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Digicel

Papua New Guinea
COVID-19 report

April 2023

World Bank

Flowminder Foundation

Authors & contributors

The **Flowminder Foundation**, a non-profit foundation specialising in the analysis of anonymous mobile operator data, satellite imagery and household survey data for humanitarian and development purposes. Flowminder provides insight and strengthens the capacity of governments, mobile network operators, national and international agencies and researchers to use big data for humanitarian and development purposes. www.flowminder.org

The Pacific Observatory of World Bank provides non-traditional data sources as complements to official statistics for improving the frequency, timeliness, and granularity of key economic / development indicators for data-driven policymaking in Papua New Guinea and the Pacific Islands.This report was commissioned by the Pacific Observatory programme.

The report was authored by Robert Eyre, with the contribution of Galina Veres, James Harrison, Sophie Delaporte, Xavier Vollenweider, and Caterina Irdi from Flowminder and Shohei Nakamura from the World Bank.

This report was made possible thanks to the aggregated and anonymised mobility indicators derived from Call Detail Records (CDR data) provided by **Digicel Papua New Guinea** (PNG)

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Executive summary

- Flowminder produced indicators of mobility using aggregated and anonymized data derived from Call Detail Records (CDR data) of the Mobile Network Operator Digicel Papua New Guinea;
- These indicators were used to measure changes in mobility from December 2019 to May 2020, period during which two main sets of measures against the COVID-19 were introduced by the government:
  - Phase 1, 26 Jan 2020 - 23 March 2020: Travels from Asia and Indonesia are banned;
  - Phase 2, 24 March 2020 - 22 April 2020: Travels between districts within Papua New Guinea are also banned.
- Only the Phase 2 measures appear to have been effective in contributing to a reduction in mobility within Papua New Guinea.

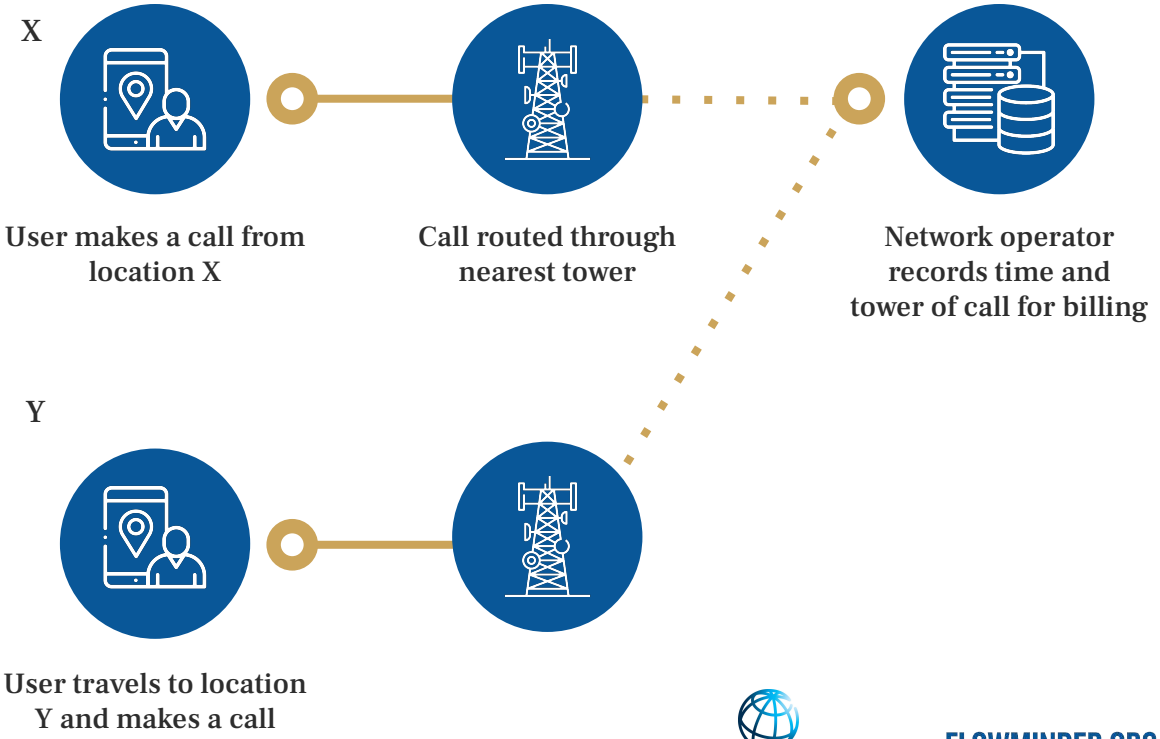
Executive summary

- All results are expressed as % change compared to the baseline period, i.e. normal conditions (Baseline from 2019-12-01 to 2020-01-25);
- During Phase 1:
  - Urban areas were visited by subscribers from *more* district;
  - The daily count of unique subscribers in urban areas *increased by* up to 20% although it did decrease by 10 % in rural areas.
- During Phase 2:
  - Subscribers traveled less than normally within the province where they live and even within the district where they live;
  - As a result:
    - the daily count of unique subscribers in urban districts decreased by 10% on average with the largest decreases in unique subscribers in urban areas recorded in Central Papua New Guinea, between -30% to -50%;
    - There was less mixing of subscribers coming from various areas of the country (entropy indicators and population mixing indicators)
  - Subscribers traveled from areas where population population mixing was lower than during the baseline period, which hence likely reduced the risk of having them been exposed to the virus before their journey.

Introduction to CDRs

Call Detail Records (CDRs)

- Base stations/towers with multiple cells
- Mobile Network Operators maintain a database of call detail records (CDR) for billing purposes
- Generated each time a mobile phone subscriber makes or receives a call, sends or receives a SMS, or uses mobile data



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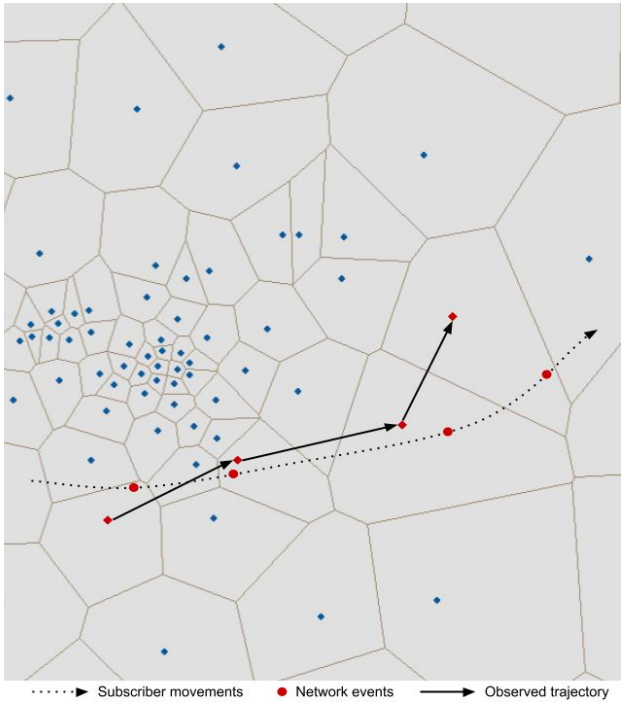
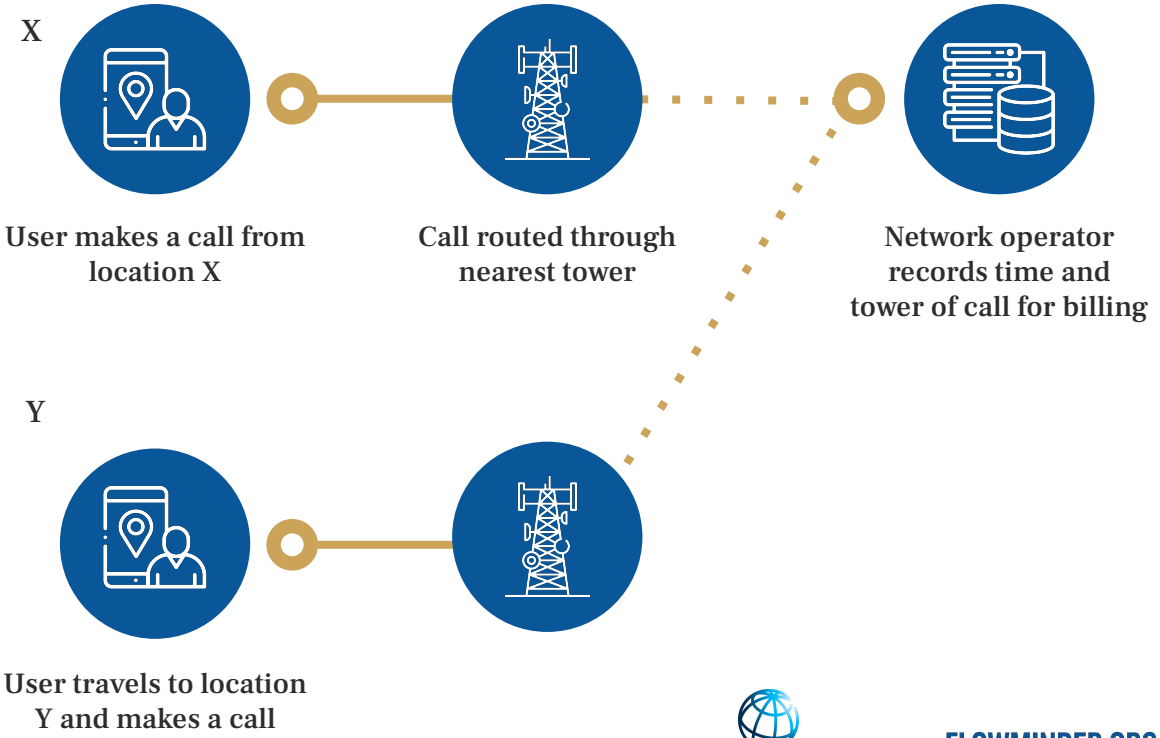
CDRs can provide near-real time estimates of population movements & changes in population density





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Benefits of using CDRs

- The data are automatically generated
- The dataset contains billions of data points from millions of people – large geographic and time scales covered
- There is a continuous stream of data – near real-time.

In the context of COVID-19

- Production of mobility indicators to plan, monitor and evaluate interventions to respond to the outbreak

Use cases of CDR data

- **Support for COVID-19 response** through the tracking of mobility trends, the estimation of changes in population density for resource allocation and incidence; and inputs to other models, such as transmission models.
- **Support for disaster response** through the analysis of population movement for better operational planning and allocation of resources before, during, and after disasters (for example, the 2021 earthquake in Haiti).
- See Annex 1 for more examples.

CDR-derived insights should never permit the identification of individual subscribers.

Ensuring privacy and transparency

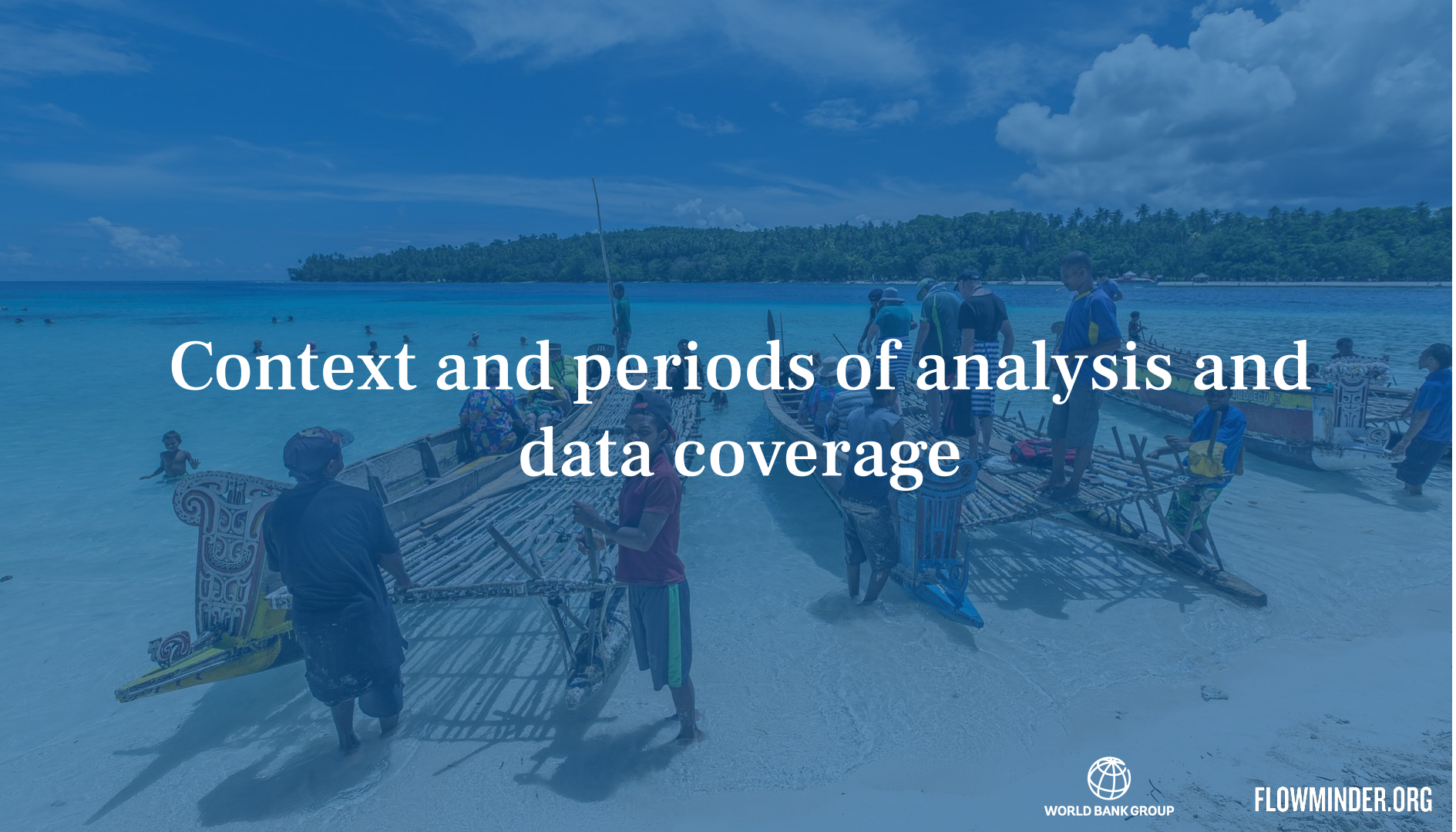
Key principles

- GDPR compliance throughout
- Transparency and peer review:
  - Detailed and open method descriptions
  - Open algorithms
  - Publications in peer-reviewed academic journals

Assisted queries

Data access in Papua New Guinea

Digicel provided aggregated Call Detail Records (CDR) following a methodology proposed by Flowminder (see here and here). Flowminder then derived the mobility indicators presented in this report (see here for the method)



Context and periods of analysis and data coverage

Introduction

Objectives of the report

- This report is part of a project that aims at showing the potential of CDRs to study mobility and more generally how MNOs data can be leveraged for decision-making. The report focuses on mobility changes in the context of COVID-19 restrictions.
- The project will additionally produce the following reports: 1) a report on the analysis of mobility patterns disaggregated by the socio-economic characteristics of the subscribers; and 2) a report on the estimation of household wealth levels and wealth maps by combining the Digicel CDR data with the World Bank high-frequency phone surveys.
- The project will seek to set up a sustainable infrastructure to continue the production of aggregated mobility metrics for public use.

