'Sharing the last drop'
Household water security and equity in small coastal watersheds

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Introduction

For rural coastal residents in much of the Philippines and elsewhere in Southeast Asia, the image of a water-rich region is a mirage. There is a water crisis in Southeast Asia, one of the wettest regions of Asia, if not the world. It is not because of the occasional El Niño, but the result of the systemic degradation of water sources by growing numbers of increasingly water-hungry people. The scale of this water crisis in Southeast Asia is still unknown because most of the attention remains devoted to finding new water supplies from the few large basins in the region. Meanwhile, the majority of the population living in small coastal watersheds thirsts for cleaner and more accessible water.

In order to gain a better understanding of the local implications of household water security and equity in areas considered water-rich by national/international water indices, the Water Equity in the Lifescape and Landscape Study (WELLS) was developed. The study was designed by the author, supported by the Rockefeller Brothers Fund, and was implemented through the International Institute of Rural Reconstruction (IIRR) with local partners in the Philippines and Vietnam. The cornerstone of the project was the development of a simple, participatory tool to assess water security and equity in rural coastal watersheds at the household level, known as the Household Water Security Mapping Tool (HWSMT). The dual objectives of the study are to help local water user groups identify and address their water security conditions and to bring greater attention to household and micro-watershed level issues of water security and equity.

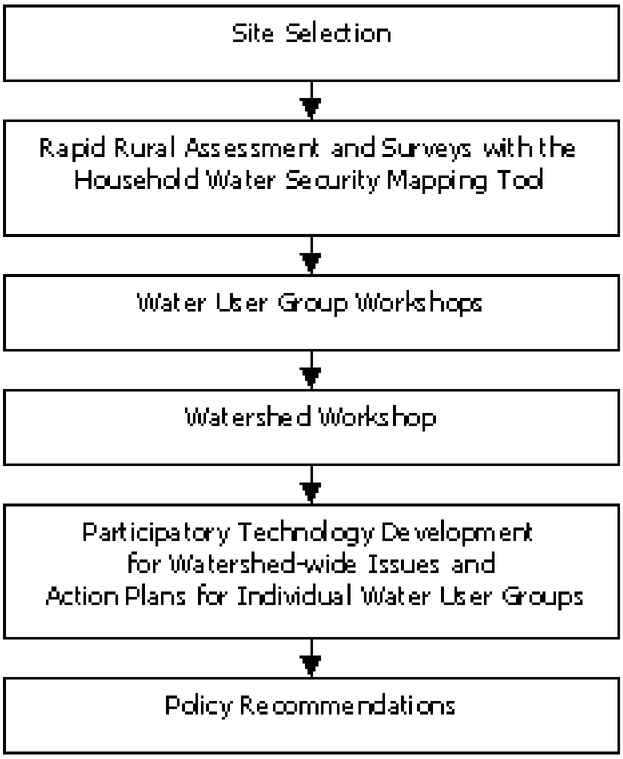
This paper details the rationale for the project, the steps in the use of the Tool and the initial lessons learned.

Water equity in the lifescape and landscape study (WELLS)

In the far uplands of Sapu Masla, Philippines, residents spend an average of six hours per household per day collecting water. This daily ritual includes walking along a hazardous trail down to a spring and carrying heavy loads of water back up the trail to the households. In the same watershed, coastal residents drink from wells where water is increasingly saline, discoloured and foul smelling. Many residents drink less than two litres per day, even in the hot summer months, while engaged in difficult physical work. All surface waters are potential sources of waterborne disease. Only a few kilometres away, a recent outbreak of cholera killed a number of residents.

The study called for short-term action research at two small coastal watersheds where local interests matched those of the project. Fortunately, two sites with pre-existing partnerships between the community and external support organisations for water resource management were identified. The first site, on the island of Mindanao in the Philippines, included relatively distinct coastal, lowland and upland areas. The second site, south of the mouth of the Mekong River, was deltaic in origin and therefore lacked the topographic diversity of the first site. After establishing partnership agreements, the study was integrated into the activities described in Figure 1.

