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Urban-Rural Population Mobility Patterns in Ghana: 2022-2024

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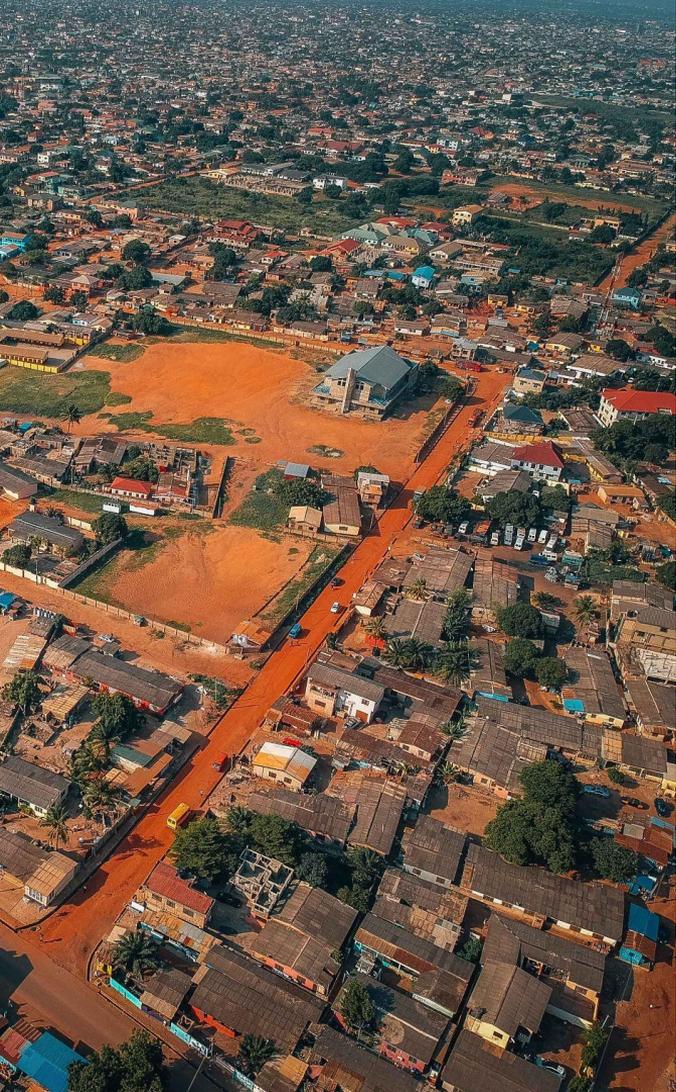
Introduction



Background

The Data for Good partnership is a pioneering public–private partnership between Ghana Statistical Service, Telecel Ghana and Flowminder to leverage anonymized mobile network data to study population distributions and mobility patterns.

Unlike traditional data sources, such as censuses and surveys, which offer static snapshots and are limited by infrequent updates, mobile network data is routinely generated by mobile network operators in near-real time which enables a more granular and timely analysis of mobility patterns and their impact on population distributions.



