

# GRID3 project aims to put everyone on the map

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GRID3 cartographers met for a training session in Kinsasha, Democratic Republic of Congo, in May 2019. Credit: Anne-Laure White

In the U.S., our Constitution mandates that a census takes place every 10 years. Other countries tend to have similar standards. Yet some parts of

the world have not conducted a national census in decades. Somalia hasn't had one since 1985; Afghanistan's first and only census took place in 1979 and didn't cover the entire country; Lebanon's last census was in 1932. The reasons for this may be political instability, war, and religious concerns, but lack of census information can have significant impacts on access to education and health services, political participation, and disaster response and risk reduction.

The GRID3 (Geo-Referenced Infrastructure and Demographic Data for Development) project, launched in March 2018, is an effort to remedy this situation in low- and middle-income countries. Managed by Columbia University's Center for International Earth Science Information Network (CIESIN), the project is a partnership with the United Nations Population Fund (UNFPA), WorldPop at the University of Southampton, and the Flowminder Foundation. The partnership is already working alongside local governments and stakeholders in Democratic Republic of the Congo (DRC), Mozambique, Nigeria, South Sudan, and Zambia.

Marc Levy, deputy director of CIESIN and director of CIESIN's GRID3 team, thinks the project has the potential to be transformational. "The world has committed to extending the benefits of development to everybody through the United Nations' 2030 Agenda and its 17 [Sustainable Development Goals](#)," he notes. "But that will be impossible without comprehensive maps. Because if you don't know where people are, you can't include them in development plans. Often the people that are unmapped are the most vulnerable because they live in a neglected or contested area."

## **How GRID3 Works**

While a traditional national census involves the counting of every single household's residents, the GRID3 population model is generated through

conducting a microcensus—a small household survey in which enumerators count only several hundred thousand homes. This aspect of the project is led largely by the UNFPA, the United Nations' mandated agency for census-related support globally.

The team then combines those microcensus results with spatial information that spans the whole country, including satellite imagery and geographic information such as settlement types and road networks.

"Based on the correlation between the spatial information we have for the entire country and the household survey information we get from the microcensus, we can generate rapid, accurate, high resolution population estimates that cover the entire country," explained Attila Lazar, principal research fellow at WorldPop, which developed the GRID3 population model.

A traditional population and housing census generates the highest quality population information; in countries where these types of censuses can be carried out, GRID3 provides support. The project also creates a detailed map of all villages, towns and cities in the country, accurate boundaries of administrative units, and maps of relevant infrastructure and other services depending on the application.

"GRID3 has the power and scope to put large numbers of people on the map for the very first time, to ensure that they can then be effectively reached through sustainable development policies that will improve their situations significantly, " adds Lorant Czaran, the UNFPA's lead technical adviser for GRID3.

## **The Fight Against Polio and the Launch of GRID3**

In the past, polio vaccination campaigns in Nigeria relied on often inaccurate or incomplete hand-drawn maps, and as a result, entire settlements were often missed. In 2011 and 2012, Nigeria was hit with

an outbreak of polio. The new cases were traced to unvaccinated areas that had been missing from planning maps. In December 2011, the country's National Primary Health Care Development Agency and its international partners got support from the U.S. Centers for Disease Control and the Bill & Melinda Gates Foundation to map the 11 northern states where most of the polio cases were occurring, using GIS technology with high-resolution satellite imagery. Inuwa Barau, now the national coordinator for GRID3 Nigeria, was involved in the effort to identify and map settlements and health facilities, and estimate the population, which enabled vaccination teams to reach children who otherwise might not have gotten immunized. Since 2016, no new cases of polio have been reported. Based on this success, GRID3 was launched to scale up the strategy in Nigeria and elsewhere.

GRID3 data is already being put to use by the health sector in Nigeria. The government is planning to do a national census, but it has been repeatedly delayed. The public health community cannot wait for the census to run more immunization campaigns, so it is relying on the GRID3 population model that provides population estimates for the whole country. The project's population estimates for the northern part of Nigeria were ready for use during the 2017-2018 measles campaign. This information was included in a map of the area where the vaccination team would go and the number of people who needed to be vaccinated.

"For the 2017-2018 campaign, we have data showing that there were many more people vaccinated in the north than in the south," said Emilie Schnarr, a project coordinator at CIESIN who oversees the work in Nigeria. "There was only one missed settlement in a hard to reach area in the northeast, compared to the south where there were many more missed settlements." In other words, the GRID3 data allowed for more thorough coverage in the north.



Teams for the 2019-2020 campaign are now in the field throughout Nigeria, validating the maps and the population count before supplies are ordered.