Figure 1 Project Design



Understanding household water security

The measurement of water availability has spawned a number of terms, such as ‘shortage’, ‘scarcity’ and ‘stress’, each with their own definitions. At the national level, these definitions allow broad comparisons between countries, but provide little useful detail for water resource management at the local level. At the household level, a more specific definition is proposed for water security. For the purpose of the WELLS project, household water security means *having sufficient access throughout the year to the minimum daily requirement of clean water to maintain a healthy life*. This definition has three main components that must be met on a year-round basis.

- *Quantity*: the volume of water consumed in the household for all uses. Previous studies suggest that the minimum volume of water consumed for all uses at the household for a healthy life is either 20 litres/person/day (households whose members bathe or do laundry at the source) or 40 litres/person/day (households that collect water for laundry and bathing)[1].

- *Quality*: the biological and chemical nature of the water. The absence of equipment and skills for measuring even the most basic chemical and biological indicators in most rural communities required an alternative approach. The project team developed a relative measure of water quality: the users’ perspective or ‘perceived quality scale’. This approach emphasises informal indigenous classification of water and recognises three categories of water quality: 1) drinkable; 2) drinkable with obvious colour, taste or odour; and 3) known to regularly cause illness. It is important to note that quality is measured at the source, before any form of local treatment takes place, such as use of rock alum[2] or boiling.

- *Access*: the cost of water, measured by an examination of the time allocated for its collection[3]. The most common methods measure either distance or time to the source or sources. Time is generally preferred because it can capture additional constraints such as terrain, collection and waiting. As with the other factors, establishing a minimum standard is somewhat arbitrary. Given that most rural households collect water some distance from the household two or more times a day, anything less than 15 minutes is likely to be uncommon. A minimum of 30 minutes per household per day was used as an initial minimum standard. Collection time is clearly related to household size.

1 This does not mean, however, that households whose members bathe or do laundry at the source use less water. In fact, they probably use much more water and have a greater negative impact on water quality. Unfortunately, there is no practical way of measuring the amount of water used when bathing or rinsing laundry directly in the river. This distinction poses the greatest challenge to the tool.
2 Rock alum is a locally available substance commonly applied to the inside wall of large clay water containers prior to filling with water. The chemical (aluminum sulfate) increases the rate at which suspended particles clump together and fall out of suspension, thus ‘clearing’ the water. The process does not kill bacteria but may reduce their levels.
3 It is also a reflection of resource access. For example, an underground aquifer or a nearby spring on private land is of no value to a household that does not have the means or rights to access the resource.

The household water security mapping tool

One of the reasons why household water security goes unnoticed is the lack of information at the household and micro-watershed level. Existing survey methods, such as municipal and provincial desk assessments of access and proximity to potable water, generate inaccurate, incomplete and locally irrelevant data. The author developed a simple, participatory assessment tool to generate a more holistic picture of household water security that can be understood and used locally. The household water security mapping tool (HWSMT) measures a number of factors affecting household water security.

- Number and types of sources.
- Quantity of water consumed per person per day.
- Quality of water sources.
- Accessibility (i.e. collection time).
- Gender roles associated with water collection.
- Water price (e.g. cash out costs).

The tool itself is a visual representation of the water path and can be easily understood and validated by the informant. A person familiar with local water use and units of measurement can successfully facilitate/administer the tool with as little as one day of training.

However, the household water security mapping tool is not a stand-alone method for natural resource management. It must be applied within the context of a longer community-based natural resource management effort. Therefore, the user of the tool should also have, or work with others who have, the following skills:

- an understanding of the factors affecting household water security (i.e. quality, quantity, access) and common minimum standards for each;
- an understanding of the units of measurement for each of the main indicators;
- basic community organising skills and familiarity with participatory research methods; and,
- familiarity with the volume of commonly used local containers and the ability to estimate water volume for uncommon container sizes.

Steps

The entire household interview process usually takes 45 minutes, but can range from 30 minutes to over one hour. It involves three main stages.