Objectives

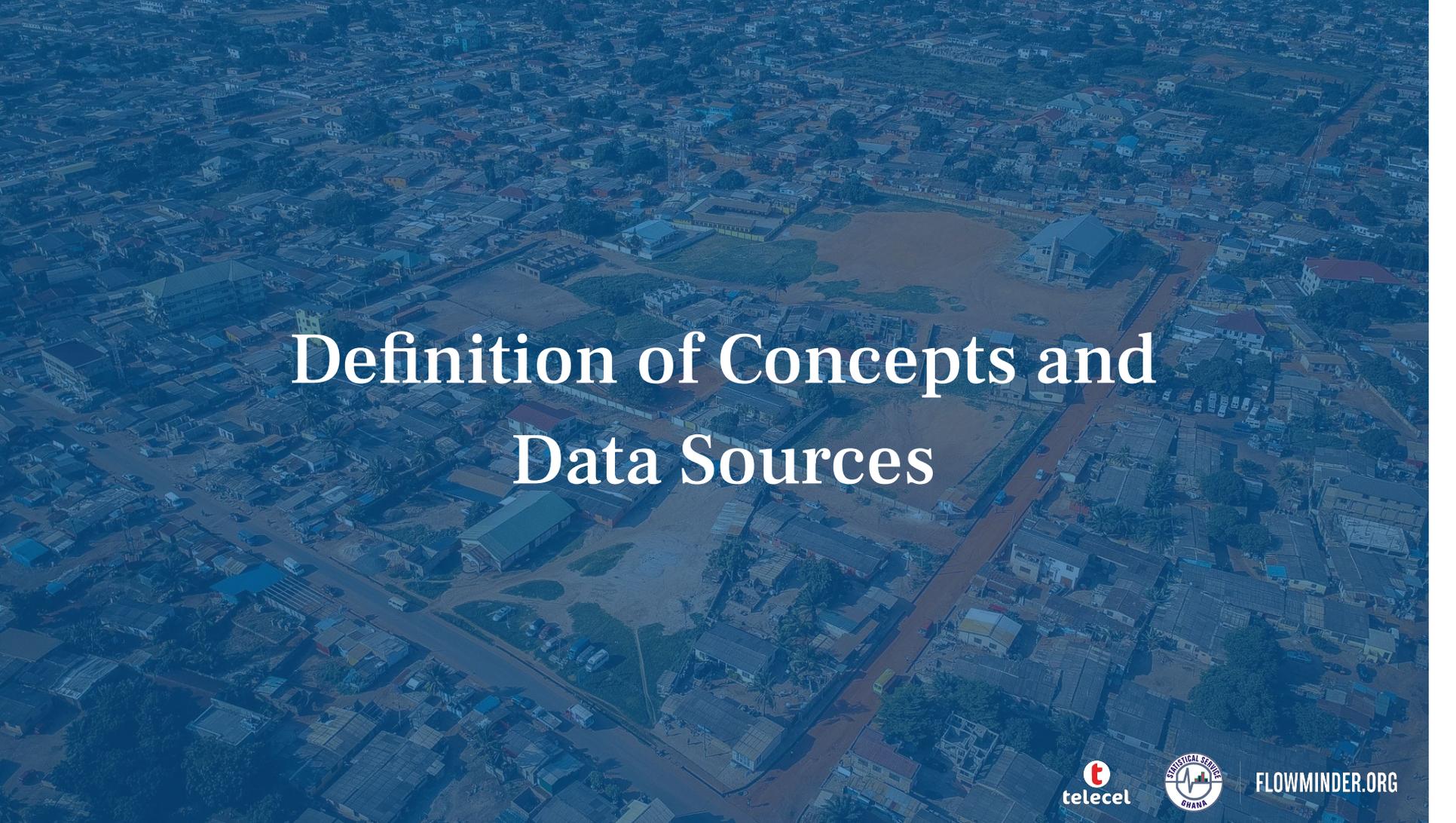
This report describes monthly population mobility distribution trends in Ghana between 2022 and 2024, with a focus on movement between rural areas, towns and smaller cities, and major metropolises.

The objective is to inform decision-making in areas such as economic policies, infrastructure development, healthcare delivery, housing, and sustainable urban planning by exploring the spatial and temporal granularity of mobile network data to investigate how mobility is impacting the distribution of the population in Ghana and how this varies over time.



Key Findings

- Rural districts, collectively, experienced substantial population growth due to movement from more urban areas, especially towns and smaller cities.
- Bole district, in Savannah Region, particularly stands out as experiencing very high population growth, which may be associated with galamsey activity.
- Many districts containing towns and cities, including regional capitals, experienced little population growth or even population decreases due to movements to rural areas or to Accra.
- Accra metropolis experienced notable population growth, in contrast to other urban areas.



Definition of Concepts and Data Sources

Definition of concepts

Call Detail Records (CDRs)

This refers to mobile phone network usage data automatically generated by mobile network operators for billing purposes.

Monthly Home Location

The monthly home location is determined by first identifying subscriber's **home location for each day** (The most frequent recent last-call-of-day location in each 7 days window, moving by 1 day everyday) and if the same location is an absolute majority of daily home locations (more than half) in the current month or is more than third of daily in the current month and majority in the previous month → assign it as **home location**.

Relocations

This refers to an estimate of the number of subscribers who change their home location from district A to district B during a given period of time. This is calculated monthly for each district. The number of subscribers relocating from district A to district B is multiplied by weights derived from survey data, CDR data and GSS population projections. This gives the number of relocations scaled to population size and adjusted for biases in the CDR datasets.

Inflow

This refers to the estimated sum of relocations from all other districts to a given district. This is calculated monthly for each district.

Outflow

This refers to the estimated sum of relocations to all other districts from a given district. This is calculated monthly for each district.

Net Relocations

This refers to the estimated net number of people relocating into a district and is calculated as the inflow minus the outflow. Positive net relocations have larger inflows than outflows, while negative net relocations have larger outflows than inflows. This is calculated monthly for each district.

