FINAL REPORT DRAFT

Emergency Response and Disaster Risk Management in Yobe State, Nigeria.

ENabling SUstained REcovery in the Northeast (ENSURE)

By

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>DRM</td>
<td>Disaster Risk Management</td>
</tr>
<tr>
<td>ETL</td>
<td>Extract Transform Load</td>
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<tr>
<td>FCV</td>
<td>Fragility, Conflict and Violence</td>
</tr>
<tr>
<td>FME</td>
<td>Feature Manipulation Engine</td>
</tr>
<tr>
<td>FR</td>
<td>Final Report</td>
</tr>
<tr>
<td>GHSL</td>
<td>Global Human Settlement Layer</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GoN</td>
<td>Government of Nigeria</td>
</tr>
<tr>
<td>GPF</td>
<td>Governance Partnership Facility</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GRID3</td>
<td>Geo-Referenced Infrastructure and Demographic Data for Development</td>
</tr>
<tr>
<td>IDP</td>
<td>Internally Displaced Person</td>
</tr>
<tr>
<td>IR</td>
<td>Inception Report</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
<tr>
<td>MCRP</td>
<td>Multi-sector Crisis Response Project</td>
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<tr>
<td>MR</td>
<td>Mid-term Report</td>
</tr>
<tr>
<td>MOA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>MOE</td>
<td>Ministry of Environment</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NCDC</td>
<td>Nigeria Centre for Disease Control</td>
</tr>
<tr>
<td>NENRSP</td>
<td>North-East Nigeria Recovery and Stabilization Programme</td>
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<tr>
<td>NPC</td>
<td>National Population Commission</td>
</tr>
<tr>
<td>NST</td>
<td>Nigeria Security Tracker</td>
</tr>
<tr>
<td>POI</td>
<td>Point of Interest</td>
</tr>
<tr>
<td>PHCDA</td>
<td>Primary Health Care Development Agency</td>
</tr>
<tr>
<td>QGIS</td>
<td>Quantum Geographic Information System</td>
</tr>
<tr>
<td>RPBA</td>
<td>Recovery and Peace Building Assessment</td>
</tr>
<tr>
<td>SPHCMB</td>
<td>State Primary Health Care Management Board</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>WR</td>
<td>Weekly Report</td>
</tr>
<tr>
<td>YOGIS</td>
<td>Yobe Geographic Information System</td>
</tr>
<tr>
<td>YOSEMA</td>
<td>Yobe State Emergency Management Agency</td>
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</tbody>
</table>
1. INTRODUCTION

In Yobe State, comprising of 2.3 million people within 17 LGAs is experiencing recurrent natural disasters such as storms and flooding, in addition to conflict–driving displacement and destruction of property and critical facilities and disrupting services. In past rainy seasons, Yobe recorded incidences of flooding and windstorm from torrential downpours, which destroyed homes, infrastructures, and many farmlands across all the 17 LGAs of the state. Flood incidence in Yobe state has been on the rise in the past decade (OCHA, 2020).

In the context of compound or intersectional risk, there is a need to adopt a comprehensive approach to reduce the impacts of floods in Yobe state (Gana A. H & Salisu K., 2020) – an approach that considers and accounts for a whole spectrum of challenges and opportunities for flood risk management from spatial risk hotspots, socio-economic vulnerability at the community level, safety nets, livelihoods and infrastructure at risk, location and vulnerability of forcibly displaced and people living in informal settlements/environmentally sensitive land/low-lying areas, and so forth.
2. PROJECT ACTIVITIES

Background

Following the conclusion of the North-East Nigeria Recovery and Stabilization Programme (NENRSP) in June 2018, the UK Government agreed to support the continuation and scaling up of World Bank (WB)-executed post-RPBA (Recovery and Peace Building Assessment) work through the second phase of Governance Partnership Facility (GPF)-funded activity. This second phase of activity is entitled “ENabling Sustained REcovery in the Northeast” (ENSURE). ENSURE, which focuses on the states of Adamawa, Borno, and Yobe, and on Federal Government institutions mandated to oversee recovery in the northeast, is implemented in close coordination with a second WB-executed project (financed through a European Union Trust Fund) that seeks to promote recovery-related financial governance reforms (including coordination) in Borno State.

The ENSURE program is to operationalize and support the Government of Nigeria’s (GoN) implementation of the Recovery Strategy and Framework, as defined by the North-East (NE) Nigeria RPBA and Buhari Plan; and to identify practical recommendations for ongoing and future GoN and development partner operations and collaboration, including the Multi-sector Crisis Response Project (MCRP). The latter includes regional programs, institutional reform, service delivery, and policy change that bridge the humanitarian and development dimensions of peacebuilding and recovery in NE Nigeria.

