Internally Displaced People (IDPs) Modelling and Predicting Data sources: IDMC-GIDD and IOM-DTM

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Introduction

Internally Displaced People (IDPs) are individuals forced to flee their homes, but remain within their country's borders [1]. As of 2024, the global number of IDPs has reached 76 million, and this number is projected to increase annually due to ongoing conflicts, natural disasters, and other crises.

Challenges

While datasets from UN agencies like IDMC-GIDD and IOM-DTM provide valuable insights, their granularity is often limited to administrative levels 1 or 2. This lack of detailed data poses significant challenges for policymakers, urban planners, and researchers.

Effective policymaking, urban planning, and survey implementation require access to granular data on IDPs. Without detailed information, it becomes challenging to allocate resources, plan infrastructure, and address the specific needs of displaced populations. Including particular gender and age groups in surveys and related activities is crucial. However, sparse and low-resolution data on IDPs often hinder accurately representing these demographics, leading to gaps in support and services [2,3].

Objective of the Work

Our objective is to leverage advanced machine learning approaches, utilizing various satellite-derived datasets and available registry data from UN and government agencies, to map IDPs at high resolution. This innovative approach aims to overcome the limitations of current data granularity and provide more accurate and actionable insights.

Methodology

Initially, we mapped IDPs using low-resolution data. This map highlights the limitations of such data, as it fails to accurately pinpoint the locations of displaced populations. For instance, settled areas are often indistinguishable without high-resolution satellite imagery.

Our preprocessing methodology involves improving georeferencing accuracy, which significantly enhances the precision of our IDP maps. By refining the spatial alignment of data points, we can better identify and analyze IDP locations.

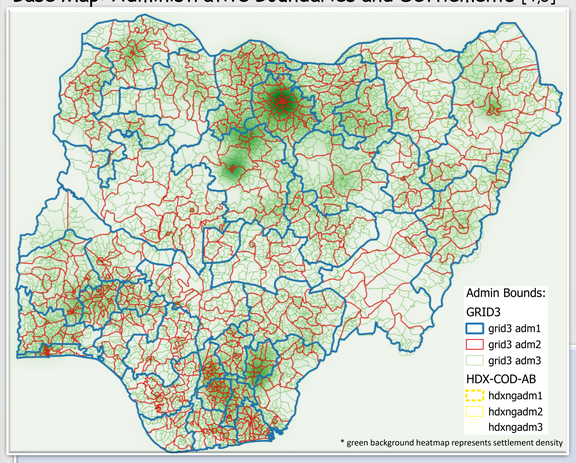
Aim

- To compile, analyze, and integrate available displacement datasets in Nigeria and the DRC,
- To map displaced people's origin and destination either at high resolution gridded or at the lowest possible administrative level.

Initial work plan

- Focus on Nigeria initially
- Review each available dataset (map, analyze)
- Clean and refine dataset spatial resolution
- Identify covariates explaining the observed spatial patterns
- Combine displacement data sources
- Further refine displacement datasets with satellite image-derived information
- Develop methods to map displaced people's origin and destination

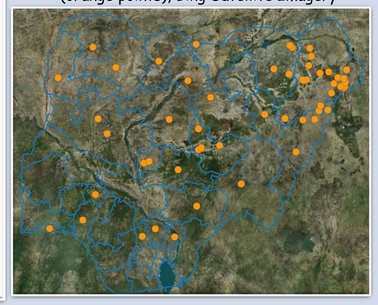
Base Map: Administrative Boundaries and Settlements [4,5]



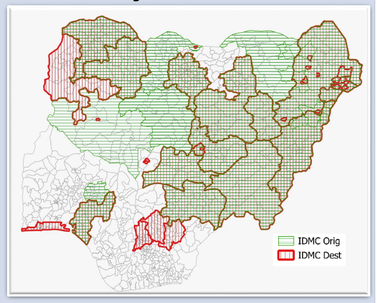
The International Organization for Migration's Displacement Tracking Matrix (IOM-DTM) is a system designed to track and monitor displacement and other population mobility. Established by the International Organization for Migration (IOM), DTM gathers and analyzes data to provide critical, multi-layered information on the mobility, vulnerabilities, and needs of displaced and mobile populations. This data helps decision-makers and responders deliver better, context-specific assistance. This tool systematically collects and disseminates data on displacement, including information on locations, target populations, and their diverse needs. The DTM includes several components such as Mobility Tracking, Flow Monitoring, Registration, and Surveys, which together provide comprehensive insights into displacement patterns and trends [7].

