Impact Assessment Report

WorldPop

Prepared by **Dev-Afrique**

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EXECUTIVE SUMMARY

Despite extensive efforts to improve the efficiency and equity of development programming, significant information gaps have left decision-makers without the evidence to improve lives and livelihoods by better understanding the world around them. Demographic data provides decision-makers with the critical denominator information needed to assess, predict, monitor and evaluate development programmes. Data challenges on quality, interoperability, capacity, availability and disaggregation all represent barriers to the effective use of demographic data in decision-making.

WorldPop addresses these gaps by providing open access population estimates for public good. This has empowered users and beneficiaries to achieve their organisational and strategic objectives towards the UN Sustainable Development Goals (SDGs). Tools developed by WorldPop are improving accessibility of data and making it easier for analysts to visualise and interpret the small area population estimates.

The expertise that WorldPop provides is reshaping development programming. WorldPop provides data, products and technical support to governments, humanitarian organisations, not-for-profit organisations, commercial companies, media outlets and donors that allow them to better target their development activity at the populations most in need.

The co-development approach has built sustainability and ownership of gridded population estimates. WorldPop works directly with national statistical offices and other government agencies on the development of products and to build capacity with the WorldPop methods. This co-development approach promotes national ownership of the outputs, which, in turn, support integration into evidence-based decision-making.

Population estimates are a foundational dataset that allow WorldPop data to be integrated into a range of applications. WorldPop data has benefitted a wide range of use cases including the distribution of shelter and clean water to vulnerable populations, the assessment of the impact of population growth on biodiversity, improvement of access to education, increased testing for malaria, and integration into vaccination microplanning.

Further development of the WorldPop offer is needed to support growing user requirements. As WorldPop products are increasingly integrated into decision-making, it is creating demand for new products and services that can support users in better use of the data. These recommendations include:

1. **New capacity building offers** that can support non-technical users, as well as products and services in new languages are required to ensure that WorldPop methods reach the right audience.

2. **Long-term partnerships** are needed to act as regional hubs for WorldPop methods and to better track the impact of data.

3. **Communities of WorldPop users** need to be convened to explore use cases and better understand user requirements.

4. **Greater advocacy of the WorldPop data** is needed to improve the communication of methods, products and their impact to the right audience.

INTRODUCTION

WorldPop is an applied research group at the University of Southampton that produces open, peer-reviewed high-resolution datasets on population distributions, demographics, and dynamics. WorldPop has consistently engaged with countries worldwide for the past decade through its research outputs (population estimates and publications) and services (geospatial and population modelling, tool development, and capacity-strengthening efforts).

As a result, an increasing number of population data users and population modelling beneficiaries utilise WorldPop research outputs and services at regional and global levels. Thus, understanding how WorldPop research outputs and services have contributed to improved decision-making for programmatic and last-mile development efforts is critical to determining WorldPop's impact.

ASSESSMENT APPROACH

Dev-Afrique used a qualitative study approach, utilizing OECD's relevance, utilisation, impact, and sustainability evaluation measures for this assessment. To increase the assessment's rigour, Dev-Afrique complemented the traditional qualitative study approach with a qualitative impact assessment inquiry (QuIP) approach to capture impact narratives and their reported drivers.

During the assessment development phase, Dev-Afrique conducted desk research and an in-depth scoping exercise with the WorldPop team to understand their definition of success, projects, and services. Insights from the scoping exercise guided the assessment's approach and provided a sampling frame of WorldPop's known beneficiaries. Dev-Afrique conducted a series of 43 beneficiary interviews and triangulated them with beneficiary impact reports.
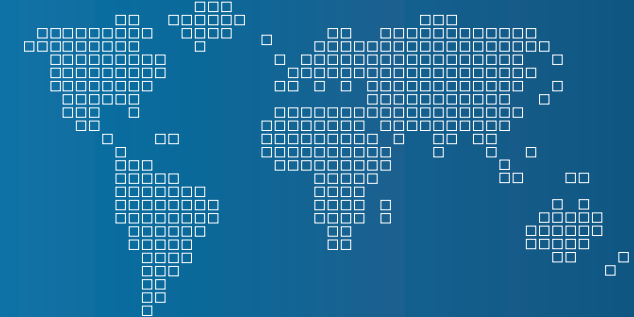
KEY FINDINGS

WorldPop research outputs and services have reshaped and provided many governments, development partners, and donors with reliable population estimates for interventions in various sectors. This report summarises stakeholder accounts on the utilisation, relevance, and impact of WorldPop research outputs and services. It further presents the stakeholder-reported drivers and enablers of WorldPop's overall impact.

Utilisation

This section presents trends in the usage of WorldPop research outputs and services, insights from WorldPop's web analytics, publication patterns from WorldPop researchers and an overview of the adoption of WorldPop's population estimates.

Trends in the Usage of WorldPop Research Outputs and Services

WorldPop research outputs and services are used by several stakeholders (humanitarian organisations, not-for-profit organisations, companies, donors, governments, media outlets, and the research community) for different purposes, depending on the needs and priorities of the organisation. Table 1 highlights trends in the usage of WorldPop research outputs and services.

