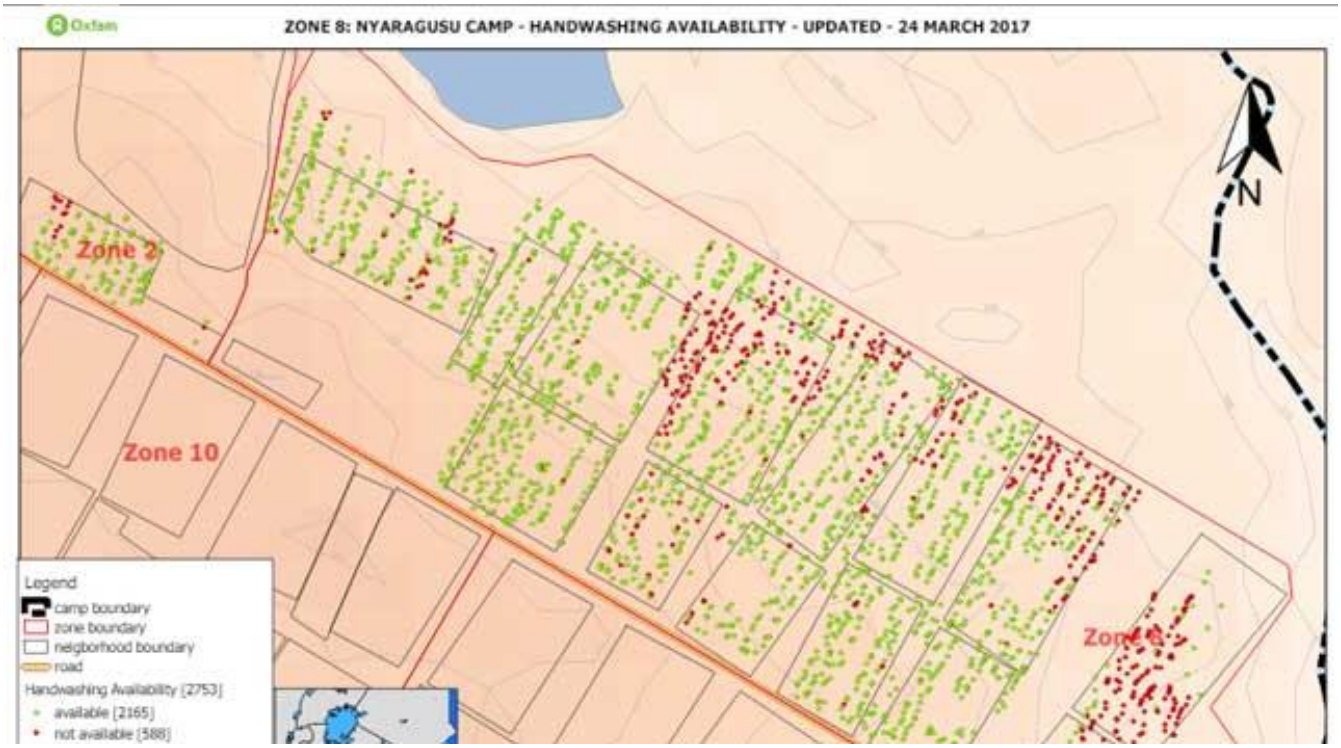

Map indicating hand-washing availability in Nyarugusu camp. Credit: Hilman Agung/Oxfam

MAPPING AND MONITORING WASH FACILITIES

Integrating mobile data collection and GIS tools for better monitoring in Tanzania

Oxfam has been piloting the combined use of mobile data collection and geographic information systems (GIS) tools to better monitor water, sanitation and hygiene facilities as part of its work to support Burundian refugees in Tanzania. As well as building capacity among staff, the pilot enabled the generation of timely and accurate data to support programme activities.

OXFAM

1 INTRODUCTION

In early 2015, political unrest and violence in Burundi forced thousands to flee across the border to Tanzania. By January 2017, more than 100,000 refugees were located in Nduta refugee camp with another 70,000 refugees in Nyarugusu camp.