Introduction | Context

- Papua New Guinea is located in Oceania, it occupies the Eastern half of the Island of New Guinea, sharing an 824 km long land border with Indonesia, it is the second largest Island country in the world.
- The 2020 population of Papua New Guinea is 9 million people, 87% live in rural areas, it ranks 153 out of 187 countries on the 2020 Human Development Index.
- The PNG health system is fragile due to the high prevalence of malaria, tuberculosis, and diabetes and access to hospitals is limited for most of the population. Distance, cost of transportation, road quality and means of transportation make access to health facilities difficult for the 87% of the population that lives in rural area.

Introduction | Context

- From 3 January 2020 to 29 September 2022, there have been 44,997 confirmed cases of COVID-19 with 668 deaths (WHO). The country entered a state of emergency on the 24 of March, and after less than two months of lockdown, on 4 May 2020, the country was declared COVID-19 free. On 20 June 2020, the government confirmed another case of COVID-19 however until early 2021, PNG did not face a major outbreak, with only 1,275 cases reported at the end of February according to Johns Hopkins University.
- As a result of pandemic-related restrictions and weaker demand, it is estimated that PNG's real GDP contracted by 3.8% in 2020. In March 2021, the World Bank forecast that economic growth is expected to rebound to about 3.5% in 2021–22, but the economy will be nine percentage points smaller in 2023 compared to the World Bank's pre-pandemic forecast (World Bank).

Introduction

The telecommunication market

- There are three Mobile Network Operators in Papua New Guinea: Digicel, BMobile Vodafone and Telikom PNG. Digicel dominates the mobile landscape with 91.98 per cent market share
- The penetration rate in Papua New Guinea was estimated at 29.70% over a population estimate of around 6.2 million and a annual growth rate of unique subscribers of 1.73
- Mobile penetration is still low compared to other countries in the Pacific, with less than a third of the population being unique mobile subscribers.
- Source: Digital Transformation: The Role of Mobile Technology in Papua New Guinea (GSMA, 2019)

Report | Study period

(*) The baseline period includes Christmas, which is observed in Papua New Guinea as a majority Christian nation. The mobility statistics we derive in this report compare counts of users and events to the corresponding median value in this period which is robust to outliers such as the Christmas period where mobility may be higher or lower than usual.

Timeline

1. Baseline from 2019-12-01 to 2020-01-25 - period of 'normal behaviour'(*)
2. Phase 1 (26 January 2020 - 23 March 2020): PNG bans all travelers from Asian countries & Indonesia
3. Phase 2 (24 March 2020 - 21 April 2020): travel between districts and provinces banned, state of emergency announced for 14 days at first then extended
4. Phase 3 (22 April 2020 to 5 May 2020) - announced easing of some restrictions

Over the whole study period, all Digicel subscribers are considered.

The timeline below summarises the period of analysis:

2019-12-01 Start of normal behaviour period

2020-01-26 Phase 1 PNG bans travel from Asia / Indonesia

2020-03-24 Phase 2 Travel between districts banned

2020-04-22 Phase 3 Restrictions eased

2020-05-05 End of Phase 3

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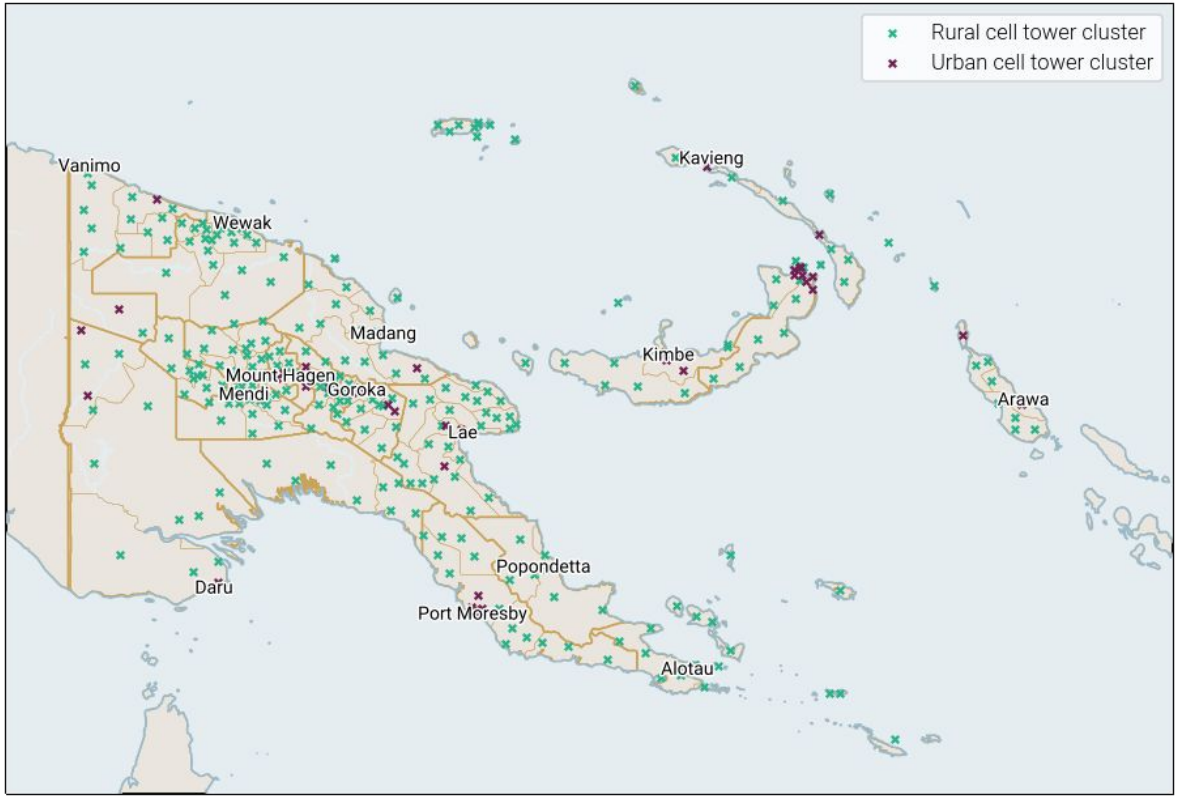
Cell tower cluster locations



Cell tower cluster locations are computed by merging the locations of individual cell towers and computing the centroid of these locations. **This avoids disclosing the location of individual cell towers** as cell tower locations are commercially sensitive data. The district boundaries are overlaid on the map.

- There are **303 cell tower clusters** over Papua New Guinea.
- The **majority of clusters** are located in the **Highlands region** of Papua New Guinea (the center of the country).

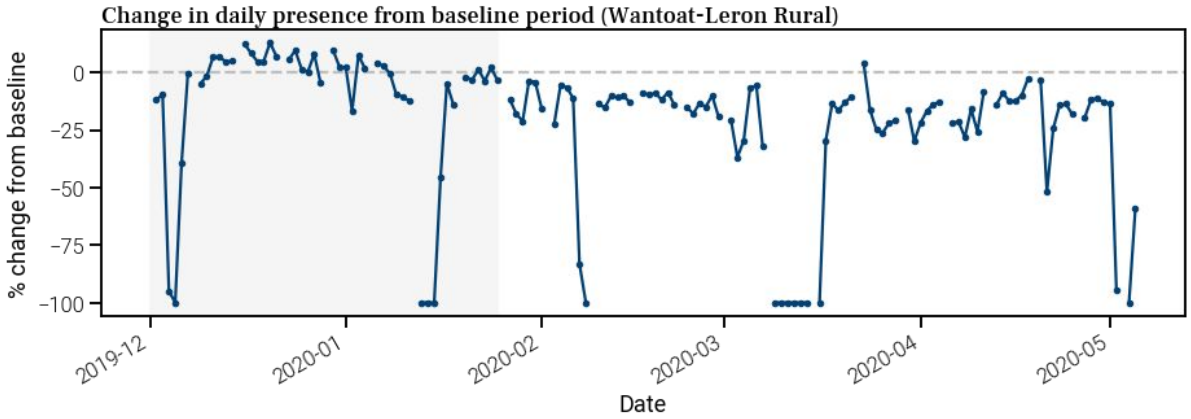
Classification of clusters: urban & rural

- Individual cell towers are classified as either urban or rural **by Digicel.**
- We label cell tower clusters as urban if they have **at least one tower** that has been marked as urban by Digicel.

Reading the figures | Time series

To show change in daily presence, population mixing and other indicators of mobility between districts, we **compare daily values of each cell tower cluster with 'normal' value during a baseline period. The 'normal' value is defined as the median over this baseline period (from x to z date).**

We then express the **change as percentage change from baseline median.** This tells us how indicators have changed **without revealing commercially sensitive data such as the number of subscribers that Digicel provides service to.**



% change = 100 * (**value** - **baseline**) / **Baseline**

In regions visited by **less subscribers,** there is **no daily presence recorded.** This is shown as a **-100% change** in the time series.

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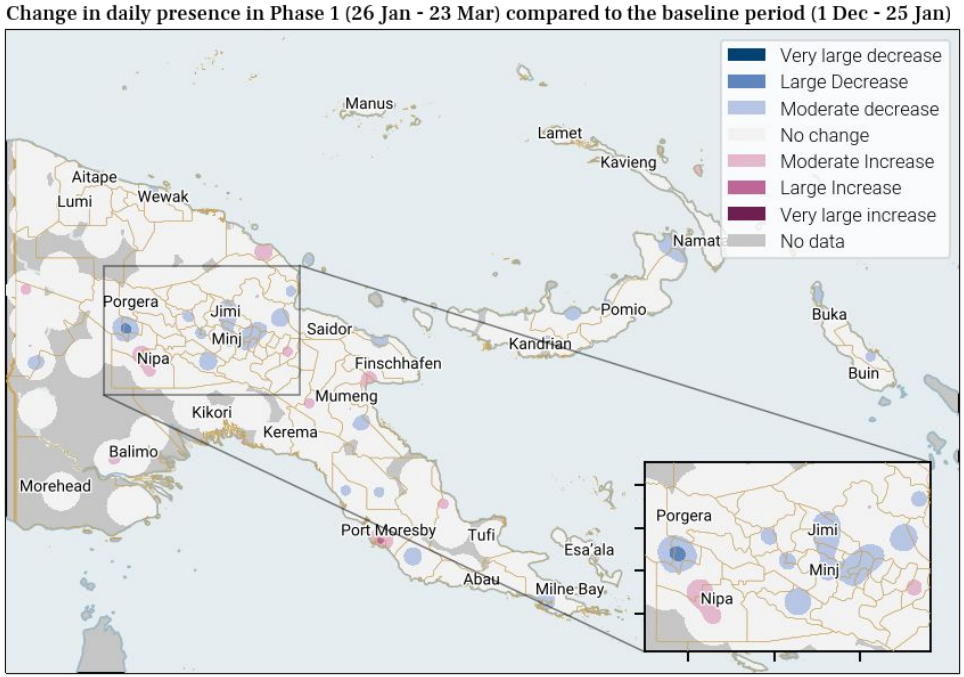
Reading the figures | Maps

For each phase of COVID-19 measures introduced in Papua New Guinea, **each cell tower cluster has an associated score** that **describes how different it is from the baseline period.**



Each cell tower cluster **consists of at least one cell tower** that covers a wider area of Papua New Guinea.

We **determine the change in a region by smoothing the score** associated to each cluster point **over the map to produce maps that indicate the wider area that is covered** (under the assumption that cell towers have the same circular range).

Blue areas show where an indicator **has decreased**, **purple areas** show where an indicator **has increased**.

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Measuring changes in
Daily presence

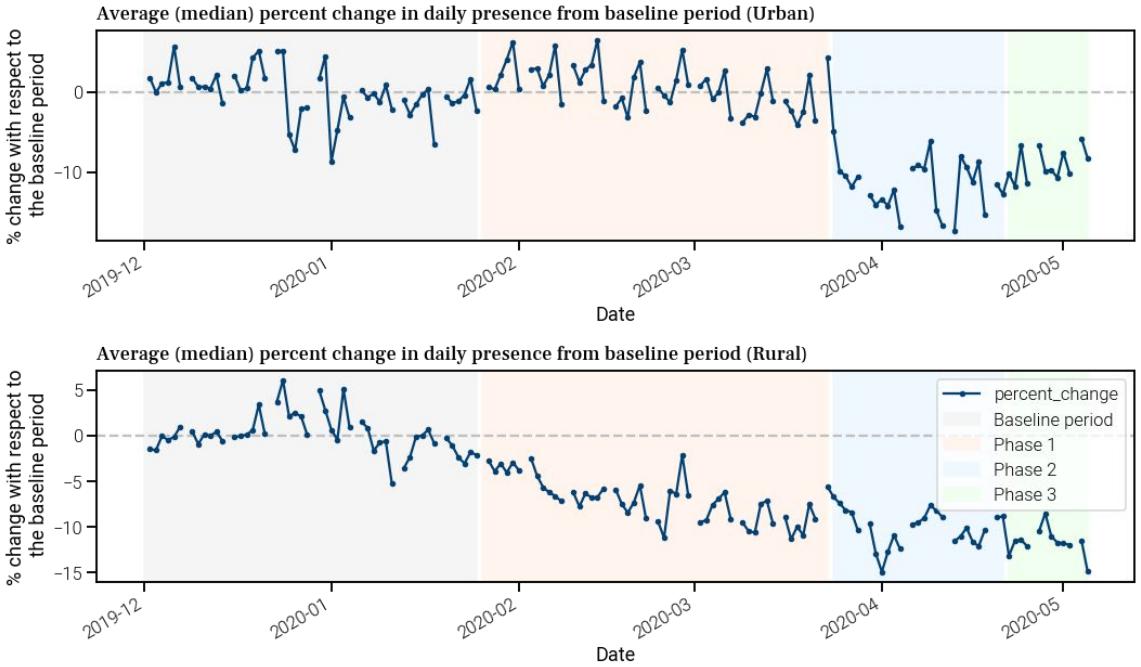
Daily presence

Daily presence is the number of unique subscribers at each cell cluster per day.