Table 1:   Trends in the Usage of WorldPop Research Outputs and Services by Various Stakeholder Groups

Stakeholder Group	Example of Stakeholders	Example of how WorldPop Research Outputs and Services are used
Humanitarian Organisations	UNFPA, UNOCHA, WHO, UNICEF, UNESCO, CHAI, and Meta (Data for Good)	UNESCO utilised WorldPop's population estimates to conduct school age and school population modelling for Ministries of Education around the world. The World Bank used WorldPop's UN-adjusted constrained data and data from WOPR to carry out poverty and equity analysis in West and Central Africa.
Not-for-profit and Non-Profit Organisations	GRID3, ESRI, DHIS2, Akros, Population Services International	Non-profit organisations are some of the biggest promoters of WorldPop's population estimates for last-mile interventions. For example, GRID3 enabled the use of WorldPop's population estimates for health microplanning in Nigeria, the DRC, and Zambia.
Companies	Fraym, Howden, CARTO	CARTO converts WorldPop's raster data into vector data and makes it available on its Data Observatory for access. The converted data is cleaned and provided to data scientists, analysts, and developers, allowing them to save time on gathering and cleaning data. Fraym also uses WorldPop to analyse human activities related to inequity and insecurity, climate vulnerability, public health, and access to critical services.

Stakeholder Group	Example of Stakeholders	Example of how WorldPop Research Outputs and Services are used
Donors	Bill & Melinda Gates Foundation and the European Commission	These respondents highlighted that technical and financial support is provided to WorldPop to produce population data that ensure development objectives are met. They also indicated the significant role of WorldPop's population estimates in the design and planning of investment strategies.
Governments	Burkina Faso, Ghana, Kenya, Nigeria, the DRC, Papua New Guinea, Thailand, and Zambia	Geographers, statisticians, demographers, data scientists and programme managers from national government agencies are major consumers of WorldPop research outputs and services. They use WorldPop research outputs and services for their capacity building activities, census planning, production of population models based on available data, among others.
Media Outlets	New York Times, Guardian, Washington Post, Financial Times, Reuters, ABC News, and El Orden Mundial	Journalists from various media outlets use the insights from WorldPop's population estimates to report global issues such as the impact of war, natural disasters, and politics on diverse populations. For example, a New York Times article titled "Maps: Where the Earthquake Struck Morocco" used WorldPop data to discuss the impact of an earthquake that struck Mexico on the population living near the impact area.
Research Community	Several academic and research institutions	WorldPop's population estimates are used by researchers for multiple research work on urbanisation, poverty mapping, infrastructures, climate changes, health, education, social policy, among others, which were published on several outlets.

WorldPop
Research Impact and Footprint

Significant discoveries from WorldPop research have sparked discussions and publicity on a worldwide scale. This was particularly evident during the COVID-19 pandemic. Other researchers have also adopted WorldPop datasets to investigate various applications, such as food security, urban planning, public health, energy, and environmental studies, among others, and even to develop new models. As presented in Figure 1, this assessment identified 866 publications that clearly cited WorldPop datasets in their reports or analyses between 2017 and 2023. The 866 publications include 701 journal articles, 32 conference proceedings, 13 news outlets, and eight book chapters.

WorldPop's population estimates are freely available online and are downloaded millions of times from various platforms like HDX, ArcGIS, and GRID3's Data Portal. However, many data users utilise WorldPop population estimates without the appropriate credit to WorldPop. This implies that the number of users and adoption reported may not truly represent the true number of users of WorldPop's population estimates.

1 Million+
downloads

(platforms: HDX, ArcGIS, GRID3's Data Portal): WorldPop's population estimates are freely available online and are downloaded from platforms like HDX, ArcGIS, and GRID3's Data Portal.

WorldPop Research Impact and Footprint

701 Journal Articles	13 News Outlets	32 Conference Proceedings

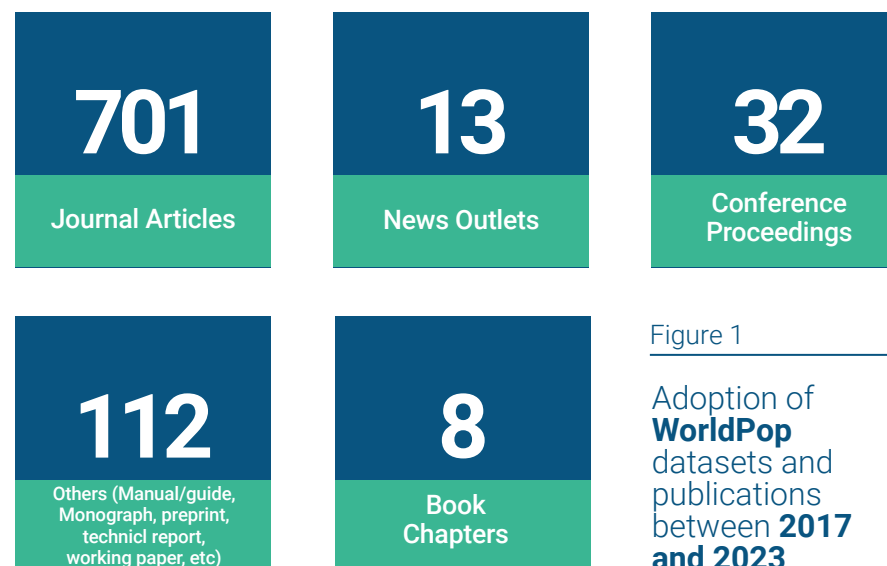| 112 Others (Manual/guide, Monograph, preprint, technicl report, working paper, etc)	8 Book Chapters