1. *Stage 1*: developing a mutual understanding with the respondent about the purpose and process of the tool. This involves explaining or reviewing the rationale and background of the project, clarifying the focus of the discussion, explaining the uses of the information, determining the most suitable person(s) to interview, identifying a suitable place (and, if necessary, time) for the interview and answering any questions the respondent may have.
2. *Stage 2*: semi-structured dialogue between the interviewer and respondent. During this stage, the process focuses around three main themes: sources, paths and uses and is facilitated by a drawing, made by the interviewer, using direct inputs and validation by the respondent. The drawing (based on a simple template of a house) serves as a visual communication aid; a concrete and mutually understandable anchor to reduce ambiguities or confusion originating from oral communication alone (see Figure 2). This stage consumes the majority of the time and is the most complex aspect of the dialogue (see Boxes 1 to 3 for guidelines for the discussions). As mentioned above, the household water security mapping tool template consists of the outline of a house and labels for the three major areas: 1) sources, 2) uses, and 3) receptors. In addition, the template includes a table for background information (i.e. name, date, season, location in the watershed, etc.) and a summary of the data (i.e. quantity or litres/person/day; quality of best source; and access or minutes/household/day).
3. *Stage 3*: collection of additional background information, such as number of household members, current season, water treatment practices and 'cash-out costs' of water uses, such as water association fees or costs of running pumps.

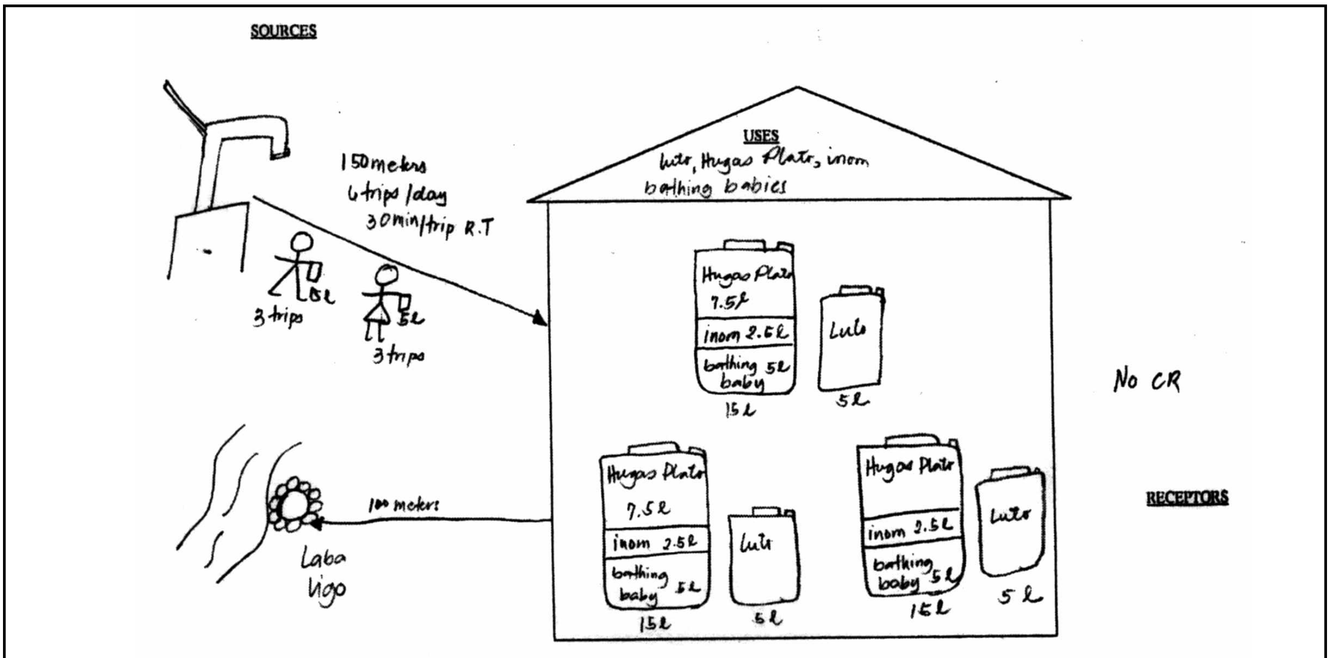
The steps taken in stage 2 are listed in the following boxes in a suggested sequence that has been tested in the field and has been shown to produce the best results. No two interviews are the same and few if any follow these steps exactly as written. This sequence will help guide the dialogue, but flexibility and awareness are important in any tool of this nature. In summary, the interview will document, estimate and calculate various factors that affect household water security.

