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Final Project Report

Bridging Gaps in Development and Emergency for the Refugee Crisis in East Africa

April 2018 - May 2019

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Global Partnership for Sustainable Development Data
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1. Acknowledgements

This project, "Bridging Gaps in Development and Emergency for the Refugee Crisis in East Africa", submitted in response to the 2017 call for proposals by the World Bank's Development Data Group (DECDG) and the Global Partnership for Sustainable Development Data (GPSDD), is supported by the World Bank's Trust Fund for Statistical Capacity Building (TFSCB) with financing from the United Kingdom's Department for International Development (DFID), the Government of Korea, and the Department of Foreign Affairs and Trade of Ireland.

Special thanks and recognition to the local governments, refugee and host communities and organizations who collaborated with the HOT team through the duration of this project; the success and impact of our activities could have not been possible without their full support and participation in the mission:

Action Against Hunger, Arua District Local Government, Bidibidi Refugee Settlement, Catholic Relief Services, Danish Refugee Council, Food and Agriculture Organization, Finnish Refugee Council, Hoima District Local Government, Humanity & Inclusion, Imvepi Refugee Settlement, International Aid Services, International Rescue Committee, International Organization for Migration, Isingiro Local Government, Kampala Capital City Authority, Kikuube District Local Government, Kyangwali Refugee Settlement, Lutheran World Federation, Nakivale Refugee Settlement, National Bureau of Statistics Tanzania (NBS), National Forest Authority, Office of the Prime Minister Uganda (OPM), Rhino Camp, Uganda Bureau of Statistics (UBOS), Uganda Red Cross Society (URCS), UNDP, UN Habitat, UNHCR, Water Trust Fund, World Food Programme and Yumbe District Local Government.

2. Executive Summary

As of May 2019, East Africa (and Uganda specifically) continues to be the center of one of the world's largest and fastest growing refugee crises. Uganda's progressive open-door policy alone has led to an influx of approximately 1.4 million refugees into the country. High mobility of refugees means distribution and size of refugee settlements changes constantly and the need for standardized accessible information to make timely informed decisions about where services need to be planned and built becomes more crucial than ever.

Since 2015, the Humanitarian OpenStreetMap Team (HOT) has worked to address these challenges in Uganda; highly dynamic situations require creative approaches to capture population, infrastructure and services data and such information must be kept updated and publicly available for use by other actors in order to be useful. Through the use of open-source technical tools combined with a community-based methodology, HOT has been able to address the critical data gap in these contexts by increasing real-time comprehensive data production on infrastructure and services where refugees and host communities reside. To ensure that government and organizations involved in the refugee response know that, first, this data exists and, second, how to effectively use it, HOT has worked extensively to support and train actors on how to systematically incorporate citizen-generated data into their programs to address and fill existing gaps.

With 1,500,000 buildings and 36,000 km of roads digitized using satellite imagery and more than 4000 facilities and services mapped across refugee communities and hosting districts for the first time, this project has generated base layer maps that can now be used to guide government agencies and organizations in the design and implementation of interventions to respond to the refugee crisis in East Africa. Our field activities spanned 52 sub-counties and 33 refugee zones and engaged more than 550 refugee and host community members to map the services and facilities within these areas. Through our trainings with more than 20 partner organizations and government agencies, these beneficiaries learned to use a multitude of technical tools to leverage the use and value of the open data generated through our field mapping activities. These datasets are now available through OpenStreetMap, and exports via platforms such as the Humanitarian Data Exchange (https://data.humdata.org/search?q=hotosm+uganda). Trainings have been designed for and provided to 23 partner organizations across Uganda and in Tanzania.

This report highlight the tools and approaches implemented over the duration of this project with the local communities, partner organizations and government agencies we have engaged with in Uganda and Tanzania to better use and produce data to more effectively respond to the regional refugee crisis. Participatory, community-based efforts should underpin organizational planning and implementation to ensure sustainability and empower local populations while providing critical, current information.

3. Final Progress Report

a) By Nov. 30, 2018: Completely free and openly available base data layers in 11 refugee hosting districts and other identified priority areas

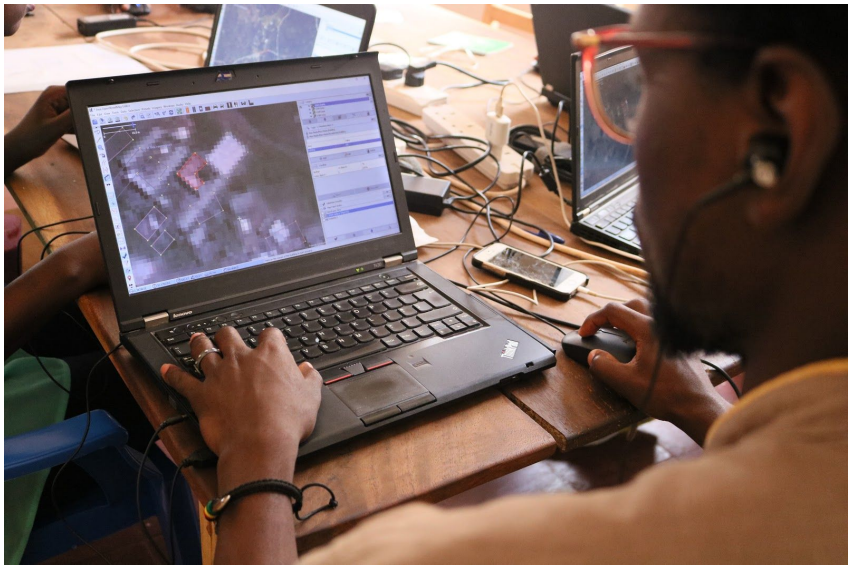
Building layers have been completed for **15 districts** in Uganda (Arua, Yumbe, Koboko, Adjumani, Moyo, Lamwo, Kyegegwa, Insigiro, Kikuube, Hoima, Kamwenge, Bundibugyo, Kampala, Bulisa, Kiryandongo). Of these, 6 districts (Hoima, Koboko, Kampala, Insigiro, Kyegegwa, Kiryandongo) were remotely mapped by the HOT team in Tanzania.

Five additional districts (Kisoro, Kasese, Bundibugyo, Nebbi, Zombo) have been *partially mapped* - this includes buildings and roads in major towns located in a 15km buffer from the border of Democratic Republic of Congo (DRC) - to generate and make available base layer maps of areas bordering DRC in support of the ongoing national Ebola preparedness plan.

Since June 2018, the following indicators have been reached:

- **1,500,000+ buildings** have been mapped
- **36,000+ km roads** have been digitized
- **4000+ facility points** have been collected (i.e. mapped health clinics, schools, etc.) by surveyors on the ground, further enhancing the value and usability of the citizen-generated maps to stakeholders.

All this data and information is available via the free and open OpenStreetMap database and is being made available to local and national government, NGOs, and anyone else interested in using this data. Easy to use exports for a wide range of infrastructure and services are available via https://data.humdata.org/search?organization=hot&q=Uganda in shapefile and GeoPackage format.



b) By Nov. 30, 2018: Training for up to 300 refugees and host community members in open data and data collection tools and techniques

Completed **training of 583 refugee and host community members** in open data and data collection tools and techniques. This number represents 137 refugees and 446 host community and government representatives who have been engaged with over the past year to map communities that have never been mapped before or who learned new tools and methodologies to generate and manage one's spatial information. Since the last monitoring questionnaire/report was submitted in March 2019, a handful of partner trainings and information distribution events (Map Share Back events - more on this below) have taken place across Uganda, including partner trainings with Lutheran World Federation in Adjumani district, Uganda Bureau of Statistics in Kampala as well as map share backs across 13 sub-counties in Yumbe district in northern Uganda, that have involved refugees, host community members and government representatives. These trainings are described in more detail in the next section.

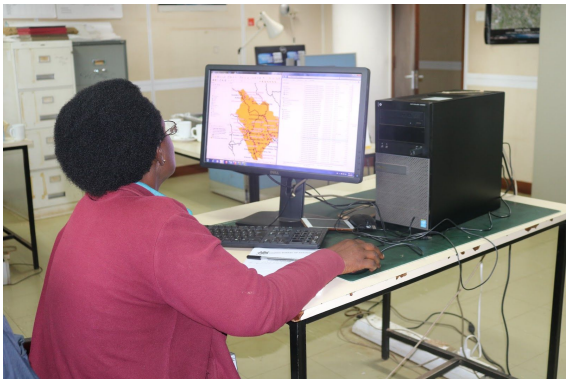
c) By Jan. 31, 2019: Capacity building for a minimum of 10 partner organizations working in Uganda and Tanzania and support as they incorporate open and citizen (refugee) generated data in their programs

-> Trainings have been designed for and provided to **23 partner organizations** in Kampala, across Uganda and in Tanzania.

Partner organizations who received technical training included: UNHCR, Office of the Prime Minister (OPM), Kampala Capital City Authority (KCCA), Finn Church Aid, Uganda Red Cross, International Rescue Committee (IRC), IAS, Action Against Hunger, Action for Africa Help (AHH), IOM, FAO, National Forest Authority (NFA), Danish Refugee Council (DRC), WFP, UN Habitat, Goal, Save the Children.

From January 2019, our objective was to engage with and capacitate a handful of partners with more tailored, one-on-one trainings to address a specific geospatial interest or need within their organization to support their response to the refugee crisis in East Africa. In Uganda, specifically, we deepened our engagement with 5 organizations who showed the most interest and commitment to developing their technical capacity to use open data and

open source tools. These organizations - Humanity & Inclusion, Water Trust Fund, Lutheran World Federation (LWF), Finnish Refugee Council and the Uganda Bureau of Statistics (UBOS) - participated in an ideation/survey process that enabled our team to identify what their training needs were. Once this was done, we developed tailored learning materials and training sessions that addressed their area of weakness; training content ranged from learning how to deploy and manage their own data collection to using their existing datasets to generate accessibility maps, for example, to support more targeted decision-making on where their services were most needed.