Figure 1

Adoption of **WorldPop** datasets and publications between **2017 and 2023**

WorldPop
Website Analytics

Between November 2022 and October 2023, more than 75,000 people visited the WorldPop website, including 8,700 users of the WorldPop Open Population Repository (WOPR)[3] and 305 users of its tutorial lessons on how to conduct small area population estimates and measure indicators.

WorldPop's website analytics (See Figure 2 and 3) shows that China has the most users of WorldPop research outputs and services between November 1, 2022, and October 31, 2023, followed by the United States of America, the United Kingdom, Burkina Faso, and India
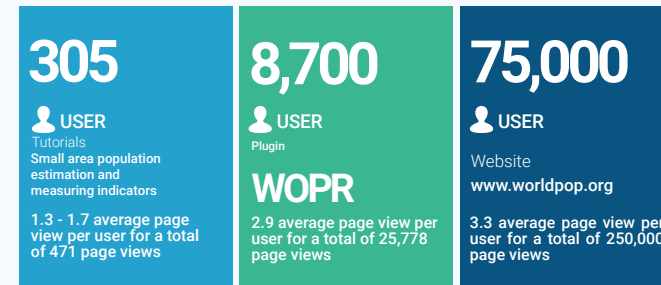
305	8,700	75,000
👤 USER	👤 USER	👤 USER
Tutorials	Plugin	Website
Small area population estimation and measuring indicators	**WOPR**	www.worldpop.org
1.3 - 1.7 average page view per user for a total of 471 page views	2.9 average page view per user for a total of 25,778 page views	3.3 average page view per user for a total of 250,000 page views

Figure 2

Users Distribution on the **WorldPop Website** (2022 – 2023)

China — 1,900

United States of America — 1,199

United Kingdom — 823

Bukina Faso — 322

India — 249

0   Number of WorldPop users
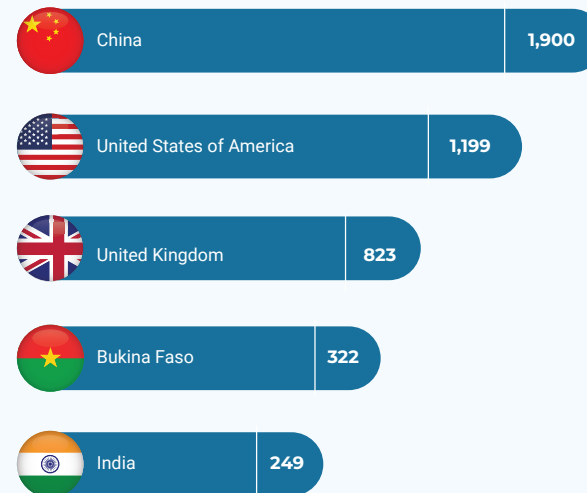
Figure 3

Top 5 Country Users of **WOPR** (November 2022 – October 2023)

3. WOPR is WorldPop's open-acees repository of gridded population estimates, and related data created using bespoke methods from individual countries.

Relevance

This section highlights the challenges that stakeholders experience in producing population data without WorldPop data, and how WorldPop research outputs and services address these gaps and align with beneficiary priorities.

Relevance of WorldPop Research in Addressing the Existing Population Data Challenges

WorldPop is tackling the existing population data challenges experienced by respondents. These challenges include difficulty in accessing population data, lack of up-to-date and reliable census data, lack of data interoperability, limited geospatial capacity, and survey challenges in politically and socially volatile environments.

The findings from this assessment indicate the following respondents' perspectives of how WorldPop research outputs and services are instrumental in addressing these data gaps and challenges:

WorldPop leads the production of high-resolution gridded population estimates:

WorldPop is well-known for using advanced modelling techniques to produce population estimates. As such, they have addressed the knowledge and capacity gaps in population modelling and estimation among national and global partners.

WorldPop provides open access population estimates for public good:

WorldPop grants open access to the population datasets they produce, which are disaggregated by demographic characteristics. This has empowered users and beneficiaries to achieve their organisational and strategic objectives for the UN Sustainable Development Goals (SDGs).

WorldPop fosters collaboration and partnership:

Given that WorldPop works collaboratively with beneficiaries at the national level to explore the use of existing population data for population modelling and estimation, respondents highlighted that there is now an improvement in the data collection methods. It has also created an atmosphere for cross-learning and productive partnership amongst partners from different sectors engaged in the same projects or programmes.

WorldPop provides tools to visualise data in diverse formats:

Provision of tools like WoprVision allows for visualization of data and easy download as a table or other formats. Respondents noted that this was particularly useful during the COVID-19 pandemic due to the pressing and urgent need for disaggregated population data for emergency response interventions.