Box 1 Sources

1. *Document sources*. Determine all the sources of water commonly used during the current season (local seasonality and other general background information should be determined at the community level during pre-survey Rapid Rural Appraisal activities, not described in this paper). Using simple symbols, draw these sources along the left margin of the map template (see Figure 2).
2. *Estimate quality at each source*. Water quality falls into one of three categories[4], each with a corresponding symbol shown below:
   - a smiling face for drinkable water (score of 3)
   - a serious face for water with clear taste, odour or colour (score of 2)
   - a face with the tongue extended for water known to cause illness (score of 1)

4 The quality of the source refers to pre-treatment quality.

Figure 2 Sample output: household water security mapping tool



Box 2 Paths

3. *Assess general pattern of daily household water collection*. Before writing anything down on the map template, assess the general pattern of water collection in the household. This includes information on who collects water, the average number of trips per day and the duration of each trip, the size and types of containers used and the location of water use. This approach reduces the need for corrections that would commonly occur without it. For example, some trips that take place every other day may mistakenly be documented as daily trips or ignored completely. The location of water use (i.e. at the source or at the household) is important because it documents certain water uses that do not involve the transportation of water to the household.
4. *Document path.* Draw a line from the household to each source of water (Figure 2). The line is not intended to represent either distance or direction; it is simply an indication of the link between the household and the source. If water is brought to the household, place an arrow on the end of the line pointing to the household. If water is used at the source, place an arrow at the end of the line pointing to the source. If water is used at both the household and the source, place an arrow on each end of the line.
5. *Document collection*. Draw a stick figure of each person who collects water from this source, clearly portraying the gender and age (adult or child) of the individual collectors. Draw the number and relative sizes of containers carried by each collector. Immediately to the right of the stick figure, place a multiply sign (x), then the average number of trips that person makes per day. If a trip is made every other day, multiply by 0.5.
6. *Estimate one-way distances*. Estimate the one-way distance (in metres) to each source of water (when possible, validate this visually or by comparing travel time with the estimated distance). Below the line, write down the one-way distance.
7. *Estimate round-trip collection time*. Calculate the round trip collection time for each trip. This figure should include average waiting time if lines are common. Write this figure (in minutes) below the water path line[5].
8. *Estimate quantity of water collected per trip*. Based on the size (i.e. volume) and number of containers carried by each individual per trip, estimate the total quantity (in litres) of water carried by each individual for each trip. If the volume is not indicated on the container, it can, with a little practice, be estimated to within a litre or two (depending on the size of the container).

Box 3 Uses

9. *Assess the daily pattern of household water usage*. Discuss the various uses of water by the household residents inside and outside of the household. Introduce the main categories of water use and determine if others are needed. It is important to standardise the categories of water use. The categories adopted by the project include cooking (including food preparation); drinking; cleaning the house; bathing (infants); bathing (adults); laundry; sanitation (associated with urination and defecation); watering plants; livestock (drinking and cleaning); and other. At the same time, examine the methods of storing and treating water and disposal of grey water.
10. *Document water uses.* Write the main uses of water on the map template (in the space above the house).
11. *Estimate average daily allocation (consumption) per use*. This is the most difficult and time-consuming task of the household water security mapping tool, requiring attention to detail, validation and triangulation. Start by calculating the total amount of water brought to the household each day (the number of trips times the quantity per trip). Determine if this amount of water is fully consumed on a daily basis.
   - At this point, it is important to examine if water is stored in containers separate from those used in collection. If it is not, then begin by estimating the allocation of water consumed by each trip. To do this, draw a picture of the containers used in the first collection trip of the day. Ask how the water is allocated to different uses. Write the use inside each container drawn on the map. If a portion of a container is used for more than one use, then divide it with a line and indicate the separate uses, writing the estimated number of litres for each. For example, if two 20 litre containers are used and one of the containers is consumed for cooking and the other two split between drinking and washing dishes, then you would have cooking written in one container and drinking and washing dishes written in the second, with a line dividing the container in half. Be sure to draw the total volume of the container on the outside and the portion consumed per use next to the use itself on the inside. Repeat this process for the quantity of water collected for each trip.
   - If water is transferred to a storage container, then determine the total volume of water in the storage container and the portions consumed for each use. In many cases, special containers will be used for specific uses. Water for laundry may be transferred to a large shallow basin; water for cooking will go to selected pots; water for bathing may go into a bucket; water for use in a toilet may go into a completely separate container and so on. These containers can also be used to calculate the total water consumed in a day for each use. If the portioned storage tank approach is used, draw the storage tank and estimate the portions. If the special use containers are used, then draw those containers. Always ask to see the containers used for storage or special uses[6].
   - It is not uncommon to go through either of these estimation methods and find that the sum of all allocations does not equal the total estimated amount of water collected. This could be the result of a number of different problems. First, make sure that all uses have been identified. Some of the ones commonly forgotten include water for sanitation purposes, water for plants and water for cleaning vegetables (cooking). Second, re-examine the allocations per use. As much as possible, speak directly to the specific users. If this does not address the discrepancy, re-examine the amounts of water collected and brought to the house. Another possible problem is the insufficient use of the drawing to establish clear communication between the interviewer and respondent. If the respondent does not fully understand what is being drawn, it is a good signal that the interviewer must put more effort into communicating the visual and verbal information.
   - Display the total quantity of water collected on an average day on the map. This figure is then divided by the number of household occupants in order to arrive at the daily quantity of water consumed per person per household (litres/person/day).

