

Rural Water Supplies Collaborative

QUICK READ

Mobile Phones and Water Point Mapping

Several software applications incorporate recent advances in information and communication technology (ICT) to improve information-gathering about water points. Among these applications, FLOW (Field-Level Operations Watch) is notable because it was developed specifically for water point mapping. With FLOW, enumerators use Android phones to enter data about each water point, and take its picture and GPS coordinates. The data can be analyzed and visualized using additional capabilities of FLOW. Another software option is EpiSurveyor. It is easy to use and the free online version is adequate for most data collection needs. The data could then be imported into FLOW, which has better analysis and visualization capabilities, or into another specialized application such as SPSS or Tableau.

Background

Water point mapping is essentially an inventory of water points that combines data on individual water points (handpumps, standposts, etc.) with a map of their locations. Water point inventories are an important ingredient in monitoring and repair systems and for investment planning.

Most water point inventories are still done in the traditional way, by sending enumerators to fill out a paper questionnaire form on each water point. However, the process is cumbersome, slow, and error-prone. The forms have to be duplicated and transported to the field, then brought to a central location, and the responses keyed into a computerized database. The database is next typically turned over to a statistician to analyze and write a report. If the enumerators also had GPS devices, the data may possibly be mapped by yet another expert. The inefficiency of these methods explains in large

part why water point inventories often do not exist, or are incomplete and outdated.

WaterAid, the British NGO, took a first step toward improving the process with Water Point Mapper. This software application takes water point data that have been entered into an Excel spreadsheet, and uses Google Earth to convert the information into a map. The map shows the location of each water point, and much more. For example, the symbol for each water point can convey information (e.g., blue for functioning, red for broken). Clicking on each symbol brings up an easy-to-read display of the data about that water point. Water Point Mapper, however, did not modify the data collection and computerization process. Rather, the application takes over once the data have somehow been collected and entered into the spreadsheet.



The ICT Revolution comes to Water Mapping

Several trends in ICT have recently spurred huge improvements in water point mapping applications. The first of these trends has been the rapid spread of mobile phones and the penetration of network coverage. A second trend has been the vast increase in mobile phone capabilities, notably smartphones with GPS and cameras, and the drop in smartphone costs. For example, a good Android phone in Kenya costs around \$100, compared to \$1,500 a few years ago. Third, the capacity to represent geographic data visually has increased dramatically, so much so that “visualization” has replaced “mapping” to describe this functionality. Finally, “cloud computing” has emerged as an easy way to share data, that is, putting data on a web server where authorized users in any location can access the information via the Internet.

FLOW (Field-Level Operations Watch) is a software application that brings together all these trends specifically for water point mapping.

FLOW

Gallatin Systems, a small private company, developed FLOW in close collaboration with Water For People, a NGO founded by the American Water Works Association. The Water For People CEO, Ned Breslin, had previously worked for WaterAid on Water Point Mapper. FLOW improves upon Water Point Mapper in that FLOW enables data collection via Android mobile phones, and data transfer to an online database via mobile phone (or computer), as well as visualization.

FLOW has three basic functionalities: data collection, data analysis, and visualization.

Data Collection: An Android phone replaces paper questionnaires. Field enumerators enter the data on each water point directly into the phone, which can also be used to add the GPS coordinates and a picture of the water point. A team can write its own questionnaire and upload it, or select from a number of standard

water point questionnaires that come with the application. Thus one mobile phone per enumerator replaces the need for a GPS device, camera, and multiple paper copies of the questionnaire. If there is mobile phone network coverage capable of data transmission, the enumerators can immediately transmit the survey data to the database on the online server. If not, the data remain on the phone’s SIM card for later uploading directly onto a computer with Internet access.

Data Analysis and the Cloud: Data are stored in an online database, although of course they can be downloaded as needed. Authorized users can access the database via the Internet. FLOW can perform statistical analysis, and generate charts and graphs.

Data Visualization: Figure 1 shows a map of water points produced by FLOW. Figure 2 shows the data that may be displayed by clicking on an individual water point on the map. These examples illustrate only some of the visualization capabilities of FLOW.

Using FLOW in Liberia

The Water and Sanitation Program (WSP), working with UNICEF and USAID, assisted the government in mapping improved water points in rural Liberia, as well as sanitation in nearby schools, using FLOW.

Figure 1: FLOW map of water points in southern Malawi, using Google Earth. The symbols are color coded, in this case, to represent operational status. Click on an individual water point, and data on that point is displayed, as in Figure 2.

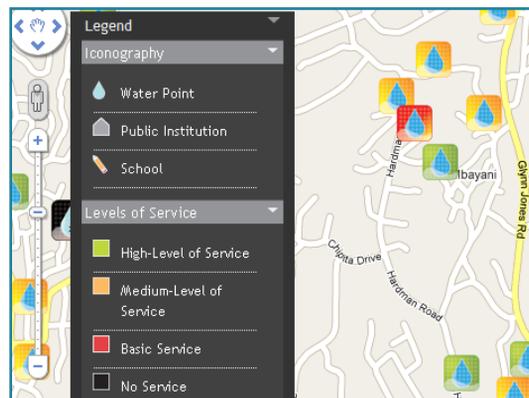


Figure 2: Example of individual water point data display. Clicking on a water point in a map such as shown in Figure 1 will display this table.



The purpose was to gather information for investment planning, in connection with the preparation of a poverty reduction strategy.

Liberia has a population of 3.8 million, slightly more than half of whom live in rural areas. Rural safe water access is officially 51%. Much of the country's infrastructure was damaged or destroyed in the civil war that ended in 2003.