WorldPop offers technical support to strengthen institutions:

WorldPop's strategy to offer technical assistance to national and subnational actors through training and technical support on geospatial mapping and model generation makes them a reliable resource for population mapping and estimation among stakeholders.

Alignment with Development Efforts of Respondents

Most respondents **(78%)** mentioned that WorldPop research outputs and services meet the needs of their development efforts. This is due to the many positive outcomes and results attributed to WorldPop research outputs and services (See tables 2, 3, and 4 for the detailed outcomes and results attributed to WorldPop). The quote below highlights the significance and relevance of WorldPop to a user.

> *We had this geo-enrichment capability project that was underpinned by a population estimate. So, in the last three years, we have shifted from using our own estimates to using WorldPop. It was exactly what we needed: more accurate and inclusive estimates.*
>
> *– Chief Cartographer*
> *– ESRI*

In contrast, **16%** of respondents said it did not meet their needs. The respondents mostly attributed this to the technical requirements of their research work, the lack of a clear understanding of the WorldPop research outputs and services, and difficulty in understanding which population estimates were applied to certain scenarios.

> *We use WorldPop research outputs and services frequently. Although the 100-metre product is nice to have when you are looking at sub-urban variability, I question the validity of the 100-metre population estimate. For instance, how much should we read into the 100 metres? Especially the age and sex. It is at such a fine scale, and the way it is generated using census data to disaggregate these age and sex breakdowns at that fine spatial resolution is difficult.*
>
> *– Ph.D. Candidate,*
> *University of Arizona*

WorldPop maintains its relevance by deploying both internal and external strategies. Respondents noted that strategies such as fostering open collaboration and partnerships, providing tools to visualise data in different formats, offering technical support to institutions, providing open-access data for public good, and leading the production of high-resolution population estimates, distinguish WorldPop.

Overall, respondents indicated that WorldPop research outputs and services were highly relevant to them

Impact

The assessment results identified three impact categories:

Accelerating progress for social impact by offering technical support to impact-led organisations

Improving targeting and access to intervention by providing gridded high-resolution population estimates with their demographic characteristics to programme managers

Strengthening population modelling capacity of national statistical offices and other government agencies through training and workshops.

Accelerating Progress for Social Impact

Respondents highlighted using WorldPop's data to develop new theories and academic publications that contributed to scientific knowledge. WorldPop's population estimates have also contributed to the increased usage of geospatial portals and tools provided by other organisations like UN-OCHA and ESRI.

WorldPop population modelling efforts have driven impact in various sectors like health, disaster response and technology. Organisations like Facebook/Meta's Data for Good program and UNFPA are accelerating progress for social change. For example:

WorldPop's population estimates enabled Facebook/Meta's Data for Good program to **provide access to shelter and clean water to 70,000 people in Nairobi and 800,000 people in Northern Ghana**
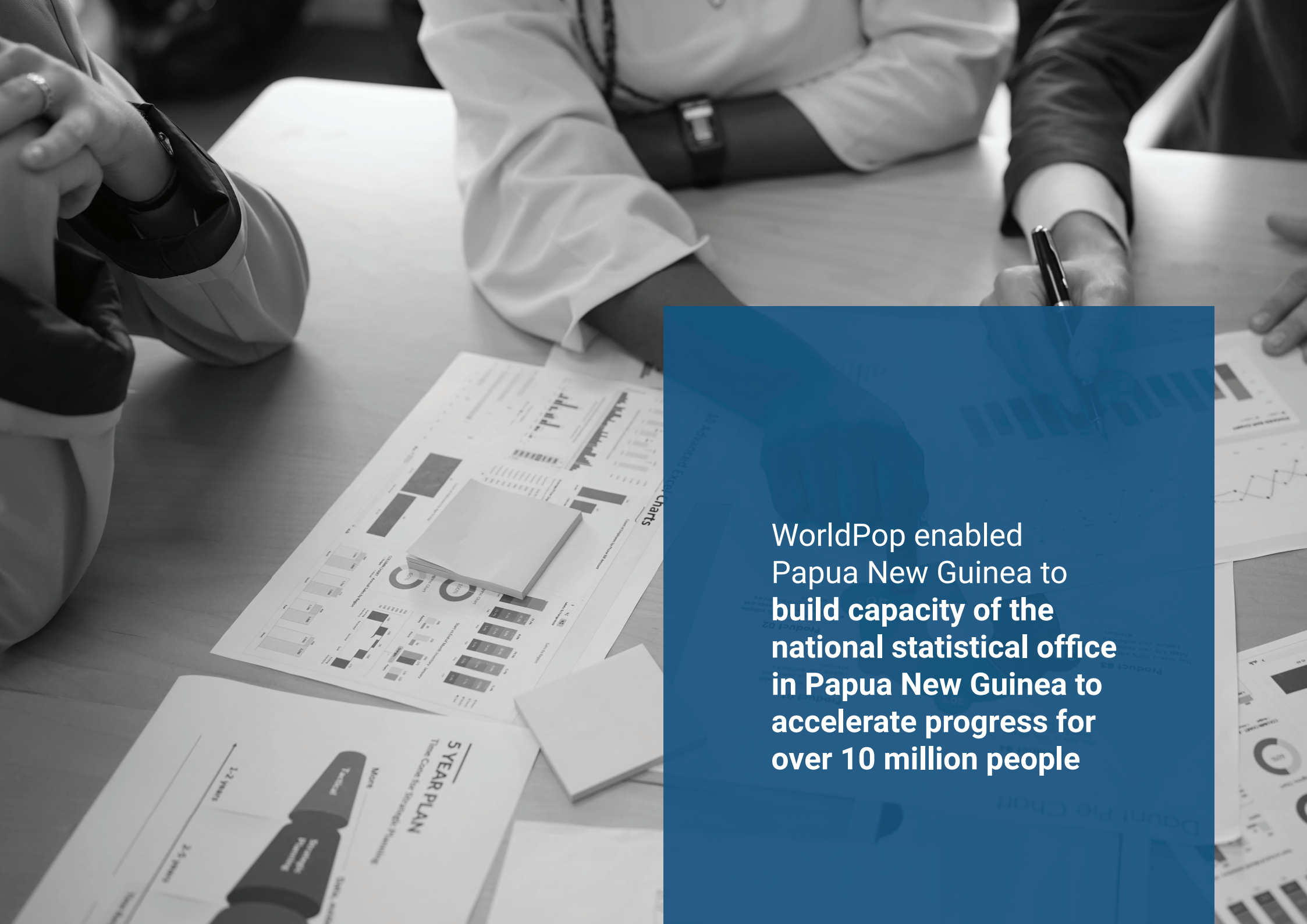
WorldPop enabled Papua New Guinea to **build capacity of the national statistical office in Papua New Guinea to accelerate progress for over 10 million people**

