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Africa User Research in Water and Sanitation

Mali

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Introduction: PATH Safe Water Project

To increase access to safe drinking water and reduce the incidence of waterborne diseases, PATH's Safe Water Project (SWP) has been exploring the potential of market-based approaches to provide clean water for low- and middle-income households. In the initial phase of the SWP, the need for new and improved technologies to support this work became clear. The goal of the SWP's product development work has been to understand user needs and preferences around household water treatment and storage (HWTS); to foster widespread demand for and availability of new and/or improved products; and to raise the bar for affordability, quality, value, and performance of HWTS products. The SWP initially focused on India and Southeast Asia (in particular, Cambodia and Vietnam). The end-user research described in this report expands the project's work to three countries in Africa—Mali, Tanzania, and Ethiopia. This report focuses on the results of the user research in Mali.

Africa User Research

The end-user research in Africa was exploratory and designed to assess the HWTS and sanitation needs of households in each country setting. The study's main goal was to *identify the needs, experiences, and preferences of potential low-income users in Africa* in the areas of water treatment and storage as well as sanitation. The study was intended to inform new product development activities and possible adaptation of safe water products developed primarily for users in Asia.



The specific objectives of the Africa user research were to:

- Collect information on potential users and their environment, including water sources; water collection, storage, and treatment practices; awareness of water treatment methods; as well as similar issues involving sanitation.
- Compare and contrast findings with results of the device user research conducted by the PATH SWP in India and Southeast Asia.
- Begin to identify potential HWTS product solutions, options, concepts, and/or prototypes.

The research included qualitative interviews with women in urban, peri-urban, and rural areas and observation and documentation of household water collection, treatment, and storage practices as well as sanitation and hygiene facilities.

To ensure a variety of water sources as well as water treatment and storage practices, interviews were conducted with 20 potential users in urban, peri-urban, and rural areas around Bamako. A total of 10 interviews with female heads of household were held in urban or peri-urban households and 10 in rural households. The interviews were conducted in Bambara or Pulaar language. Each household visit included the interview, an exercise using a choice of concept cards, as well as observation of the

participant's drinking water source, storage container, and latrine or toilet facilities. In some cases, a demonstration of handwashing was observed. The study team also conducted an "out of box" introduction of an unfamiliar water filtration device in selected households to observe approaches to assembly. To provide context, interviews were also conducted with eight stakeholders including health workers and water and sanitation system managers.

Identifying appropriate solutions

To understand user needs, experiences, and preferences in the areas of HWTS and sanitation, it is important to first understand what current *choices* are—what water sources are available and what water treatment methods, if any, are used.

Awareness of and concerns about drinking water safety are also important, as they affect potential demand for household water treatment products.

Successful product development and market-based solutions need to consider *access*—both to markets where products can be purchased and whether individual resources are available to pay for products.



Framework—understanding user needs. Credit: PATH.

Findings on HWTS

Choice

Drinking water collection and storage: Nearly all households obtained their drinking water from a well in their yard/compound and/or a neighborhood hand pump or standpipe within five minutes walking distance. Three out of twenty participants paid a vendor to deliver water due to long lines at the community standpipe. While no participants walked distances longer than five minutes to reach their water source, most made several trips a day to stock the water necessary for their household's needs. Access to sufficient quantities of drinking water was problematic for many. Most households collected their household drinking water in 20–25L jerry cans, transported in carts or on their heads, or in open buckets.



Typical household water storage and dispensing practices. Credit: PATH/Siri Wood.

All participants kept drinking water in 20–30L artisanal clay water pots or “jars” just inside their front door. About half of the pots observed were stored on a bed of wet sand that kept the water surprisingly cool. These water pots are ubiquitous throughout Mali. Every household kept the jar covered with a plastic or metal plate and a plastic cup set upside down on top for dipping and drinking.

Water treatment methods: None of the participants reported regularly treating their household drinking water. Treatment of any drinking water is rare, and no filter devices exist. Some participants had heard of chlorine or use it, but many reported pouring chlorine in their well (which is ineffective for treatment), and then using this water for household cooking or cleaning. A few participants reported using a fine netting or fabric as a sieve to remove particles as they pour drinking water into their clay pots. These findings echo the 2006 national Demographic and Health Survey which found that 62 percent of Malian households use no treatment method, while 24 percent use fabric as a sieve. Nine percent report using bleach, while boiling water is virtually a non-existent practice, 0.2 percent (CPS/DNSI 2007).

