June 2025

Open Mapping for CLIMATE *RESILIENCE*

Case Studies

HOT
Humanitarian
OpenStreetMap
Team

Humanitarian OpenStreetMap Team

About this collection

This Case Studies Collection on Open Mapping for Climate Resilience is the first of four Collections covering the Humanitarian OpenStreetMap Team's (HOT) Program Areas. Each case study tells the story of HOT and its partners in engaging local actors in learning, mapping, and leveraing open geospatial data and tools for climate resilience across four regions.

This evaluation followed the Global Evaluation Initiative's BetterEvaluation guidelines, using a Pre-post Design, which was anchored in a Case Study approach and on elements of Contribution Analysis. Desk research and interviews were conducted to capture the assess outcomes and impact.

Findings from this collection are intended to inform GIS and development practitioners, communities facing climate impacts, local governments and others involved in initiatives that generate and use open geospatial data to improve local planning, services, and climate adaptation strategies.

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We hope this Collection inspires learning, and action toward more climate-ready and inclusive communities.

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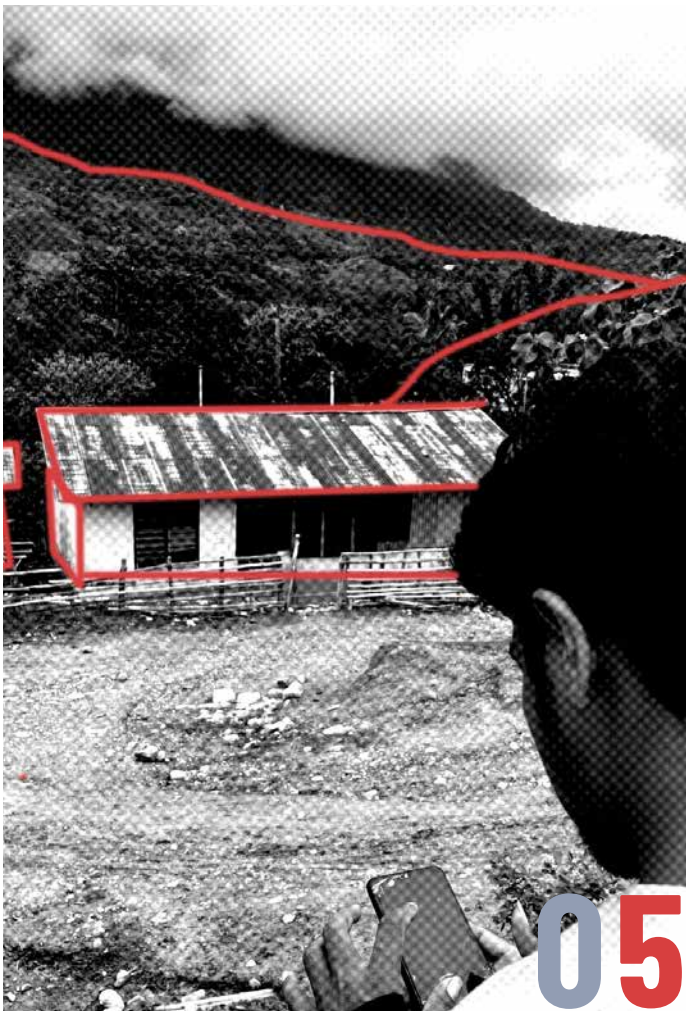


Introduction:
Open Mapping for Climate Resilience

Communities across Asia Pacific, Eastern and Southern Africa, West and Northern Africa, Latin America and the Caribbeans are currently facing recurring climate shocks—floods, droughts, and warmer cities—with limited access to reliable geospatial data that can inform their resilience efforts.

Open mapping initiatives led by the Humanitarian OpenStreetMap Team (HOT) and its regional open mapping hubs have provided governments, NGOs, and communities with the critical insights needed to improve planning and respondse in a warming world. As a result, local actors now use geospatial data to inform disaster plans, strengthen infrastructure, and reduce climate vulnerability.

CONTEXT

Across the world, climate change is amplifying existing vulnerabilites due to a combination of geographic exposure, socio-economic inequality, and under-resourced infrastructure.

- In the Asia Pacific region, coastal communities and Small Island Developing States face mounting risks from sea level rise, storm surges, and cyclones. Infrastructure, livelihoods, and water sources are highly exposed (United Nations, n.d.).
- In Eastern and Southern Africa, countries are already experiencing intensified flooding, droughts, and cyclones, with agriculture-dependent communities particularly at risk (UNICEF Eastern and Southern Africa, n.d.).
- Western and Northern Africa face intersecting threats of desertification, extreme heat, and water scarcity. These pressures are increasingly linked to security challenges, migration, and urban stress (Schaar, 2020).
- In Latin America and the Caribbean, the frequency and severity of hurricanes, floods and droughts have escalated. This situation is worsened through increased poverty and increasing levels of hunger in the region (United Nations in the Caribbean, 2025; World Meteorological Organization, 2025).

"Geospatial information is a critical component of the national infrastructure and knowledge economy; a blueprint of what happens where, and the means to integrate a wide variety of government services with proven societal and economic value."

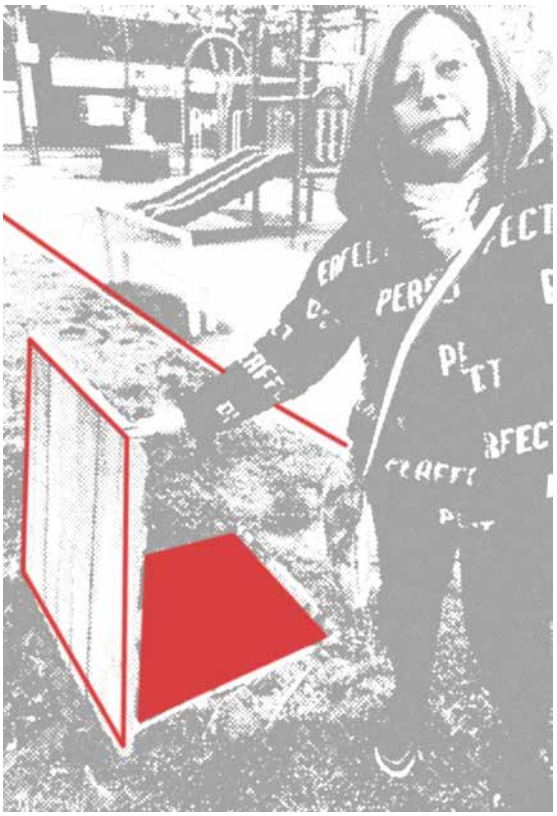
UN-GGIM Task Team on Geospatial Information for Climate Resilience, 2024.