Exploration of WorldPop research outputs and services: Examining detailed outcomes and sample cases that illustrate their impact.

1 **Publication of Articles in Academic Journals and Strategy Documents**

Outcome and Results Achieved

WorldPop's population estimates and models enabled researchers to publish articles in scholarly journals and produce humanitarian action documents. Using WorldPop data, researchers were able to develop scholarly articles by applying and adapting WorldPop population estimation models, compare statistical models, train new models, review model applicability in different sectors, and publish findings on peer reviewed journals, articles, conference proceedings, among others.

Sample Case

The OCHA Humanitarian Index report uses WorldPop's population estimates as part of its population indicators to plan for humanitarian actions and measure global progress. In addition, over 800 publications in journals, conference proceedings, and media articles, among others, clearly cited and utilised WorldPop's population estimates for analysis across 58 countries (between 2017 and 2023). Given WorldPop's open-access policy, this represents only a fraction of WorldPop's data use and application, suggesting even wider reach and adoption.

Notably, a publication on the novel random forest regression tree-based mapping approach has recorded over 800 citations according to Google Scholar.

2 Increased Usage and Interactions with other Geospatial Portals and Platforms

Outcome and Results Achieved

HDX and ESRI platforms that share WorldPop population data on their portal attract more users, thus increasing their global reach.

Sample Case

A respondent from HDX highlighted that a substantial number of the 2 million downloads per year by their 1.5 million users are WorldPop's population estimates. Additionally, a webinar delving into WorldPop's gridded population estimates has emerged as the most popular video on the OCHA Centre for Humanitarian Data's YouTube channel, amassing over 3,000 views. ESRI also mentioned that the disaggregated WorldPop estimates they host are among the ten most used services.
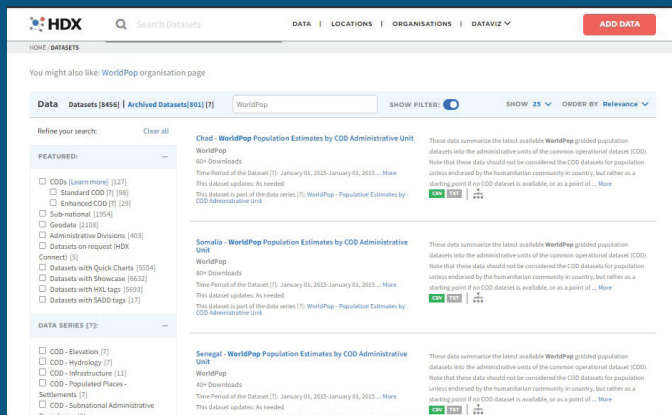
3 Enabled Development of Tools and Dashboards

Outcome and Results Achieved

WorldPop's population estimates served as input data to compare, analyse, and train other AI models.

Sample Case

The Facebook/Meta Data for Good Program's population density map AI model was developed using WorldPop's population estimates.

UNESCO developed a simulation model that helps ministries of education anticipate the next few back-to-school periods to allocate teaching staff or send textbooks based on the number of expected students in different schools and classrooms.

The Food and Agriculture Organization (FAO) uses WorldPop's population density data to improve the methodology for The Biodiversity Integrated Assessment and Computation Tool (B-INTACT). The tool is used to assess the impact on biodiversity of various investments at project, programs, and policy levels. FAO is using WorldPop's population density data as one of the covariates for meta-analysis to produce more granular and fine-tuned monetary estimates in more countries.