Our engagement with UBOS represents a particularly important use case; the government agency has invested a significant amount of time over the past 18 months to create more awareness and capacity within their institution around the use of open data and OpenStreetMap to leverage their existing data. UBOS staff have received a handful of two-day trainings through the duration of this project to learn technical tools to disseminate statistical data and other government data sets generated by UBOS as open data. From learning QField - a tool that enables demarcation of areas to support census activities - to a handful of data collection and visualization tools such as ODK, OMK and QGIS, these trainings strove to build upon (or review) UBOS staff' understanding and knowledge of applying these tools to enhance the effectiveness of their work. The government agency has specifically been learning technical tools to support the planning and design of the implementation of the national census in 2022; HOT intends to continue to support the UBOS team in the development of their technical skills and capacity to support these ongoing efforts.

In Tanzania, the HOT team implemented a two-week hands-on training with the National Bureau of Statistics - the national agency responsible for compiling and distributing census data - at their head office in Dodoma, Tanzania. The objective of this training was to capacitate senior GIS officers and other government representatives in using ODK Collect

'line tracing' (mobile) tool to trace and demarcate enumeration boundaries/areas in preparation for the national census in 2022. The two-week training focused on both a class and field component where participants, first, learned how to create survey forms to conduct field data collection and, then, travelled to an area outside of the capital city to collect data (i.e. trace boundaries) and experiment with the tool on the ground. While this activity was funded by another donor, we believe the impact of the HOT-led NBS training was valuable for a number of reasons; we created a greater understanding among NBS staff about how their activities - and the will to collect and analyze their own data - would allow for their achievements towards the SDGs to be measured more systematically and comprehensively.

These partner organization trainings - made possible through funding from the World Bank TFSCB - have enabled a handful of NGOs and government agencies in both Uganda and Tanzania to have a clearer and more systematic understanding of how to incorporate citizen-generated data and open source tools into their program.

d) By May 30, 2019 (instead of Mar. 31): Enhancements to analysis tools for decision-makers to incorporate OpenStreetMap data in a more systematic way, having global impact.

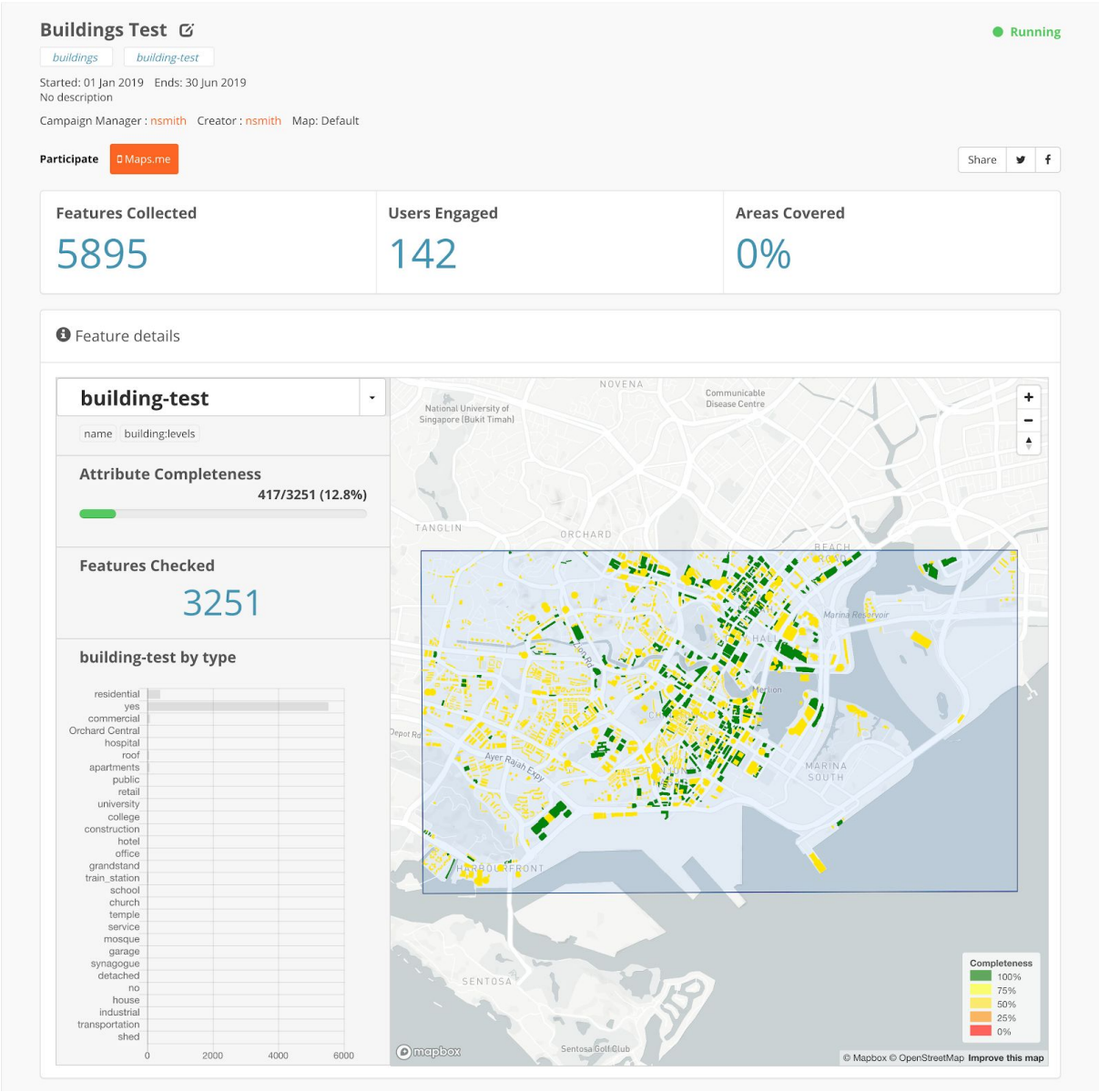
Our efforts to make enhancements to analysis tools for decision-makers were focused around the MapCampaigner OpenStreetMap monitoring application (https://campaigns.hotosm.org/). MapCampaigner development focused on two key areas:

1. user experience improvements, and
2. software performance and bug fixing. Improvements in these areas were based off of our user testing and feedback process to ensure input from direct users of the software.

For user experience we made improvements to the readability of the feature details section. The chart was adjusted to be horizontal to factor for the diversity of features that can be tracked. Additionally, we refactored the way the map data is show to improve how users interact with the data and the speed at which it is loaded. We added more statistics around user engagement. Users can now download stats group by day, by type, and by user to get a full breakdown of editing engagement. Lastly, we completely revamped the way campaign setup happens by changing how users interact with the YAML editor and example templates. The improvements to the setup have made it easier for users to quickly set the types and attributes to be monitored.

Furthermore, we put software development time into enhancing the performance of the data processing pipeline for users and address a number of outstanding software errors and bugs. We made improvements to the feedback to users when an error in the application has happened. Users now get an error message giving them insight into the issue. We revamped our data processing pipeline to create vector tiles for improved map loading and enable

larger areas to be processed. The Maps.me participation function was fixed to allow users to download existing data and use the markers as guides for follow up specific features to edit.



All new features can be seen here: https://campaigns-staging.hotosm.org/. Final testing is being completed and updated software will be made available to all users in June 2019.

e) By May 30, 2019 (instead of Mar. 31): An actionable set of guidelines, and updated "Open Mapping for the SDGs" GPSDD Toolbox guide

To document the lessons learned from the World Bank/GPSDD project as well as to support the understanding and sustainable use of OSM data by partners and local government, HOT updated the "Open Mapping for the SDGs" guide originally published in 2016. Since its original development, HOT and partners have gained valuable experience and documented case studies in the use of Open Mapping by local communities, governments, and other

partners. This update has allowed that knowledge and experience to be added to the guide and accessible in a format that is digestible and easy to use.