A total of 150 local enumerators were trained in using FLOW-equipped Android phones, provided with motorbikes, and sent out across rural Liberia. Approximately 7,500 improved water points were mapped. The teams completed this task in less than 30 days, despite demanding conditions. The exercise cost about \$250,000. Most of the budget was for staff, but it also included the costs of the phones, fuel and repair for the motorbikes, and a fee of \$10,000

to Gallatin Systems, the developer of FLOW, to provide back up and adapt FLOW to the requirements of the project.

The Liberia experience uncovered some practical issues in using FLOW. For example, the battery life in the phones was limited, while access to electricity for charging was unreliable. This was addressed through external chargers powered by standard AA-batteries. As there was no mobile phone or Internet connection in the field, enumerators came into the administrative headquarters and downloaded the data onto computers, from where the data were transmitted to the online server.

Alternatives to FLOW

Joel Selanikio's frustration with paper questionnaires for gathering health data led him, with Rose Donna, to develop EpiSurveyor. This application enables a project team to turn just about any mobile phone—even very inexpensive ones—into a data collection tool. In other words, FLOW requires smartphones and a network capable of transmitting data. EpiSurveyor requires only phones and networks capable of transmitting text (SMS, or Short Message Service capability). Furthermore, the free version of EpiSurveyor, available at the eponymous website, is simple enough for most users to begin deploying it within a day, and powerful enough to serve most survey data collection needs.

Learning Events Online

The information summarized in this *Quick Read* comes from the LEO (Learning Event Online) that was hosted on RWSC in April 2011, on the topic of *FLOW: Smartphones and Water Point Mapping*.

A LEO is a collection of material around a single topic posted to RWSC. In this case, the material comprised video clips of presentations on FLOW by Ned Breslin, Water For People CEO, a blog by Maximilian Hirn, who worked with FLOW on the Liberia project, and remarks by Edward Anderson, on ICT trends, and by David Michaud, on the LAC Region's interest in software applications for rural water supply and sanitation monitoring systems. Lilian Pereira uploaded a great deal of material gathered by LAC on this subject.

RWSC members enthusiastically participated in this discussion, posting many comments and questions to which Max, Edward, and David responded. As a result of this lively interest in the topic, RWSC had the most page views of 590 Scoop groups in April 2011. Scoop is the World Bank's social collaboration platform.

The discussion continues to evolve. As of June 2011, RWSC members are weighing in on the comparative advantages of FLOW versus EpiSurveyor. Recently posted interviews with Ned Breslin, closely associated with FLOW, and Joel Salanikio, co-developer of EpiSurveyor, have stimulated this discussion.

The downside is that the statistical analysis and visualization functionalities are not equal to those of FLOW, at least for the purposes of water point mapping. Other than using FLOW, a task manager can deal with this limitation to EpiSurveyor in one of two ways: export the data collected in EpiSurveyor to FLOW, or another application such as SPSS or Tableau; or pay DataDyne, Joel and Rose's social enterprise, the engineering costs to develop the desired functionalities for EpiSurveyor. The advantage to the latter option lies in its externalities. Those improved functionalities, once developed, become available even to users of the free version. Many of those users are NGOs, governments, and private enterprises working, like the World Bank, to promote development.

PoiMapper and ODK (Open Data Kit) are other alternatives to FLOW.

Next Steps

The Quick Links box provides access to further information on this subject on RWSC. This includes links to the EpiSurveyor site, where the free version is available, and the Water for People and Gallatin Systems sites, where FLOW can be obtained.

Water point mapping is just one area in which ICT systems can aid the sector. Future RWSC discussions will explore other areas, such as beneficiary feedback, billing and collection, etc.

Q U I C K

The following links go to material on RWSC, on the World Bank's Intranet.

[Mobile Phones and Water Point Mapping](#) – Page providing links to all material on this topic in RWSC. Regularly updated. Find links to websites for FLOW, EpiSurveyor, PoiMapper, Water Point Mapper, and ODK.

The following links are some of the highlights to be found on the Mobile Phones and Water Point Mapping page.

[FLOW vs. EpiSurveyor Discussion](#) – WBG staff familiar with the two applications weigh in with their views. Great place to post questions about either or both applications.

[Interview with Ned Breslin](#) – CEO, Water For People, explains what he sees as the relative merits of FLOW compared to EpiSurveyor.

[Interview with Joel Selanikio](#) – The co-developer of EpiSurveyor describes the merits of EpiSurveyor compared to FLOW.

[FLOW and Rural Water Point Mapping in Liberia](#) – Max Hirn describes the experience of the Water and Sanitation Program in using FLOW.

[ICT Trends](#) – Numerous video clips explaining the ICT revolution, including Ed Anderson explaining how FLOW fits into larger ICT trends, and Inger Andersen on monitoring by beneficiaries.

[Mobiles for Accountability and Public Participation \(M-APP\)](#) – Read about additional uses of ICT systems for the water sector.

[Inger Andersen's commendation to RWSC members](#) for collaborating through RWSC rather than e-mail to discuss this important topic.



L I N K S

Member Credits

The following RWSC members contributed to this Quick Read and the discussion on FLOW: Max Hirn, David Michaud, Alex Demosthenes, Lilian Pena Pereira, Monica Dorhoi, Antonio Serrano, Soma Ghosh Mouluk, Jonnalagadda Murty, Edward Anderson, Malcolm Childress, Jacqueline Dubow, Thomas Fugelsnes, Julia Bucknall, Sara Sultan, Alexander Bakalian, Samuel Mutono, Martin Alton, Tahira Syed, Almud Weitz

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