Despite these rising climate risks, many governments and NGOs operate with limited access to up-to-date geospatial data. Foundational basemaps showing roads, buildings, and elevation are often outdated or incomplete, while other existing geospatial data are inaccessible due to institutional restrictions and cost barriers (Norris, 2023; Norris & St Clair, 2024). HOT-supported open mapping projects aim to close these gaps through open mapping and community partnerships—linking data with local action.

APPROACH, OUTCOMES, *& IMPACT*

Between 2021 and 2024, HOT has implemented over 30 projects focused on open mapping and climate resilience. These efforts were delivered in collaboration with local governments, youth groups, and NGOs. The core of HOT's approach is being community-centered: communities are not only mapped—they become mappers themselves.

- Youth and community volunteer mappers played a central role in collecting and validating data, and supporting planning processes.
- Projects enabled decision makers to access and use geospatial data to prepare and respond to climate-related hazards such as floods, droughts, and extreme heat.
- Activities included trainings on open mapping tools, remote and field mapping, data analysis and knowledge exchange.
- The co-created maps and assessments that resulted from these projects are shaping local action and benefitting communities.



This collection aims to highlight only four of those projects, which are representative of the diversity of ways open geospatial data and tools, in the hands of communities, can contribute to prepare them for the climate risks they now face:

- In Timor-Leste, hazard maps helped identify flood-prone villages, and guided evacuation planning for at least 80 households.
- In Nakuru City, Kenya, flood risk assessments helped the city government prioritize drainage upgrades, benefiting 10,000 villagers.
- In Nigeria, government's sustained air quality monitoring is expected to protect over 3.5 million people in growing cities.
- In Maipú, Chile, maps informed the municipality's investment in heat-resilient public spaces for around 60,000 residents.

CONCLUSION

HOT's experience demonstrates the power of open mapping as a mechanism towards multi-sector collaboration, active community engagement, and data-driven planning.

Across Asia Pacific, Africa, and Latin America and the Caribbean, open geospatial data and tools are enabling governments and NGOs to better tailor services—from early warning systems in flood-prone areas, to improving water access in drought-affected communities, to investing towards cleaner air, and greener spaces.

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Field Mapping in Bobonaro Municipality (G-SIG, 2022)

How Youth-Led Community Mapping *Boosted Climate Preparedness in Timor-Leste*

Authors[1]:
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Dana De Guzman, Humanitarian OpenStreetMap Team (HOT)

SUMMARY

In municipalities like Bobonaro, in Timor-Leste, communities face rising threats from flooding and drought, worsened by climate change. Yet, until recently, disaster risk planning relied on hand-drawn maps and fragmented information. HOT's Asia Pacific Open Mapping Hub and World Vision Timor-Leste (WVTL) together with the youth group, Grupo Sistema Informasaun Geografia (G-SIG), trained local volunteers to collect and visualize risk data using open-source tools. These efforts not only filled critical data gaps but also helped shape decisions—from identifying the most at-risk people and designing evacuation routes to improving access to water in drought-prone villages.

UNDERSTANDING THE *CONTEXT*

It starts with a basic question: **how do you prepare a village for a disaster you can't see coming?**

For years, staff at World Vision Timor-Leste (WVTL) struggled to answer this with the limited tools they had. Risk assessments relied on maps drawn by hand on flipcharts, passed from one field team to the next, at times getting damaged. There was no reliable system to show where the flood waters might rise, or which homes would run dry in a drought.

Meanwhile, the climate crisis deepened. Timor-Leste began facing stronger and more frequent extreme weather events—flash floods that swept away crops, and longer dry seasons that left families without water (European Commission's Disaster Risk Management Knowledge Centre, n.d.; World Bank Group and Asian Development Bank, 2021). **Communities in Bobonaro, one of the country's climate-vulnerable municipalities, were among the hardest hit**.

1 All research, analysis, and conclusions are the authors' own. OpenAI was used to assist with drafting, and the text was reviewed, edited and validated by humans.

World Vision had a growing number of disaster risk management and anticipatory action projects in Timor-Leste. Yet, back in 2021, WVTL faced major constraints. Zito Soares, previous Disaster Ready Project Coordinator, and now the lead of the Humanitarian and Emergency Affairs of WVTL, shared how their risk assessments previously depended on hand-drawn maps, often lost or damaged during field visits. This made it difficult to compile consistent disaster data across project areas.

Then, in 2022, as part of the broader Disaster READY Timor-Leste initiative under the Australian Humanitarian Partnership (AHP), WVTL teamed up with HOT's Asia Pacific Open Mapping Hub and Grupo Sistema Informasaun Geografia (G-SIG) to prepare for the implementation of Phase II of the project, which was looking to enhance disaster preparedness across municipalities. **Their goal: generating reliable geospatial data to better inform local disaster preparedness, led by local actors on the ground** (Australian Humanitarian Partnership, n.d.).

Field Mapping in Baucau Municipality (WVTL, 2022).

OUR APPROACH *IN ACTION*

Between July and October 2022, HOT and WVTL trained over 30 participants—including nine women—from NGOs, government offices, universities, and social enterprises. Participants learned how to use OpenStreetMap (OSM) for data digitization, field data collection (including mobile mapping with KoboToolbox), data analysis and risk modeling.