5 The assumption is that each collector travels the route in the same amount of time. If this is not the case, note individual times beside each collector instead of below the water path line. Collection times may vary as a result of waiting periods at certain times of the day and transportation methods of individual collectors (e.g. by foot vs. by horse). Due to terrain and the weight of full containers, travel time to and from the source is not always equal.

6 Use your own volume estimates rather than a combination of your own and those of the user to reduce the amount of estimation error.

Summarising and analysing the results

After completing each interview, the information derived from the tool is summarised and written into the table (see Table 1) on the top of the map template. For each household, the following information can be presented: quantity, quality, access, price, collector gender, uses, presence of sanitary toilet and presence of wastewater receptacle. This summary is helpful in identifying the range for each factor. For example, in one watershed, the range for quantity may be from 8-200 litres/person/day. Based on the indicators of water quality, quantity and access, each household's water security can be assessed using the information obtained from the tool. If any of the three critical indicators are not met (i.e. they are below some established standard) then the household is considered water insecure.

Table 1

Location of household:		Respondent's name:	
Interviewer's name:		Date (season):	
Ecosystem or water user classification:			
Number of occupants:		Collection responsibility (male, female, both):	
Quantity (litres/person/ day):		Quality of best source:	
Access time (minutes/ household/day):		Price (cash out cost only):	

The information for each household can be presented on a simple radar graph. Each axis of the graph has an independent scale for each of the three or four factors measured: quantity, quality, access and, when possible, cost. The results for each factor are plotted on the appropriate axis. The plotted points are connected with a straight line to the next nearest axis. The results are either a triangle (quantity, quality and access) or a kite (quantity, quality, access and price) depending on the number of factors included. In addition, the minimum standards are also plotted on the graph. In this way, the household can be compared to the standards. Each axis is laid out so that the worst conditions are closest to the centre and the best conditions radiate outward. Therefore, the larger the triangle or kite, the better the water security (see Figure 3).

In order to examine the question of equity, it is necessary to compare the degree of water (in)security between households or water user groups (water user groups are determined based on a combination of location and water use patterns). By plotting the results of two households or the average conditions of two water user groups on the same graph, an easy comparison can be made. This form of comparison, illustrated in Figure 4, is a powerful method of communicating priority needs to local development planners or decision makers.