This measures the number of users who made a call in each cell cluster at a given time period.

Reduction in daily presence across all cluster locations in PNG

Monday - Saturday



These graphs show the median change (from the baseline period) of the number of active subscribers at cell tower clusters on Mondays to Saturdays in urban and rural areas. As Sundays have lower phone usage that week, they are omitted.

- There was a **5-10% increase** of unique subscribers in urban areas after borders were closed to Indonesia and other Asian countries, suggesting more people were visiting urban areas than usual.
- Urban locations show a reduction of **-10% of unique active subscribers** after measures that banned travel between districts and provinces in Papua New Guinea.
- **Rural locations** on average **show a decline** over the entire period of study, suggesting less people were visiting and making calls in these areas.

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Phase 1 | 26 January 2020 - 23 March 2020

Travel ban from Asian countries and Indonesia

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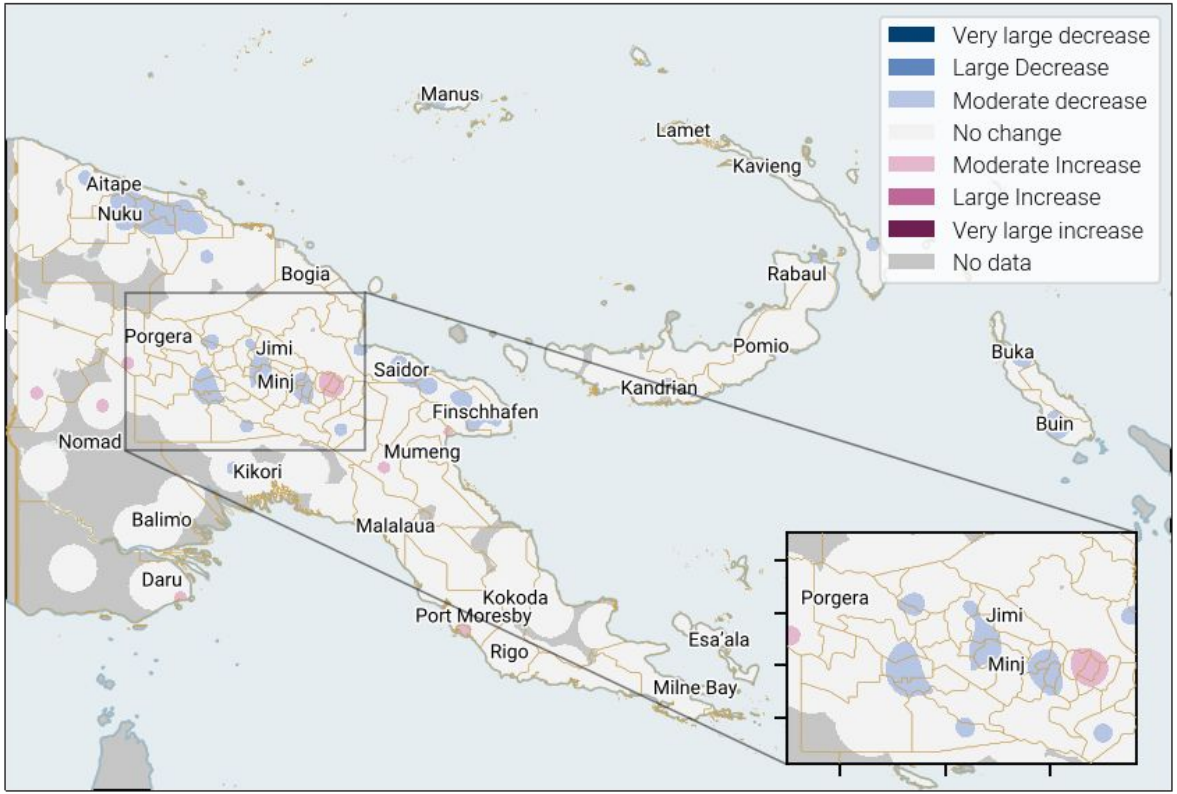
Phase 1 | Monday to Saturday daily presence

Change in daily presence in Phase 1 (26 Jan - 23 Mar) compared to the baseline period (1 Dec - 25 Jan)



This graph shows the regions of Papua New Guinea that show an increase (pink) or decrease (blue) in the daily presence of unique subscribers during the first phase of lockdown measures.

- The **central districts** of PNG **showed the most varied change in daily presence in Phase 1.** More cell tower clusters in these areas allow a higher granularity of changes to be observed.
- We can see **hotspots** around Papua New Guinea that **show an increase in daily presence (10-20%)** in the first period of COVID-19 related measures (26 Jan - 23 Mar). These are typically urban capitals of different provinces of PNG.

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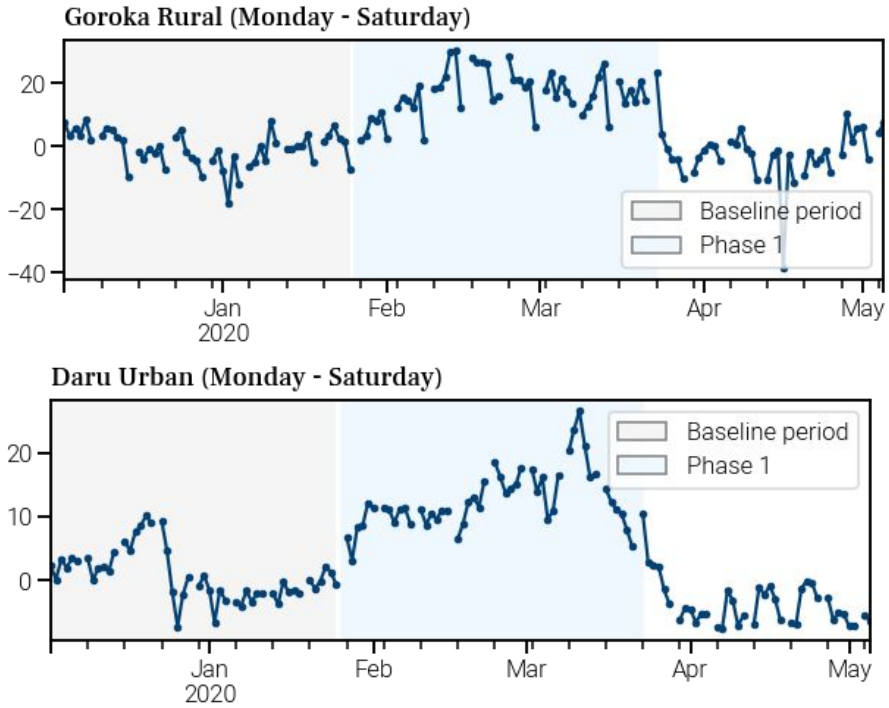
Phase 1 | Monday to Saturday daily presence

Biggest increases in daily presence



These graphs show **the clusters in Papua New Guinea that show the most significant increase** in the daily presence of unique subscribers during the first phase of lockdown measures.

- **Areas that increased** in daily presence following the announcement of the first COVID-19 measures in PNG **include Goroka**, the capital of the Eastern Highlands province and **Daru** the capital of the Western Province.
- **Nearly all urban areas** were observed to **show no change or an increase** in daily presence after a travel ban from Asia and Indonesia was introduced. This means that we see **more** people in some areas **after** the restrictions were introduced.

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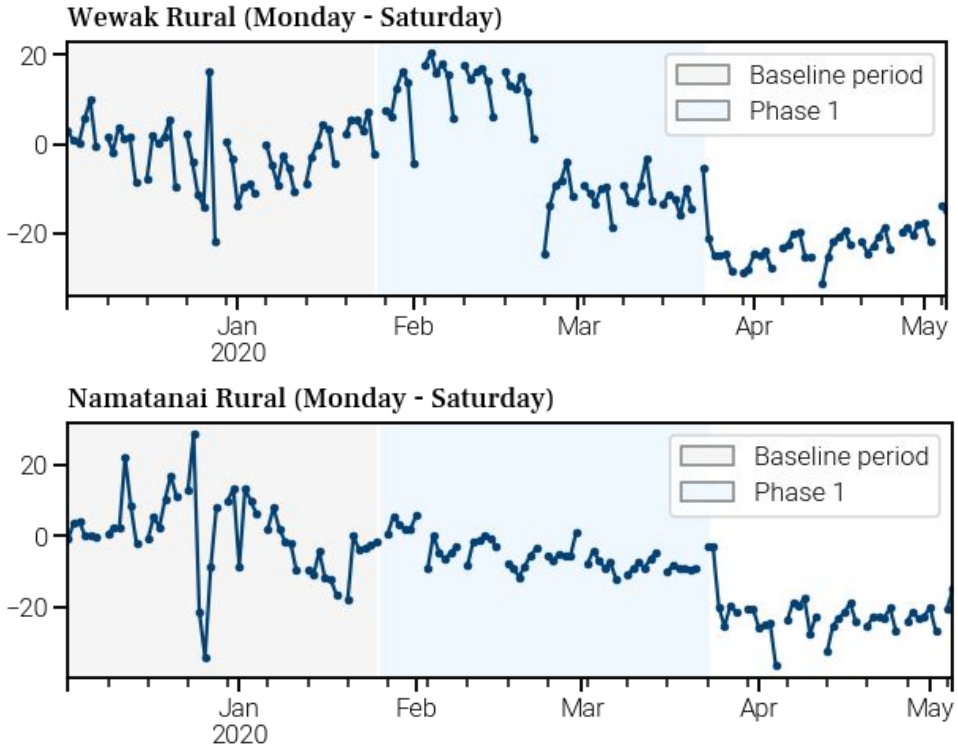
Phase 1 | Monday to Saturday daily presence

Biggest decreases in daily presence



These graphs show the clusters in Papua New Guinea that show **some of the most significant decreases** in the daily presence of unique subscribers during the first phase of lockdown measures.

- **Rural areas** on the north coast **and areas in central PNG were disproportionately lower in daily presence (10-20%)** than those on the south coast.

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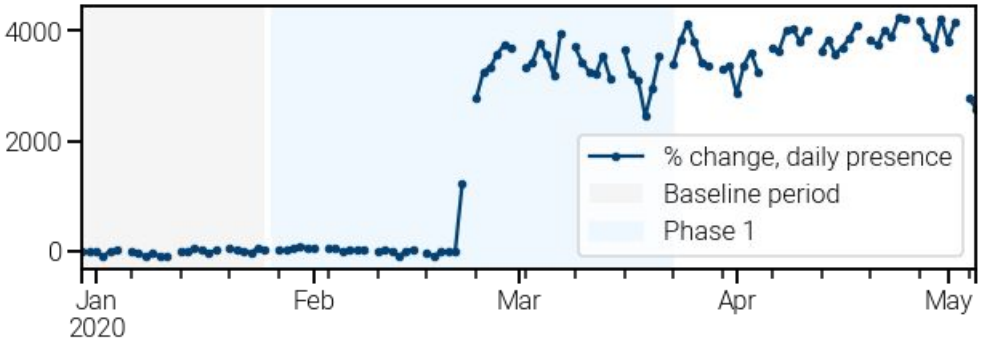
Caveats | Changes in daily presence data are not necessarily related to mobility

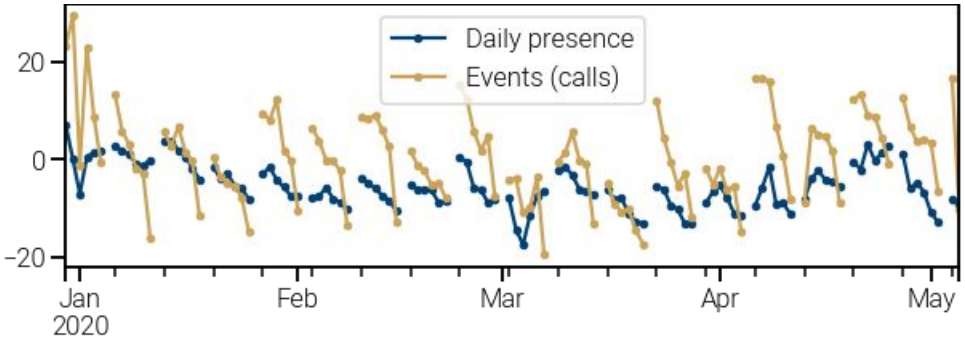
% change from baseline in daily presence, and number of events (Maramatana Rural)



- In the cluster located near Maramatana Rural, we see a **4,000% increase** from the baseline period in January 2020.
- It is likely that, after the middle of February, there was greater coverage in the area.

Caveats | Changes in daily presence data are not necessarily related to mobility

% change from baseline in daily presence, and number of events (Porgera Rural)



- Drops in daily presence can also be related to the number of network events (the number of phone calls / SMS messages / data sessions) in an area.
- Measuring subscribers' mobility relies on them using their phones consistently throughout the week.
- Here, we observe a decline in daily presence over each week, but also a decline in phone usage over the week.
- We cannot conclude (in the case of Porgera Rural) that there were less subscribers in the region as a number of events decreases over the course of week too.
- Over the whole dataset, we observe a weak positive correlation (corr=0.33) between the % change of the number of calls made on average per user, and the % change of daily presence in an area from the baseline period. This suggests that changes in daily presence cannot be explained solely by a reduction of phone usage in an area.