Awareness

Need to treat: The awareness of the need to treat household drinking water was extremely limited among the participants. The perception of “good water” was—as found in many parts of the world—related to taste and clarity (and coolness). Generally speaking, clear water was considered “good” or “safe” and turbid water was sieved through a piece of fabric and allowed to settle and decant in the ceramic water storage pots. When asked about common health concerns, water-related illnesses were not often cited; malaria was by far the most problematic, with several participants mentioning cough and seasonal flu.

Available products: Some people had heard radio or television messages about Aquatabs (socially marketed chlorine tablets) but the study did not find any women who had tried it.

Access

The question of quality aside, access to sufficient volumes of drinking water was a serious concern for about half of the households interviewed in Mali, as wells dry up in the dry season, or water at the public standpipe is available only during limited hours. Access to water is a problem in two primary scenarios. First, in rural and peri-urban areas almost everyone has a well on the land where they live or

How do people get their water pots?

Stacks of ceramic pots are seen abundantly in open-air markets or for sale alongside roads. The pots are typically given to the bride as part of the marriage arrangements by her mother, who supplies kitchen-related items such as bowls, utensils and water jar.

The bride moves to the husband’s compound, so the study typically found the women respondents living with her husband and children, with the husband’s birth family in separate rooms or living quarters in one large concession.



within two houses away. However, since the dry season is from February through June, wells run dry or the water gets muddy during this season. People then fetch water from sources slightly farther away from their homes during this part of the year. Second, in certain peri-urban neighborhoods, there are enormous pressures for water and the boreholes/pumps dry up. Also, even though standpipe water is available, water is dispensed slowly or only comes on for a few hours in the day (or around 3:00 a.m.).

In the most extreme case, observed in a poor, peripheral peri-urban neighborhood of Bamako, the population has completely resorted to a privatized water collection and distribution system wherein young men invest in hand-pushed or donkey-pulled metal carts that hold from 6 to 20 twenty liter jerry cans. They spend hours waiting for the water to come on, then fill their cans and distribute along identified routes where they have customers who pay between 25–50 FCFA (5–10 cents) for 20–25L of water that is delivered directly to their door). This system fills a need for women who have so much other household work—including laundry, cooking and cleaning— that they cannot afford to spend hours waiting for water at the pump.

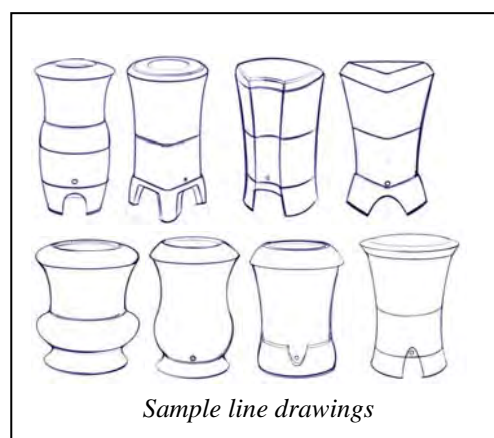


Typical drinking water sources and transportation scenarios. Credit: PATH/Siri Wood.

Identifying potential solutions—product options and concepts

Formative research and subsequent product development conducted by the SWP in India and Southeast Asia resulted in a set of [design guidelines for HWTS devices](#), [three new gravity-fed HWTS devices](#), and a [redesigned Ceramic Water Pot](#). The Africa research aimed to gather user feedback on product options and concepts, including the three gravity-fed devices based on these design guidelines.

In Mali, two types of product concept cards were used to assess user opinions about configurations and characteristics of devices. First, a series of line drawings were shown to participants to gather feedback on potential product shapes without the influence of color and material. Second, a set of color photos of durable HWTS products was shown—including the new product prototypes developed following the formative



work described above. Participants were asked about overall product preferences—which product they liked best, least, and why, as well as about particular product attributes such as shape, size, durability, and perceived affordability.