Objectives

The Terms of Reference for the project defines the overall objectives to conduct baseline assessment by:

- Collating and assessing available datasets for identifying priority locations for in-depth compounded risk assessment; and
- Assessing existing IT capacity and regulations regarding data collection and storage, to recommend most appropriate option for developing an integrated data platform.

Activities

2. Engaged YOSEMA, partners and the use of open data platforms for the collection of the following datasets:
a. Historical flood data for the year 2019 and 2020 (YOSEMA).
b. Projected flood data for the next 5 and 10 years’ time (FATHOM).
c. IDP data from 2015 to 2020 (IOM).
d. Settlement data i.e. boundary information urban and rural settlement (GHSL & GRID3).
e. COVID 19 data (NCDC).
g. Point of interest and infrastructure i.e. education facility, health facility, market, road network. (GRID3).
h. Population data (WorldPop, GHSL).

3. Performed data analysis on 2019 and 2020 historical flood analysis on households affected at settlement and LGA level.

4. Produced maps for 2019 and 2020 historical flood result at settlement and LGA level.

5. Performed spatial data analysis and maps on the projected flooding for 5 and 10 years’ time and obtained priority locations at risk considering the type of settlement and the population density.

6. Data analysis on infrastructure exposed to the projected flood on health facilities, education facilities, market, roads, settlements and estimated population affected in the next 5 years and 10 years period.

7. 2021 current flood situation and urban growth rate of one of the most priority location for compounded risk assessment.

8. Data analysis and mapping of urban growth across the years.

9. Analysis and mapping of COVID 19 cases and number of deaths recorded.

10. Performed data analysis for IDPs on:
    b. Data analysis showing the population aggregated by LGAs from 2015 to 2020.
    d. Analysis for COVID-19 compliance.

11. Analysis and mapping of security incidence in Yobe state.

12. Analysis and mapping of vulnerable and high risk areas.

13. Engaged with multi-stakeholders to review and assess the existing spatial data infrastructure, institutional and legal frameworks for the collection, management and sharing of spatial data for multiple purposes.

14. Recommendation of the most appropriate data platform based on existing capacity and needs at the state level.
3. RESULT

*Historical Flood in Yobe State*

Data was collected for areas affected by the flood event using Kobo Collect. Information on the number of households affected, level of damage of flood, GPS location of affected areas and other useful information were collected. Below are the maps generated from the data collected.

An estimate of over 274,000 people and 241,000 people were affected during the 2019 and 2020 flooding respectively using the WorldPop UN adjusted data.
Projected Flood in Yobe State

Analyses were performed to project the areas that are likely to be flooded in the next 5 years and 10 years’ time. The data source used for this analysis is the FATHOM dataset.

The FATHOM flood-hazard model (previously known as SSBN), is a global gridded dataset of flood hazards produced at a global scale. It provides flood water extent and depth for a range of pluvial and fluvial hazard scenarios, expressed as “return period”, which indicates the probability of occurrence (i.e. once in 5, 10, 20, 50, 75, 100, 200, 250, 500, 750 and 1000 years). The Data are at 3 arc-second (approximately 90m) resolution and have a global coverage between 56°S and 60°N.

For this research purpose, the scope is for 5 years and 10 years flood projection. Settlements likely to be flooded within this projected period were obtained and mapped as shown below:
The projected flood is divided into 3 subsets namely:

1. Fluvial Undefended (FU): fluvial flood hazard data, without defence estimation.
2. Fluvial Defended (FD): fluvial flood hazard data, with defence estimation.
3. Pluvial (P): flash-flood or pluvial flood hazard data.

Data Limitations

The Data contains sources of uncertainty that can make it unsuitable for certain purposes. As with all environmental models, the accuracy of the Data may vary and cannot be guaranteed.
**Infrastructure and Population Exposed to Projected Flood**

According to the UN Population Division population growth rate, an estimate of 446,635 and 546,962 population will be affected in the next 5 years and 10 years projected flood respectively. The chart below shows the number of infrastructure, road network and settlements likely to be affected for the projected flood in 5 years and 10 years period.

![Chart showing affected numbers](image)

**Satellite Imagery of High-Risk Areas**

Settlements likely to be affected during the projected flood were identified and mapped. The settlements termed as high-risk areas are settlements within the urban areas with high population estimate.

The population data was obtained from WorldPop. This dataset was produced based on the 2020 population census/projection-based estimates for 2020 and has a resolution of 3 arc (approximately 100m at the equator). The satellite imagery maps for some of the high-risk areas could be seen below:

![Satellite image](image)
Flood Incidences (Nahuta Communities in Potiskum LGA)

Five persons including children have been killed while two others are missing after flood wrecked Potiskum Local Government Area of Yobe State. The flooding following a heavy downpour on Sunday night, August 15 2021, also destroyed several buildings in many parts of the commercial town of Potiskum Nahuta communities as shown in the picture below.