Cumulative Net Relocation

This is obtained by sequentially summing the monthly net relocation of a district over a specified period. This corresponds to the change in residents due to mobility only (and not natural growth).

Residents

This is the estimated number of de-facto residents per month, in a given district, calculated as the sum of the population for that district in the previous month and the estimated net relocations to that district between the two months, multiplied by a district-specific rate of population change - accounting for births, deaths and international migration.

The district estimate of residents for each month is calculated from the baseline population for that district - the census count for July 2021. In other words, the estimates are calibrated to the 2021 census counts. For all months after the census month, the cumulative sum of all net relocations is added, and the sum is multiplied by a district-specific rate of population growth.



Mobile network data – CDRs

The population distribution and mobility estimates presented in this thematic brief were derived from Call Detail Records (CDRs) provided by Telecel Ghana (previously Vodafone Ghana). The CDRs contain - among other things- the timestamp of subscribers' network events (e.g. making/receiving a call or SMS or using mobile internet data), as well as the location of the cell towers routing those network events, which can be used to approximate the location of groups of subscribers and estimate their movements over time. These estimates are not traditional population and survey estimates. Readers not familiar with this data source are encouraged to read explanatory documentation on Flowminder's CDR data analytics Knowledge Centre ([FlowGeek.org](https://flowminder.org/flowgeek)) or a more detailed description of indicators hosted on the [Haiti Mobility Data Platform](https://flowminder.org/haiti-mobility-data-platform), which uses the same methods as this brief.

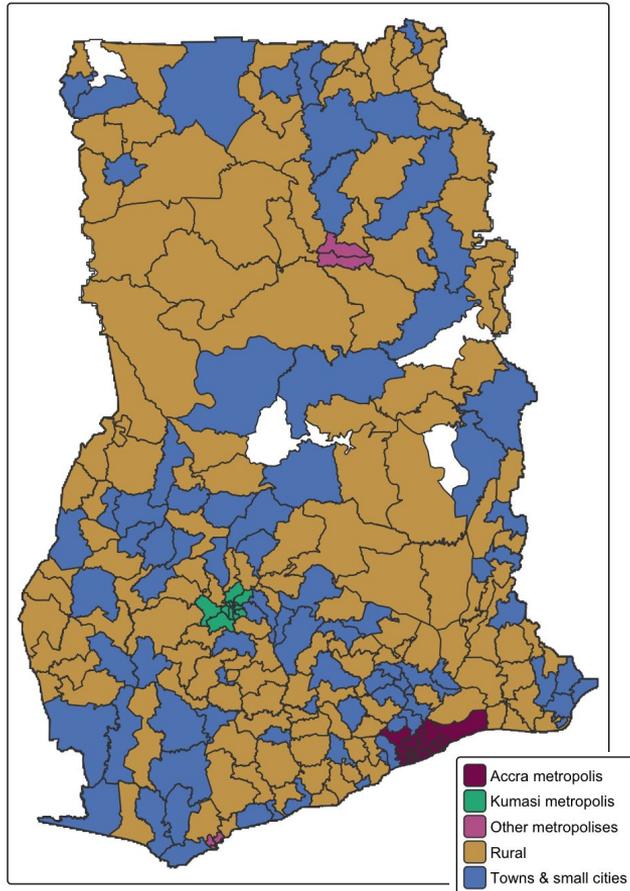


Census and survey data

The CDR dataset cannot be assumed to be perfectly representative of the entire population of Ghana, due to the demographics of phone ownership and Telecel's subscribers. In spite of these limitations, the dataset still provides a good indicator of changes in a population's movements as a significant proportion of the population is included in the dataset. Therefore, aggregated and anonymised CDR data used to produce the estimates and indicators in this document have been combined with other data sources to adjust for biases in the CDR dataset.

The population and mobility estimated in this report have been corrected to make the indicators representative of the whole population (instead of representing only Telecel Ghana's subscribers). For this, the indicators have been scaled to be representative of the population using a recent Annual Household Income and Expenditure Survey (AHIES), implemented in 2022. Furthermore, the methodologies for calculating long-term mobility estimates used in this thematic brief are robust to temporal variation in phone usage.

District Classification



For the purposes of this report, each district was classified as being a rural area, a town or smaller city, or part of a major metropolis. Districts in the Accra and Kumasi metropolises are classified separately, while Sekondi-Takoradi and Tamale are combined in a single group labelled “Other metropolises”.

Rural districts are those that are neither designated as municipal nor included within any of the defined metropolitan areas. They typically represent less urbanised regions with lower population densities and limited urban infrastructure.