Phase 2 | 24 March 2020 - 21 April 2020
All travel between districts and provinces banned, state of emergency declared
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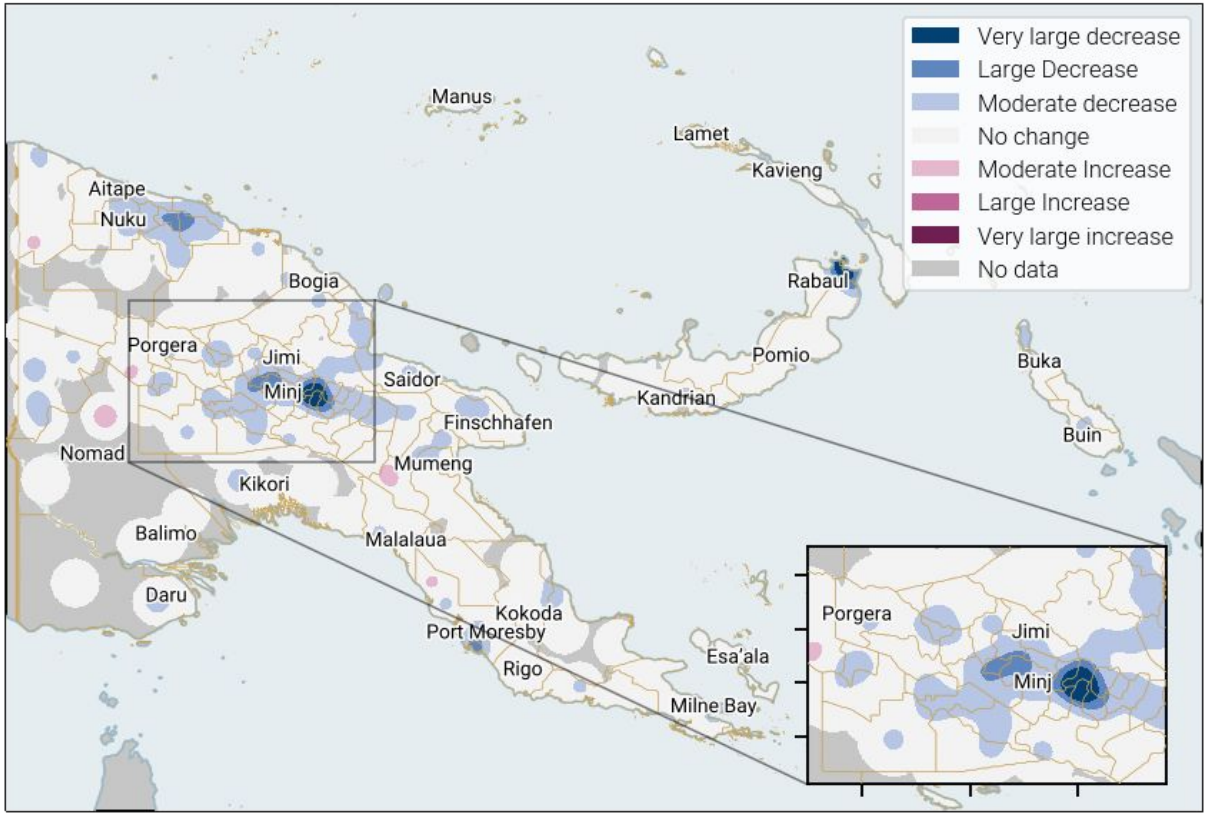
Phase 2 | Monday to Saturday daily presence

Change in daily presence in Phase 2 (24 Mar - 21 Apr) compared to the baseline period (1 Dec - 25 Jan)



This graph shows the regions of Papua New Guinea that show an increase (pink) or decrease (blue) in the daily presence of unique subscribers during the second phase of lockdown measures compared to the baseline period.

- **Central Papua New Guinea,** and the **northern border of Papua New Guinea** show the **largest decline in daily presence (~40%)**, along with the **most Northern tip of East New Britain.**
- Of all areas, the largest increase in daily presence was seen in the province of Nomad (40% increase).

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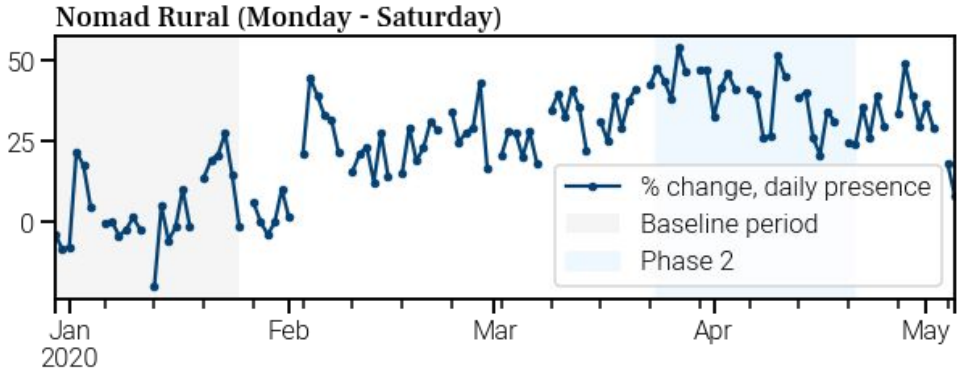
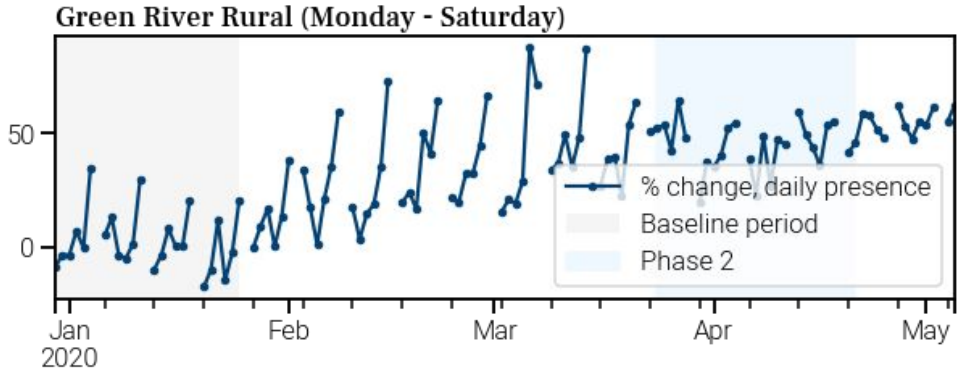
Phase 2 | Monday to Saturday daily presence

Biggest increases in daily presence





These graphs show the clusters in Papua New Guinea that show **the most significant increase** in the daily presence of unique subscribers during the second phase of lockdown measures.

- All **clusters that show an increase** in daily presence **compared to the baseline** in Papua New Guinea **were located on the mainland.**
  - **All locations were rural.**
- This suggests that **subscribers were more active in rural clusters** compared to the baseline level of activity **after the second set of measures were announced.**

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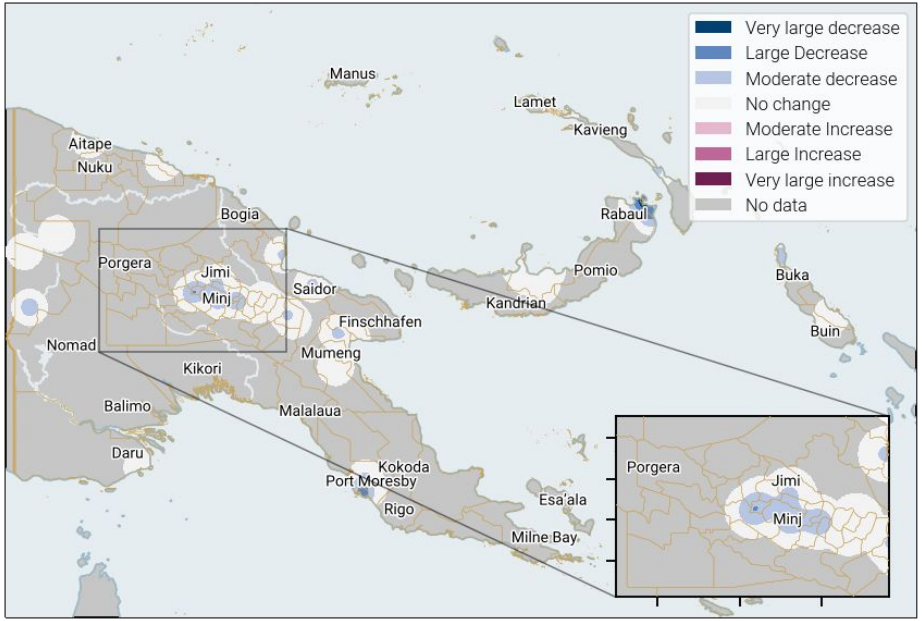
Phase 2 | Monday to Saturday daily presence

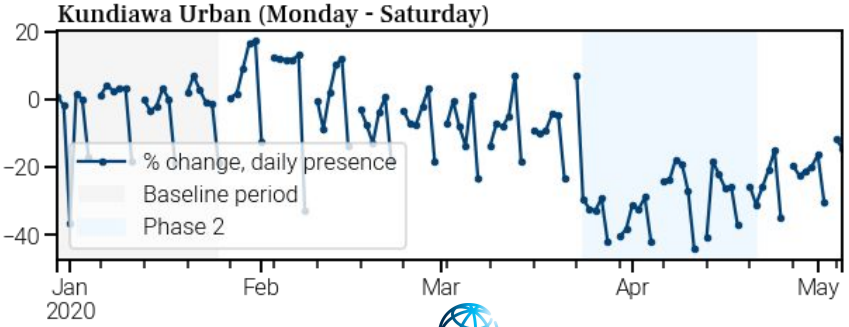
Biggest decreases in daily presence

Change in daily presence in urban clusters in Phase 2 (24 Mar - 21 Apr) compared to the baseline period (1 Dec - 25 Jan)



These graphs show the clusters in Papua New Guinea that show **the most significant decrease** in the daily presence of unique subscribers during the second phase of lockdown measures.

- The **majority of urban regions** show a **moderate decline in daily presence after the second set of measures compared to the baseline** introduced to prevent the spread of COVID-19 in Papua New Guinea. The **largest decreases in daily presence** were between **-30% and -50%** in urban areas.



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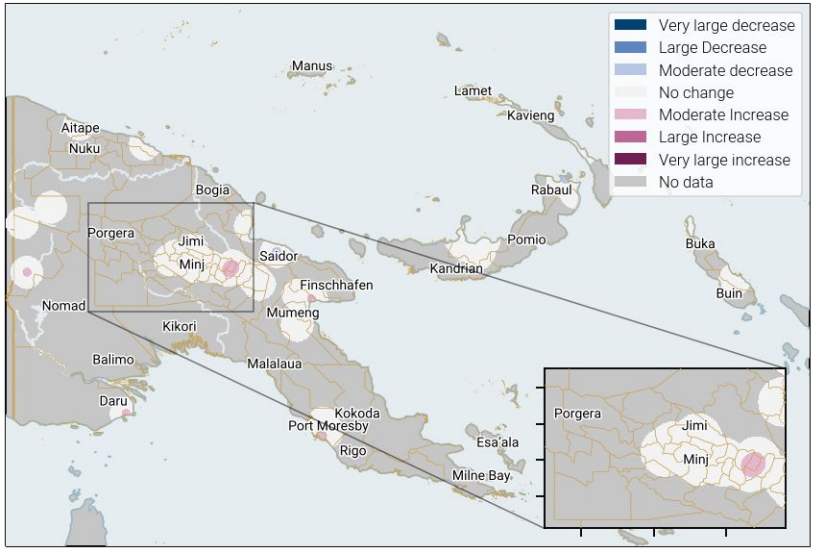
Phase 1 vs Phase 2

Comparison (Urban areas)

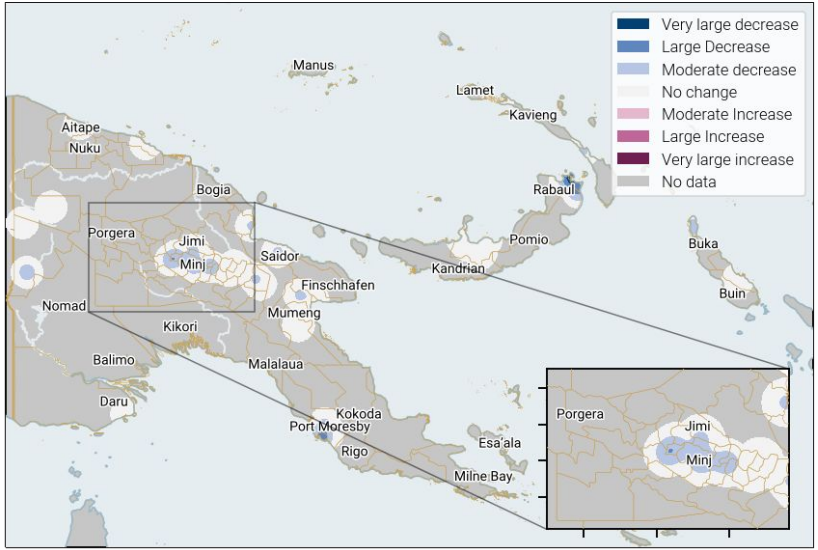
These graphs show the change in daily presence in urban areas in PNG after the first and second COVID-19 measures were announced.