Given general unfamiliarity with durable products, the interviewer provided a brief explanation of water filtration devices and how they work to participants. Despite their lack of experience with durable products, all participants expressed interest in owning a product that would provide clean water and contribute to their family's health.

Product feedback—shapes and products

The participants in Mali expressed specific needs and preferences related to specific attributes of durable HWTS



Participant viewing device photographs.
Credit: PATH/Siri Wood

products. For the **line drawings**, the most popular shape was a drawing of a traditional hourglass-shaped clay pot with a wider mouth, narrow middle, and wide, round bottom. Participants liked the familiarity and aesthetic form of this design. Two priority features used by participant to evaluate products were *shape* (“beautiful”, “it looks like my jar”) and *volume* (devices that were perceived to hold the most water).

For the **photographs**, participants reacted most strongly to product *aesthetics*, “it’s beautiful” and “nice to look at”. The favorite product was a basic ceramic water pot filter that fit in a plastic bucket. Participants liked that it looked *attractive*, *durable*, and *easy to clean*.

Other product attributes mentioned were *size* (devices that looked as if they would hold enough water), *ease of cleaning*, *durability* (this was most frequently mentioned as a concern), and *fit* (too high was not practical for Mali).

HWTS user needs

The formative research on HWTS and sanitation in Mali provided information about user needs related to water and sanitation—both expressed (that is, needs that were clearly articulated by the participants) and observed (that is, needs that were identified through the research but not overtly stated by participants).

Expressed needs. Due to very hot temperatures most of the year and a dry, dusty environment in the Sahara Desert and the semi-arid Sahel, keeping drinking water cool is the strongest value expressed by participants. Ceramic pots keep water cooler than plastic or metal containers and thus are the preferred storage vessel. Large volume and durability of the water storage container are emphasized due large family size with many children. A water storage device holding

“Water from the standpipe is good to drink, it suds very well and it’s clear.”



“I’m satisfied with the water. The taste is good, the water is clear and it suds well.”

10L is considered insufficient and burdensome to refill; 20–30L of stored water is valued. Ease of cleaning was also mentioned as an important attribute.

Overall, the participants did not express concerns about their drinking water—either in terms of water quality or the need for water treatment, and, diseases related to water and sanitation were not identified as a key concern. On the whole, participants described their water as clean or potable, and, while almost half of the participants were aware of chlorine products, none of the participants reported either consistent or correct chlorine use.

Observed needs. While HWTS was not an expressed need, researchers observed several needs related to household drinking water and storage. *First*, there is a clear need for information about quality of drinking water—both of source water and water stored for household use. Many participants expressed the belief that their water was “clean” — citing clarity, taste and sudsing ability as reasons for this belief. While all of these are important attributes of “good water” for the participants, the assumption that this water is also “safe” is erroneous and potentially harmful. *Second*, in addition to the need for information around water quality and the potential need to treat, there is also a need for accurate information around household water treatment. Even though participants did not prioritize household water treatment, several participants reported chlorine use, although most were either uncertain about the dose, did not use chlorine regularly, and/or reported treatment of well water (that is, the source water itself), rather than the household drinking water container. *Finally*, even if source water is clean, the team observed opportunities for recontamination during collection and storage—including using uncovered storage containers and using a plastic cup for dispensing and drinking at point of use. A 2007 survey by Population Services International in Mali found that the risk for contamination in the home was high for 32 percent of households, and the risk for contamination during transportation was high in 20 percent of households (Corker 2007).

Results for sanitation needs

The Africa user research also explored sanitation needs and experiences of users. According to the most recent World Health Organization/United Nations Children’s Fund Joint Monitoring Programme for Water Supply and Sanitation data, 45 percent of Malians use unimproved sanitation facilities, 22 percent use “improved” facilities, and 14 percent practice open defecation (WHO/UNICEF 2012).ⁱ

ⁱ “Improved” sanitation facilities are defined by the World Health Organization as sanitation facilities that (a) ensure hygienic separation of human waste from human contact; and (b) are not shared (used by a single household).