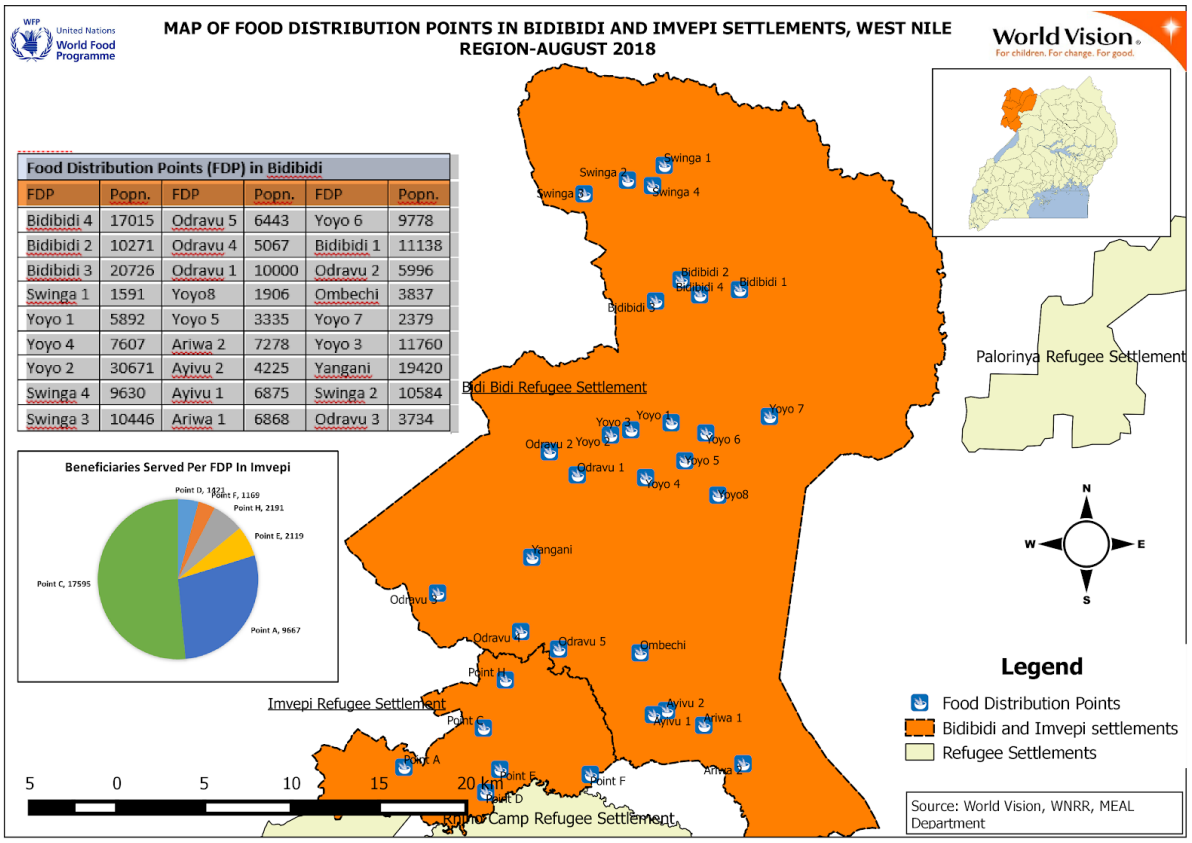
In order to promote sustainable growth of this knowledge base, HOT has transformed the Open Mapping for SDGs guide from a static document into a dynamic web-based portal with capability for PDF download. This new format makes the information more accessible, allows for updates to be made in the future and provides access to a greater range of resources, such as hands-on training, teaching materials, and tools. This updated version also contains an in-depth look at how organizations can focus their open mapping projects towards specific SDGs through targeted project examples and data models for more efficient implementation.

Because of the dynamic nature of the web-based portal and the ability to edit content, HOT intends to continue to build upon the tools, approaches and case studies that have been outlined in the initial version as projects and field activities are completed and publicly documented.

The newly updated Open Mapping for SDGs guide can be found at: https://hotosm.github.io/gpsdd-documentation/.

f) By Apr. 15, 2019 (instead of Mar. 31): Information products developed by the trained stakeholders will fill gaps in existing coordination mechanisms and information systems for the refugee response.

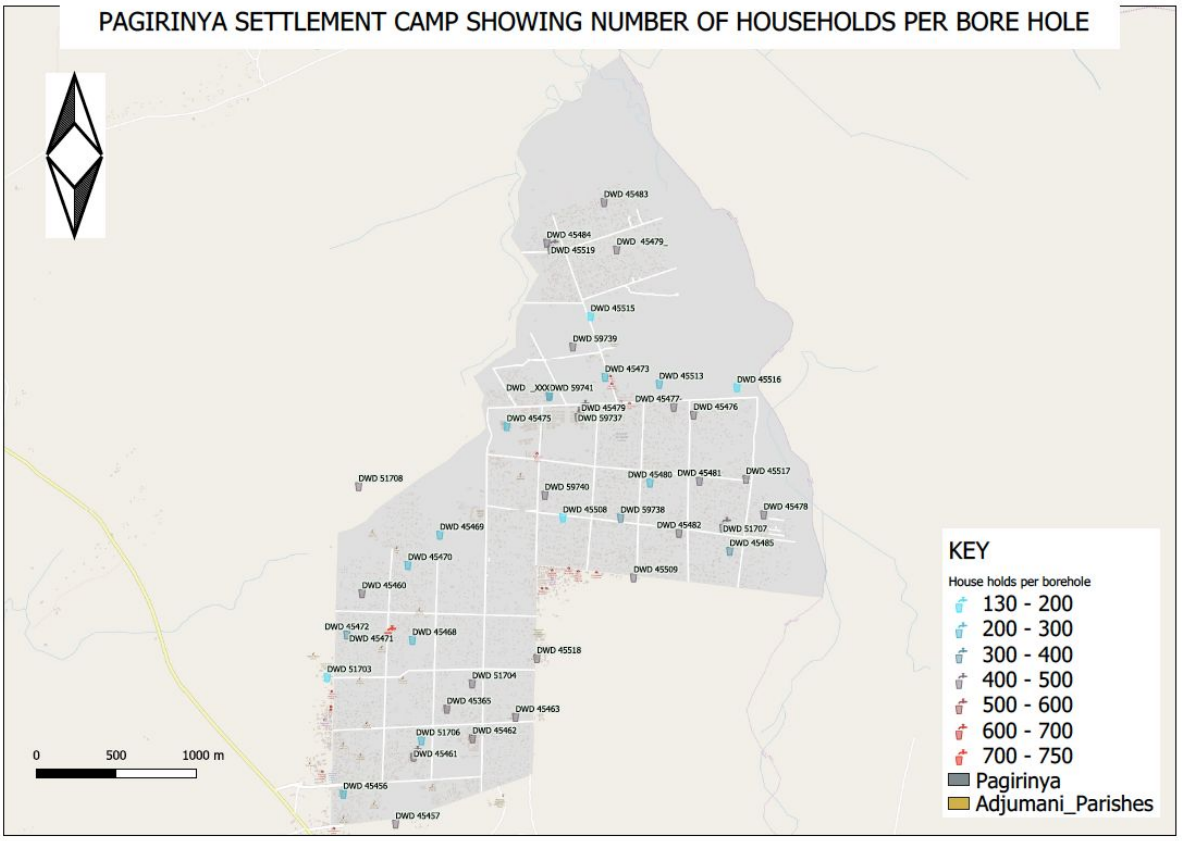
Through the numerous partner and technical trainings we have conducted, organizations have often shared their newly developed maps with our GIS lead and training facilitators for feedback, technical support or general comments. Below are a few of the information products we'd like to showcase in this report, developed by organizations that we have trained in QGIS to generate maps using either their own data or OpenStreetMap data - some of which was generated in northern Uganda in the early phases of this project.



*Map 1: This map was produced by M&E and Project Officers from **World Vision International** after a GIS training that took place in the West Nile region.*

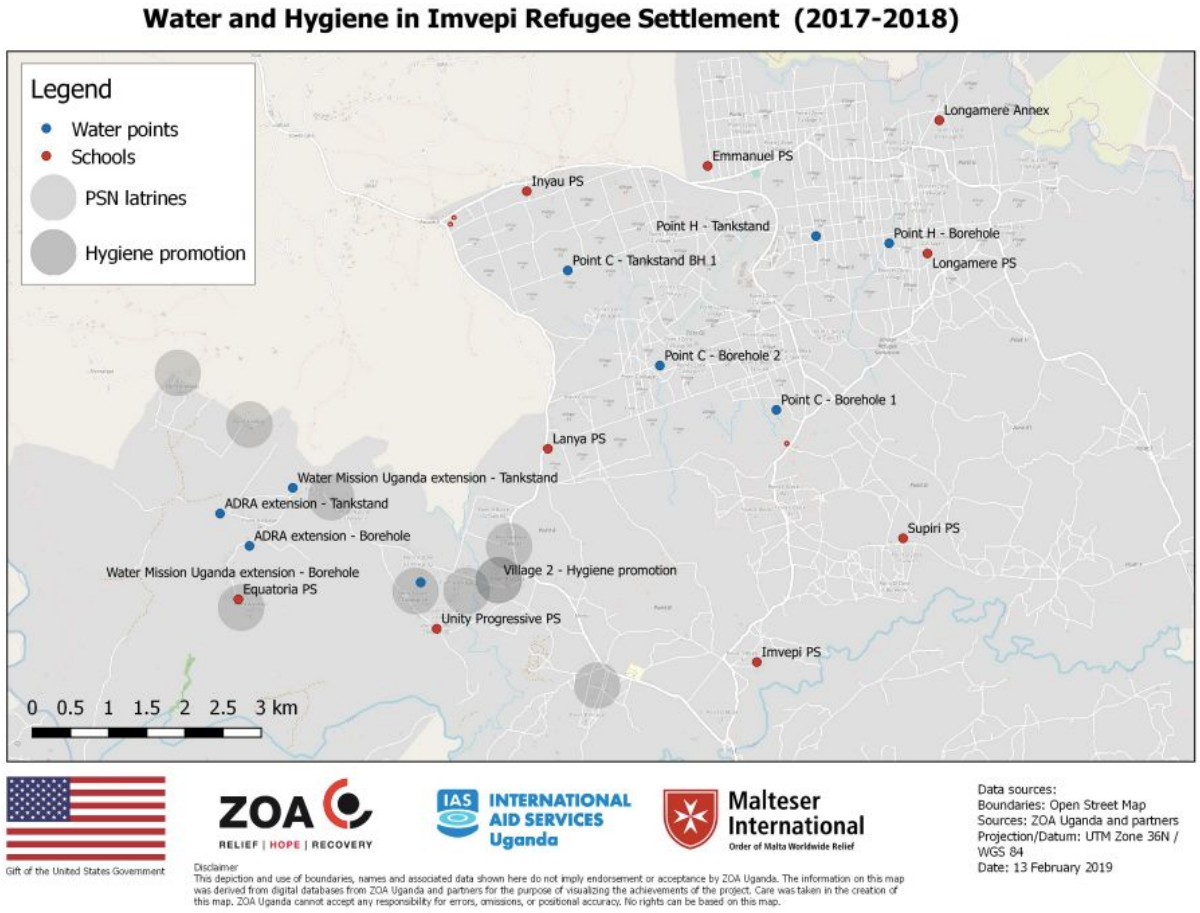
The map shows Food Distribution Points in Imvepi and Bidibidi Refugee settlements as well as population in order to identify the service and accessibility gaps.