With guidance from HOT and WVTL, the youth-led GIS group, G-SIG, played a key role in leading field mapping in Bobonaro. Using tools like the HOT Tasking Manager, HOT Export Tool, and InaSAFE, local teams engaged community members in mapping **more than 47,000 buildings, 350 kilometers of roads, and over 700 community facilities across Bobonaro**, as well as two other municipalities: Baucau and Aileu.

This data was uploaded to OSM and cross-referenced with known hazard zones.

For the first time, WVTL had a spatial picture of where climate risks were most concentrated.

Open Mapping Training with Gov't, NGO, and community members (WVTL, 2022)

IMPACT ON *PEOPLE AND COMMUNITIES*

With this new data, WVTL and local governments shaped their anticipatory action efforts. In the Bobonaro municipality, **hazard maps helped identify villages most at risk of flooding.** These maps guided early warning efforts and informed evacuation planning for at least 80 households in sub-villages Ilat-Laun and Suriubu of Bobonaro (World Vision Timor-Leste, 2024). As residents were engaged in mapping, **Julmira de Almeida, Project Lead of G-SIG**, noted that:

"when disasters happen, [*community members*] know the place that's safe for them to go and what are things that they must do to protect themselves during disasters."

WVTL also used the skills and knowledge gained through HOT's training to continue community mapping activities that inform drought response.

Together, WVTL, G-SIG, and community members co-created an El Niño Monitoring Report that mapped and identified areas facing severe water shortages. In eight drought-affected villages, WVTL installed 15,000-liter water tanks, refilled daily, ensuring about 438 households had access to water through the dry season (World Vision Timor-Leste, 2024).

Finally, under WVTL's Regreening Communities Project, young farmers are learning to map and use a Regreening Monitoring Platform to track environmental restoration of their fields in Bobonaro and Baucau. With it, they can report on soil and water conditions, helping build long-term climate resilience of 15 Farming Land Sites in two villages in Baucau.

"This data really helps us —not only for disaster preparedness planning, but for all projects, whether it's on climate resilience, child protection, or wider development work. Before starting interventions, we now better understand the situation of communities in vulnerable areas."

—Zito Afranio Soaress,
Humanitarian and Emergency Affairs Manager, WVTL

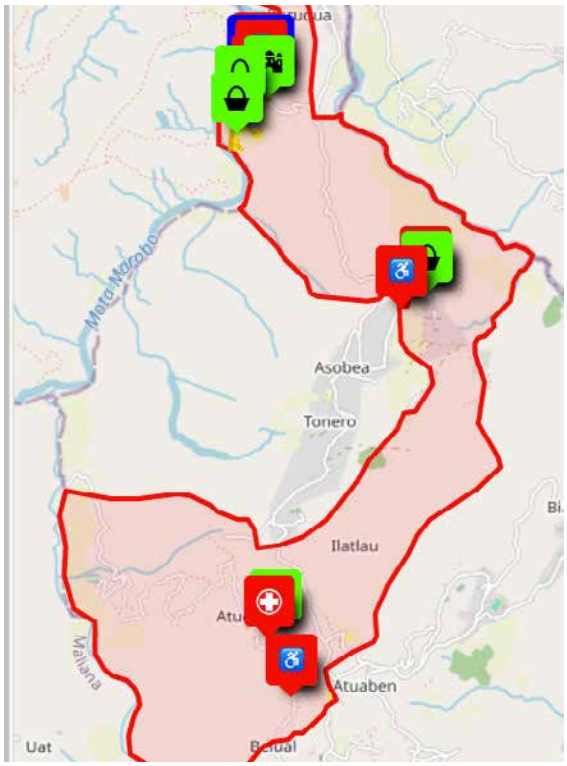
HOW CHANGE *CAN LAST*

This initiative sparked the formation of the OSM Timor-Leste Community, a network of volunteer mappers from government, civil society, and youth groups.

Beyond the partnership with HOT, WVTL invested in strengthening G-SIG's role as youth-led mapping organization—supporting its organizational capacity development to lead mapping initiatives across sectors. This extended beyond the Disaster Ready Program, as WVTL continued to work with G-SIG to better engage the youth and community members in planning.

"After we're involved in open mapping, it's like a dream come true. A lot of agencies want to collaborate, [*they*] want us to, help them in mapping, provide them not only data, but also provide them skills in mapping using open mapping software such as QGIS, Ushahidi, and OpenStreetMap."

> Ponciano da Costa de Jesus, Executive President, G-SIG



Screenshot of WVTL and G-SIG's Anticipatory Action Flood Risk Map of Ilat-Laun, Bobonaro, visualized through uMap.

Zito Soaress, Humanitarian and Emergency Affairs Manager of WVTL, noted that they continue their collaboration to map and identify households living in vulnerable areas, aiding WVTL in providing support where it is most needed (World Vision Timor-Leste, personal communication, May 2, 2025).

WVTL's example has inspired others in the Australian Humanitarian Partnership network to explore how open data can improve their work towards inclusive community-based disaster risk management and anticipatory action. The Timor-Leste government is now looking at ways to formally integrate OSM data into disaster workflows.

Meanwhile, community members who once relied on flipcharts are building the digital maps that guide their own resilience.

INSIGHTS FOR THE *FUTURE*

This project shows how local organizations can engage youth groups and community members with open geospatial data and tools to fill critical gaps in areas vulnerable to disaster. What started as a participatory mapping effort has evolved into a movement that has proven effective in preparing communities before climate disasters strike, taking active roles in local climate action, benefiting from early warning systems for flood-prone villages, increased water access for drought affected communities and soil monitoring for farming.

Field Mapping in Baucau Municipality (WVTL, 2022).

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Participatory Mapping and Air Quality Monitoring *for Cleaner Air in Nigeria*

Authors[1]:
Carter Draper and Dana De Guzman, HOT

SUMMARY

In urban areas like Kaduna, Lagos, and Ogun in Nigeria, communities face increasing exposure to the health and climate risks of industrial air pollution—often with limited access to localized data. While government and academic institutions had started air quality monitoring, they faced barriers in spatial coverage and data accessibility. The Eco-Smart Cities - Nigeria Project, led by HOT's West and Northern Africa Open Mapping Hub, enhanced these efforts by scaling air quality monitoring to more areas. By combining participatory mapping and a blend of satellite and sensor-based air quality tracking, the project expanded data coverage, improved accuracy through localized monitoring, and strengthened collaboration across sectors—laying the foundation for better-informed planning to reduce pollution and protect public health.