- **In Phase 1, nearly all urban clusters** show the same effect over the different COVID measures: **a moderate increase (5-10%) after the ban in travel from Asia and Indonesia**



Phase 1

- **In Phase 2, nearly all urban clusters** show the same effect over the different COVID measures; **a moderate decrease (5-10%) from the baseline period after travel between districts was banned.**



Phase 2

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Phase 1 vs Phase 2

Comparison (Rural areas)

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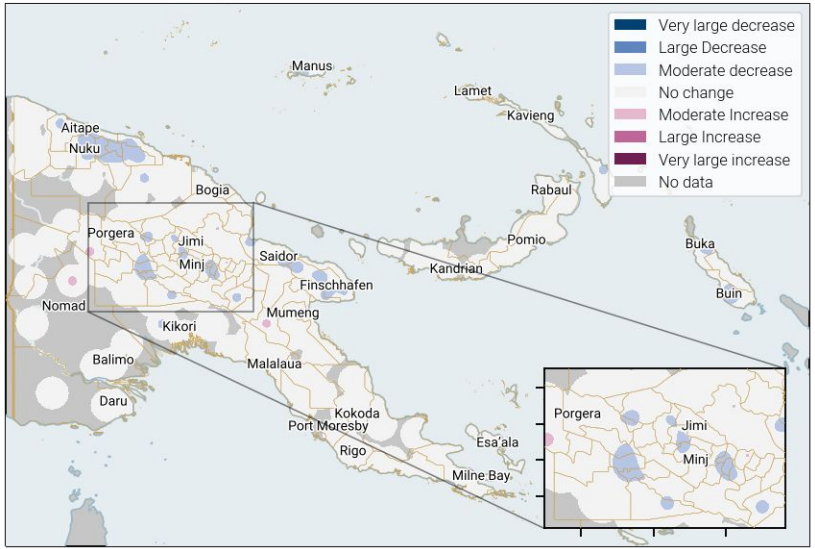
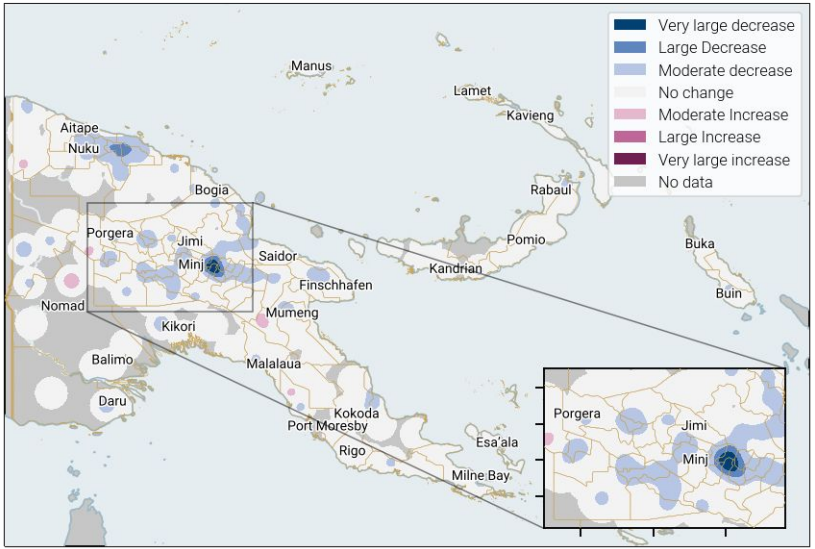
These graphs show the change in daily presence in rural areas in Papua New Guinea after the first COVID-19 measures were announced (ban on travel from Asia and Indonesia).

- **Rural clusters** over time **exhibit behaviour similar** on **both phases of the COVID-19 measures**; if a **region was low in daily presence in the first measures**, they are **lower or the same in the second set of measures** (likewise with increases).
- Almost all decreases are moderate (5-10%) in Phase 1.



Phase 1



Phase 2

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Measuring changes in
Population mixing

Population mixing

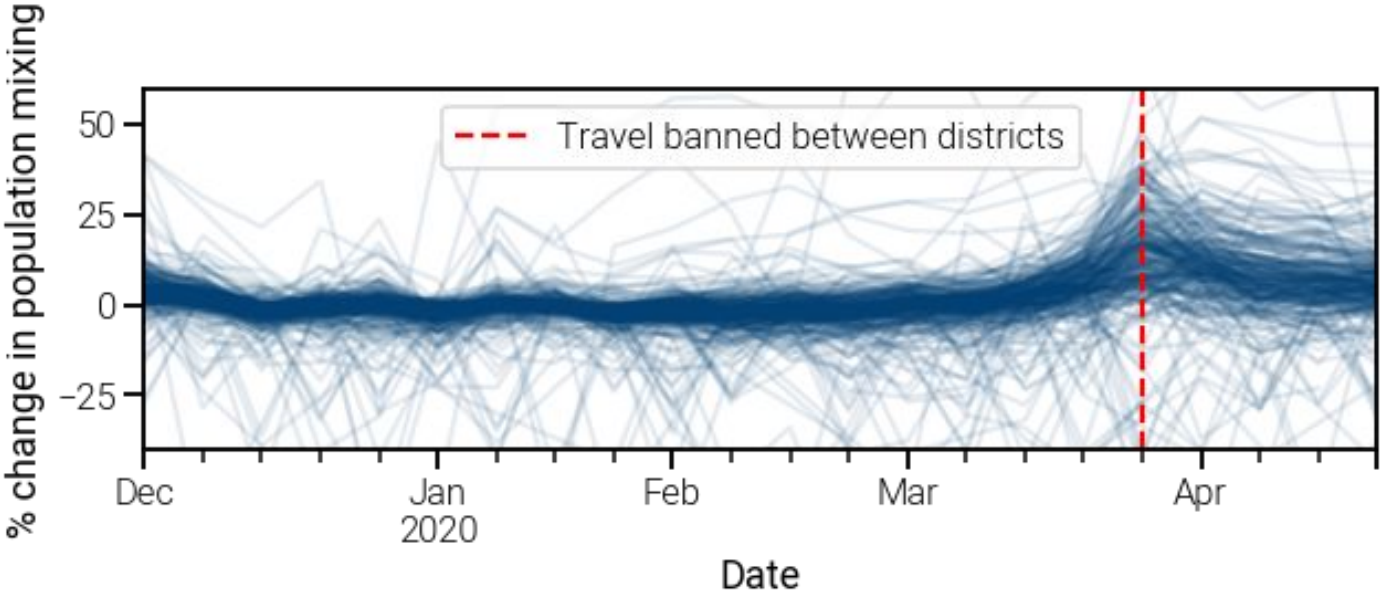
The population mixing indicator tells us how similar subscribers are at a cell cluster over the week.

Calculated as the average unique visitors per day divided by the number of unique visitors over the whole week.

A high value of this indicator implies that the subscribers interacting with a cell tower each day tend to be at the cell tower over the whole week, suggesting a low amount of population mixing.

A low value of this indicator implies that there is a mixture of subscribers interacting with a cell tower over the whole week

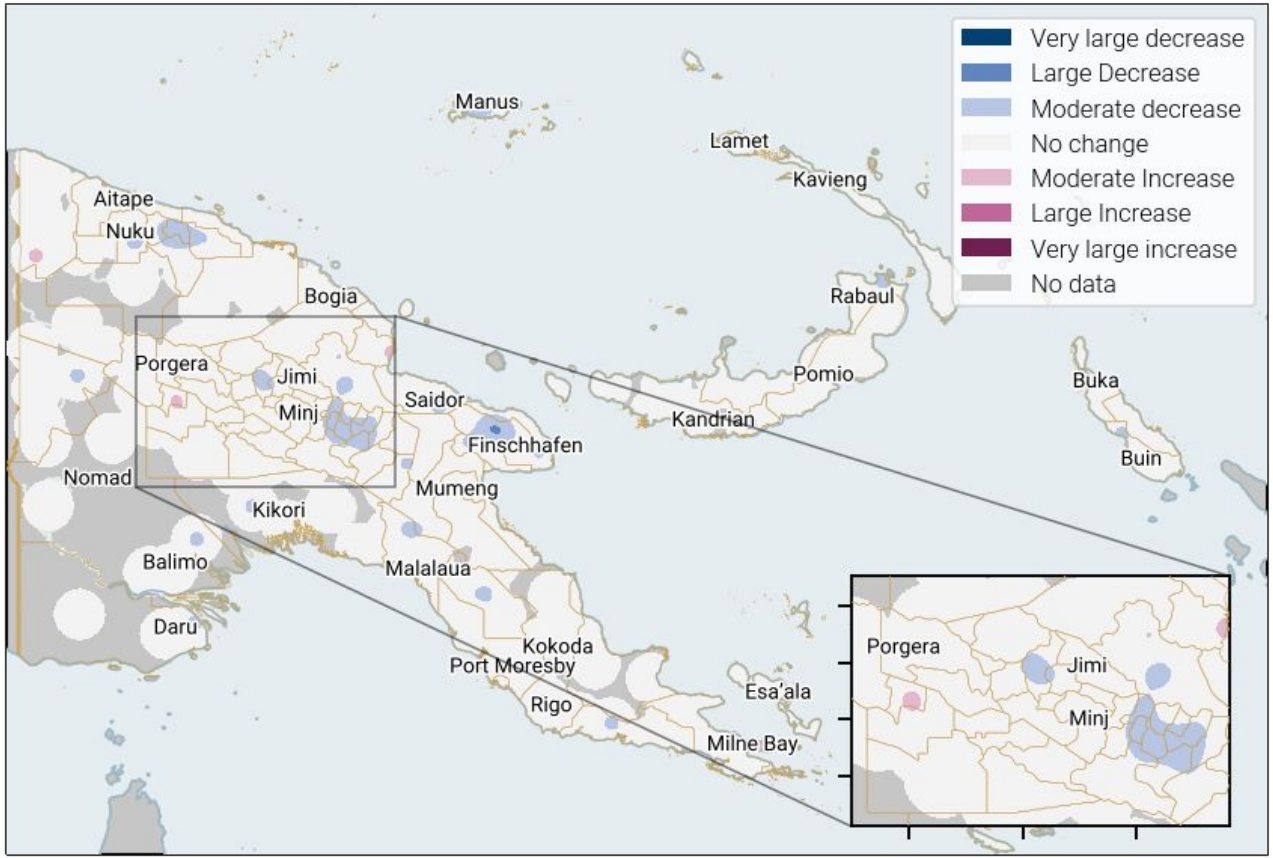
Changes in population mixing



This graph shows the change in population mixing over time in Papua New Guinea over all cell clusters after the different COVID-19 measures were announced.

After the travel ban was introduced, the population mixing indicator increased by 10%, suggesting that there was an increase in the proportion of unique visitors staying at the same location over the week. The initial measures have had limited effects on population mixing.

Change in population mixing in Phase 1 (26 Jan - 23 Mar) compared to the baseline period (1 Dec - 25 Jan)



This graph shows the change in population mixing in PNG after the first COVID-19 measures were announced (ban on travel from Asia and Indonesia).

Blue is a decrease in population mixing factor which suggests **less subscribers are staying in the same places over the week.**

- **Population mixing** during the first set of measures suggests that **urban areas were visited by a larger variety of subscribers compared to the baseline period.**
- We see **no significant change over most of the country.**

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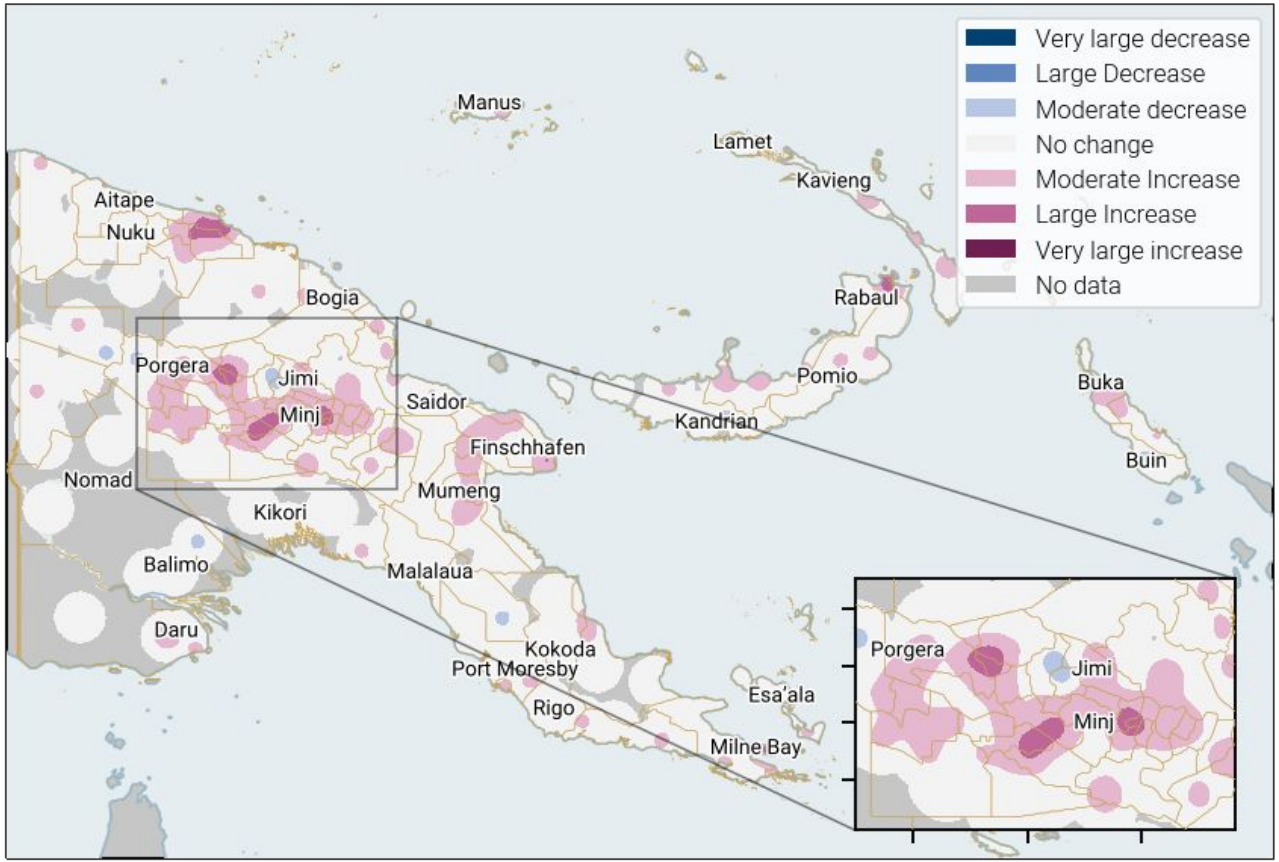
Change in population mixing in Phase 2 (23 Mar - 21 Apr) compared to the baseline period (1 Dec - 25 Jan)



This graph shows the change in population mixing in PNG after the second COVID-19 measures were announced (ban on travel between districts).