Datasources: Combination of World Vision International and OpenStreetMap data



Map 2: This map, produced as part of the training for M&E officers and assistants of ***Lutheran World Federation (LWF)****, shows the localization and utilization of water points in Pagirinya Refugee Settlement.*

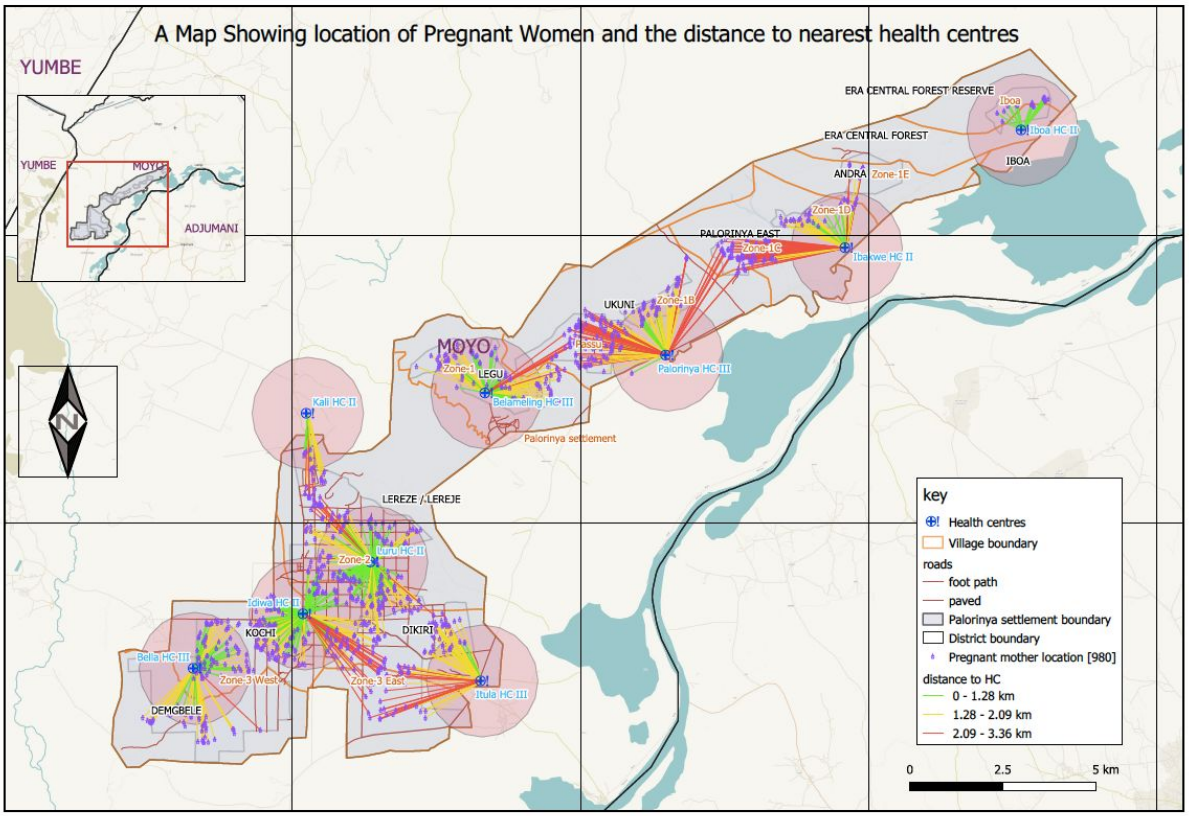
Datasources: Waterpoints with household information from LWF;
background image from OpenStreetMap and contributors



*Map 3: This map was generated by **ZOA** using data collected by HOT's staff during field activities in Arua district.*

The map highlights two things: the location of WASH points and schools in Imvepi Refugee Settlement as well as proposed buffer zones for where latrines for People with Special Needs (PSN) should be built and where hygiene promotion should be carried out.

Datasources: WASH and schools data from HOT
Boundaries from OpenStreetMap and contributors



*Map 4: Created by participants from the **Lutheran World Federation (LWF)** training in Adjumani district.*

It shows the accessibility of healthcare services for pregnant women in Pagirinya Refugee Settlement. The distance shown is a simple proxy measurement for accessibility of maternal health care services. The analysis was conducted using QGIS.

Datasources: Data on pregnant women from LWF household surveys
Health centers, ways, boundaries from OpenStreetMap and contributors

New information product developed for district-level leaders and decision-makers:

A hard-copy atlas containing all WASH and Other Facilities data collected by refugee and hosting communities in each sub-county of the 51 sub-counties in Arua and Yumbe districts since June 2018

Recognizing the rich datasets generated through our community-based field interventions, we made the decision to develop a district-level atlas that would combine all data and maps generated throughout the project and support decision-makers with a resource that could be referred to to guide their decisions.

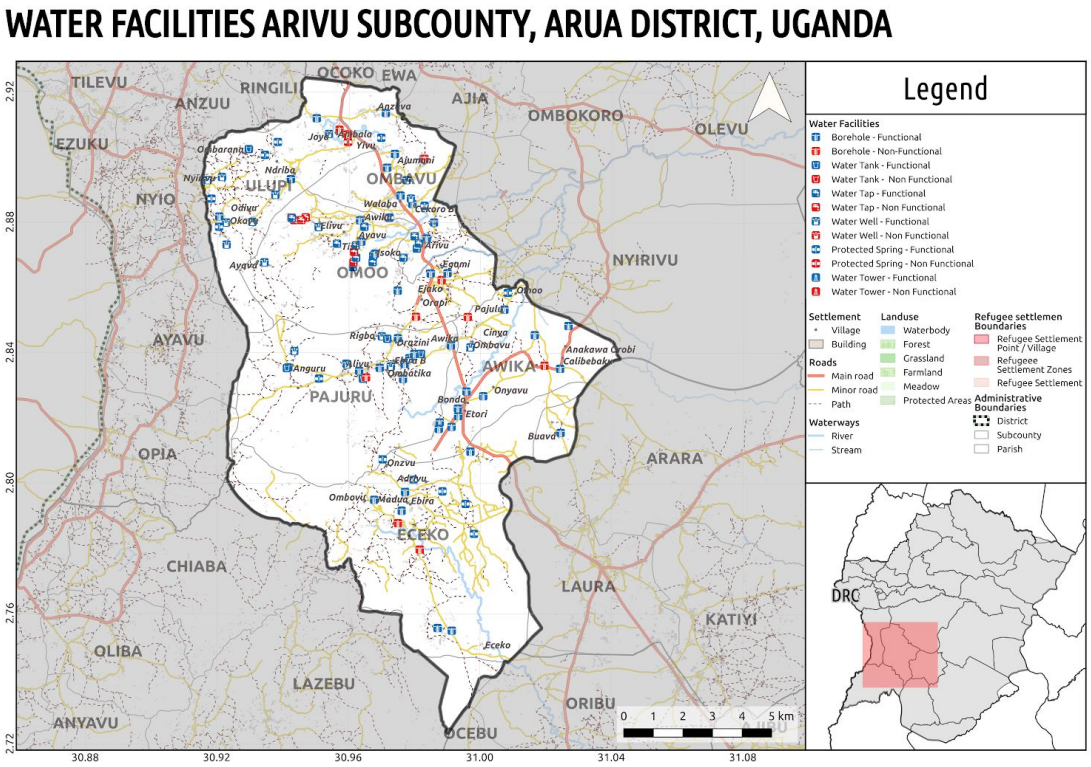
The atlas we developed contains 129 maps with introductory sections for each of the areas where field data collection was done; it covers the refugee-hosting districts of Arua and Yumbe, Kyangwali Refugee Settlement in Hoima District, Nakivale Refugee Settlement in Isingiro District, Rhino Camp and Imvepi Refugee Settlements in Arua District and BidiBidi Refugee Settlement in Yumbe District. This atlas will be distributed to the local government leaders in each of these districts, refugee settlement leaders, and other partners, such as the Office of the Prime Minister (OPM) and UNHCR who play an active role in the refugee response in Uganda.

The maps contain information on water, education, health, community centres, and other important public facilities in each sub-county. Some of the maps also show each district's measure towards achieving four SDGs;

- Goal 3: Good Health and Wellbeing for people
- Goal 4: Quality Education
- Goal 6: Clean water and sanitation
- Goal 11: Sustainable Communities.