Source: Linda Ikeji Blog News
**IDP Distribution from 2015 to 2020**

IDP data obtained from IOM were analysed for several rounds. The data was harmonized for each year and mapped to obtain the spatial distribution of IDPs across the years.

**IDP Population Trend from 2015 to 2020**

![IDP Population Trend Graph](image)

![2015 IDP Population by LGA](image)

![2020 IDP Population by LGA](image)
**COVID-19 Compliance in IDP Camps**

The IDP dataset was analysed and mapped to show the distribution of IDP camps with Hand Wash Facility. The data shows that over 82% of the IDPs are not COVID-19 compliant. The map distribution and chart can be seen below:

![Map of Yobe State showing IDP camps with Hand Wash Facility](image1)

**Legend**
- None
- Yes
- Yes, but no soap/water

![Pie chart showing COVID-19 compliance](image2)

**Urban Growth of Garin Liman Settlement in Potiskum LGA**

Potiskum LGA remains one of the high risk areas in Yobe state in addition to its urban growth as shown in the map below:

![Map showing urban growth of Potiskum LGA](image3)

**Legend**
- Water surface
- Land no built-up
- Built-up from 2000 to 2014
- Built-up from 1990 to 2000
- Built-up from 1975 to 1990
- Built-up up to 1975
COVID 19 – Number of Cases and Deaths

Yobe has a total of 501 COVID 19 cases with a total of 9 deaths recorded as at August 20 2021 as shown in the chart and map below.

Source: NCDC
Yobe is among the least state with COVID 19 cases

The trend of COVID 19 cases from the map is higher at the South-West and moving towards the North-East due to commercial activities. There is the need to regularly take precaution in observing social distancing, avoid crowded spaces, wash hand regularly, use face masks and report cases immediately to relevant authority if observed.

An expected increase in COVID 19 cases in Yobe cannot be ruled out due to ongoing social and commercial activities in the state.

**Security Incidence - Total Deaths & Cases**

The following charts and map below shows the number of cases and deaths by LGA and years from 2011 to 2021.

Source: NST
**Risk Analysis**

Potiskum is one of the highest risk area according to the risk analysis base on its vulnerability to historical and projected flood, security challenges, critical infrastructure and population exposure to flood hazards. The map shown below indicate the risk level of settlements in Yobe state.

A snapshot of a data visualization tool (Power BI) for creating a simple risk analysis dashboard is shown below:

<table>
<thead>
<tr>
<th>Risk Analysis Dashboard</th>
<th>LGA Name</th>
<th>Ward Name</th>
<th>Settlement Name</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Settlement Count</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>9814</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Chart</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low</td>
</tr>
<tr>
<td></td>
<td>high</td>
</tr>
<tr>
<td>48.3%</td>
<td>(1.7%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary Table</th>
<th>LGA</th>
<th>Settlement</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eccles</td>
<td>Sarkin Hausawa</td>
<td>Abubza Hajiya Kyauta Street</td>
<td>low</td>
</tr>
<tr>
<td>Eccles</td>
<td>Sarkin Hausawa</td>
<td>Abubza Iyato Mai Towo Street</td>
<td>low</td>
</tr>
<tr>
<td>Eccles</td>
<td>Sarkin Hausawa</td>
<td>Abubza Kalaqo Street</td>
<td>low</td>
</tr>
<tr>
<td>Eccles</td>
<td>Sarkin Hausawa</td>
<td>Abubza Mohammed Mai Angua</td>
<td>low</td>
</tr>
<tr>
<td>Eccles</td>
<td>Sarkin Hausawa</td>
<td>Abubza Samisu Dan Muri Street</td>
<td>low</td>
</tr>
</tbody>
</table>
**Tools used**

An ODK form was designed for the data collection of 2020 flood areas. Data analysis was performed using GIS software (QGIS) and ETL (Extract, Transform and Load) tool called FME (Feature Manipulation Engine). Tableau, Power BI and QGIS were used for the data visualization of charts and maps. Below is a snapshot of the data analysis for the projected flood areas performed using the ETL tool.

![Data Analysis Snapshot](image)

**4. IT CAPACITY & DATA INFRASTRUCTURE ASSESSMENT**

**Assessment**

A meeting was held with the stakeholders from YOSEMA, MOH, partners from the state, LGA and community level and the following issues were discussed as highlighted below:

1. The organization’s existing tools and standard operating procedure for the design and collection of spatial data.
2. The organization’s existing data storage platform for the storage of spatial data.
3. The institutional and legal frameworks for the collection, management and sharing of spatial data.
4. GIS, data analysis, data visualization tools and skills.