The Internal Displacement Monitoring Centre (IDMC) is the world's leading source of data and analysis on internal displacement. IDMC provides high-quality data, analysis, and expertise to inform policy and operational decisions aimed at improving the lives of internally displaced people (IDPs) and reducing the risk of future displacement. IDMC's primary data product is the Global Internal Displacement Database (GIDD). This comprehensive system collects, manages, and analyzes data on internal displacement caused by conflict, violence, and disasters. The database is designed to provide reliable estimates and insights into the causes, triggers, and patterns of displacement [6].

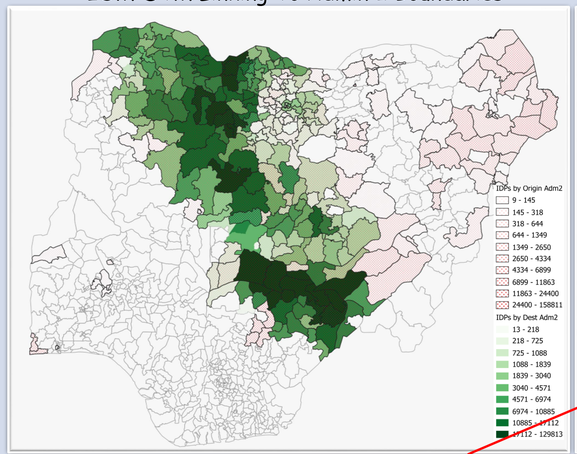
IDMC-GIDD Raw Data Visualization (orange points), Bing Satellite Imagery



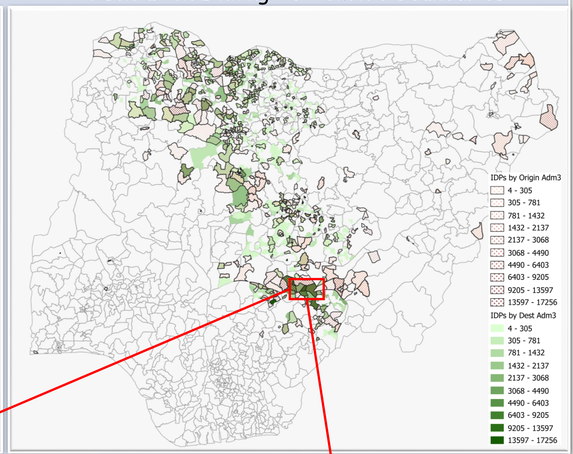
IDMC – Linking to Administrative Boundaries