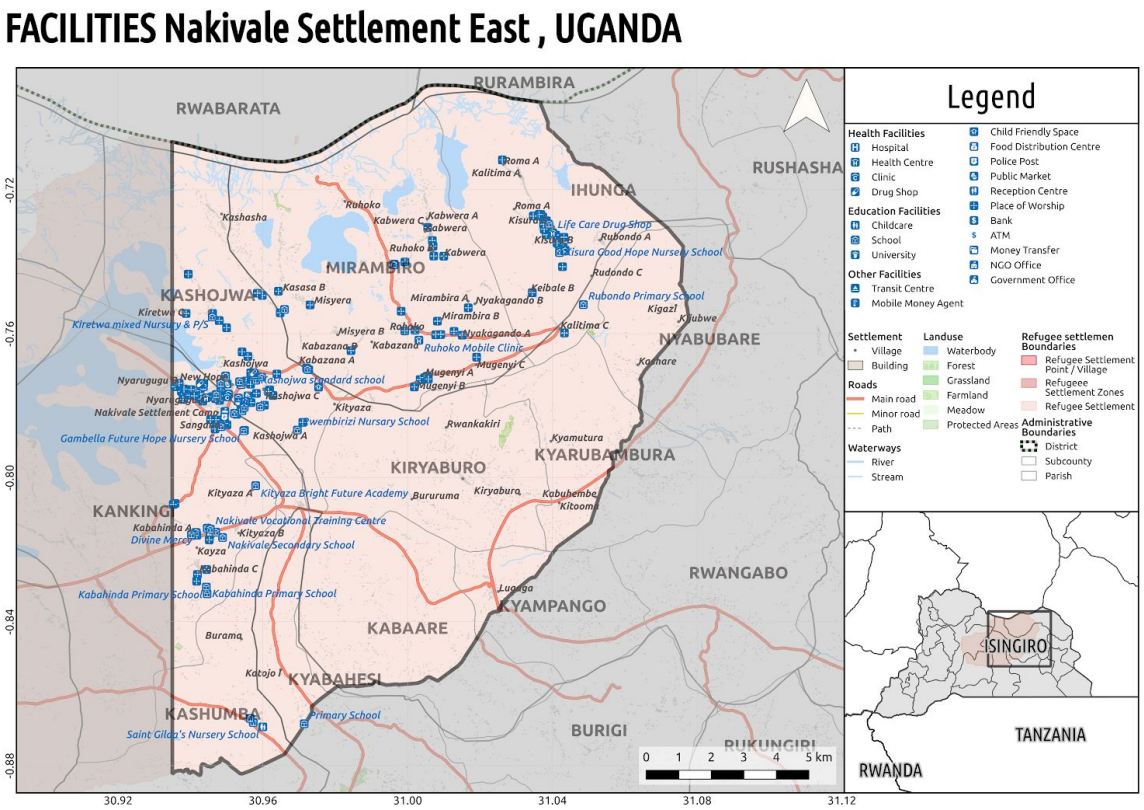
The availability and use of this information, particularly in a hard copy format, will be vital in assisting local government leaders at both the district and sub-county level to quickly assess where services gaps exist and how additional resources can be allocated more appropriately given the data.

The following section highlights four of the maps which belong to larger atlas; each map is accompanied with text to highlight what specific data it contains.



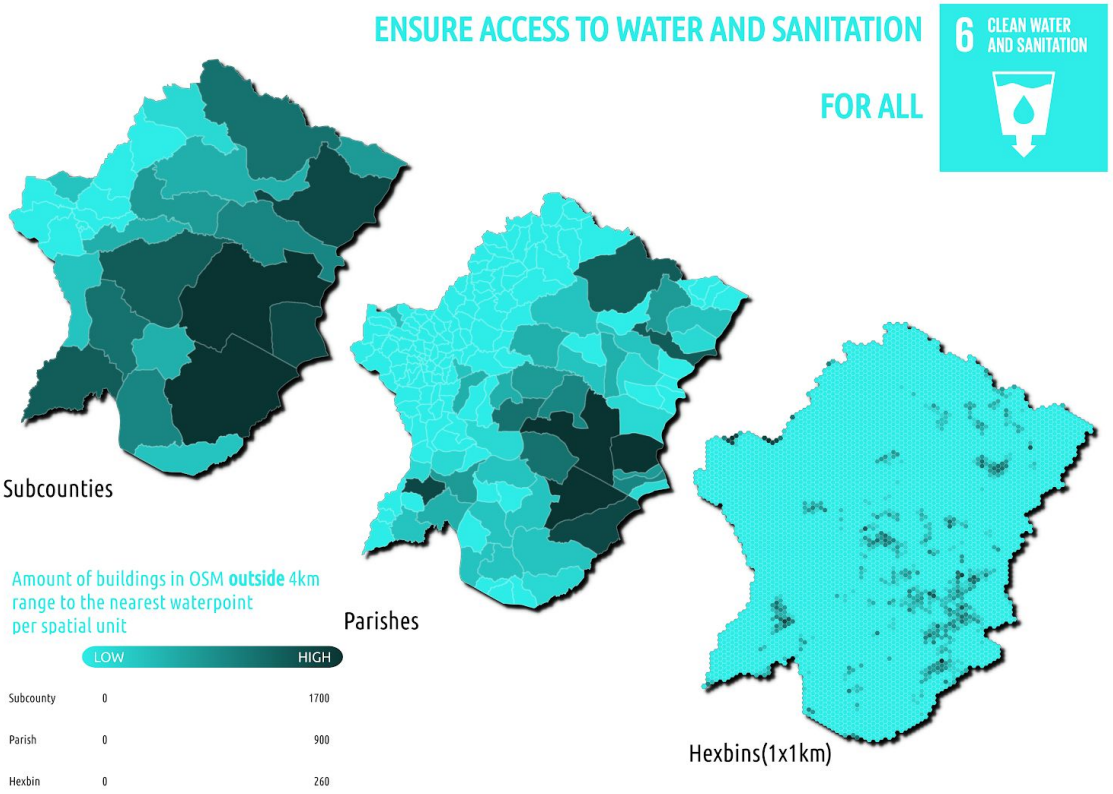
Map 1 from the HOT Arua and Yumbe District Atlas: Water Facilities map for Arivu Subcounty in Arua district.

The map depicts all water related entities in the sub county. It is underlain by a basemap consisting of the most important features as roads, buildings and boundaries.



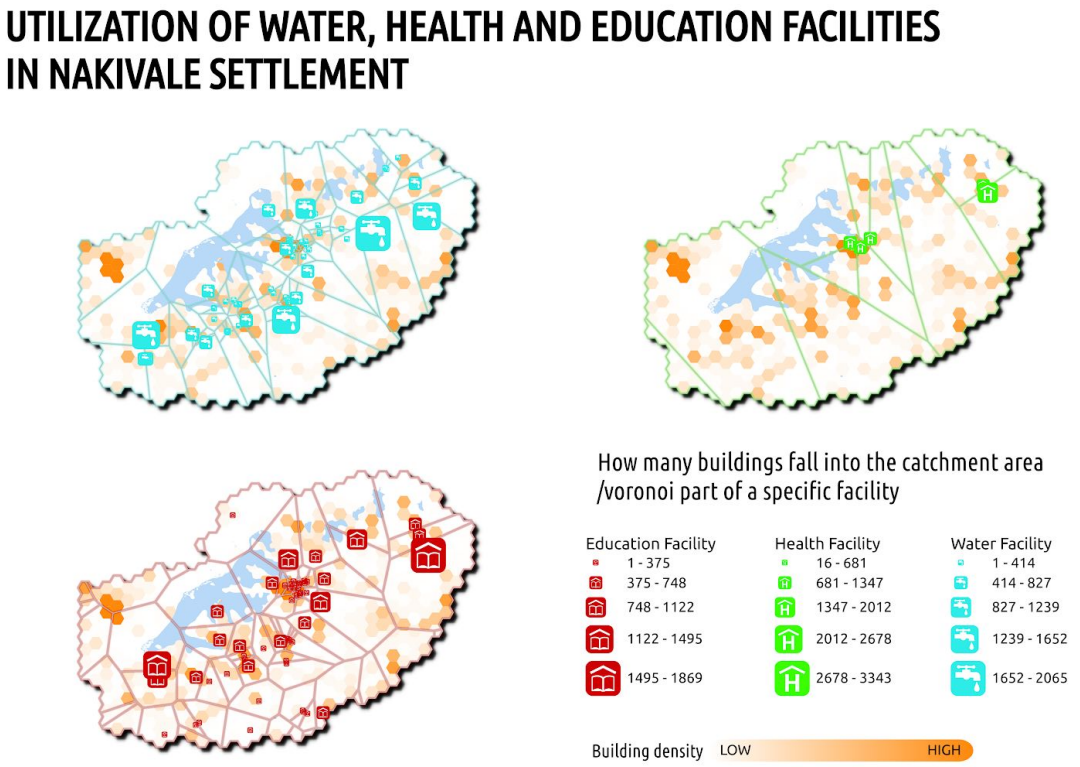
Map 2 from the HOT Arua and Yumbe District Atlas: Facilities Map for Nakivale Refugee Settlement East in Isingiro, Uganda.

The map shows where the most important facilities are located in the settlement; these facilities include health, education and other (government, financial, etc.) related entities.



Map 3 from the HOT Arua and Yumbe District Atlas:
This is a visualization of water accessibility in Arua district.

For each area unit, the amount of buildings outside a 2km perimeter is presented. Due to the granularity of OpenStreetMap data, we are able to gain a better understanding of where the underserved areas in a given sub-county, parishes and hexbins are. This, in turn, provides greater insight to those who can use the data to make decisions on where the greatest need for accessing water more easily is.



Map 4 from the HOT Arua and Yumbe District Atlas: a visualization of utilization of water, health and education facilities for Nakivale Refugee settlement, Isingiro, Uganda.

Visualization of the utilization of water, health and education facilities for Nakivale Refugee settlement, Isingiro, Uganda. Voronoi diagrams for each type of facilities are used as catchment areas for buildings/households. The symbols represent how many buildings/household most likely use a facility. Once more, the granularity of OpenStreetMap can help us better understand where services and users are located which in turn can help to allocate additional services where they are needed most.