UNDERSTANDING THE *CONTEXT*

Urbanization and industrialization have brought both progress and pressure to Nigeria: while they drive economic growth, they also result in increasing air pollution.

Research shows that back in 2019, there were 198,000 reported premature deaths that were attributable to air pollution in Nigeria (Clean Air Fund, n.d.).

In growing cities like Kaduna, Lagos, and Ogun, these dynamics have led to worsening air quality and mounting public health risks. The World Health Organization (n.d.) reports:

Engagement with Kaduna State University representatives (HePD, 2024).

"many of the sources of outdoor air pollution [such as industries and transport] are also sources of high CO2 emissions. […] Pollutants not only severely impact public health, but also the Earth's climate."

1 All research, analysis, and conclusions are the authors' own. OpenAI was used to assist with drafting, and the text was reviewed, edited and validated by humans.

Air Quality Sensor Device used during data collection (HePD, 2024).

Before this project, local actors had laid an important foundation to address this issue. The Lagos State Environmental Protection Agency (LASEPA) and other environmental regulatory agencies operated air monitoring stations, while universities and NGOs carried out research and advocacy efforts.

However, air quality data remained fragmented and coverage limited—particularly in industrial zones. In Kaduna, Kaduna State University (KASU) reports that they lacked air quality sensors on the ground for their air quality research, leading them to be dependent on satellites using global modelling.

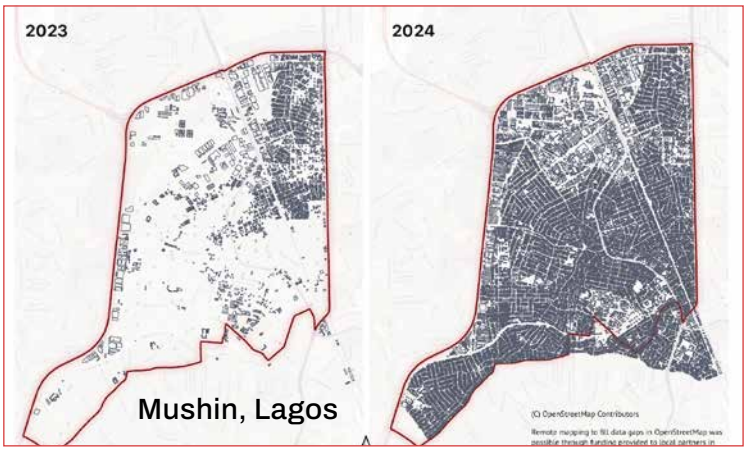
In Lagos, LASEPA had established citywide air quality monitoring, but also lacked ground air quality sensors for the few locations, creating what are known as 'dark spots' in their ground monitoring capacity.

The Eco-Smart Cities Project in Nigeria was designed to build on this foundation by increasing access to reliable, localized environmental data, and strengthening local capacity and collaboration towards cleaner air.

OUR APPROACH *IN ACTION*

In 2024, HOT's West and Northern Africa Open Mapping Hub supported the local youth-mapping organization Humanitarian enhanced Platform for Development (HePD) to team up with the Lagos, Kaduna, and Ogun States' environmental protection agencies (LASEPA, KEPA, and OGEPA, respectively) and universities (LASU, KASU, and OOU—Olabisi Onabanjo University) in a shared effort to improve how air quality is monitored and used for planning. Together, they followed a three-phase process: **Preparatory, Data Collection & Analysis, and Knowledge Sharing** (Humanitarian enhanced Platform for Development [HePD], 2024):

- **Preparatory:** the team reviewed existing studies to identify data gaps and trained local partners for project implementation.
- **Data Collection & Analysis:** the team led two efforts: (1) open mapping with student volunteers to fill critical gaps in OSM building and road data, and (2) air quality monitoring with low-cost, solar-powered sensors to measure key pollutants like nitrogen dioxide (NO_2), sullfur dioxide (SO_2), and particulate matters (PM_{10}, and $PM_{2.5}$) around industrial zones. This was made possible through collaboration with the state agencies and universities. They also received a total of six solar-powered ground air quality sensors, and were trained on how to use them.
- **Knowledge Sharing:** maps and initial findings were shared with stakeholders to support public engagement and local planning discussions.



Before and After mapping of Mushin, Lagos show increase of building footprints mapped in OSM.

Altogether, **over three million buildings, 6,000 km² of roads, and 38,895 km² of land were mapped in 22 local government areas** in Kaduna, Lagos, and Ogun (HePD, 2024).

OUTCOMES AND POTENTIAL IMPACT *ON PEOPLE AND COMMUNITIES*

Through this project, government agencies, academic institutions, and civil society groups gained access to open mapping platforms and solar-powered air quality sensors—enabling more community-driven and real-time data collection across target areas.

A preliminary air quality analysis in Kaduna surfaced that "the combined presence of these pollutants [NO_2 and SO_2] highlights the compounded health risks for residents exposed to this mixture of contaminants during peak traffic hours or periods of industrial activity" and a "moderate range" in Mushin, Lagos.

The analysis noted that "while air quality in Mushin was not severely hazardous,it remained a concern, particularly for vulnerable populations" (HOT's West and Northern Africa Open Mapping Hub, 2025).[2]

This improved access allowed for the generation of localized insights into pollution levels—particularly in industrial zones where residents can be exposed to a mixture of contaminants. The initial findings underscored potential health risks especially to vulnerable groups like children and the elderly.

"The solution provided is unique and purposeful compared to the satellite estimates that do not [accurately] reflect the local situation. Running a 24-hour nonstop air quality monitoring station without any overhead cost was a game changer."

Kaduna State University

The participatory approach and initial findings of this project helped communities better understand local air pollution and its health impacts.