Figure 3. Household water security triangle

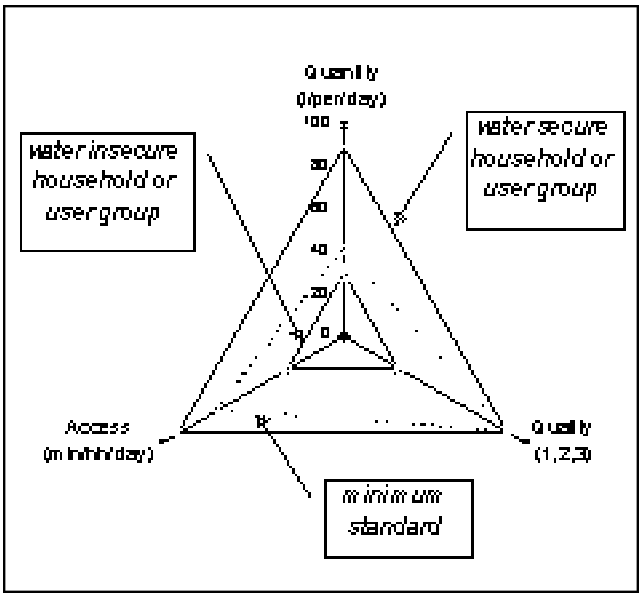
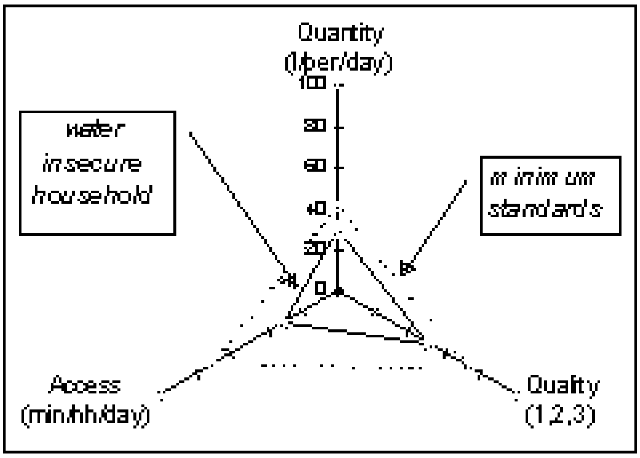


Figure 4. Comparing households or user groups



Strengths and limitations

Strengths

- The tool emphasises the visualisation of information from and for the respondent.
- The tool is holistic, collecting information on the various factors affecting water security.
- The community easily understands and recognises the meaning of the outputs and results of the tool.
- The tool generates much needed household level information.

Limitations

- The tool is of limited use when the sources of water are within the household. This is because collection is generally more frequent, erratic and involves small or no containers. Therefore, the precision of estimating quantity is reduced.
- The tool does not capture special or infrequent water usage. For example, if certain activities occur only once or twice a month, they are commonly not captured in the daily water picture.
- The tool does not capture differences in consumption within the household.
- A test for the reliability or precision of measurements (especially for quantity) by interviewers has not yet been developed.

Lessons learned and policy recommendations

The Household Water Security Mapping Tool fills the need for a rapid, participatory and relatively precise assessment tool of household level water security. The tool examines three of the most critical factors affecting household water security: quality, quantity and access. By comparing the level of household water security among water user groups, inequities can be discovered. The information generated by the tool will empower households, will inform water resource developers and will guide the evaluation of new water supply projects. The discourse on global water scarcity continues without the benefit of systematically documented local information. The household water security mapping tool provides an opportunity to create a better picture of water scarcity. Instead of a painting made from broad strokes, this picture will be a mosaic of local realities.

The WELLS project has also facilitated local analysis of information, vision setting, action planning, skills development and linkages with external support groups. The greatest contribution has been providing each water user group with a better understanding of their own household water security profile. The profile is a simple snapshot of the actual conditions of the group in relation to international standards and to other water user groups in the watershed. This profile and comparison helped water user groups identify their limiting factors (quantity, quality, access or price) and develop a plan to address them accordingly. Short workshops were used to share information and establish consensus, identify priority concerns and establish a vision for the future. Financial and logistical support allowed selected community representatives to attend a field-based agroforestry-training programme to address one of the priority issues in the watershed. Additional follow-up technical assistance, provided by IIRR technical staff, ensured the application and extension of lessons learned. Finally, each water user group developed a simple proposal to address a problem in their particular group and establish a watershed-wide co-ordinating mechanism. Project staff edit and endorse these action plans/proposals to local funding agencies.

The lessons learned from the project provide powerful support to a variety of policy recommendations. The completion of this linkage is a critical step in the overall learning agenda of the project. For further information on some of the key lessons and their corresponding policy recommendations, please contact the current project manager (see *Notes*) or the author.

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Notes

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