After the assessment, it was observed that there is a gap in the aforementioned topics. There are no robust and adequate data infrastructure, institutional and legal framework for the data collection, management and sharing of spatial data. There are no efficient skills for data processing, integration, analysis, visualization and storage of data. There are no adequate GIS skills to perform geospatial analysis and mapping of communities for urgent intervention.
**Recommendation**

1. The need to have an institutional and legal frameworks for the collection, management and sharing of spatial data.
2. The need to use database platforms i.e. PostgreSQL, MySQL for storing spatial data.
3. The need for capacity building of staffs
4. The need to use data visualization tools i.e. Power BI, Tableau and PowerPoint for creating, sharing and presenting report. Google drive could be used for data sharing purposes.
5. The need to use GIS tools i.e. QGIS, ArcGIS, for mapping and spatial data analysis.
6. The need to use data analysis tools i.e. Excel, FME, STATA, Python, R, etc.

**Proposed Database Platform**

PostgreSQL database has been proposed for use by the stakeholders for storing spatial data due to the following reasons below:

PostgreSQL is a powerful, open source object-relational database system that uses and extends the SQL language combined with many features that safely store and scale the most complicated data workloads.

PostgreSQL has earned a strong reputation for its proven architecture, reliability, data integrity, robust feature set, extensibility, and the dedication of the open source
community behind the software to consistently deliver performant and innovative solutions. PostgreSQL runs on all major operating systems, has been ACID-compliant since 2001, and has powerful add-ons such as the popular PostGIS geospatial database extender. It is no surprise that PostgreSQL has become the open source relational database of choice for many people and organisations.

Below is an inexhaustive list of various features found in PostgreSQL, with more being added in every **major release**:

- **Data Types**
  - Primitives: Integer, Numeric, String, Boolean
  - Structured: Date/Time, Array, Range, UUID
  - Document: JSON/JSONB, XML, Key-value (Hstore)
  - Geometry: Point, Line, Circle, Polygon
  - Customizations: Composite, Custom Types

- **Data Integrity**
  - UNIQUE, NOT NULL
  - Primary Keys
  - Foreign Keys
  - Exclusion Constraints
  - Explicit Locks, Advisory Locks

- **Concurrency, Performance**
  - Indexing: B-tree, Multicolumn, Expressions, Partial
  - Advanced Indexing: GiST, SP-Gist, KNN Gist, GIN, BRIN, Covering indexes, Bloom filters
  - Sophisticated query planner / optimizer, index-only scans, multicolumn statistics
  - Transactions, Nested Transactions (via savepoints)
  - Multi-Version concurrency Control (MVCC)
  - Parallelization of read queries and building B-tree indexes
  - Table partitioning
  - All transaction isolation levels defined in the SQL standard, including Serializable
  - Just-in-time (JIT) compilation of expressions

- **Reliability, Disaster Recovery**
  - Write-ahead Logging (WAL)
  - Replication: Asynchronous, Synchronous, Logical
  - Point-in-time-recovery (PITR), active standbys
  - Tablespaces

- **Security**
- Authentication: GSSAPI, SSPI, LDAP, SCRAM-SHA-256, Certificate, and more
- Robust access-control system
- Column and row-level security
- Multi-factor authentication with certificates and an additional method

**Extensibility**
- Stored functions and procedures
- Procedural Languages: PL/PGSQL, Perl, Python (and many more)
- SQL/JSON path expressions
- Foreign data wrappers: connect to other databases or streams with a standard SQL interface
- Customizable storage interface for tables
- Many extensions that provide additional functionality, including PostGIS

**Internationalization, Text Search**
- Support for international character sets, e.g. through ICU collations
- Case-insensitive and accent-insensitive collations
- Full-text search

There are many more features that you can discover in the PostgreSQL documentation. Additionally, PostgreSQL is highly extensible: many features, such as indexes, have defined APIs so that you can build out with PostgreSQL to solve your challenges.

PostgreSQL has been proven to be highly scalable both in the sheer quantity of data it can manage and in the number of concurrent users it can accommodate. There are active PostgreSQL clusters in production environments that manage many terabytes of data, and specialized systems that manage petabytes.

(Source: PostgreSQL Official Website)
Annex

Stakeholder Engagement Sessions

Engaging with the YOSEMA team

Engaging with the Executive Secretary YOSEMA, Dr. Muhammad Goje

Engaging with the YOSEMA ES and the M&E Officer, Umar Danlami

Engaging with the YOSEMA team

Engaging with multi-stakeholders from YOSEMA, MOH, PHCDA, etc.

Engaging with multi-stakeholders from YOSEMA, MOH, PHCDA, etc.