HePD noted that "community awareness of air pollution issues has significantly improved," (Humanitarian enhanced Platform for Development (HePD), personal communication, May 16, 2025) as people began to recognize pollution sources and risks in their daily lives.

Citizen group UrbanBetter, shared that this access to evidence is "enabling us to engage from an evidence-based perspective and to demand climate actions and responsibilities from our city administrators." (UrbanBetter, personal communication, May 4, 2025). Meanwhile, government agencies are now better equipped to track air quality and take informed steps to protect over 3.5 million people in Nigeria.

In Lagos, LASEPA continues monitoring at newly established monitoring sites.

"With the addition of two solar-powered air quality monitoring sites, some of the 'dark spots' have now been illuminated with 24-hour observation. With complementary datasets [*from OSM*], we are better positioned to design emergency response plans for sister agencies in the event of a gaseous accident."

Lagos State Environmental Protection Agency

Air Quality Sensor Device used during data collection (HePD, 2024).

While in Kaduna, Prof. Mande K. Hosea, project coordinator and Director of the Center for Climate Change and GIS at KASU, explained that sustained efforts by the university aim to produce analysis and recommendations by 2026 to support regulatory planning and shape air quality policies—**potentially benefiting over 2 million Kaduna residents.**

[2] Richard Djarbeng, the air quality expert consulted for this study, notes that the short timeframe of the on-ground air quality monitoring may not have captured the full pollution patterns in these areas. There is need for longer-term monitoring to better inform analysis and recommendations.

HOW CHANGE *CAN LAST*

This project strengthened sustainability by embedding tools, practices, and parnerships into local institutions.

The participating universities and government agencies have integrated the six solar-powered air quality sensors into their ongoing monitoring programs to support teaching, research, and regulatory work.

The collaborative, participatory approach has also been institutionalized by key actors.

Respondents from LASEPA, KASU, and UrbanBetter confirmed that they are continuing with monitoring efforts to inform future analysis and planning.

With guidance from air quality expert Richard Djarbeng, HOT will further develop a Standard Operating Procedure (SOP) to help local communities replicate this monitoring model in their own contexts.

INSIGHTS FOR THE *FUTURE*

The Eco-Smart Cities project in Nigeria demonstrated how open mapping and air quality monitoring can strengthen local capacities to address the climate and health challenges of urban air pollution.

By building on existing government efforts and fostering collaboration across sectors, the project provided tools, data, and approaches that supported local actors to generate early insights, engage communities, and begin embedding environmental data into their institutional processes.
Although full-scale policy change may take time, the foundation has been laid for more data-driven decision-making and participatory governance. With continued investment in collaborative monitoring and cross-sector dialogue, cities like Lagos, Kaduna, and Ogun are better positioned to advance air quality action and build more climate-resilient, health-conscious urban environments.

Mapping activity with the HePD team (HePD, 2024).

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Installation of Air Quality Monitoring equipment at the LASEPA office, Lagos (HePD, 2024).

Using Open Mapping to Tackle Flood Risks *and Build a Climate-Ready Nakuru City, Kenya*

Flood Risk Assessment Maps showing flood-prone areas in Nakuru City.

Author[1]:
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SUMMARY

In the city of Nakuru, Kenya, rapid urban growth and disrupted natural water flows have made flooding a persistent threat. Through the Imagery for Social Good initiative—supported by HOT's Eastern and Southern Africa Hub and Microsoft—the Nakuru city government and local communities came together to map flood-prone areas and understand the risks. With newly available open geospatial data and training, the city has begun designing nature-based solutions like sponge infrastructure, reducing the threat of displacement for thousands of residents.

UNDERSTANDING THE *CONTEXT*

Kenya is increasingly vulnerable to climate change, with frequent and severe flooding, droughts, and temperature extremes disrupting livelihoods and urban infrastructure. World Bank reports that over 70% natural disasters in Kenya are linked to to extreme climatic events, with flooding alone affecting an estimated 150,000 people each year (World Bank Group, 2019, 2021).

The city of Nakuru, one of the country's fastest-growing urban centers, is particularly at risk.

Situated in the Great Rift Valley, between the Mau and Aberdare mountain ranges, Nakuru receives heavy stormwater during rainy seasons. Moreover, the population has grown tremendously over the years, driving housing demand up. This rapid urbanization has increased stormwater runoff, leading to flooding in the lower parts of Nakuru.

Mr. Festus Bor, City Planner from the Nakuru City Government, explains that due to flooding, several communities near Lake Nakuru had to relocate, leaving their homes and their livelihoods behind.

1 All research, analysis, and conclusions are the authors' own. OpenAI was used to assist with drafting, and the text was reviewed, edited and validated by humans.

The Nakuru Government recognized these challenges and has been working on addressing them even before 2021, when Nakuru earned city status. For example, it has been preparing a County Spatial Plan, which aims to improve urban and rural development (Nakuru County Government, 2019). However, Mr. Bor acknowledged that the County, including the city of Nakuru, had limited baseline geodata that hindered effective flood risk mitigation planning.

OUR APPROACH *IN ACTION*

In 2022, HOT's Eastern and Southern Africa Open Mapping Hub, Microsoft, and the Nakuru City Government collaborated to harness Machine Learning (ML) technologies to generate open and accessible geospatial data.

Anchoring back to the concept of "sponge city", where urban features allow water to be absorbed and filtered below-ground (Sieker, n.d.; World Future Council, 2016), the Satelite Imagery for Social Good Kenya project aimed to use the data to support the city's flood mitigation strategies and strengthen its overall climate resilience.