A key component of Oxfam's response has been the construction of a number of water, sanitation and hygiene (WASH) facilities in Nyarugusu and Nduta camps. In Nyarugusu camp alone, Oxfam manages 5 out of 12 camp zones, with 81 water points, 10,435 latrines and 10,512 bathing facilities.

One of the biggest challenges has been how to monitor these facilities in a systematic, accurate and timely manner so as to respond to needs and ensure ongoing maintenance. The initial monitoring method was paper-based, with data then manually consolidated into a spreadsheet for review. This can be a time-consuming process, and its manual nature leaves room for inaccuracy. Moreover, with no geo-location and unique code related to each WASH facility, the collected information is merely a mass of data from which it can be hard to visualize the situation or extract tangible evidence to track facilities over time. This makes it challenging for teams to have accurate, up-to-date information on the status of facilities, or to review historical data to help inform programme planning.

Oxfam therefore identified an opportunity to improve the quality of monitoring activities by introducing a faster data collection process facilitated by mobile survey tools. This approach aimed to enable the gathering of more reliable, high quality, traceable and updateable data from the field that could be easily imported into a geographic information system (GIS technology) for further analysis.

2 SETTING UP THE PILOT PROJECT

Having identified this need, the Oxfam team successfully bid for internal innovation funding to pilot the use of mobile survey tools to collect data and GIS technology to review and monitor the status of WASH facilities. Given the replicability of this type of activity, it was felt that the project offered the potential to generate highly transferable learning.

The project was piloted in zone 8 of Nyarugusu camp, home to 14,588 refugees. Due to its relatively short implementation period, from 1 February to 31 March 2017, in the first phase of activities the project focused on collecting data related to latrines. A total of 2,753 latrines were subsequently labelled and monitored. The pilot was run by Oxfam's ICT Humanitarian Support Personnel (HSP) with support from the Oxford-based ICT in Programme team. Guidance was also provided by the Information Services (IS) Security Advisor, also based at head office.

Significant emphasis was placed on data security and ensuring that responsible data approaches were considered across the board.

Software selection

Following an internal review, Quantum GIS (QGIS) was selected to support the project's visualization and analysis of data. It was selected on the basis of its open source licence, powerful functionality and widespread use by other agencies with which Oxfam had consulted.

In order to further streamline the process of monitoring, SurveyCTO was selected for data collection. This software was selected for a number of reasons:

1. As one of Oxfam's two recommended mobile data collection tools,[1] it has been approved by Oxfam's IS department in terms of data security.
2. It has a global positioning system (GPS) feature allowing the capture of specific coordinates with which to track data by location.
3. It has a dataset feature that allows a single dataset (for example a latrine or water point labelled with a unique ID) to be updated over time.
4. As SurveyCTO is based on the Open Data Kit (ODK) platform, it integrates seamlessly with QGIS.
5. Reliable technical support is available around the clock.

Data security

The IS department in Oxford provided initial guidance on the project's data security considerations. Following dialogue and scoping with the local team in Tanzania, the data security of the project set-up and use of QGIS were analysed and the project was given a green light to proceed. Key considerations which led to this assessment were:

- **The data to be collected was not sensitive**: No PII (personally identifiable information) would be collected, e.g. name, ID, biodata, family members, address, contact details, etc. The data to be collected was: WASH facilities type, location, the code, functionality, year of construction, construction progress;
- **Data collection process would be secure**: As noted above, SurveyCTO is one of Oxfam's recommended mobile survey tools and has already undergone an internal review for data security compliance;
- **Data storage would be secure**: The data would be stored entirely on Oxfam mobile and laptop devices. Following an IS department recommendation, Meraki mobile device management licences were purchased in order to ensure that data held on the project's mobile phones could be erased remotely;
- **Data would be accessed only by authorized personnel:** Only key Oxfam staff participating in the project would have access to SurveyCTO. Data would be processed on Oxfam laptop(s) with standard encryption and access rights.