Municipal districts, outside the boundaries of the defined metropolitan areas, are assigned to the “Towns and smaller cities” category. These represent more urbanised areas, but not of the size and density of the major metropolises. This category includes a number of regional capitals.

This method for classifying districts lacks robustness but is suitable for the exploration of mobility patterns between urban and rural areas conducted in this report.



Results

Results

National-level insights

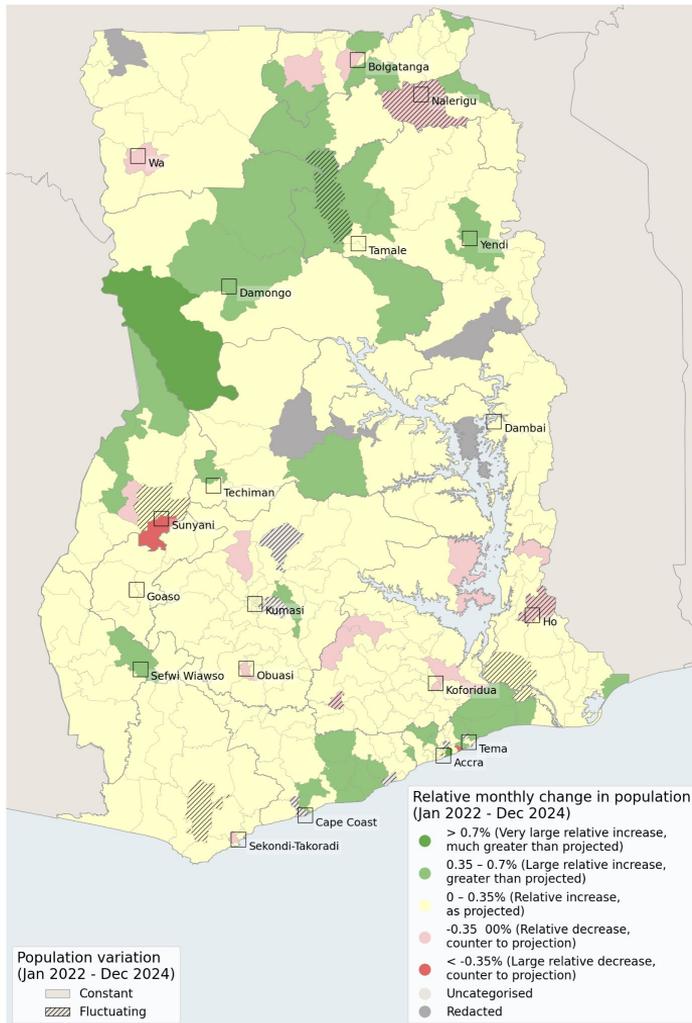
National Overview

This figure shows the relative monthly in the population of each district in Ghana between 2022 and 2024, with reference to the projected growth of the population based on the 2021 national census.

The populations of green and yellow districts are increasing, with green districts increasing faster than projected and yellow districts increasing in line with projections. The populations of red districts are decreasing, despite being projected to increase.

Districts in light grey have large fluctuations which make it difficult to assess whether the population of a district is increasing or decreasing.

A number of rural districts stand out as experiencing substantially greater increases in population than projected. In contrast, several cities experience decreases in population, specifically Bolgatanga, Ho, Korifordua, Nalerigu, Obuasi, Sunyani, and Wa.



Population growth

Estimated changes in population distribution from January 2022 to December 2024, relative to the 2021 census