Improving Targeting and Access to Interventions

Respondents highlighted the top-down (constrained and unconstrained data) and bottom-up population estimates as valuable tools that enable program managers to achieve last-mile development results. These results include improved site optimisation for equitable distribution of health services, improved effectiveness and efficiency of microplanning activities, improved effectiveness and efficiency of program strategy and plans, and the use of WorldPop's population estimates as proxy population data in countries without reliable population estimates.

WorldPop's identification of 100 zero-dose LGAs enabled local vaccination teams to **increase vaccine coverage and access across 67 LGAs in Nigeria.**

WorldPop enabled the Clinton Health Access Initiative (CHAI) to increase malaria **testing by 18% in Banga Lubaka, DRC.**

Findings from the assessment show that WorldPop's contribution led to increased access to health interventions in underserved and marginalised populations in the Democratic Republic of the Congo and Nigeria through CHAI and GAVI-funded projects. The following is a snapshot of the realised impact:

1   Improved Site Optimisation for Equitable Distribution of Health Service

Outcome and Results Achieved

WorldPop's population estimates are triangulated with national population data in regions or countries whose population data are out-of-date, not presented as gridded estimates or not publicly accessible.

Sample Case

WorldPop's Ghana 1km live birth estimates (2015) informed CHAI's quantification and mapping of newborns within sickle cell screening site service areas in Ghana. The analysis from this work improved the optimisation of new screening sites, which was done in collaboration with the Ministry of Health, Family Health Division of Ghana Health Service, and Noguchi Memorial Institute of Medical Research. Based on program data, the addition of seven sites from this analysis could result in the screening of 10,211 more infants. This represents a 42% increase in screened newborns.

The Kenyan Ministry of Health utilised WorldPop's population estimates to estimate several types of coverage, such as the count of children who have not received any doses of vaccines (referred to as zero-dose children) and determining the coverage rates for DPT1, DPT3, polio vaccines, as well as HPV doses or antigens. In addition, the Kenyan Ministry of Health utilised these datasets for its full portfolio planning, which is an application submitted to Gavi to receive funding for immunisation-related activities.

> **CHAI's** utilisation of WorldPop's data to identify new sickle cell screening sites could potentially increase infant screening by **42%.**
>
> ● ● ●

2 Improved Effectiveness and Efficiency of Microplanning Activities

Outcome and Results Achieved

WorldPop, through partnership with GRID3 program, contributed enormously to the success story of GRID3 as highlighted in the GRID3 Impact Report (2017-2022). Given GRID3's support to microplanning efforts at national and sub-national levels in DRC, Nigeria, Burkina Faso, South Sudan, Sierra Leone Zambia and more. WorldPop has enabled health workers to effectively deploy resources to vulnerable populations as they were able to identify who the target population is and where they are.

Sample Case

In Ethiopia, CHAI utilised WorldPop's population estimates to propose oxygen plant sites that could benefit more than 7 million people.

Currently, the National Administrative Department of Statistics (DANE) in Colombia uses WorldPop's PreEA tool to automate the delineation of economic units and the allocation of operational teams to each unit in preparation for the country's economic census in August 2024. Prior to using the preEA tool, DANE manually assigned 12,000 census officers to survey areas. WorldPop's preEA tool has enabled a more equitable distribution of workloads to census officers across 2000 economic units. This has significantly reduced the time required to delineate a city's economic unit from 2-3 days to five minutes. Therefore the PreEA tool has helped DANE to save time and optimise costs for delineating survey areas by requiring less human resources for area delineation.

- preEA boundary
- Uncrossable features
- Administrative boundary
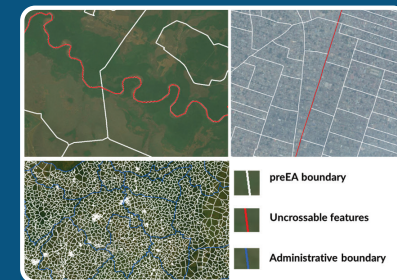
WorldPop's **PreEA** tool reduced **DANE's** area delineation process time from **2-3 days** to **5 minutes** per city

3   Worldpop's Population Estimates are Used as Proxy Population Data in Countries without Reliable Population Estimates

Outcome and Results Achieved

WorldPop's population estimates are triangulated with national population data in regions or countries whose population data is out-of-date, not presented as gridded estimates or not accessible publicly.

Sample Case

Burkina Faso used WorldPop's population estimates in its preliminary census results to capture areas not accessible due to various geographical and security challenges in the country. Similarly, in Colombia, WorldPop worked with the Colombia National Statistical Office to co-develop population estimates to complement the country's population data enumeration process, particularly in areas that could not be captured due to varying factors.

UNESCO described how WorldPop's population estimates were combined with the 2020 Togolese census data to estimate the presence of school-age and adolescents in planning for education intervention.