Field activities

During consultation with key stakeholders, Oxfam's ICT HSP quickly identified the need to ensure that each WASH facility to be mapped was labelled with a unique code to avoid duplication and ensure effective data handling with respect to each facility. While contractors were engaged to carry out this piece of work, planning continued to recruit enumerators and build and test the mobile monitoring survey they would use to capture data on the status of facilities. Time was also spent to ensure that all relevant base maps were sourced to help staff visualize the data once collected. As the Tanzania country team had already invested in a number of mobile phones to use for data collection, there was no need for further procurement.

Staff and enumerator training

Training of enumerators engaged to carry out mobile surveys to capture baseline data on WASH facilities was carried out over two days, 4–5 March 2017. Due to limited familiarity with mobile phones and low levels of literacy, the training was broken down into separate sessions on using mobile phones, navigating the surveys, and understanding the questionnaire. Delays in the coding of facilities meant that the enumerators were called upon to carry out a degree of coding themselves, alongside collecting baseline data, to minimize project delays. While data collection time had to be extended due to the extra work, this flexibility was crucial in helping to keep the project moving.

Training for project administrators was held 14–18 March 2017, with two days focused on mobile data collection and three days on the use of QGIS for data visualization and analysis. Twenty trainees took part, from Oxfam, local partner Tanzania Water and Sanitation Agency (TWESA), Water Mission and UNHCR. Half of the participants were public health engineers; the other half were health promoters, monitoring, evaluation, accountability and learning (MEAL) staff, shelter associates and an IT officer. Topics focused on how to design surveys, monitor the results, export data, create data sets and link up with QGIS. The part of the training specific to the GIS software aimed to demystify the use of GIS and covered basic map creation, basic map styling, utilization of external sources to create maps, creating contour maps, geo-referencing, GPS use, data export, map printing and mapping the data generated from SurveyCTO.

The pre-training survey indicated that 50–70% of indicators collected by participants at the time were related to the inventory and status of WASH facilities. Some 90% of participants stated that paper was still the main medium used to collect data, and 60% stated that they had had no exposure at all to mobile data collection tools. All participants stated that in cases where they had acquired maps from external sources, they found mapping to be of prime importance for planning, implementation and reporting. Participants' previous exposure to GIS was limited. A few were familiar with QGIS in superficial ways, while some had experience in the use of Google Earth and GPS for data collection.

Feedback at the end of the training indicated that 32% of attendees were very satisfied with the quality of the training, 63% were satisfied and 5% somewhat satisfied. Prior to finalizing the sessions, action plans were established for overall programme areas for both Nyarugusu and Nduta, with clear actions, assigned focal points and schedules agreed to ensure continuity of activities beyond the end of the pilot project period.

External engagement

As noted above, colleagues from both UNHCR and Water Mission were invited to attend the GIS and SurveyCTO training. Following these sessions, Water Mission planned to follow up with training for its staff, and UNHCR also planned to replicate the monitoring system in its shelter project. According to Patrick Mutai, UNHCR Shelter Officer in the Kigoma office: 'The GIS and SurveyCTO training has opened up new ideas on how we can monitor, evaluate and carry out assessments related to shelter in the refugee camps in Tanzania. Making our reporting paperless is a big achievement and also improves the accuracy of the data we collect.'

3 KEY LEARNING AND RECOMMENDATIONS

The project found the following to be key benefits of introducing ICTs:

- **It provides clear, evidence-based data:** The pilot project has proven that using QGIS and SurveyCTO in combination adds significant value for WASH facilities monitoring. SurveyCTO has a dataset feature that allows data to be updated over time – a unique feature that is not readily available in other mobile data collection tools. The data generated by SurveyCTO in the form of CSV (comma separated value) is compatible with QGIS map creation, which then can be used for further analysis. This process provides clear, traceable evidence from the field.
- **Improved speed:** Using digital tools for data collection and consolidation has proven significantly faster than using typical manual methods.