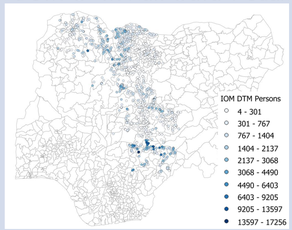
IOM-DTM Linking To Admin 2 Boundaries



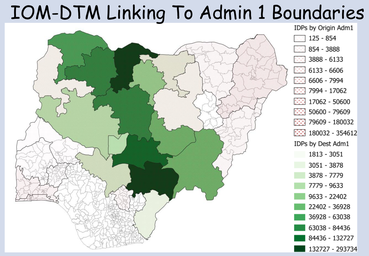
IOM-DTM Linking To Admin 3 Boundaries



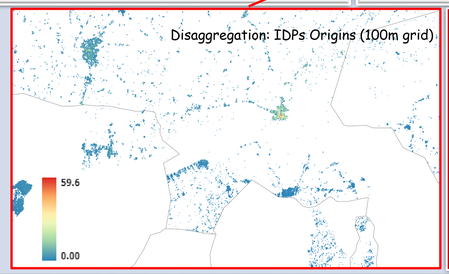
IOM-DTM Raw Data Visualization



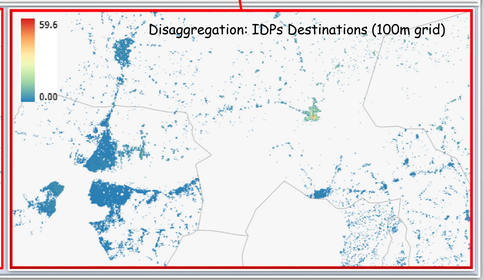
IOM-DTM Linking To Admin 1 Boundaries



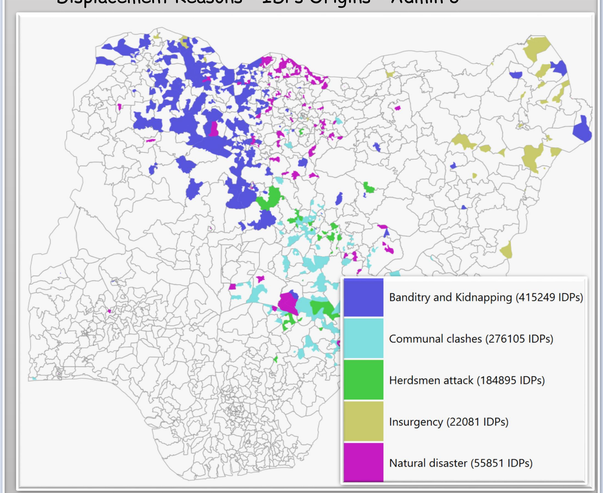
Disaggregation: IDPs Origins (100m grid)



Disaggregation: IDPs Destinations (100m grid)



Displacement Reasons – IDPs Origins – Admin 3



Model Output

Our modelling output includes high-resolution IDP maps, which provide detailed insights into the distribution of displaced populations. For example, by overlaying satellite images, we can zoom in on specific areas to demonstrate the improved accuracy and granularity of our data.

Benefits

High-resolution IDP maps offer several benefits:

- Flexibility to aggregate data to any geographic boundary.
- Easier identification of IDP locations.
- Enhanced utility for future national household surveys on IDPs.
- Improved resource allocation and policy planning.

IOM DTM – Linking to Geospatial Boundaries

IOM DTM State/LGA/Ward Names – GRID3 Admin 1/2/3 Polygons

DTM Roun	Date of Ass	KI's	Population Type	Region	State	LGA	Ward	Site Name
R12	45215	3	IDPs dispersed in North cent		Benue	Logo	MBAGBER	Elkyochi
R12	45210	2	IDPs dispersed in North cent		Benue	Makurdi	NORTH BANK I	EAkaundu Ityough
R12	45213	3	IDPs dispersed in North cent		Benue	Kwande	YAAAV	ETuran Community Sec Sch
R12	45213	4	IDPs dispersed in North cent		Benue	Kwande	YAAAV	EEnia Pri Sch
R12	45211	4	IDPs dispersed in North cent		Benue	Kwande	MBAIKYOR	ERcm Prim Sch Nyihemba

wardname	rdco	lganame	acoc	statename
1004 / Aboyade	L...	Eti Osa	2...	Lagos
A Ozizor	A...	Ogbaru	4...	Anambra
Aagba	O...	Boripe	3...	Osun

1. State DTM == State Adm1 -> define the state ***polygon A*** from Adm 1,
2. LGA == LGA Adm1 and LGA within the ***polygon A*** -> define the LGA ***polygon B*** from Adm 2,
3. Select all wards from Adm 3 within the ***polygon B***, find:

○ a ward with an equal name,
○If no, remove all non-letter symbols and convert to the lower case,
○check for equal names (lower case) or the names with the Levenshtein distance < 4 and <30% of the string length.

IDMC – GIDD Overview:

Pros:

- Multiple Data Sources
- Flexible Data Model (Multiple Origins and Destinations)
- Origin/Destination Point Data
- Abundant Attributes

Cons:

- Low Granularity
- Limited Timeframe (currently, only 2023 for Nigeria)
- Inconsistency in Origin/Destination Data
- Complex Data Model

Conclusion: By addressing the limitations of current IDP data and employing advanced modeling techniques, our work aims to provide more accurate and actionable insights. This will ultimately support better decision-making and resource allocation for displaced populations.

Next Steps:

- Finalize linking the IOM data to the boundaries at the lowest possible resolution
- Identify important covariates explaining the observed patterns
- Break down the high-resolution IDP maps by age and sex
- Analyzing satellite images for features that can help with origin and destination identification

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References:

[1] Leus, X., Wallace, J., & Loretti, A. (2001). Internally displaced persons. Prehospital and disaster medicine, 16(3), 116-123.
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[3] Tatem, A. J., Dooley, C. A., Lai, S., Woods, D., Cunningham, A., & Sorichetta, A. (2023). Geospatial data integration to capture small-area population dynamics. Harnessing Data Innovation for Migration Policy, 10.
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[6] Internal Displacement Monitoring Centre: Validated Data (GIDD) https://www.internal-displacement.org/database/displacement-data/
[7] International Organization for Migration (IOM), May 10 2023. DTM Nigeria — Site Assessment — Round 44 (North-east) — IDPs. IOM, Nigeria. https://dtm.iom.int/datasets/nigeria-site-assessment-round-44-north-east-idps