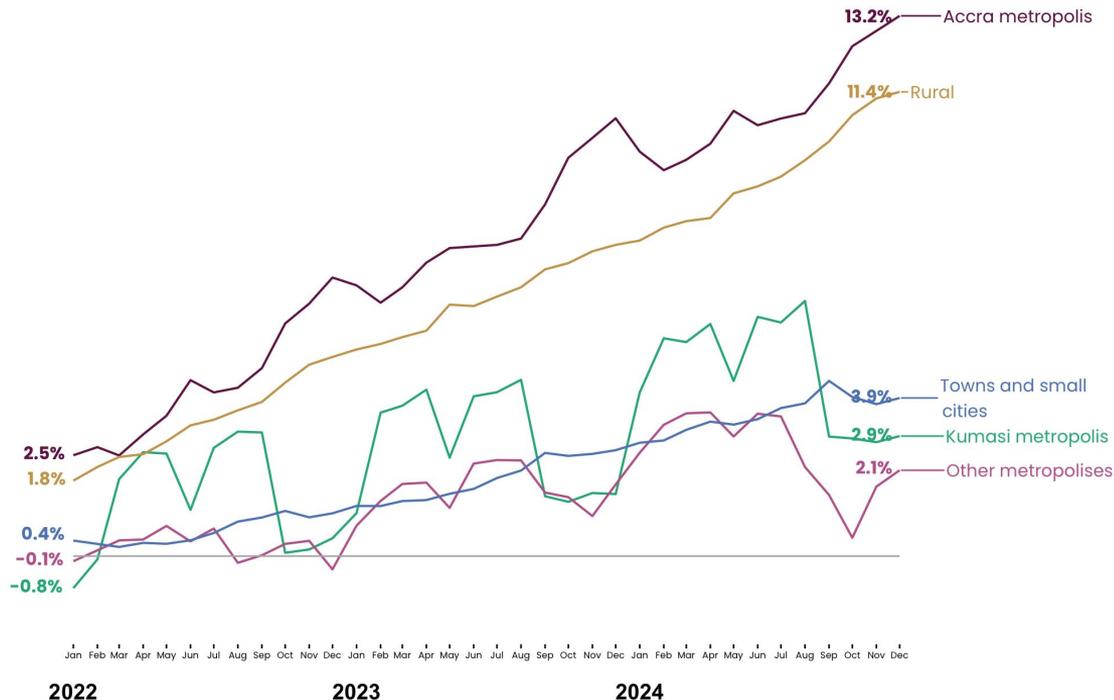
Accra Metropolis remains a magnet for growth, experiencing an estimated growth of **13.2%** since the 2021 census, exceeding official projections.

Contrary to expectations, rural areas also experienced greater than projected population increases. Rural districts collectively experienced an estimated growth of **11.6%**.

In comparison, towns and smaller cities (including regional capitals such as Bolgatanga, Ejisu, Ho, Koforidua, Sunyani and Wa) and the major cities of Tamale and Sekondi-Takoradi (labelled Other Metropolises) experienced substantially slower than projected growth.

Kumasi metropolis experiences large, seasonal fluctuations in population associated with the large movements of students.

Growth trend of categories



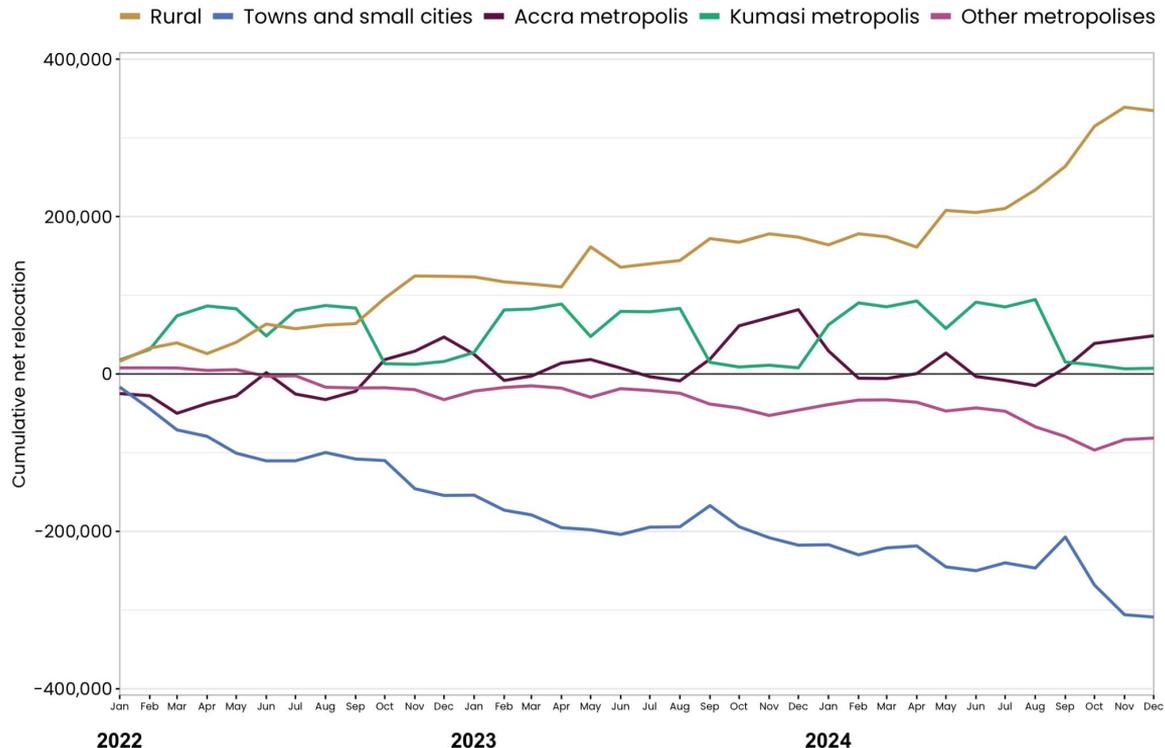
Relocation trend

Total estimated net relocations by location type from January 2022 to December 2024

The total net relocations (i.e. the number of people estimated to relocated to districts of a given class, minus the whose relocated out) also indicate substantial migration to rural areas, and migration out of towns and smaller cities.