Burkina Faso 2020 UN adjusted

Estimated total number of people per grid-cell at a resolution of (30 arc seconds approximately 1km at the equator)
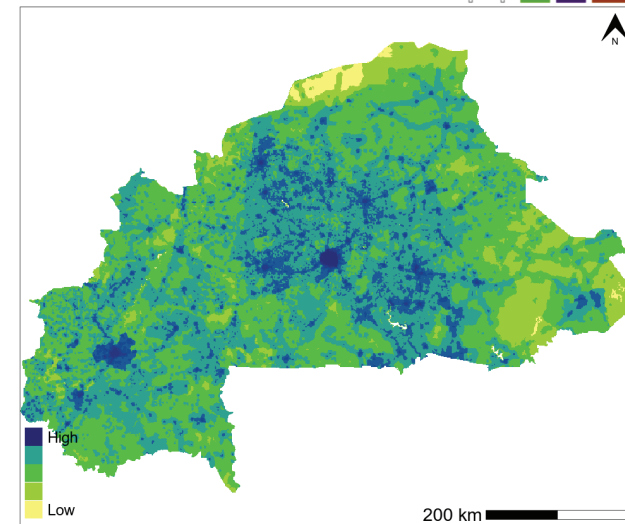
High

Low

200 km

4 Improved Effectiveness and Efficiency of Program Strategy and Plans

Outcome and Results Achieved

Governments and development partners can accurately target interventions to specific population groups using WorldPop's population estimates.

Sample Case

Data Science Nigeria leveraged WorldPop's granular 1km by 1km administrative level population estimates to identify low-income students for their "Learn at Home" initiative. This project provided at-home educational materials to children who faced significant barriers to learning due to the COVID-19 lockdown and subsequent school closures. Through this effort, about 8 million learners were reached.

WorldPop's population estimates enabled the Learn at Home project to deliver learning materials to nearly **8 million low-income students.**

5 Increased Understanding of Demographic Composition

Outcome and Results Achieved

Demographic profiling by age, gender, and other factors opens a new way to disaster response planning and humanitarian programme design for donors, allowing them to identify the target population's characteristics.

Sample Case

In DRC, the National Agency for Clinical Engineering and Digital Health (ANICNS), the National Agency for digital health, mentioned that the government, using WorldPop data, was better informed about the distribution of pregnant women living within more than a 5km radius of an existing health facility.

Strengthening Population Modelling Capacity

WorldPop's capacity-building and strengthening activities are typically embedded in their projects rather than as a standalone activity. This implies that capacity is being built to either use an existing dataset, co-create new datasets, increase understanding about the methodology of the population estimates production, and/or share general geospatial knowledge. WorldPop has increased capacity at the national and global levels through trainings in 14 countries, reaching partners at national statistical offices and other government departments, census planners, university students, and faculty.

Respondents from this assessment highlighted that WorldPop capacity strengthening activities have resulted in increased geospatial literacy for more evidence-based decision-making, the discovery of new talents in areas with limited opportunities, increased awareness of geospatial potential, and increased collaboration for geospatial capacities.

1 Cascading Knowledge to Sub-National Levels

Outcome and Results Achieved

Previous WorldPop trainings and workshop participants acquired skills and knowledge that could be cascaded to other geospatial specialists at the sub-national level.

WorldPop, through the Countdown to 2030 project, improved the analytical reporting skills of district health information officers in Ga South and Nzema East by 66% and 127%.

Sample Case

A regional director from the Ghana Health Service, who participated in the Countdown to 2030 training in Ghana is now organising geospatial analysis lessons on a YouTube channel.

2 Discovering New Talent

Outcome and Results Achieved

In-country partner researchers have gained new perspectives on population modelling after receiving WorldPop training. It provides an opportunity for young talents to demonstrate their abilities and talents. Without WorldPop's training, these local researchers may not have received exposure or opportunity due to their current environment.

Sample Case

Through WorldPop's training in Papua New Guinea, UNFPA identified mathematics specialists and talented researchers at the University of Papua New Guinea to offer more training and mentorship support.

3 Increased Awareness of Geospatial Potential

Outcome and Results Achieved

There is an increased awareness and documented use cases of geospatial data for evidence-based decisions that can be attributed to WorldPop contributions through training, stakeholder engagements, and production of population estimates.

Sample Case

In Brazil, the statistics and geography department at the Brazilian Institute of Geography and Statistics is now willing to collaborate to increase usage of geospatial data and analysis for decision-making. This was attributed to WorldPop's support in training the institute on population modelling approaches.

4 Increased Collaboration For Capacity Building

Outcome and Results Achieved

WorldPop, through its active collaboration with UNFPA regional offices and National Statistics Offices, has organised several in country and online workshops. Notably, through a collaboration between WorldPop and UNFPA's Benin country office, WorldPop trained the country's National Institute of Statistics and Demography (INStaD), National Institute of Geography (IGN) and the University of Abomey Calavi (UAC).

Sample Case

The collaboration in Benin led to further field work in Cotonou and Abomey-Calavi, where the WorldPop team supported census efforts in the country. The census data was used to further test the use of WorldPop's PreEA tool and to create final census enumeration areas.