4. Lessons Learned

The following section highlights the lessons we have learned while implementing this program over the last 18 months. This ranges from becoming more intentional about how an intervention is designed and implemented, to learning how genuine capacity within an organization - either internally or amongst a partner, government or local community - is built and sustained, each phase of this program has provided us with greater insight and confidence to be able to replicate, scale and adapt our activities to different contexts with more effectiveness.

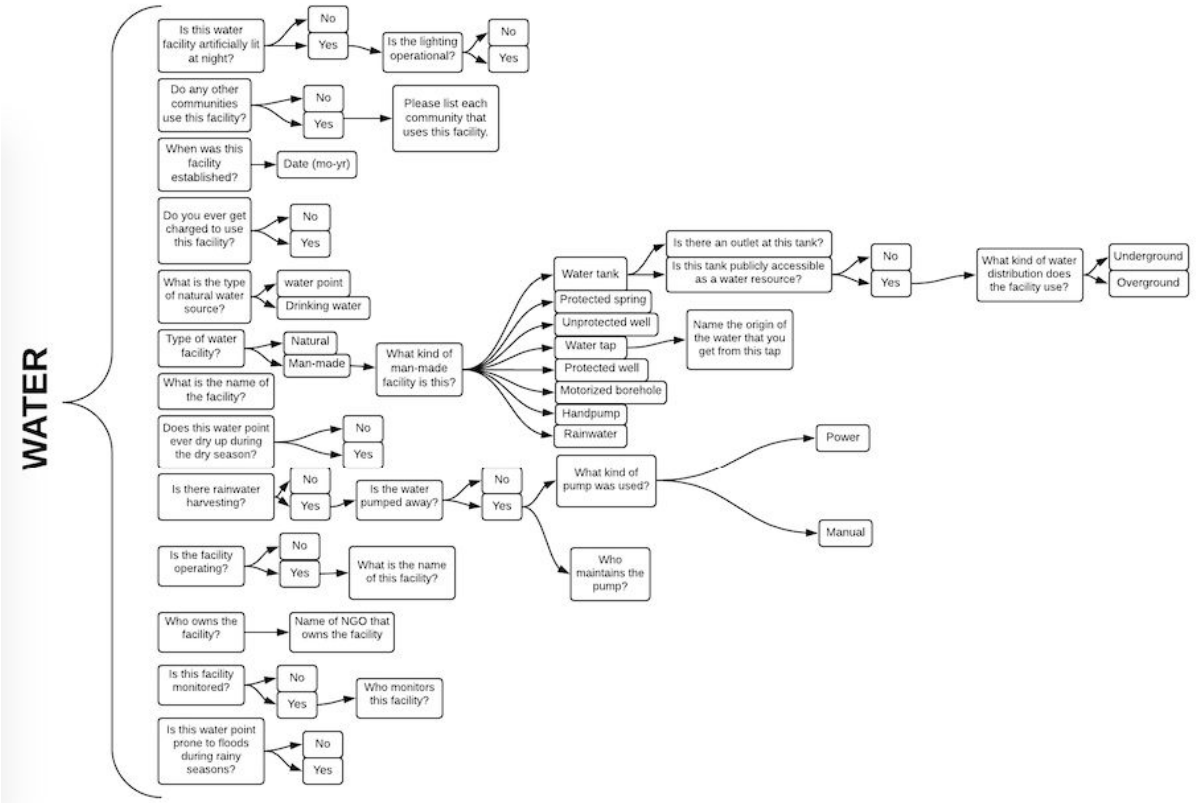
To make data (open data, open mapping, OSM) actionable and valuable to partners, it is crucial the needs of the partner and local government are understood and addressed to guide the design of an intervention.

Before any data collection and field mapping activities can be initiated, a specific area (district or sub-counties) must be identified and remotely mapped to create a base data layer of buildings and roads that will be used to guide the actual mapping. At this stage, it is crucial to engage with actors on the ground to assess where the greatest needs are for more comprehensive and up-to-date data. If you simply choose an area or region to prioritize without consulting existing partners and local government who are already working to serve communities in these places, you run the risk of generating data that is either redundant, a duplication of existing efforts or even controversial if you're missing the (political or social) background context. In this project, districts and settlements to be mapped were determined by Uganda's Office of the Prime Minister (OPM) - who is responsible for registration and allocation of land to refugees - and UNHCR according to data needs they identified in the refugee-hosting districts. Priority was also given to the refugee settlements in Northern Uganda (West Nile) based on data needs identified by UNHCR, NGOs, implementing partners and governing body, like OPM, in their quest to improve their project planning and service delivery (water, food distribution, health care, etc.) through the use of more comprehensive data.

When thinking about *what* exact data be collected (or places be mapped) in refugee-hosting districts and settlements, it is equally important to address the data needs of the existing stakeholders. Taking the time to research, discuss and understand these actors' needs will ensure the information being collected would be useful, able to fill gaps in their understanding of the physical environment and, ultimately, lead to actionable data being generated that can be used to more effectively respond to the needs of a given population.

The following image represents one set of questions relating to the mapping WASH facilities or points that belong to the much larger survey flow chart which makes up our survey. Developed in collaboration with UNHCR's Information and GIS team and the Office of the Prime Minister (OPM), the flow chart intends to demonstrate the logic and reasoning behind

different questions being asked during field mapping activities in refugee and hosting district communities.



Experimenting with new approaches - whether activity design or partner outreach - can be insightful and rewarding, but also time-consuming. Important to be mindful of project timelines.

In the first five months of the project, our approach to identifying partners to train involved reaching out to organizations - that we either already knew or whose activities we were familiar with - and asking them about their understanding, use or interest in using OpenStreetMap, open data or tools in their programming. After speaking to a handful of organizations - who we were confident would benefit from additional training - over the phone or through email, we scheduled these sessions, prepared and delivered these trainings and, in all cases, received positive feedback from organizations about what they had learned. This approach, however had its constraints; we were limited to the organizations that we knew or had contacts for and because communication via telephone or email can limit one's ability to truly understand the challenges and technical gaps being faced within an organization. Recognizing these constraints, we engineered a new approach to reaching out to partners that would provide enough initial information about each organization's current use and interest of OpenStreetMap that we could follow up on.

We developed a Google Survey form[1] that would be shared with relevant staff from each organization to assess their understanding and use of OpenStreetMap and open data in their programs as well as their specific technical needs to be able to incorporate geospatial tools and methodologies into their activities more effectively. Additionally, we developed a crowd-sourced Master contact list of focal points, GIS and Information Management personnel and field staff from more than 60 organizations supporting the refugee response to share the survey with. With more +30 responses from different individuals from various organizations, we established a knowledge base of organization's activities, their current use of open data and tools and gained a better understanding of their needs and interest in learning, for example, how to generate their own data, downloading OSM data to supporting their activity implementation or even uploading their own data to OSM.

Changing one's activity implementation approach mid-project can be risky but doable if done with enough foresight and planning. By determining as a team that our 'partner reach out' approach was not working as well as it could and considering how much time remained in the project, we switched gears and worked diligently to build a Master contact list using our networks and our partners' networks. In between developing this Master contact list, developing in "OSM Partner Outreach Survey", sharing the survey with partner organizations and receiving responses that we could follow up on with more relevant questions relating to their programs, we spent three weeks refining a process that wasn't working well. As a result of this, however, we were able to engage more deeply with multiple partner organizations about their interests, perceived technical gaps and training needs - with most not even falling within our immediate network - by identifying and catering to their specific needs more precisely.

Dedicate time to understanding the beneficiary's interests, needs, technical gaps and existing 'champions' before designing a training program for them.

A question that often came up throughout the project was, how we could support more effective use of OSM/open data with selected organizations responding to the regional refugee crisis. Asking partner organizations to fill out the OSM Partner Outreach Survey allowed us to gain a better understanding about the user's interests and institutional needs to incorporate geospatial tools and methodologies into their programs. What happens next is most important: extensive engagement with beneficiaries (local partner, government agency, etc.) to identify the particular problem or challenge they are facing and are keen to addressing with open data or tools. Using the OSM Survey responses as a starting point, our team spent a considerable amount of time going back and forth with beneficiaries - either on the phone, through emails or in person - working to understand how more technical approaches could be incorporated into their workflow to maximize the impact of their efforts.

[1] This Google Survey form was created to better understand partners' understanding and use of OSM data and open source tools. Survey can be accessed here: *https://forms.gle/YPME49ATq51Le3DX8*

It became clear that most, if not all, organizations are keen to provide their staff with new skills in order to improve their programs but often times, when an institution receives free training from another organization, it can resembles a 'one-size fits all' situation. When training materials are not adapted to the participants' background knowledge and existing skill level, the opportunity to genuinely learn a new tool that can be applied independently (post training) is often times lost. Asking questions about the roles and responsibilities of the training participants and their general understanding of the tools, before the training, enabled us to develop tailored content that was suitable and specific to each group.

In addition to understanding the specific problem an organization was trying to address, the extensive engagement with our beneficiaries also consisted of co-identifying the most suitable tools and co-designing the training materials. This was further validated when there was someone within the organization who was 'championing' the adoption of specific tools or technical skills to enhance the impact of their existing work. Through trial and error, we learned that involving an organization in the content development of a training engagement led to more buy in and investment in the successful implementation of a session. By investing time to understand beneficiaries and their specific need or interest -as early in the process as possible - these findings have guided us in developing tailored training materials that fit their needs and that could be used as resources to refer back to at a later time.

Create mechanisms to gather feedback from participants about your approach and training materials and recommendations for how to improve the overall quality to inform planning the next training.