"The team got training from HOT on how to map on OSM, extract data from QGIS, and use other mapping tools that made the team more efficient in the use of geospatial data"

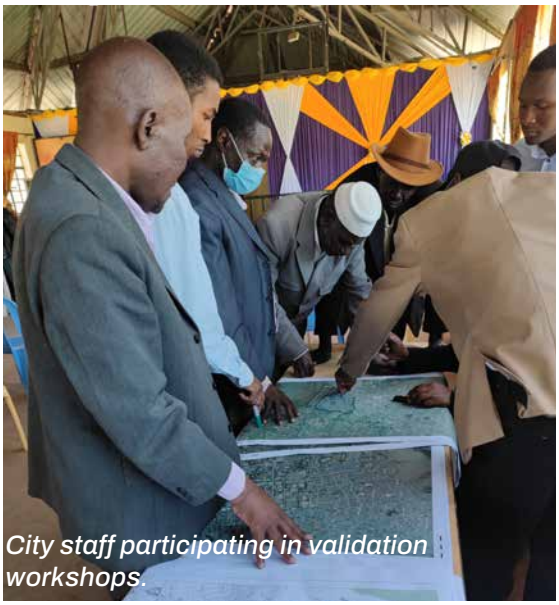
Mr. Gitau Thabanja
Nakuru's City Manager

Field data collection activity.

Activities included training, AI-assisted remote mapping, field mapping, and flood risk modelling and verification. The training involved twenty city staff and OpenStreetMap (OSM) community members learning to use AI-enabled tools and data, such as MapwithAI, Rapid, and Microsoft AI's open buildings dataset (Microsoft, 2022)

It also included an introduction to OSM's remote mapping tools, in addition to field data collection tools, like ODK, OSMAnd, and StreetComplete, necessary to add extra attributes such as street names, schools, and other points of interest to OSM.

AI-assisted mapping enabled quicker remote mapping and provided more time for human validation and participatory field mapping. Local communities were then engaged to help identify high-risk zones, verifying flood models with lived experience.



City staff participating in validation workshops.

The terrain model HAND (Height Above Nearest Drainage) was then employed to simulate flood scenarios and prioritize interventions.

The collaboration generated **1.4 million building footprints, 19,131km of roads, and over 4,000 village names being added to OSM, covering nearly 21,000 km². Data was then used to develop a flood risk assessment of Nakuru City** to better inform the city's flood mitigation strategy (HOT's Eastern and Southern Africa Open Mapping Hub, 2022).

IMPACT ON *PEOPLE AND COMMUNITIES*

The data revealed flood-prone areas and surfaced gaps in the drainage infrastructure. **Mr. Gitau Thabanja explained how the generated baseline data and flood risk assessments helped the city prioritize investments for upgrading its drainage systems and develop a technical proposal for a sponge city model**—featuring nature-based solutions like permeable pavements and green spaces.

With improved flood modeling, Nakuru began closing unsafe open drainage channels and addressing solid waste accumulation that blocked water flow. Insights from the data allowed planners to target high-risk areas and allocate resources more efficiently.

Mr. Bor adds that **about 10,000 people indirectly benefited from the improved drainage systems**. In the past, other families chose to relocate from their homes, with floodwaters damaging belongings, disrupting work, and school.

Now, with the construction of new stormwater drainage infrastructure in the flood-prone areas, the city has seen people return to the communities. Residents are better able to focus on rebuilding their lives and livelihoods.

Participatory mapping also fostered stronger collaboration between city officials and residents.

"For almost 100 million Kenya[n] shillings, we've done two main drainages. And I'm happy to report that this time around, even with heavy rains, we have not experienced [the same level of] flooding as before. Through this mapping, we have now started addressing the challenges of flooding not from guesswork, but from informed GIS-based guidance."

Mr. Gitau Thabanja,
Nakuru's City Manager

Nakuru's efforts have been recognized by the World Bank through its City Planning Labs (CPL) program (Nakuru County Government, 2024; World Bank Group, n.d.), validating the city's commitment to data-driven and collaborative urban planning. The award also helped advocate for increased funding for GIS and resilience infrastructure.

HOW CHANGE *CAN LAST*

Nakuru City continues to integrate open geospatial data into its urban planning strategies. Building on the success of the Satelite Imagery for Social Good project, the city has joined HOT's Climate Ready Cities Program (HOT's Eastern and Southern Africa Open Mapping Hub, 2024).

Beyond mitigating flood risks, the city is now using GIS to inform its sustainable urban mobility efforts (Nakuru County Government, 2024). This includes planning safer infrastructure through walkways and cycling lanes, supporting green infrastructure. They further strengthened their Nakuru Sponge City Program using data to inform nature-based solutions to address urban and climate challenges (Holmes, 2025; Kenya News Agency, 2024).

"Through [a] participatory approach, we are able to create a pool of residents that we can engage in not only in the flooding but also for public participation on budget making. This process gives us a community that we can rely on."

Mr. Gitau Thabanja,
Nakuru's City Manager

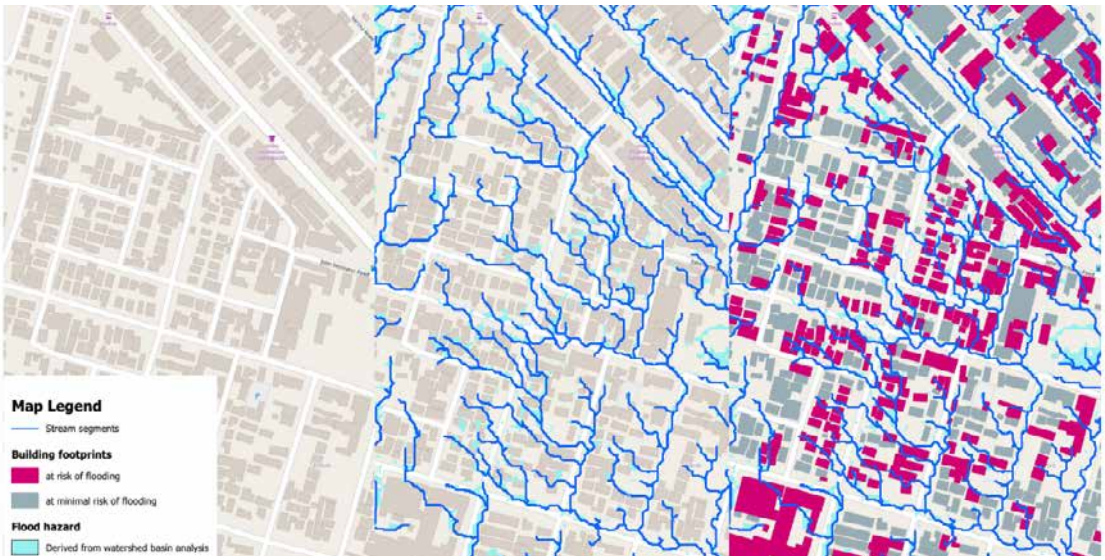
Notably, the participatory approach has also improved how the city systematically involves its residents in shaping policies and projects. Community members now contribute to identifying local risks, leading to stronger civic engagement and more responsive planning.