Pink is an increase in population mixing factor which **suggests less variety in the subscribers we see in a week.**

- **The second phase** shows that **over the whole country, more subscribers tend to stay in the same location compared to the baseline.**

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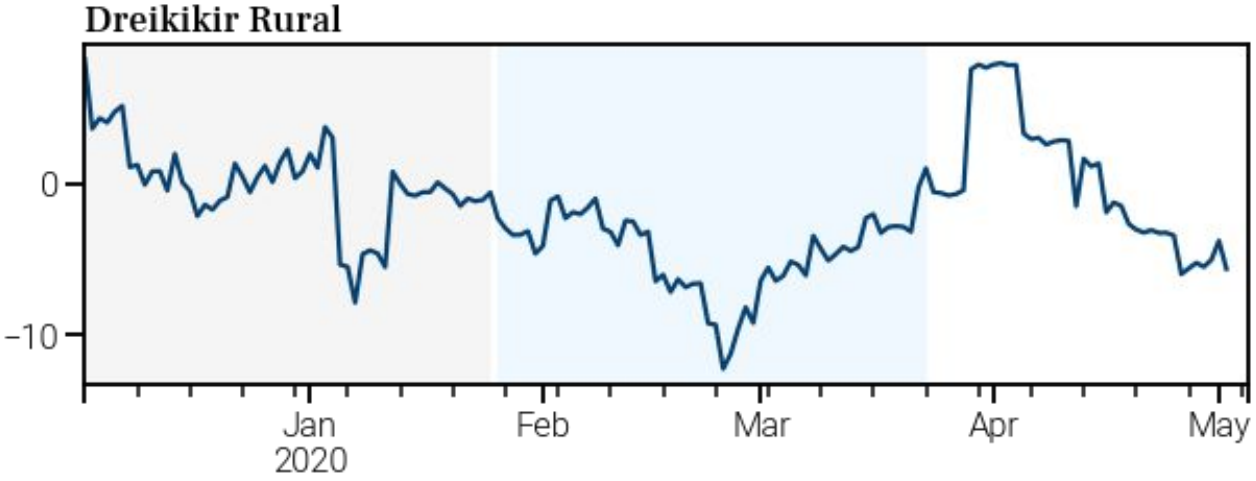
Visits from high population mixing locations



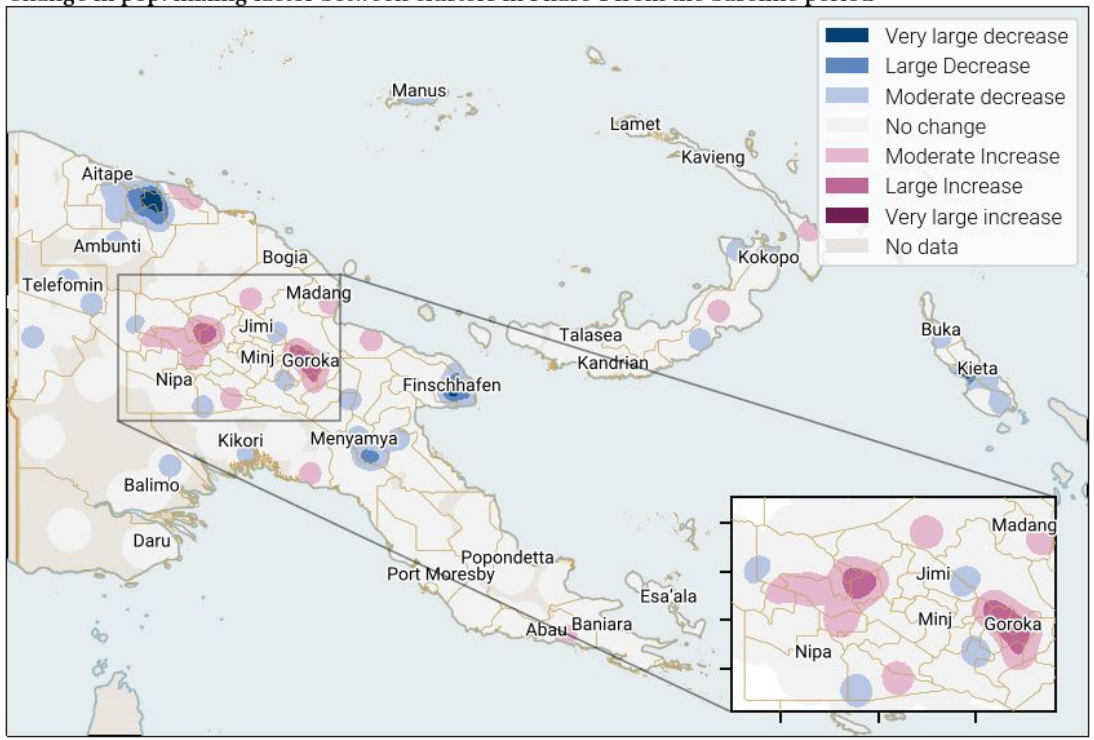
Instead of only measuring the population mixing factor per cell tower cluster, we can measure the visits from areas with a high or low population mixing factor.

- We can see that in the Dreikikir Rural cell cluster, there was a **12% reduction** at the end of February **compared to the baseline** in visits from **areas with high population mixing**. It suggests **more visits** from areas towards the end of February with a **high turnover of subscribers.**
- In April, we see a **7% increase** in visits from high population mixing **suggesting that more visitors came from areas where users stay in the same places over the whole week.**

Phase 1 | Visits from high population mixing locations

This graph shows the **change in the average population mixing factor from areas that visit each location**. Pink areas highlight regions that are visited by areas that have less varied subscribers, Blue areas highlight regions visited by areas that have a mixture of subscribers over each week.

Change in pop. mixing factor between clusters in Phase 1 from the baseline period



- We see **hotspots of increases and decreases** in the population mixing factor over the whole country.
- **Largest decreases** in population mixing factor are in **Finschhafen**, a port town on the west coast, and **near Wewak** on the north coast, the capital of the East Sepik province. **A large decrease suggests a increase in visitors from locations that have many different visitors.**
- **Largest increase in mixing factor is in Goroka,** capital of the Easter Highlands province. It suggests that **the people who visit, come from areas that do not have many visitors.**
- **This indicates areas that are visited by people who come from areas that are also visited (or not) by people. This is useful for determining areas visited by people who may have had a higher risk of becoming ill with COVID-19.**

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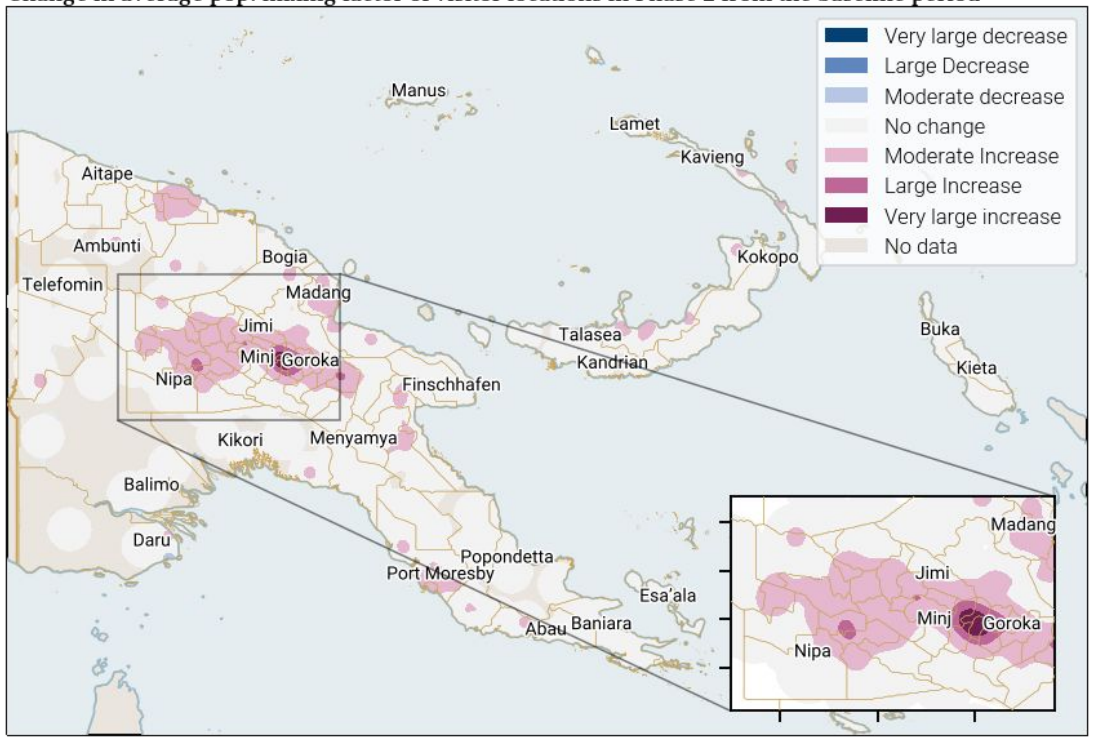
Phase 2 | Visits from high population mixing locations

This graph shows the change in the **average population mixing factor from areas that visit each location**. Pink areas highlight regions that are visited by areas that have less varied subscribers, Blue areas highlight regions visited by areas that have a mixture of subscribers over each week.

Change in average pop. mixing factor of visitor locations in Phase 2 from the baseline period



- As the **lockdowns prohibit travel,** we rightly see that all regions have had either **no measurable change or a moderate to very large increase in population mixing factor.**
- It suggests that across the country, that the people who travel come from areas that are visited much less on average compared to the baseline period, therefore these people have less risk of transmitting COVID-19 as they will have been in contact with less of a variety of people.

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Measuring changes in
origin-destination entropy
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Origin-destination entropy

Entropy measures how ‘surprising’ an outcome is.

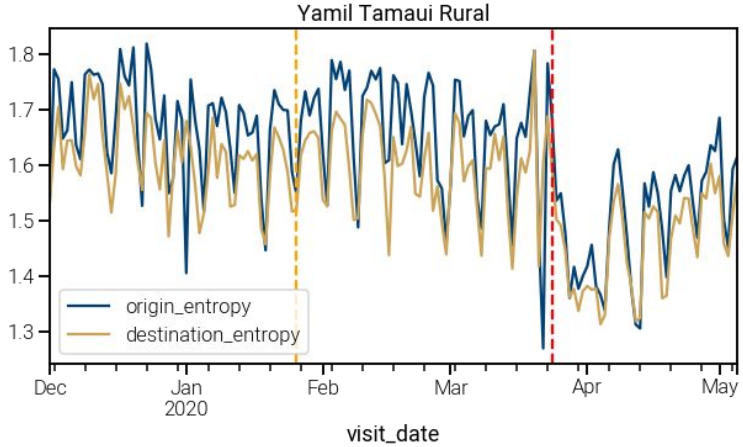
In the context of travelling between clusters, we can measure whether visitors to a cluster come from a selected few locations (low entropy) or a larger variety of locations (high entropy).

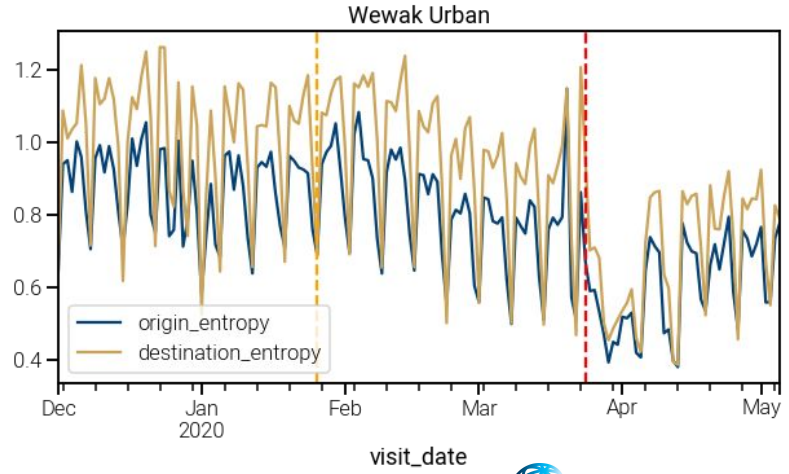
This allows us to measure if travel links between clusters have reduced after restrictions - lower entropy implies less subscribers visiting from different locations (origin entropy) or subscribers are visiting less locations (destination entropy).

Origin-destination entropy | Interpretation

- We see in these two examples that after the first set of measures, entropy steadily declined suggesting that these areas were being visited from less number of places, and the subscribers in these cell cluster were visiting less places.
- After the second measures were introduced, we see an even bigger reduction in the number of places subscribers travelled to and from.

The graphs below show the origin-destination entropy of two locations in northern Papua New Guinea (see left). The dashed golden line is the start of the first set of restrictions on travel. The dashed red line is the start of the second set of restrictions on travel.





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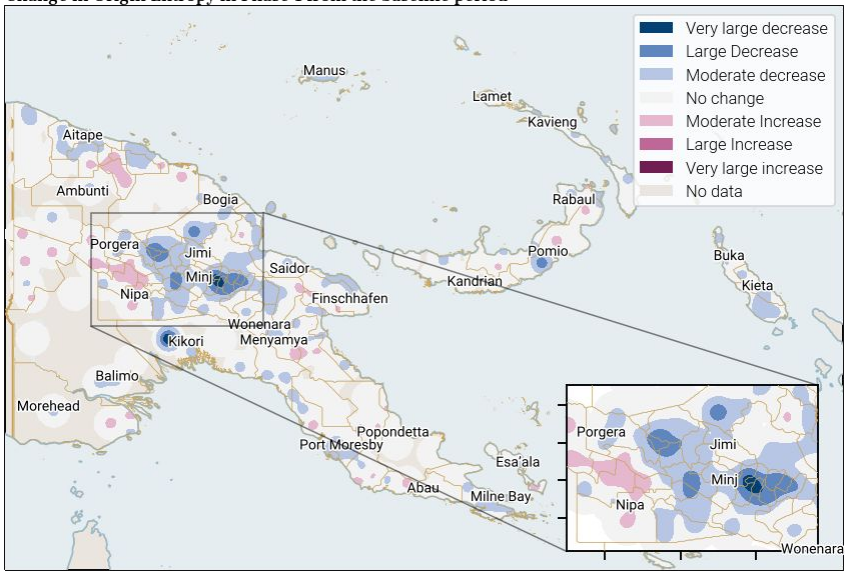
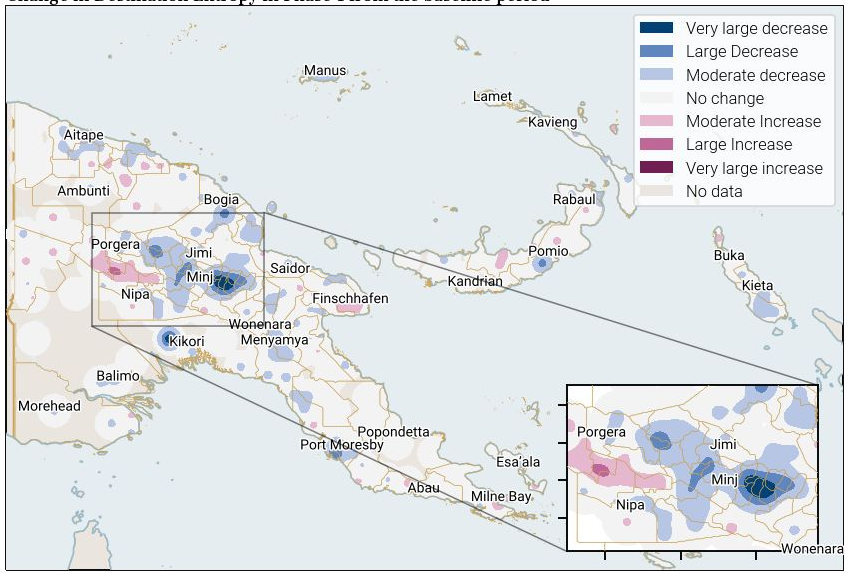
Origin-destination entropy | Phase 1 Maps

Change in Origin Entropy in Phase 1 from the baseline period



Change in Destination Entropy in Phase 1 from the baseline period



We can see areas of increases and decreases in entropy over the whole country in Phase 1.