Aside from being able to assess how useful and practical training is to participants, we created a Post Training Survey to help us understand where there were opportunities to improve the quality of the content, the delivery of the training and its overall usefulness to the work participants do. After each training engagement, participants were asked to fill out a Google Survey form, that asked them to rate the quality of the training from 1 to 10, how they think they'll apply their newly developed skills to their existing work, etc. Our team would then analyze these responses and incorporate the most practical and valuable

feedback into planning the next training program. In the early stages of this program, for example, whenever we planned a partner training we would create presentation slides/deck for the session but refrain from distributing the materials to participants afterwards. The reason for this, is because the presentations were missing the level of detail that one - who didn't actually attend the training - would need to self-learn the material as most of the sessions involved hands-on exercises with a facilitator providing in-person support. With multiple training sessions under our belt, we quickly learned that many participants still wanted the training materials to be able to refer back to when either reviewing the content or being tasked with training their peers. Understanding the need and availability of good quality training materials, we began developing our training content in a way that someone - who wasn't physically at the training - could open the presentation deck and follow along in order to self learn. This valuable piece of feedback, along with other participant responses, have given us direction in planning our partner engagements; from considering the length of trainings and the types of exercises (theoretical versus practical) to incorporate to what ways we could improve our trainings in the future, asking participants for their anonymous feedback can go along way in improving one's approach to providing training and capacity-building sessions to other organizations.

Refugees and host communities have been instrumental in the implementation of our field mapping activities; there is a great need for programs and donors to be cognisant of the roles these groups *can* (and by all rights, should) play in identifying service gaps and issues in refugee camp/hosting district contexts.

HOT's general approach to engaging with communities is simple: local people, local devices, just add (open) knowledge. We have come to understand that most people are invested in the development and well-being of their communities and would, if the opportunity was presented to them, take part in addressing issues to improve their communities. Often times however communities lack the platform to bring such issues to light. The implementation of field mapping activities across the country could not have been done without the full support and participation of the local communities who live in these districts. Because local community members, whether a refugee or someone from the host community, have the local knowledge about a place and expertise on how to best engage with service providers or other actors in a given sub county, it was vital to leverage the capacity and existing

networks of these groups by involving them in the project. Through technical training on data collection tools using their personal smartphones combined with 'standby' support via Whatsapp to address such technical issues as they arose, refugees and host community were eager and capable to map services, facilities and other points of interest throughout the sub-counties that we worked in.

In many instances, we learned first hand that people within a community are more open to answering questions about a specific point of interest (POI) and its features - whether at a primary school, a borehole or a mobile money stand - if the questions are asked by people who they already know or are familiar with. Often times, it is these same people - the surveyors - who will be much more informed about the location and operational status of a POI and can identify the person/group responsible for maintaining it than someone from outside the community is. The lesson is simple: do not underestimate the power of local knowledge and tools or the value of existing networks to generate data that is useful, meaningful and can be used to support interventions across different contexts.

Though it depends on the technical tool being taught (i.e. OpenDataKit (ODK) Collect, QGIS, etc.) and an institution's availability, training sessions are most effective when delivered over multiple days versus one-day engagements and most engaging when done in smaller versus large ones.

HOT's multi-day training sessions stretching beyond one day events were received most positively by participants. Our team learned that multiple sessions enabled participants to become familiar with the content and as a result feel committed to investing time and energy into the learning

process. The 'lengthier' training sessions - those taking place over multiple days - created a space for more collaborative and hands-on sessions where participants seemed to become more comfortable with learning through practice, asking questions and becoming eager to tackle problems alongside their peers. In example, the ways in which staff from Humanity & Inclusion produced an output in the form of a mobile survey in XLS format and the QGIS maps produced by Lutheran World Federation staff exemplifies what is possible when trainings last more than one day - genuine capacity building. Because of this, well-structured training sessions over multiple days not only enhance participants' commitment to the sessions but also lead to greater success in project implementation as participants will have genuinely gained new skills from the engagement.

Make it a priority to return to the communities you've engaged with to validate data, update information and giving them an opportunity to provide feedback on the final information product their local/host/refugee communities supported to develop.

Over the last twelve months, the HOT team has witnessed the rapid change and development of available services and facilities in both urban and rural contexts across Uganda. In refugee and hosting district environments, especially, the rate at which the availability and distribution of services and infrastructures are changing with respect to their names, organization/institution responsible for its maintenance, functioning status, etc. has been astounding. Understanding the value and importance of validating community generated data (i.e. verifying the existence, location and functionality of services and facilities) to support evidence-based decision-making, we have prioritized returning to sub-counties in both Arua and Yumbe district over the last six months to conduct such verification and map share-back exercises with local leaders.

These activities, referred to as "Map Share Backs," have been useful for a number reasons. First, these activities have enabled our team to collect vital feedback on recent changes in a given sub county with respect to available services and facilities, updating spelling errors,

change in names, etc. Through this process, infrastructural updates and/or changes are recorded and later taken back to our office, fact-checked by our team and incorporated (updated) in OpenStreetMap. These hard copy maps remain in sub county offices, often times to replace the hand-drawn maps that leaders use to guide their every day decisions, until we are able to produce an updated version and send it back to them.

Second, these Map Share Back sessions have been invaluable as they provide local leaders an opportunity to interact with and ask questions about the work that was conducted in their sub counties. Local leaders, in both Uganda and Tanzania, have consistently expressed their gratitude to our team for returning to their sub counties and presenting to them the final (map) products created through the participation and support of their local communities. We have learned through these interactions that, in many cases, actors who conduct work in a given place simply "take information" but never return to these communities to confirm whether the final outputs reflect communities' true needs or interests or even share the results of final work. Though there are additional costs associated with returning to communities to fact-check and confirm the validity of the work that's been done, the benefits of such activities are manifold: increased trust between local communities and an organization about how their contributions are translated into a product, heightened sense of engagement throughout the process, less resistance to participating in future activities, and so on.

Having a solid work plan for implementation is vital to achieving your goals, but willingness and expectation to deviate from the original plan and adapting to existing conditions is equally important.

Although having an activity implementation plan is useful and strategic, the willingness to respond and adapt to the actual conditions - that may or may not be reflected in your initial plan - is an equally important factor to project progress. There have been many instances where we had developed a work plan to conduct meetings or field mapping in refugee settlements or hosting districts in northern Uganda that we were forced to deviate from because an activity area was larger or more densely populated than we realized or because local leaders were not available in their offices when we arrived to obtain permissions. The

lesson? Plan and expect for delays and always have multiple contingency plans to ensure the team's time and energy are maximed and useful to the mission.

Because the geographic area of the places we have mapped can vary in size and density, we often to resort to boda-bodas, also known as motorcycles, to split the field mapping team between sub counties in order to cover as much ground as possible on a given day. This strategy often worked well when we could get a team to a central location and hire and launch bodas from there. However, when distances (from where our field team stayed) to the center as well as between sub counties became bigger, bodas were less efficient due to extensive dust and condition of the roads in these environments. In these cases, despite having an initial plan, we would quickly have to return to the drawing board, update our travel plan using the field car and decide what the most practical order of visiting sub counties and dropping off field staff was to conduct mapping activities that day.

On a similar note, despite making arrangements and setting meetings to visit local leaders or administration before arriving in a given sub county, it is important to note that nothing is set in stone. Things may come up and local representatives may not show up, answer their phones, fail to ask someone else to cover for them while they're out of office - and it will be up to your team to make the most of this time to ensure you're able to meet your objectives and intended mission while you are in the field. We learned to tackle such scenarios by having a designated 'Community Meeting Coordinator' who could quickly call another leader in the next sub county, for example, and schedule another meeting to ensure our time was spent usefully.

The original proposal that HOT submitted for this project focused on the implementation of field mapping activities in both Uganda and Tanzania. In the first few months of the project, however, we learned that the need for such interventions in Tanzania were comparatively less than in Uganda. Despite conducting a scoping exercise in the Kigoma region of Tanzania to explore how mapping could support the use and availability of data by partners part of the existing refugee response, no significant refugee arrivals had materialized and no immediate need was indicated by the local UNHCR office or local partners. We anticipated field needs in Tanzania due to the Burundi and DRC situations but the context in Tanzania remained relatively stable while the refugee crisis in Uganda exploded. In Uganda, an

additional 150,000 refugees arrived from South Sudan and DRC in 2018 (https://data2.unhcr.org/en/dataviz/66?sv=0&geo=220). It quickly became clear that our efforts and interventions would be more valuable and impactful in the Ugandan context and that shifting the focus to field mapping interventions in Uganda would allow us to be instrumental in generating the data that partners could use to support the refugee response. The willingness to adapt our initial work plan to respond to the actual problem - the lack of available data of services and facilities in the refugee and hosting district communities in Uganda - afforded us the opportunity to generate data that would be useful to partners on the ground working to serve the affected populations.

Built organizational capacity within HOT by bringing selected Tanzania staff to Uganda to participate in the development and implementation of activities in order to support similar future interventions in Tanzania.

Despite learning that HOT's efforts to implement field mapping interventions in support of the refugee response would be more impactful in Uganda than in Tanzania, we were still keen to involve and leverage the Tanzania team and their unique expertise in the program. Between November to March 2018, eight staff from Tanzania were stationed in Uganda to assist with upcoming field mapping activities and partner training engagements. Before this project, the HOT staff in Tanzania had limited experience with implementing field mapping activities in a refugee and host community context as most projects in country have focused more on development related initiatives. This project provided members of the Tanzania team first-hand exposure to how participatory mapping activities are planned and executed in a more humanitarian context. From training refugees and host community members in Nakivale Refugee Settlement in southwestern Uganda to use their smartphones to collect WASH, health and education data to visiting communities in Arua district in northern Uganda to share back the maps that had been developed for sub county leaders, these experiences have prepared the team to be able to design, execute and document similar activities in Tanzania in the future.