This raises important questions about what is driving migration to rural areas and out of smaller urbanised areas, but not the metropolises of Accra and Kumasi.

In particular, could migration to rural areas be associated with **unofficial economic activity, such as galamseys.**



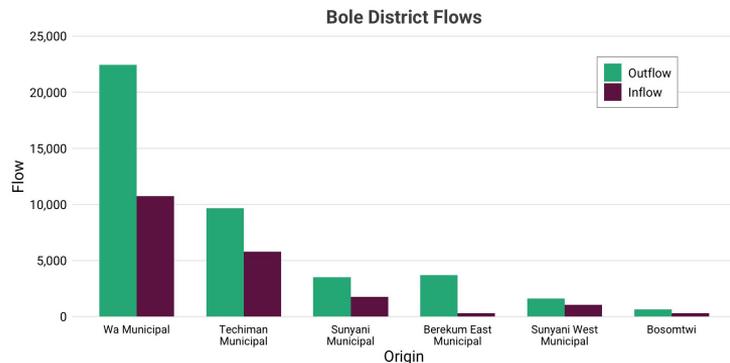
Results

District-level insights

Relocation Trends – Rural areas

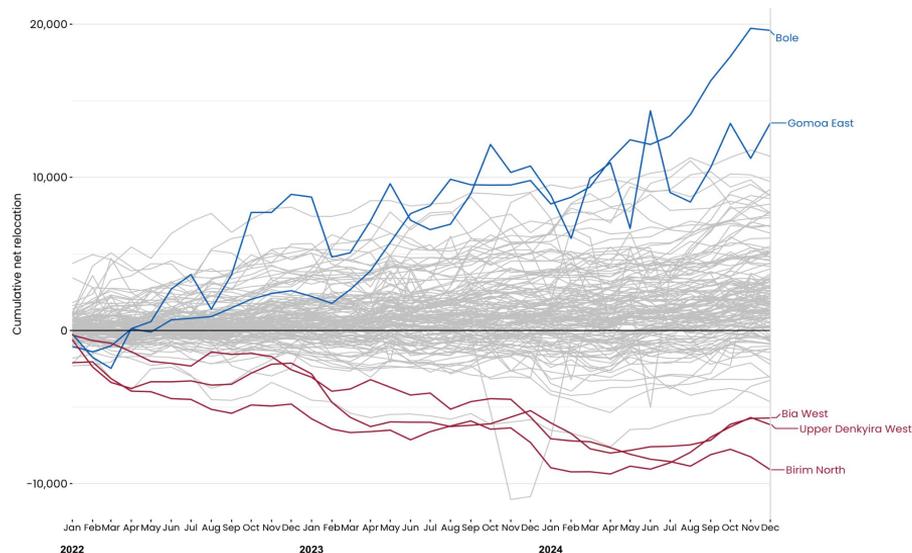
Many rural districts experienced significantly larger relocations into the district than out of the district, resulting in greater than projected population growth, between 2022 and 2024.

In particular, **Bole** in Savannah Region experienced very positive net inflows, especially from smaller cities like Wa, Techiman, Sunyani and Berekum, potentially associated with increase galamsey activity in the area. In particular, approximately twice as many people relocated to Bole from the urban Wa than from Bole to Wa in this period. Will a smaller number of people relocated from urban Berekum East to Bole, this number is **11.4** times larger than the number of relocations from Bole to Berekum East.