By embedding geospatial tools, data, and participatory processes into daily operations, Nakuru is laying the groundwork for more inclusive and sustainable urban governance.

The Nakuru City team announcing they received the World Bank City Planning Labs (CPL) grant. Source: Nakuru County Government, 2024.

INSIGHTS FOR THE *FUTURE*

This is an exemplary case of how combining AI-assisted tools with local mapping and community collaboration can drive data-informed, sustainable urban development. By integrating these efforts with institutional commitment, the city is both responding to current climate challenges and laying a strategic foundation for long-term urban resilience. Nakuru shows what can happen when decision-makers understand the possibilities brought by open geospatial data and tools, and communities are deliberately engaged with for urban improvement actions.



Resulting Flood Risk Assessment Map

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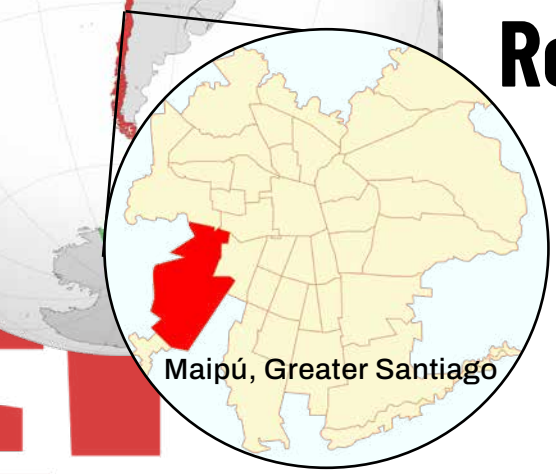


Reclaiming Public Spaces *for Climate Resilience in Maipú, Chile*

Author:
Raiza Pilatowsky Gruner, HOT

SUMMARY

Facing increasing exposure to heat in the Sol Poniente neighborhood of Maipú, Chile, due to climate change and the urban heat island effect, local officials partnered with HOT and community leaders to map and assess their green spaces. The intervention uncovered that a third of the officially registered public squares were being misused, and 20% lacked adequate shade—putting vulnerable groups at risk during heatwaves. Equipped with accurate, community-sourced data, the municipality is now targeting investments where they're most needed, transforming neglected plots into safe, usable spaces.

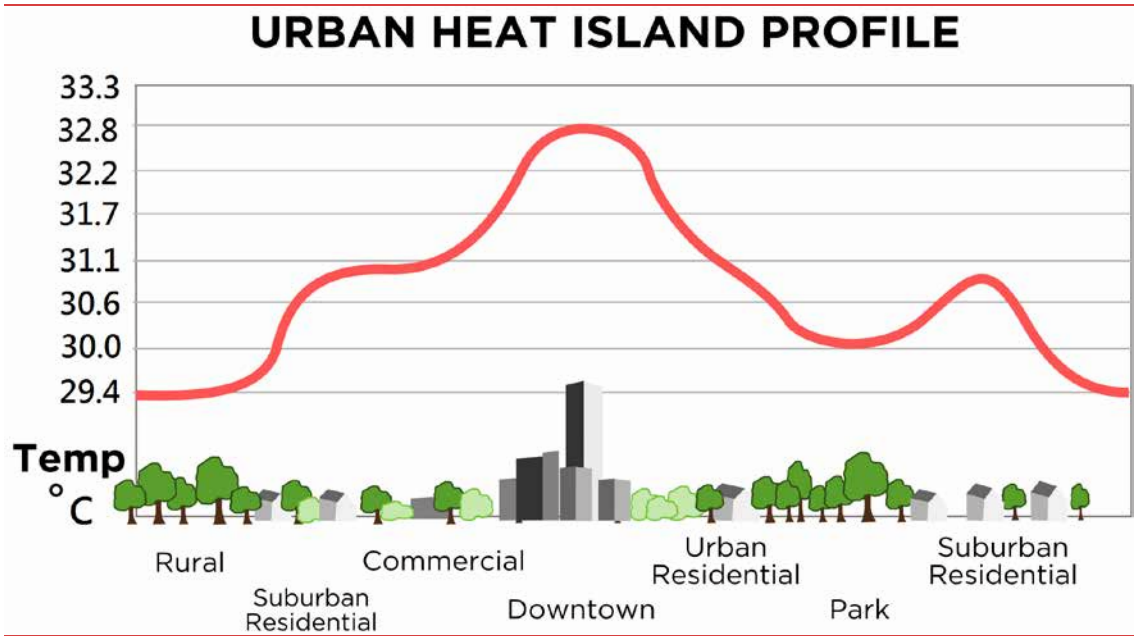
UNDERSTANDING THE *CONTEXT*

We all know it. That experience of walking on a hot summer day through a long sidewalk, the exhaust of the cars bathing us in grey, noxious gases, with not a tree in sight to provide some relieving shade or a gentle breeze to cool us down. This is known as the urban heat island effect.

The amount of concrete, the lack of permeable surfaces, and reduced vegetation are the perfect recipe for cities to get warmer than their surrounding areas (Climate Central, 2021).

Experts have pointed out that addressing the urban heat island effect in cities also works as a strategy for climate change mitigation and adaptation (United States Environmental State Agency, 2014), as increasing green spaces and reducing emissions from transportation and industries can counteract the effects of both phenomena.

But in order to address this, city governments and officials first need to spatially identify the state of their green infrastructure and use that information to determine where to invest to improve it.