Origin

Blue areas are regions visited by less distinct regions compared to the baseline period, purple areas are visited by more distinct places compared to the baseline period.

Destination

Blue areas are regions to which subscribers visited less places, purple areas are areas with subscribers visiting more places.

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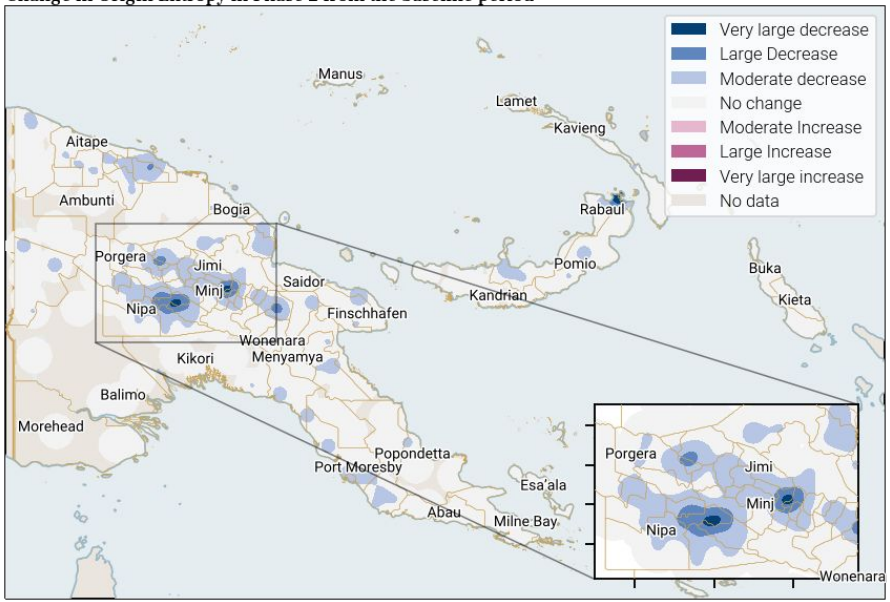
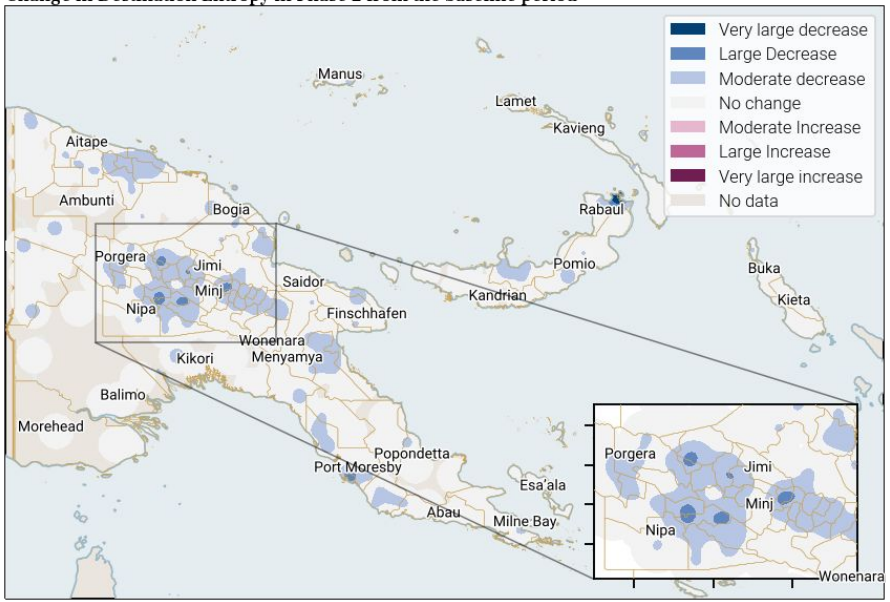
Origin-destination entropy | Phase 2 Maps

Change in Origin Entropy in Phase 2 from the baseline period



Change in Destination Entropy in Phase 2 from the baseline period



In Phase 2, we can see the whole country visits less places, and subscribers coming from less places (i.e. an decrease in entropy). This is caused by the introduction of the second set of COVID-19 measures banning travel between districts.

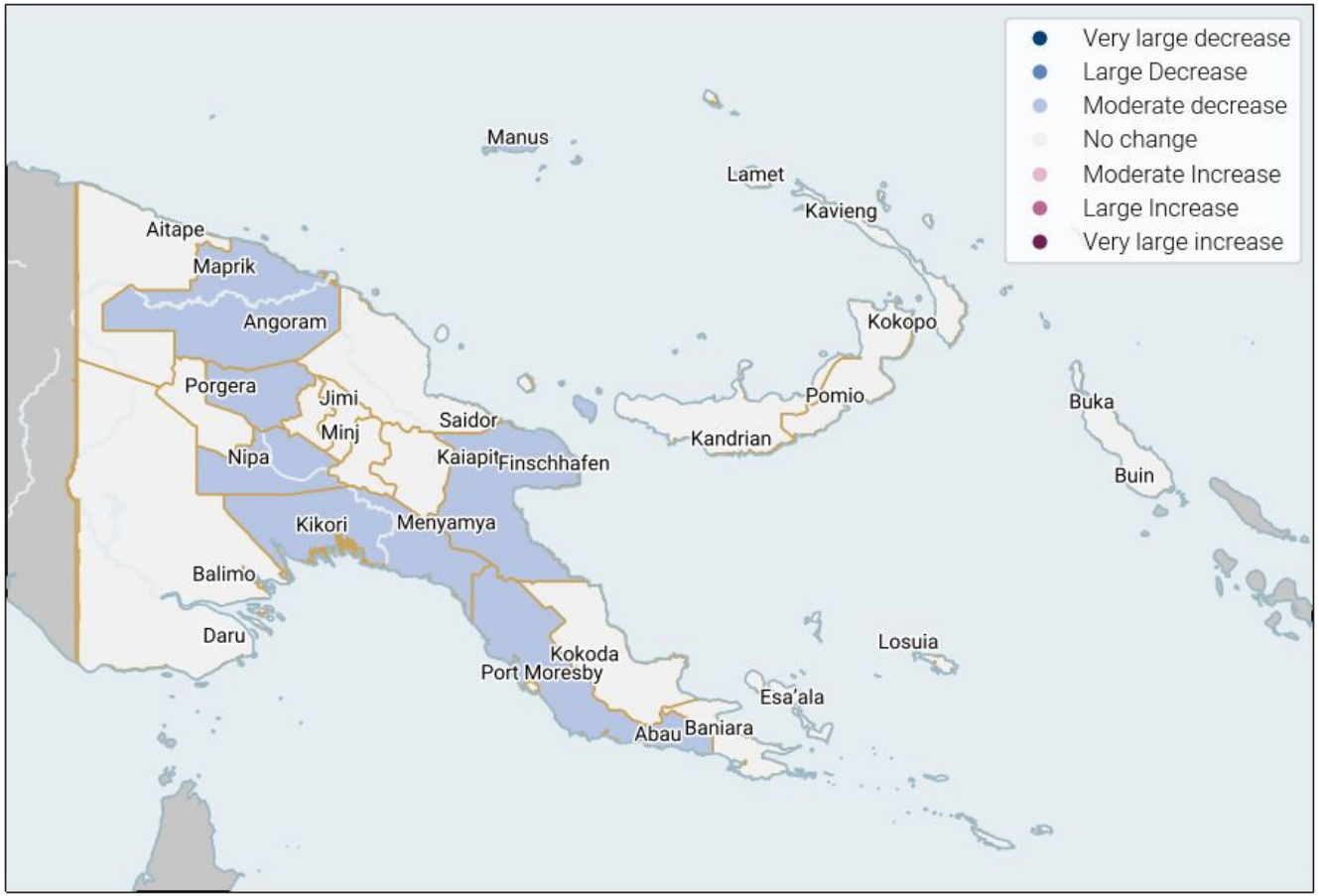
Average clusters per subscriber

We can also show travel within a given province.

This indicator measures the average number of distinct clusters visited within a province per subscriber.

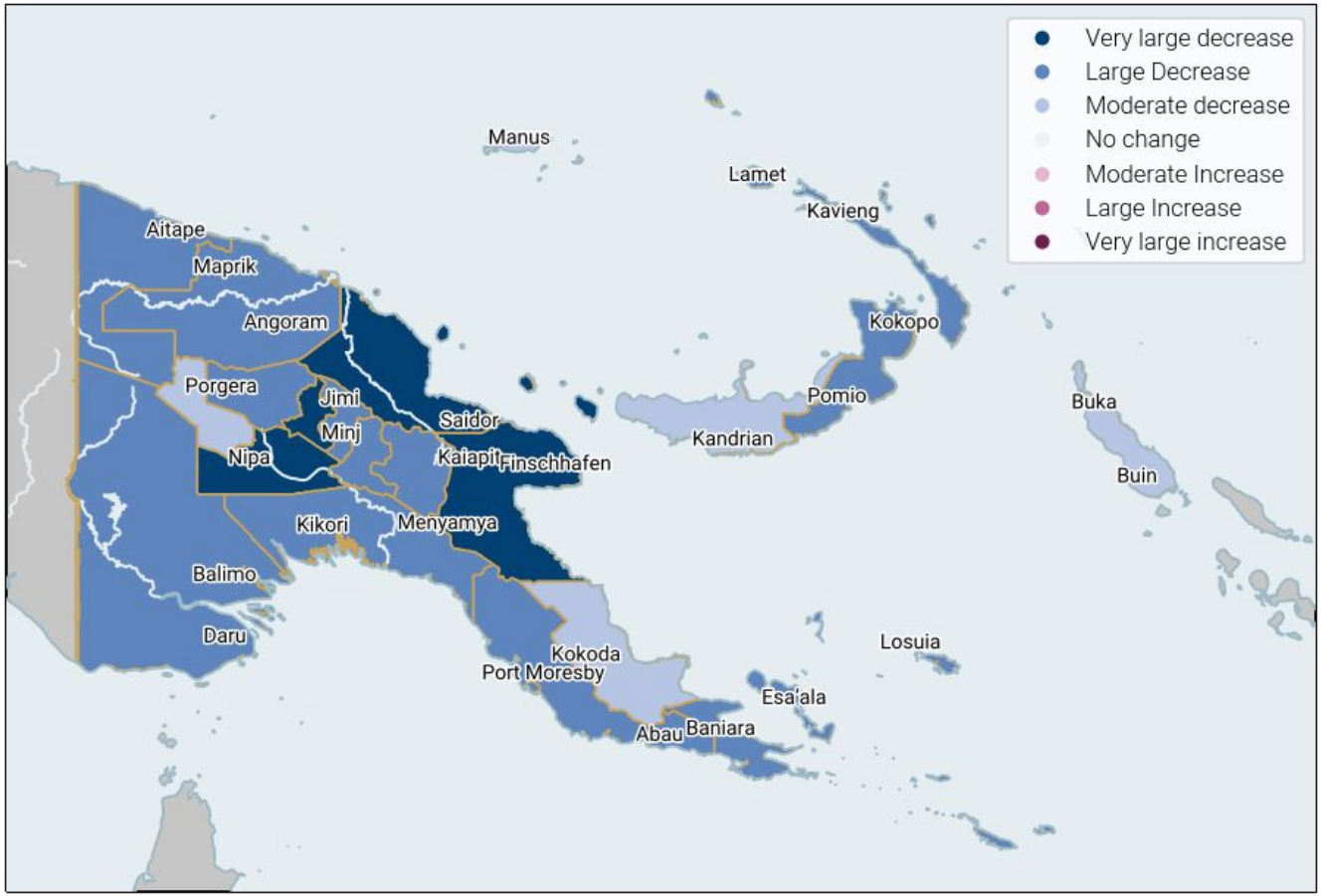
A higher value indicates that subscribers within the province are more mobile, whereas a lower value indicates that subscribers move around less within the province.

Changes in intra-region mobility in the first phase of COVID related measures (Jan 26 - March 23) compared to the baseline period (Dec 1 - Jan 25)



- The **majority of the country** shows **no sign of changes** between **how varied subscribers visits are within provinces** after the first set of measures were announced.

Changes in intra-region mobility in the second phase of COVID related measures (Mar 24 - April 21) compared to the baseline period (Dec 1 - Jan 25)



- The majority of the country shows **a large to very large decrease** in **how varied subscribers visits are within provinces** after the second set of measures were announced, suggesting that the **whole country is following measures to reduce travel** within provinces and districts.