Insights

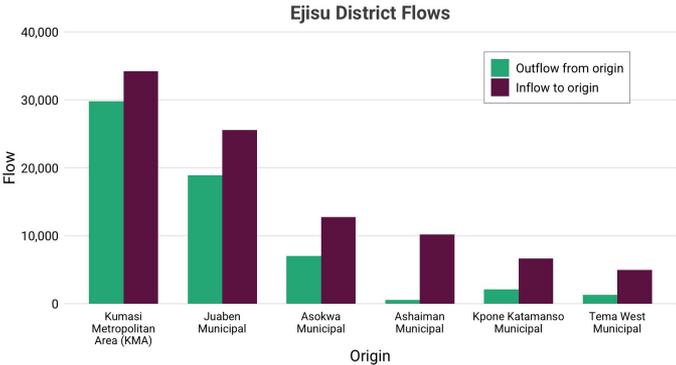
Contrary to expectations, our analysis indicates substantially greater relocations to rural areas than from rural areas, driving greater than projected population growth in many rural districts. In some districts with very large population increases, such as Bole, this may be associated with illicit economic activities, such as galamseys.



Relocation Trends – Towns and smaller cities

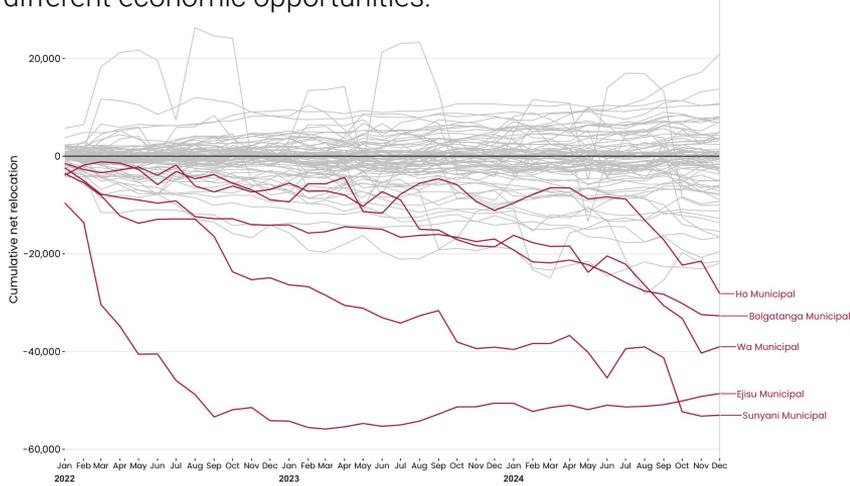
Most districts with towns and smaller cities are estimated to be experiencing greater relocation out of the districts than in, with Ejisu Municipal and Sunyani Municipalities in particular experienced larger net negative flows between 2022 and 2024.

The main destinations for those relocating away from Ejisu are Kumasi Metropolitan Area and the nearby town of Juaben. However, the difference between inflows and outflows is substantially greater from Ashaiman municipalities in Accra metropolis, with **18.1** times as many people relocating from Ejisu to Ashaiman than from Ashaiman to Ejisu.



Insights

Our analysis shows that a number of towns and smaller cities, including several regional capitals, are experiencing substantially greater relocation out of than into these districts, resulting in reduced population growth or even population decline. This may reflect shifts in economic activity, potentially influenced for the COVID-19 pandemic, and subsequent relocation people to Accra or to more rural areas with different economic opportunities.



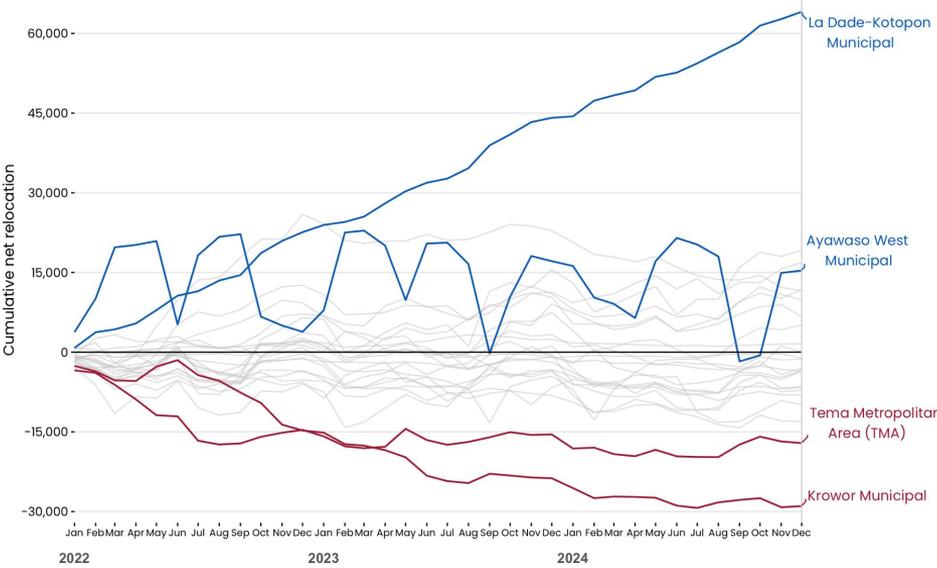
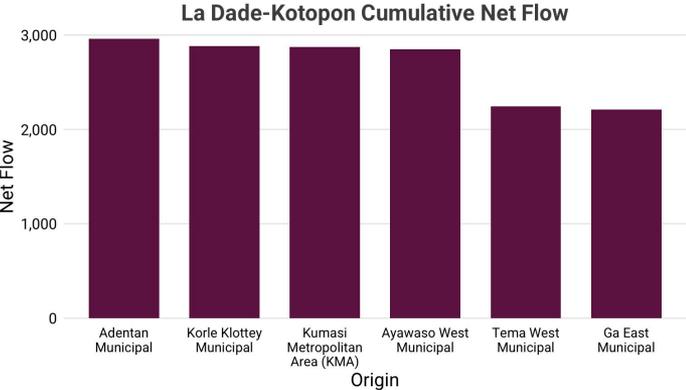
Relocation Trend - Accra Metropolis

