

# Climate Resilient WaSH in the Pacific

## Using mobile survey tools to understand multiple water sources and uses

### METHODS BRIEF

#### Research statement

Understanding multiple water sources and uses is critical to informed programming for climate change adaptation (CCA) in water, sanitation and hygiene (WaSH). Collecting data on multiple water sources is considered by many to be time consuming and complex, and traditional survey tools developed for this purpose have not been widely adopted. In this study, we demonstrate the value of new mobile survey technologies (also known as Computer Assisted Personal Interviewing, or CAPI) that have enabled efficient and simplified data collection on multiple water sources and uses in the Republic of the Marshall Islands and the Solomon Islands.

#### Findings

1. Mobile survey tools enable the delivery of complex questionnaires for the investigation of multiple water sources and uses, generating more advanced datasets to inform WaSH and CCA programming.
2. Mobile survey tools enable researchers and practitioners to rapidly assess a broad range of water sources and uses in less time than traditional methods and with improved quality control. Results from this study reveal the superior speed and accuracy of mobile survey tools over traditional pen and paper interviewing methods.

#### Background

Climate change is a serious threat to Pacific Island Countries (PICs) and their freshwater resources. Sea level rise, saltwater intrusion, increasing evaporation rates and changing rainfall patterns will all affect the water cycle and, potentially, the availability of water for human use. This poses significant adaptation challenges for development and human health in PICs.

While it is increasingly understood that multiple water sources and uses are a key aspect of household water management and adaptation, most surveys conducted for global water, sanitation and hygiene (WaSH) research and monitoring focus exclusively on the “primary source” of water for drinking and cooking (Bartram et al 2014). Multiple water sources and uses are commonly overlooked and interconnections with other critical WaSH issues, including hygiene, water quality, and adaptation to climate variability, are not well understood. Through the application of a mobile survey tool, this study reveals the potential for this technology to enable rapid and high quality data collection on multiple water sources and uses, for more informed WaSH and CCA programming in PICs and elsewhere.

#### Methods

Research described in this brief was conducted as part of the Pacific Adaptation to Climate Change for Water, Sanitation and Hygiene (PACCWASH) Project, investigating adaptation to climate change for WaSH in PICs. This research was funded by the Australian Government Department of Foreign Affairs and Trade, and managed by the International WaterCentre. Research partners were the Water Institute at the University of North Carolina, Griffith University, Monash University, University of Alabama, and the University of the South Pacific.

A household survey was conducted in five communities in the Solomon Islands and eight communities in the Republic of the Marshall Islands between August 2014 and November 2015, adapted from a questionnaire originally developed by Wittington (2000). A paper-based version of this survey was field-tested in the Solomon Islands, then rolled out in two communities (44 household) before the study transitioned to the mobile survey platform, SurveyCTO. The mobile survey tool was used to complete a total of 291 surveys across eight communities in the Marshall Islands, and three additional communities in the Solomon Islands, with a team of three local enumerators in each country.

#### Who is this brief intended for?

This brief describes findings from a survey of household water management conducted in the Solomon Islands and the Republic of the Marshall Islands using a mobile survey tool. Findings are intended for local and international programming staff in the WaSH sector.

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## Finding 1: Mobile survey tools enable the delivery of complex questionnaires for the investigation of multiple water sources and uses.

Gathering information on multiple sources, multiple uses, and the location of use provides a more accurate depiction of the actual household water budget and the amount of water used for less understood domestic applications, such as hygiene. Understanding how multiple water sources and uses change in response to seasonal variability and extreme events provides further insight into local adaptation strategies.

The initial paper-based survey used in this study evolved from a questionnaire designed by Whittington (2000) that is considered to be the gold-standard in differentiating multiple sources and uses, and identifying interconnections between household water management practices and seasonal variability. This questionnaire was adapted to generate a more comprehensive understanding of household water management practices in PICs, incorporating elements on location of use, and the impact of extreme events - floods, droughts and cyclones – that are common to the region. This substantially increased the length and complexity of the paper-based survey, adding 52 questions and 3 additional pages to the original 44 questions and 11 page form.

Local enumerators found this paper-based survey time consuming and difficult to implement due to its length, intricate grid-type framework and complex skip patterns. To increase the speed ease and quality of data collection, a decision was made to transition to a mobile survey tool. Additional investment of time was required to program the mobile survey tool, however, the open data kit platform employed by SurveyCTO, and its user-friendly Microsoft Excel interface reduced barriers and increased accessibility relative to other programming interfaces (Caviglia-Harris 2011).

The mobile survey tool allowed researchers to design, upload, field-test and modify the electronic questionnaire with ease. Data security was also enhanced, with local enumerators able to save and store completed survey responses on laptops and external hard drives, rather than carrying around paper forms, and to able to send or upload electronic forms to a password protected online server.

The Android tablets used by enumerators were typically capable of up to ten hours of survey work, but required periodic recharging. Access to a power source can be problematic in areas without a reliable electricity. In remote and isolated study communities battery charging arrangement varied according to local circumstances, and included solar panels, diesel generators, and vehicle power supplies.

## Finding 2: Mobile survey tools are faster and more accurate than traditional paper-based methods.

A comparison of the mobile survey tool and initial paper-based method revealed much shorter delivery times using the mobile technology.

Initial paper-based surveys took enumerators on average 44.5 minutes to complete. The duration of subsequent surveys using the paper form actually increased, possibly due to enumerator fatigue. In comparison, the mobile survey tool took an average of 32 minutes to complete.

As enumerators became more experienced with the use of the mobile survey tool, they required less time to deliver each subsequent survey. Mobile survey times decreased by approximately 17 minutes between the 1st and 100th surveys performed by the enumerators.

Data accuracy and reliability was also improved with the mobile survey tool, with fewer data entry errors than those observed when the same survey was performed using paper-based methods. The error rate for paper-based surveys was 307 per 10,000 data entries (with each question representing one data entry point). In comparison, the mobile survey has a much lower error rate of 4.49 per 10,000 data entries. Drop down menus, mandatory entry fields and embedded skip patterns increased the speed, ease and quality of data collection by enumerators resulting in fewer data entry errors and missed responses. The transition from a traditional paper-based survey to a mobile survey platform simplified the delivery of a complex questionnaire.

The mobile survey tool developed for this study has produced an advanced dataset on multiple water sources and uses capable of generating greater insight into household water management and adaptation practices in PIC study communities. For more information on survey results, see the brief *Multiple household water sources: a traditional strategy for addressing rainfall variability*.

The adoption of mobile survey tools also has the potential to enable larger-scale regional surveying capable of characterising multiple water sources, and generating more advanced datasets to inform WaSH and CCA programs and policy.

We hope that the findings of this study will help to evolve WaSH research and monitoring by stimulating more investigation of multiple water sources and household water management.

## References

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## Want to know more?

This brief describes findings from the Pacific Adaptation to Climate Change for Water, Sanitation and Hygiene (PACCWASH) Project. For more information, please contact Principal Investigator, Dr Wade Hadwen, at [w.hadwen@griffith.edu.au](mailto:w.hadwen@griffith.edu.au), or visit [www.watercentre.org/portfolio/wash-and-climate-change-adaptation-in-the-pacific](http://www.watercentre.org/portfolio/wash-and-climate-change-adaptation-in-the-pacific)

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