## Implications for Education, Food Security, and More



Group photo of the GRID3 team members who met in Kinsasha, Democratic Republic of Congo, in May 2019. Credit: Anne-Laure White

GRID3 data is being put to other uses besides health. The Nigerian education policy states that students should live within two kilometers of a school, but before the GRID3 datasets, there was no way to measure

this. The Ministry of Education in Nigeria has information on how many students are enrolled in each school, but some of the numbers are unreliable. By utilizing GRID3's population data, schools with inaccurate numbers have been identified and student numbers have been verified; this matters because schools with more students receive more funding. Schnarr said the population data is also being used to determine where it would be most effective, within the given budget, to build new schools or increase access to preschools.

GRID3 is also helping the Central Bank in Nigeria measure access to financial services. "They have data on how many people have access to bank accounts across the whole country, but they don't have accurate up-to-date data on the total adult population in those regions," said Levy. "So they're using the GRID3 data to figure out the proportion of adults that have registered bank accounts, and that becomes a performance indicator that helps them identify areas that are successful and areas that are lagging, so they can increase efforts in areas that are lagging." Schnarr noted for example, that women in the north have far fewer bank accounts than men compared to women in the south, so that may eventually lead to more banks being built there.

According to Barau, the data could potentially be used to increase food security as well. The Central Bank of Nigeria provides loans to farmers for cash crops. GRID3 could locate farms and aid in soil analysis to help the bank identify better places to provide loans for specific crops. The team would take soil samples in a small area, then use a vegetation index (satellite technology that measures wavelengths to indicate soil or vegetation) to extrapolate the soil characteristics by region. Based on this information, it would be possible to determine that a particular area is better suited for rice compared to sorghum, for example. "The overall objective for food security is about output yield per hectare," said Barau.

At this point, all the Nigerian GRID3 data have been turned over to

Nigeria's National Space Research and Development Agency, and the team is assisting the agency in creating a data portal that it will own and run. "It's relatively easy to just provide a data solution to something," said Levy, "but to really find ways to viably integrate it with all the ongoing processes within the country so that it takes root after we leave is a lot harder. And that's what Barau is putting a lot of his effort into."

Barau said that the most important factor for success is to provide robust geospatial data that is "alive" and in tune with reality, since data is continuous and always changing. "We have to have a clear pathway of how new data from the lower level where the action happens is synchronized with the larger database," he said. This will involve training stakeholders on the ground to input and update data and connect it with the central database. Keeping the database alive will then help stakeholders understand its potential uses and its value.

## **Working in the DRC**

GRID3 has also worked with the Democratic Republic of the Congo (DRC), one of the most populous countries and the second largest in Africa. DRC's upcoming national census will be the first since 1984, but officials may have difficulty reaching every part of the country. GRID3 is exploring options for adding population estimates to the traditional census results to address census undercoverage in areas of high insecurity.

In 2018, GRID3 began modeling population in five provinces, which represent 20 percent of DRC's territory. That work was in support of the health sector. The data will likely be released in late 2019 or 2020 but the government census will probably not occur until 2021.

Kevin Tschirhart, project coordinator at CIESIN who oversees work in the DRC, said that there is a huge need for population and boundary data

in DRC. "There were recent outbreaks of polio, measles and Ebola that had a pretty high toll in terms of human life," he said. "If we had better, more harmonized, less fragmented population and settlement data, these kinds of outbreaks could be much more controlled than they currently are. And we could really improve the response and limit casualties."

To demonstrate the value of GRID3, the DRC team is conducting a pilot immunization project in the Kwilu Province using the modeled population data. "Our team on the ground is still walking into villages that haven't seen any vaccination teams in the past years because they're very remote villages that were only identified in satellite imagery," said Tschirhart. "And they're too far away from any health centers to get vaccines on a regular basis." He hopes that the data GRID3 is collecting will demonstrate its value for the routine immunization campaign in 2020.

Tschart said that conversations have also begun with a DRC team that builds flood models. GRID3's high-resolution population data could potentially help policy makers determine what places are at risk of flooding in the Kinshasa area, which has experienced significant flooding in the past.

In addition to developing high-resolution data, the GRID3 team trains each government and other users on how to apply the data and ensures that they have the technology to employ it effectively. The project aims for a relatively brief intervention in each country, with the ultimate goal to make GRID3 data available to local decision-makers, and let the government take it over and maintain it.

"Our goal is to not only provide data to countries but to help support a culture of evidence-based decision-making," said Cathy Riley, implementation director at Flowminder. "To achieve this, training and capacity strengthening are indispensable. There is an abundance of



knowledge and will in GRID3 countries, current and future. It is our responsibility to tap into that potential and hand over the keys so that local experts can own the data and methodologies, and continue the work beyond the active GRID3 involvement."

GRID3 is scheduled to receive three more years of funding from the Bill & Melinda Gates Foundation and the United Kingdom's Department for International Development. While the funded phase of the initial countries—Democratic Republic of the Congo, Mozambique, Nigeria, South Sudan, and Zambia—is coming to an end, GRID3 aims to maintain its momentum. "It is a really exciting time for GRID3," adds Czaran, "as the newly funded phase enables us to scale up the good work to many more countries."

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