The Accra metropolis reveal distinct patterns influenced by demographic and seasonal factors. La Dade-Kotopon a prime municipality has shown a steady and significant population increase, reaching over 45,000 net gains by mid-2024, likely driven by **economic opportunities** and **luxurious urban development**.

The symmetry between inflows and outflows excluding La Dade-Kotopon and the destination of migrants leaving the Krowor Municipal supports the phenomenon of stable population distribution within the metropolis.

Insights

La Dade-Kotopon Municipal has experienced much greater inflows of people than outflows, driving a large increase in population. These flows may be related to a number of features in the area including Kotoka International Airport. **Ayawaso West Municipal** exhibits notable **seasonal fluctuations**, associated with the movement to students at the **University of Ghana**.



Conclusions

The analysis of domestic migration patterns in Ghana from 2022 to 2024, derived from anonymised mobile phone data, reveals important population dynamics which are reshaping the population distribution of the country. Contrary to established narratives of urbanization, rural districts have emerged as experiencing substantial population growth, driven by migration from urban areas, especially towns and smaller cities including regional capitals. Bole in Savannah Region experiences especially large migration into the district, which may be associated with alternative economic activities such as illicit galamsey mining sites.

Districts categorised as containing towns and smaller cities, once seen as transitional zones, and the metropolises of Sekondi-Takoradi and Tamale are experiencing notable population stagnation or even reductions due to greater migration out of these districts than it. This may indicate a possible reconfiguration of economic opportunities and living preferences post-COVID-19. However, Accra Metropolis, in comparison, experiences high population growth over this period suggesting important differences between the capital and other cities.

This study highlights the value of mobile phone data in capturing near-real time mobility trends, offering a dynamic and granular perspective that traditional census methods cannot. These insights are vital for evidence-based policymaking in infrastructure, health, housing, and urban planning. As Ghana continues to evolve, integrating innovative data sources into national planning will be key to fostering inclusive and sustainable development.

Recommendations

- Classification of districts
- Greater granularity to better define degree of urbanisation
- Population estimates in the process of being rescaled with the addition of more recent AHIES data
- Combine with data on galamsey activity to better assess whether this is driving the migration into certain areas such as Bole
- Combine with other economic data, such as jobs data, to assess other economic drivers

Data & policy privacy

The mobile network data provided to Flowminder is fully anonymised. This means that **no personal data**, such as an individual's identity, demographics, location, contacts or movements, is made available to the government or any other third party at any time. All results produced by Flowminder are aggregated results (for example, subscriber density in a given municipality), which means that they do not contain any information about individual subscribers. This approach complies with the European Union's General Data Protection Regulation (EU GDPR 2016/679). Data is processed on a server installed behind Vodafone Ghana's firewall in Ghana, and no personal data leaves the operator's premises.

Data considerations

The estimates shown are our best current assessment of movements from non-traditional data: anonymised data from a mobile network operator. However, there are a number of uncertainties. The information should be interpreted together with other available evidence.

Acknowledgement

This study was made possible thanks to the anonymised data provided by Vodafone Ghana. This report was funded with UK International Development from the UK government. The analysis presented has also been possible thanks to funding by the William and Flora Hewlett Foundation and Vodafone Foundation that support Flowminder's activities in Ghana, where Flowminder is partnered with Ghana Statistical Service and Vodafone Ghana, under the Data for Good partnership, to integrate mobile operator data into official statistics and enhance development planning.

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