for climate adaptation projects

HOW CRe–AIT CAN HELP

At CRe-AIT, we focus on the intersection of climate change and health, using climate data to develop innovative tools like chatbots, community monitoring systems, flood prediction models, and situation rooms.

1. We can support effective flood management and early warning systems that are critical for reducing the effects of flooding, heatwaves, and other climate events by ensuring communities are informed and prepared

2. We can map flood and landslide-prone areas and assist in prioritising heath facilities where infrastructure and essential equipment may be at risk, while training healthcare providers for disaster response can minimise disease outbreaks

3. We can assist in developing costed climate and health plans, including the cost of making facilities climate resilient and analysing the costs of failing to adapt infrastructure to climate challenges

4. We can support countries with their proposals for climate and health adaptation projects that require international financing

5. Our AI supported chatbot delivers real-time alerts and training on heatwaves, threats to agriculture, flooding and other climate hazards, while community level monitoring provides insights into population needs during crises. For example, knowing where agriculture is being affected by climate events, like flooding, and having the information to create area tailored response plans, like installing effective drainage systems in fields to quickly remove excess water

6. Our tools integrate seamlessly with country-specific situation rooms to enhance planning for the overall health eco-system

By empowering stakeholders with AI-driven insights, early warning systems, and targeted interventions, CRe-AIT is committed to supporting Nigeria in building robust, climate-resilient health systems and addressing the long-term impacts of climate change.

CRe–AIT 2024

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BIBLIOGRAPHY

REFERENCES

Government of Nigeria: Data on Dengue
Link: Nigeria_Climate_and_Health_VA_assessment_report_-_FINAL.pdf

WHO: Data on Malaria, Diarrhea, Heat related deaths
Link: https://iris.who.int/bitstream/handle/10665/208865/WHO_FWC_PHE_EPE_15.11_eng.pdf

UNICEF: Data on Diarrhea
Link :https://www.google.com/search?
q=Diarrhea+in+Nigeria&rlz=1C1GCEU_frFR1054FR1054&oq=Diarrhea+in+Nigeria&gs_lcrp=EgZjaHJ
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MYFhgeMgoICRAAGBMYFhge0gEINzgzOGoxajeoAgiwAgE&sourceid=chrome&ie=UTF-8

Government of Nigeria: Climate Change and Health National Vulnerability
and Adaptation Assessment Report
Link:https://www.atachcommunity.com/fileadmin/uploads/atach/Documents/Country_documents/
Nigeria_Climate_and_Health_VA_assessment_report_-_FINAL.pdf

OECD: Aid activities targeting global environmental objectives
Link: https://data-explorer.oecd.org/vis?
df[ds]=DisseminateFinalDMZ&df[id]=DSD_RIOMRKR%40DF_RIOMARKERS&df[ag]=OECD.DCD.FSD
&dq=DAC_EC..1000..2.10...Q._T..&lom=LASTNPERIODS&lo=2&to[TIME_PERIOD]=false

Climate Funds Update:
Link: https://climatefundsupdate.org/data-dashboard/themes/

UNICEF: MAKING NIGERIA OPEN-DEFECATION-FREE BY 2025
Link: https://www.unicef.org/nigeria/media/1491/file/Nigeria-making-Nigeria-open-defecation-free-
by-2025.pdf.pdf

The eroded landscape of Akwuke Beach, Enugu State, believed to have been a river once.
https://commons.wikimedia.org/wiki/File:Climate_and_weather_in_Nigeria_20.jpg

DATA SOURCES

In each case the graph or visualisation was created by our team at CRe-AIT.

Figure 1: Precipitation Map
 Source: NASA / Climate Analytics Group

Figure 2: Flood Hazard Map
 Source: Coalition for Disaster Resilient Infrastructure

Figure 3 & 4: Natural hazard by type & Population displaced due to floods
 Source: World Bank & Internal Displacement Monitoring Centre

Figure 5: Landslide Susceptibility Map
 Source: Coalition for Disaster Resilient Infrastructure

Figures 6 & 7: Health Infrastructure
 Source: The Population Health Unit, Kenya Medical Research Institute - Wellcome Trust

Figure 8: Land Cover - Agricultural Areas
 Source: Copernicus

Figure 9: Temperature Projection
 Source: World Bank

Figure 10: Average Temperature Map
 Source: NASA / Climate Analytics Group

Figure 11: Projects per Sector
 Source: Green Climate Fund, Global Environmental Facility, OECD Aid Activities