This is what the municipality of Maipú, Chile, set out to do through a collaboration between the Open Government Partnership (OGP) and HOT's Latin American and the Caribbean Hub.

Beyond these issues, the members of the Planning and Development Unit of the Maipú Municipality also recognized that climate change affects the usage of these areas, especially by vulnerable populations, and can have other indirect consequences, like health issues.

"Our initial spark to join this program was a critical need to have trusted data for public investment management, especially for squares and parks. With several earned funds, we faced the challenge of investing without a clear vision of the current state of these areas, which made us look for tools that would facilitate collecting this information."

During spring and summer, the high temperatures can render public spaces unusable, and lacking the right equipment, they can also become dangerous sites for sensitive age groups during periods of heat waves. With this in mind, the team set out to update and acquire the necessary information to invest in these public spaces and adapt them to a warmer climate.

"We see the urgency of tackling climate change in a practical and territorial way. We face a critical data vacuum about our green areas, which makes it more difficult to have effective interventions"

Members of the Planning and Development Unit of the Maipú Municipality

Local social leaders meeting (OGP, 2024).

OUR APPROACH *IN ACTION*

For this project, the Planning and Development Department of the Maipú Municipality decided to focus on the Sol Poniente neighborhood, which houses around 60,000 people. It's also where there's a higher percentage of vulnerable population (by Chile's own socioeconomic measurements) and the place they considered most lacking in open public spaces for recreation.

According to their own registry, previous to the implementation of this project, the area had 131,000 m^2 of green areas, which they subcategorized into squares, parks, median strips, cloverleafs, gardens, etc. The registry only showed 84 squares, but not their conditions.

Guided and supported by the CoMapper team, HOT's implementing partner, they designed a survey using KoboCollect, which included standard information like location and size, but also the conditions of the square, types of equipment present, types of use, number of people present, comfort, and safety. The survey was co-created with local social leaders, who gave input into their priorities for the areas, and who were trained to collect the information.

The resulting data—**71 polygons corresponding to Public Open Spaces**—was incorporated into the OpenStreetMap platform. Additionally, **12 plazas in the area were visually recorded using Mapillary.**

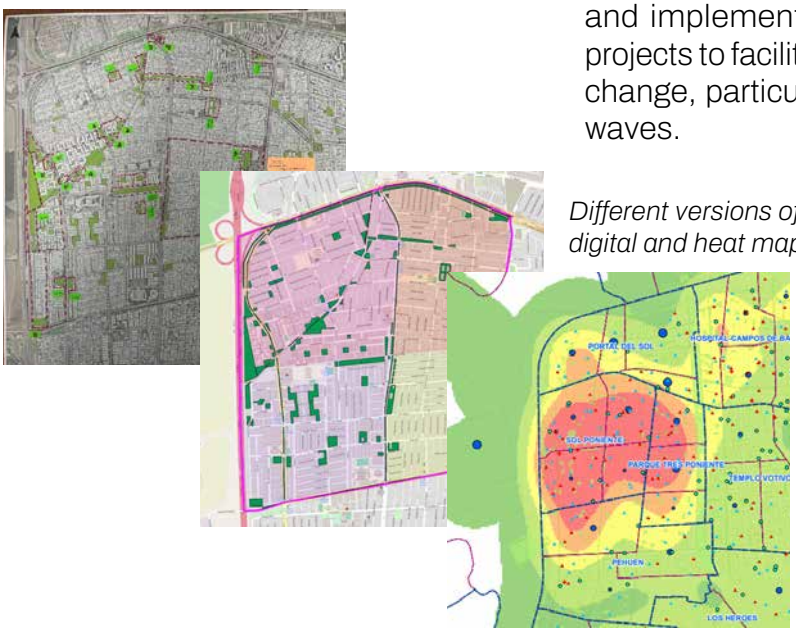
Local leader collecting field data through the survey (OGP, 2024).

OUTCOMES AND POTENTIAL IMPACT *ON PEOPLE AND COMMUNITIES*

After data collection and analysis, members of the local government **realized that instead of 131,000 m² of green areas, the Sol Poniente neighborhood only has 97,000 m², with 60 squares instead of 85 previously registered.**

The project made them see that, although on paper Sol Poniente had designated 85 spaces as public squares, in reality around 25 of them were being used as garbage dumpsites. They also realized that none of the green areas with playgrounds had equipment with shade, and that out of 60 public squares, 19% don't provide shade at all. This means that during warm periods, those public areas won't be used, or if they are, vulnerable users like elderly people and children are at risk of heat exposure.

This issue becomes worse by cross-referencing with maps of surface-level temperatures of the area, which show that the public spaces in the neighborhood have significantly higher temperatures than the surrounding areas of the municipality.



Different versions of the resulting map: physical, digital and heat map for cross-reference.

The municipality is currently overlapping this information with neighborhood complaints and crime databases in order to prioritize which spaces to invest in first. On the long-term, they are looking to coordinate with other Municipal Units like Community Development and the Safety Department to invest its funds in the squares with higher turnout, start adding equipment to provide shade for the users, and establish a program to adapt these public spaces to warmer temperatures.

HOW CHANGE *CAN LAST*

Currently, the Planning and Development Unit of the municipality is looking to expand this methodology to cover its whole area of influence beyond just the Sol Poniente neighborhood. **Francisco Medina, former Head of the Planning and Development Unit of the Municipality of Maipú, noted that the collected geographic data will be cross-referenced with information on heat islands.** This analysis will help identify priority areas for designing and implementing urban regeneration projects to facilitate adaptation to climate change, particularly in response to heat waves.

INSIGHTS FOR THE *FUTURE*

This project gave Maipú's local government a clear picture of its public green spaces—revealing gaps between official records and on-the-ground realities. What were once overlooked or misclassified areas are now being prioritized for investment, with a focus on creating safer, climate-resilient spaces for those most affected by extreme heat. The approach shows how combining open tools with local knowledge can lead to more responsive urban planning—offering a model for other cities facing similar challenges.

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