Scaling to western Uganda for a new project (IOM); applying the multitude of lessons learned from this project to replicate and scale activities both effectively and strategically in other parts of the region.

Starting in June 2019, the HOT team will collaborate with the International Organization for Migration (IOM) on Ebola virus disease (EVD) preparedness between Uganda and DRC. Combining participatory mapping activities with open source tools to be able to identify gaps in personnel, available health supplies, infrastructure, etc. at multiple Points of Entry (POE) along the border of Uganda and DRC, HOT's mission is to capaciate and support existing district level POE information frameworks and personnel to gather and disseminate POE data more efficiently to enable decision-making at the Ministry level more quickly. In other words, our intervention will support the Ministry of Health and other relevant actors in Uganda supporting the Ebola response with faster access to data from the border crossings between these two countries which in turn will enable more efficient decision-making on what gaps need to be addressed when and how. Having experimented and refined our approach to community based mapping in hard-to-reach places with low-tech tools through the World Bank/GPSDD project funding, our team is now in a position to replicate this methodology to support Ebola preparedness plans in Uganda. From understanding how to effectively manage and coordinate community-led field mapping to identifying the best framework to cleaning field data (as it is coming in) to ensure the high, usable data quality, these best practices will enable us to replicate and scale our interventions in different contexts to address different problems with confidence.

5. Risk Mitigation

Did you need to address any risks? If yes, what were the risks and how were they managed or mitigated?

Risk elements include usual rural field-surveying risks (wildlife, dehydration, etc), and so surveyor protection and security in the field are a top priority. Frequent check-in intervals, both in the field and outside of work hours when not in Kampala, are enforced and observed.

Remote personal/team support is necessary at all times, and communications are conducted over live WhatsApp channels, which are monitored 24/7 during all field-mapping periods and include regular (at least twice daily) check ins of staff.

Extensive sensitisation of surveyors, as well as consistent and close supervision, with hourly digital location reporting (OSMAnd) each day in the field is enabled by our data collection methodology.

Community entry is performed through local district authorities, and awareness communication from local government bodies is requested and confirmed before fieldwork commences. This procedure entails senior management securing all permissions to conduct field activities with relevant stakeholders before the field team and surveyors hit the ground.

Night travel to and from the field is minimal, and careful scrutiny of transport means and mechanical inspection of field transportation is carried out in person by the Country Management Team before and after all field activities.

6. Output Indicators

Have there been any final results or outcomes in which data or methods have allowed data to be produced: faster; more cheaply; at a higher resolution or granularity, or where there was no data before?

Over the last year, we have continued to engage with and provide training to refugees and host community members to map their own communities while simultaneously improving our approach and methodologies to produce citizen-generated data. Refugees play a key role in this data production having detailed knowledge of the informal systems, facilities and infrastructure that exists where they live. While many humanitarian, development and government agencies haven't yet systematically leveraged their capacity - the HOT team has. Our approach enables refugees and local host communities to share their knowledge in an organized, interoperable, systematic way that has proven to be a cost-effective solution to fill current data gaps in the refugee response.

There has previously been little or no data available in any of the areas now mapped by the project. Where data has existed, HOT methods have proved cheaper and better than any other methods previously implemented. As previously mentioned, in both contexts, the local knowledge of our surveyors are leveraged to enable efficient and high-quality data collection in communities, by the communities.

The feedback methodology with which maps are made available and data is validated by communities has increased trust and cooperation between the HOT team and these groups; this reputation enabling better, faster and more respected map products.

The scaling of field mapping into new areas is accelerated exponentially by peer-learning: expert refugee surveyors are introduced to new surveyors, creating trust, understanding, respect, and empowerment, as well as social cohesion between communities. This leads to better, more detailed data being made available by the communities. The speed at which mapping happens, when co-led by other 'veteran' community mappers, proves the value of this method.

Has the project contributed to the production and/or use of data disaggregated by a) sex b) disability c) age, d) geography (or other)?

Mapping of wheelchair access as part of the Sanitation, Education, Health and other surveying has contributed to data relating disability.

The collection of pharmacy data also renders a layer of sanitary supplies provision and is particularly relevant when evaluated in conjunction with secondary schools. Female surveyor performance statistics are also trackable across all field projects.

Distances between communities and Education, Health, WASH, social amenities, and Cash-Based Interventions were visualized to better understand the different communities; some of these outputs will be featured in the district level atlas for Arua and Yumbe to

encourage decision-makers to advocate for greater accessibility in places where this is lacking.

Population density buffers, administrative divisions, distances, and narratives were also frequently visualised across many map products to identify patterns and gain insights from the collected data.

Has the project contributed to the use and/or production of gender statistics?

The surveying of 'Lit' and 'Un-Lit' service installations in refugee and host communities leads to an analysis layer with which the common problem of sexual and gender-based violence against young women (and men) in those communities can be addressed.

Data collected on health facilities in multiple district across Uganda combined with the geographic location of villages highlights the distance that citizens, particularly women, must travel to access health services. Maps, like these, can be used by local leadership to advocate for services in places they are lacking for, again, particularly women.

7. Media Coverage

Output Type	Dates	Publisher	Name	Description
Presentations	Feb 2019	HOT	"Bridging the Gaps in Development and Emergency for the Refugee Crisis in East Africa" Link	Developed for a GPSDD/WB Lightning talk, this presentation deck provides an overview of the following project related components: the goals, objectives, partners we have interacted with, tools and techniques used, sustainability campaigns carried out and lessons learned.
Presentation	April 2019	HOT	"With, by and for refugees: Participatory Mapping of Uganda's Refugee Hosting Districts" Link	Developed for a session for ICT4D 2019 in Kampala, this presentation deck provides a general overview of HOT's various projects and activities in Uganda's refugee hosting districts as well as the country's national vision and plan with respect to the refugee response. The presentation also highlights the gaps that still need to addressed with respect to data usage and availability in the refugee responses.
Social Media			Twitter account: *hotosm_uganda*	HOT Uganda's Twitter handle. This platform is used to share project updates and content relating to HOT Uganda's field activities, training sessions and information product distribution through the country.

				Total followers: 791
Video	June 2018	Dowd Films	Charting The Uncharted: The Volunteers Putting Unknown Villages On The Map	This short video presents the challenges - and solutions - to largely unmapped areas across Uganda. With glimpses into HOT's global remote mapping and community field data collection activities, it becomes evident the positive impact these activities have in resource allocation, distribution and accountability.
News article	April 2019	National Geographic	How Bidibidi Uganda Refugee Camp Became A City	This time-series article takes a bird's eye view of the growth and livelihoods in the Bidibidi Refugee Settlement in northern Uganda. Through the use of OSM and satellite data, the article explores and highlights the expansion of the settlement from clusters of houses to a mini city within a larger village. There is a clear explanation about how open data can assist in the understanding of settlement patterns and informing development and humanitarian actors in resource planning.
Video segment	May 2019	BBC	10 minute segment in BBC's 'Equator from the Air' series	HOT Uganda's project in BidiBidi was featured on the prime-time BBC TV programme Equator from the Air, which looks into how aerial technology is helping protect wildlife and support people around the equator.

				The show includes a comprehensive slot about HOT (at 34.00 mins) featuring interviews with Michael Yani and Dayan Amandu, who explain how we provide local communities in the settlement with the tools to map it themselves. The presenter maps with the team and visits a health centre and school, positively showing the impact of HOT's data and how it is used. Following the show, there was positive activity on social media and new people reaching out to HOT excited to have discovered the work we do.
Guide	May 2019	HOT	https://hotosm.github.io/gpsdd-documentation/	Updated "Mapping for the SDGs" guide

8. Conclusions

As mentioned at the start of this report, this project has enabled the addition of 1,500,000 buildings and 36,000 km of roads digitized using satellite imagery and more than 4,000 facilities and services mapped across refugee communities and hosting districts for the first time into open data sources. As such, this project has generated base layer maps that can now be used to guide government agencies and organizations in the design and implementation of interventions to respond to the refugee crisis in East Africa. Our field activities spanned 52 sub-counties and 33 refugee zones and engaged more than 550 refugee and host community members to map the services and facilities within these areas. Through our trainings with more than 20 partner organizations and government agencies, these beneficiaries learned to use a multitude of technical tools to leverage the use and value of the (open) data generated through our field mapping activities. These datasets are now available through OpenStreetMap, and exports via platforms such as the Humanitarian Data Exchange (https://data.humdata.org/search?q=hotosm+uganda).

Perhaps most importantly, trainings have been designed for and provided to 23 partner organizations across Uganda and in Tanzania, building capacity to collect, share and use open mapping data within a number of humanitarian and development organizations at the forefront of assisting and managing the region's refugee crisis and development challenges, including the national statistics offices in both countries. This includes continued assistance in integrating open data and mapping sources towards specific SDG indicators and targets.

Along the way, a number of challenges were identified and addressed, as evidenced by the Lessons Learned section of this report. As a result, a lot of progress was made towards a situation where organizations fully recognize, utilize and collaborate effectively on shared open data and open mapping repositories such as OpenStreetMap. HOT does anticipate there will be an ongoing need for sustained engagement and support to arrive at this objective, part of this comes down to technical support, assistance on use cases and implementation, and capacity building. But an equally important part is supporting and encouraging a change of attitude and collaborative models towards more open sharing and collaboration on data sources, collection efforts, and towards standardization of formats in indicators, data collection, and data use and sharing. With the growth of local open data and mapping communities, the connections HOT has been able to create and foster over the duration of the project, and the follow up projects starting to materialize, HOT is positive to be able to continue supporting in this.