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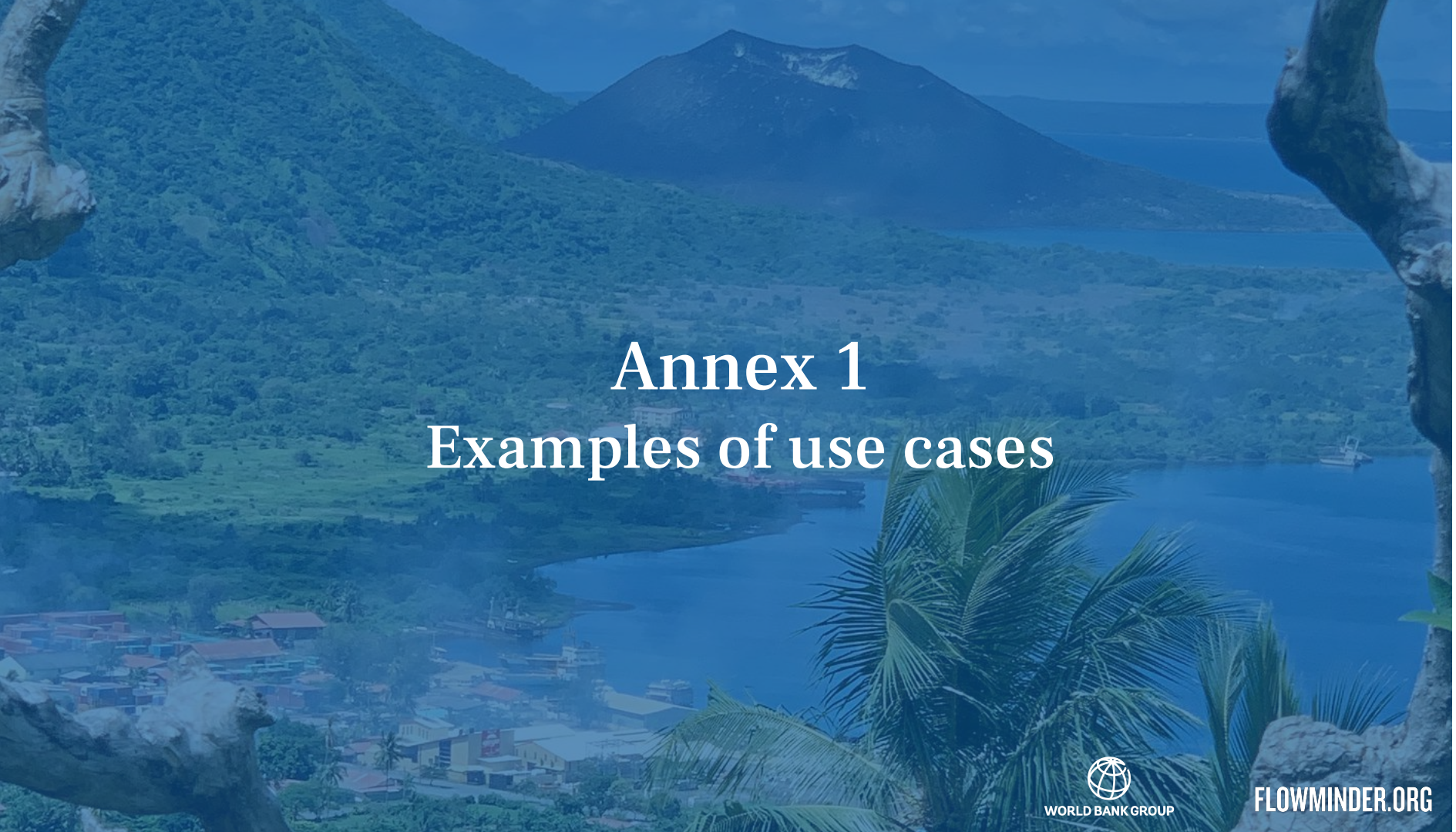
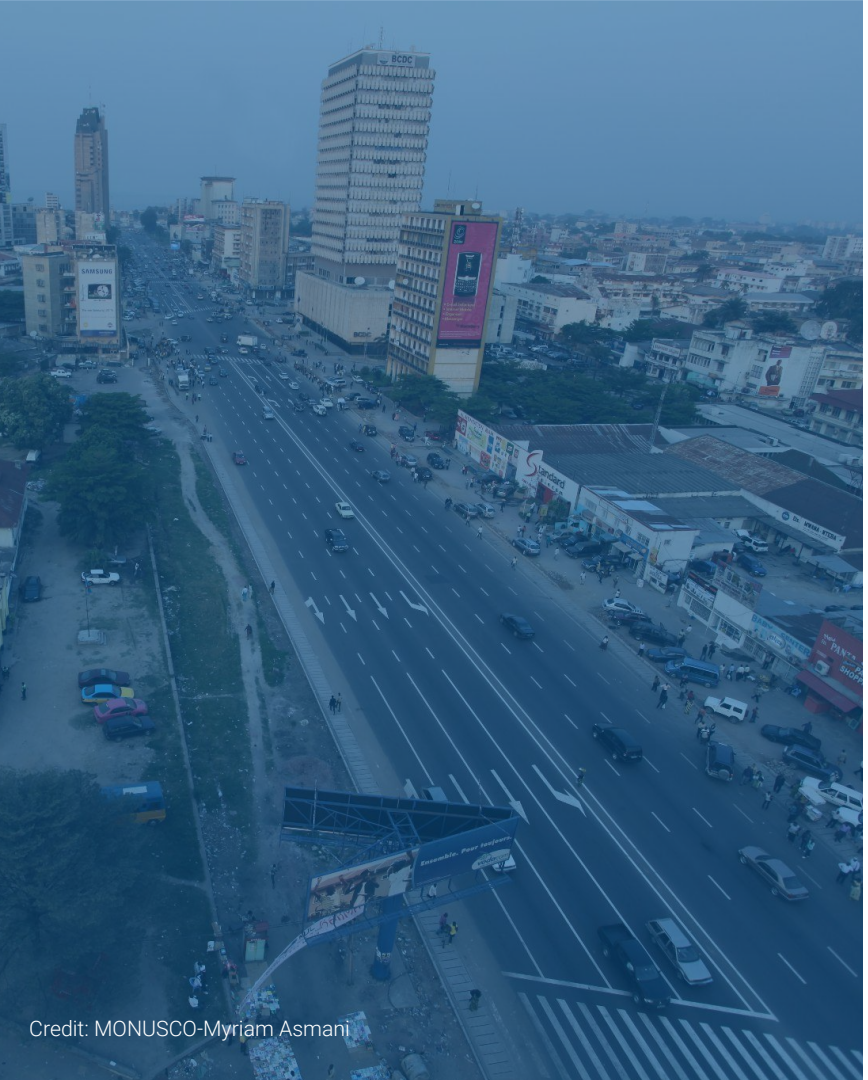


Annex 1
Examples of use cases



Credit: MONUSCO-Myriam Asmani

Example: Service placement optimisation in DRC

- In October 2018, the Government of the Democratic Republic of the Congo (DRC) launched a plan to tackle low routine immunisation coverage across the country
- Flowminder, as part of the GRID3 Mapping for Health programme, is leading on the delivery of mobile operator data analytics, analysis of gender obstacles to vaccination, and the implementation of a household survey to serve as input data for the modelling of high resolution gridded population estimates, to strengthen routine immunisation in the country
- Flowminder, has developed algorithms to allow for the optimisation of the placement of advanced vaccination sessions

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Example of using CDR: COVID-19 response

Flowminder worked with MNOs and governments to enable mobile network operators and others to **produce relevant data** and analyses rapidly for **improved decision making** to support the **global response** against COVID-19.

Utilising mobility data in the COVID-19 context

Primary effects of COVID-19 measures

Side effects of COVID-19 measures

Changes in population density for resource allocation and incidence measures

Input to other models, e.g. transmission models

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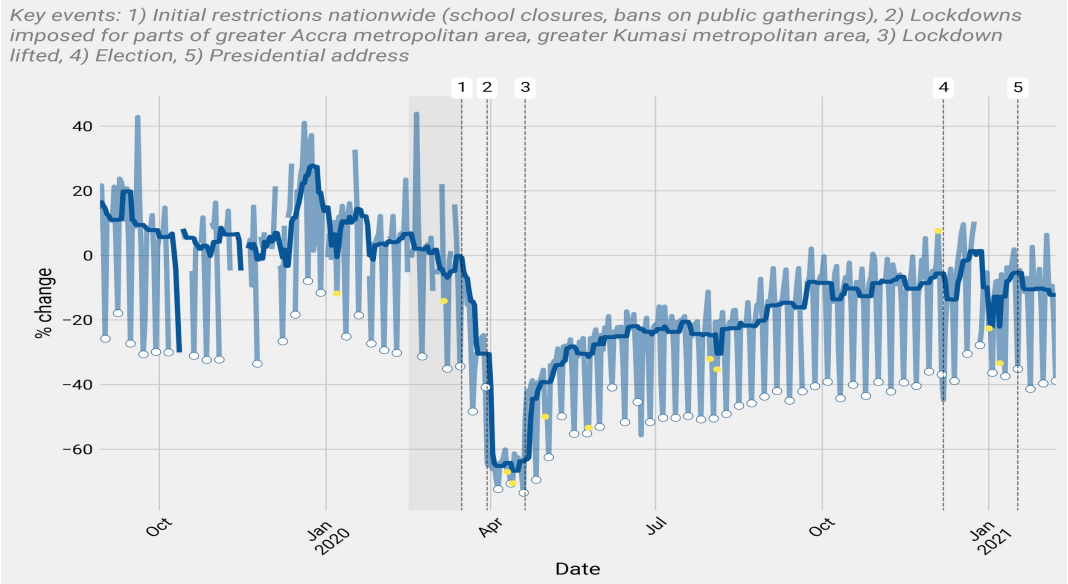
Example: Supporting the Government of Ghana during Covid-19



Percentage change in the number of trips between any two districts in Greater Accra, each day.

- Increased significantly, relative to the lockdown period, immediately after lockdown measures were lifted
- Continued to increase over the remainder of the year, but remained below levels from the comparable period September 2019 - February 2020.

"This [collaboration] is certainly a proof that telecommunications such as ours can leverage the strengths of their core business to do good in a more consistent and sustainable way. We pledge our commitment to ensure that data is mined for the good of every Ghanaian."

Patricia Obo-Nai, **Chief Executive Officer (CEO) of Vodafone Ghana**

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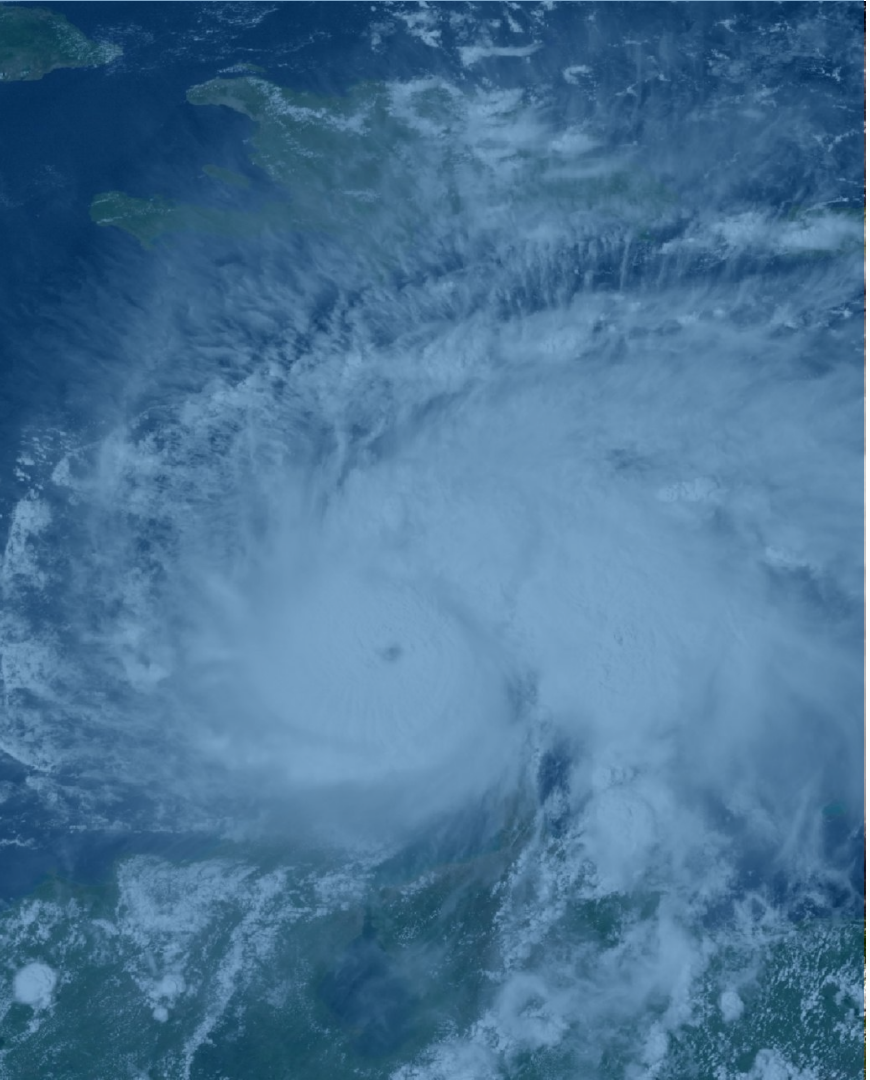

Example: Disaster response

- The 14th of August 2021 an earthquake and the passage of the Tropical Depression Grace in Haiti led to population displacement and caused severe destruction
- Flowinder supported the humanitarian response providing information on population movement, comparing their usual location during the week preceding the earthquake with their locations
- CDR can be used in the context of rapid onset disaster for:
  - Better operational planning and allocation of resources before, during and after cyclones or other rapid onset disasters
  - Improved support for host communities during recovery, management of resources for displaced populations
  - Supporting populations where displaced people are returning
  - Data-informed reconstruction planning

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Other Flowminder's work on CDR

- Gang Violence in Plaine-du-Cul-de-Sac, Haiti, 24 April 2022,
- 2021 Haiti earthquake | Report 1: Population movements estimated with mobile operator data from Digicel Haiti: report from 20 August
- 2021 Haiti earthquake | Report 2: Population movements estimated with mobile operator data from Digicel Haiti: report from 27 August
- Eruption of Mount Nyiragongo: Estimating population displacement using mobile operator data
- Analysis of call detail records to inform the COVID-19 response in Ghana—opportunities and challenges
- COVID-19: Supporting the Government of Sierra Leone with mobility data
- COVID-19: Supporting the Government of Namibia with mobility data
- COVID-19 | Democratic Republic of the Congo (DRC): Report, May 2020. Initial insights into the effect of mobility restrictions using anonymised and aggregated mobile phone data
- Estimating the resilience to natural disasters by using call detail records to analyse the mobility of internally displaced persons

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