  Data collection: The average time to complete a single survey using a mobile phone is 2 minutes 30 seconds. One enumerator could collect 30–40 records over the course of 3–4 hours. Daily data collection was limited by travel time to the camp, enumerator briefings, phone distributions, and lunch breaks. During the course of the project, data from a total of 2,753 latrine data points was collected over 8 days by 18 enumerators.

  Data consolidation: This is done by uploading the survey, which takes 2–5 minutes depending on the internet connection. Data is consolidated as and when the surveys are uploaded.

It should be noted that the above is not comparing like to like, as the digital survey was very different from previous manual surveys in terms of content collected. For the purpose of fair comparison, a small exercise was carried out to simulate an estimation of the time taken if the same data were collected manually. SurveyCTO was much faster, especially in the data consolidation process; as noted above, SurveyCTO consolidates the collected data as surveys are uploaded, while the manual process requires 2–3 days.

- **Greater accuracy:** The use of digital tools led to increased levels of accuracy, both in terms of location (related to GPS data) and information (the supporting data collected):

  Location accuracy: There is a general misconception that Android GPS only works if there is network coverage. Using the Android device, the location accuracy is between 4–6 meters. In order to maximize accuracy, it is extremely important to leave the GPS recording process uninterrupted and to carry out the data collection on a clear, sunny day.

  Information accuracy: The ability to collect accurate information comes from experience – the more conversant the enumerator with the questionnaire, the better their judgement in inputting accurate, consistent data. In order to maximize the accuracy of the collected data, the mobile survey was coded with response restrictions and conditions to help increase data quality. Enumerators then took part in training and a pilot test while daily monitoring of the data collected was carried out. Such activities are the key to ensuring accurate data collection.

Practical learning points for scaling up this model are:

- **Create a WASH facilities ID/code in the planning phase:** One of most basic challenges relating to WASH facilities is the absence of a unique code for each facility which makes tracking of individual facilities difficult. The initial absence of code/ID linked to the WASH facilities consumed significant time in this project. The code must be created prior to the data collection process to ensure traceable data by location. A good code should be consistent, practical and unique. During this project, the data collection process was halted to complete facilities coding. One of the key recommendations for this project is the provision of a unique facility code or ID from the planning phase. It is also recommended to explore the use of QR codes to support this process.
- **Institutionalize the work on GIS and mobile data collection:** During the course of the project, staff were selected to continue the use of these applications, based on their working area and technical capacity. However, the work related to GIS and data consolidation should ideally be allocated to a single unit or person to ensure consistency in data analysis and map formatting. One potential place for this function would be within the MEAL unit.
- **Allow for longer project duration and ‘hand-holding’ process:** The short project duration was challenging, with effectively just six weeks

for implementation. There were also unforeseen challenges that required extra time, such as coding/ID mapping of the WASH facilities and limited enumerator skills and capacity. Participants' feedback on the training was very positive, but as 'practice makes perfect', the project should allow for a longer phase of close support to help embed activities. Therefore, a recommendation for future activities is that this type of project should allow at least at least 4–6 months for a proper accompaniment process to strengthen capacity (by getting into a routine/building experience through practice) and internal institutionalization.

4 NEXT STEPS

This pilot is part of a wider piece of work seeking to inform Oxfam's usage of GIS tools. Despite the relatively short implementation span during a very busy period towards the end of the financial year, the project achieved significant progress, especially in aspects relating to capacity building, influencing and the generation of timely, accurate data to support programme activities. Moving forward, Oxfam will seek to ensure that recommendations and findings from this pilot are fed into field activities, alongside its work to streamline the use of GIS across Oxfam in a more strategic manner and build internal capacity to utilize best-fit GIS tools.

NOTES

1 E. Tomkys and L. Eldon (2016). *Mobile Survey Methods*. Oxfam GB. http://policy-practice.oxfam.org.uk/publications/mobile-survey-toolkit-617456

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