Sustainability

Respondents emphasise the strong potential for sustained impact through WorldPop research output and services due to WorldPop's capacity strengthening activities, the technical soundness of the methodology, increased access to the data, as well as the collaboration and partnerships with local actors.

The impact of WorldPop research outputs and services was considered positive and the sustainability of the outcomes from WorldPop's contributions was highly valued.

This can be attributed to:

1. Beneficiaries' and users' sense of ownership of outcomes;

2. WorldPop's capacity-strengthening activities through training and resources, which often accompany project activities;

3. The technical soundness of the research methodology;

4. Increased visibility of and access to data for use, such as presentation of WorldPop's work in conferences in Cape Town, Nairobi, Sri Lanka, etc., hackathons in Ghana; and

5. Collaboration and partnerships with local actors.

RECOMMENDATIONS
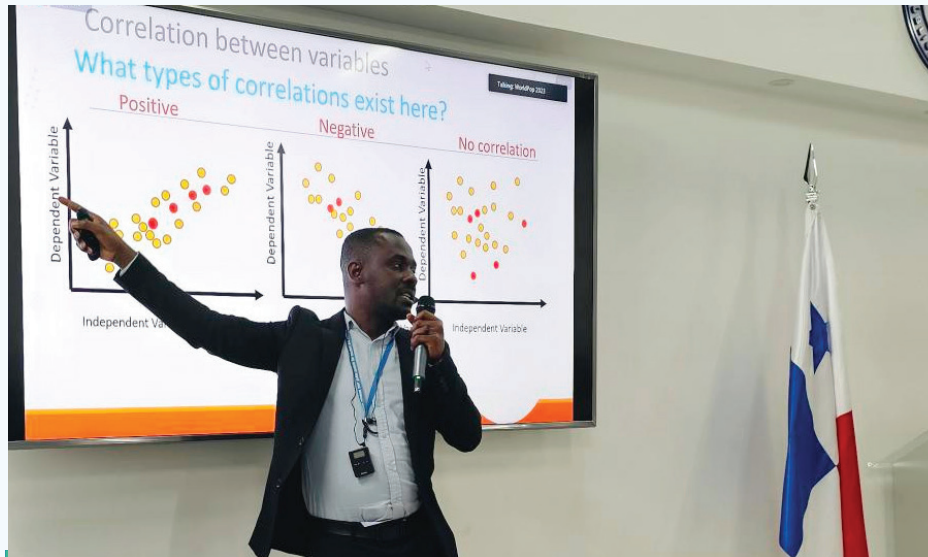
Furthermore, the report also incorporated feedback from respondents regarding potential areas for improvement to sustain the achieved outcomes and results for beneficiaries and users. The recommended improvement areas cover the following:

1. Capacity strengthening

Respondents acknowledged the invaluable support WorldPop provided to strengthen their capacity to understand population modelling and produce datasets. However, other opportunity areas exist for WorldPop to further strengthen capacity of its users and beneficiaries, which include:

- Provision of training in several languages

- Creation of off-the-shelf online training modules

- Categorisation of trainings based on levels

- Creation of short course for professionals

- Provision of trainings using various GIS tools

- Creation of model adoption guidelines

2. Technical competency

Respondents provided recommendations and suggestions that would be useful to consider for the website, research outputs, and research techniques. These recommendations include:

- Increase visibility of WorldPop's cloud-based sites and options such as cloud-optimised geo-tiff server and Google Earth Engine options.

- Enhance building footprint attribution by incorporating attributes like land use types (residential, commercial, and mixed use) as covariates into population modelling.

- Provide additional data visualisation options.

- Disaggregate data by countries and regions on WorldPop's website.

3. Collaboration and ownership

To further sustain the impact and maximise the opportunities that come with it, respondents suggested that WorldPop should:

- Support countries to conduct census. It is however, important to note that WorldPop is already providing this support as part of its offering to countries like Papua New Guinea, Thailand, and Cameroon. This presents an opportunity to scale further to other countries.

- Explore longer-term partnership to foster continuous knowledge sharing and deliver greater value instead of short-term consulting arrangements.

- Build relationships with local researchers to ensure wider data dissemination in WorldPop post-production phase.

- Have national champions or coordinators to oversee in-country engagements.

4. Communication and Advocacy

Effective communication goes beyond the leadership; thus, respondents highlighted the need to invest in enhancing WorldPop's communication strategy and improve visibility of its work and impact. The following recommendations were provided for WorldPop to:

- Create communication guidelines by standardising presentation templates and use everyday language in presentations.

- Increase its newsletter's visibility by leveraging social media platforms, industry forums, and partnership with academic and professional organisations.

- Talk more and be more present, so that it can own its platform by hosting events at the national and global level.

This assessment revealed that WorldPop has enabled several national, regional, and global-focused organisations to democratise access to interventions through improved targeting of specific demographic groups. WorldPop has also enabled numerous national statistical agencies in Africa, South America, and the Southern Pacific to strengthen their statistical modelling and geospatial capacities through capacity-building programmes (trainings and workshops).

Overall, WorldPop research outputs and services were highly impactful, enabling global and national development actors to achieve programmatic and last-mile successes.