User experiences—sanitation

Sanitation facilities

All households had covered pit latrines and use private septic companies that come and clean out the pits periodically. However, there were significant differences in maintenance and materials used; cement blocks were more common in urban areas and mud bricks were used in rural areas. The participants' latrines were characterized by their permanence—durable materials were used and pits are emptied rather than moved. Overall, the latrines in urban areas were older and had a higher number of users, whereas, in rural areas, most latrines had been built or rebuilt/remodeled within the last three years. The 2006 Demographic and Health Survey in Mali found that 11 percent of households had modern private toilets or improved latrines, 34 percent (23 percent urban and 39 percent in rural) had rudimentary latrines, 34 percent (27 rural and 49 percent urban) used shared latrines and 21 percent (28 percent rural and 7 percent urban) had no toilet facilities at all.



Latrines in urban, peri-urban, and rural Mali. Credit: PATH/Siri Wood

Open defecation

Participants were asked if open defecation was a problem in their community. All participants stated that open defecation is not a problem; however, at least two children were observed defecating in the open near houses in rural areas. More than half of the houses had plastic children's potties in the courtyard or outside the latrine.

Stakeholders also described open defecation as an important issue. Throughout Mali, a number of governmental and non-governmental agencies are working to scale up Community-Led Total Sanitation (CLTS) as a popular approach to community sensitization about open defecation.

User needs—sanitation

This initial assessment helped identify user needs and preferences around toilet facilities. The functional sanitation ladder provides a framework for thinking about improving sanitation facilities and potential next steps for product development (Kvarnström et al. 2011). The rungs of the ladder include (1)

containment of excreta; (2) safe access and availability; (3) management of greywater; (4) reduction of pathogen in treatment; (5) reuse of nutrients; (6) reduction of eutrophication risk; and, (7) integrated resource management. The first two rungs of the functional ladder, in particular, identify criteria for improving latrines as well as evaluating sanitation facilities.

Containment of Excreta	Safe Access and Availability
<ul style="list-style-type: none"> • Clean facility in obvious use • No flies or other vectors • No fecal matter lingering in or around latrine • Hand-washing facility with soap in obvious use • Lid • Odor free 	<ul style="list-style-type: none"> • 24 hour access, year round • Privacy, personal safety, shelter • Adapted to needs of users (such as children, women, elderly)

Functional sanitation ladder (rung 1 and 2). Credit: PATH/Jennifer Foster

Observed needs around sanitation facilities in Mali included privacy (rung 2) and hand-washing (rung 2). Although participants did not describe it as a problem, the walls of many of the latrines provided limited privacy, and, in some cases, the hole could be observed from the opening to the latrine. Although there was some awareness around hand-washing, there was minimal use of soap. While some respondents reported “washing” their hands after cooking or cleaning and using the toilet, most reported using only water rather than water and soap together.

The research also pointed to some community level needs—both expressed and observed—around sanitation. Latrine maintenance and waste management were key issues. In particular, dumping by latrine maintenance companies is a major issue facing the Ministry of Health sanitation staff.



Latrine Maintenance. Credit: PATH/Siri Wood

Other issues include consumer financing for upgraded/improved latrines, particularly given the influx of CLTS projects in Mali, as well as a need for increasing awareness about and promoting behavior change around open defecation, particularly by children under age five.

Public health and expanding product choice

Product development and public health

This study constituted an initial phase in a user-centered design process for gathering information about the needs, experiences, and preferences of potential low-income users of HWTS and sanitation in three settings in Africa. This user-centered approach is crucial to developing a solution that is appropriate for the local context and environment, that is acceptable to potential end users, and that will be used correctly and consistently to improve the health of low-income households. While qualitative, exploratory and introductory by nature, findings from this study suggest directions for potential product solutions and concepts that could improve the health of children under five and their families.

Appropriate solutions

Need for HWTS products

The Millennium Development Goals describe effective access to drinking water in two ways—as access to a reliable “improved” source and availability of safe water, that is, water that meets standards for levels of microbiological, chemical, and other contaminants. This research highlights that access to clean water at the source is necessary but not sufficient, since the researchers observed many behaviors that can cause recontamination during collection and storage. The need for improving consumer choice of household solutions is clear, including increasing the availability of durable (HWTS devices) and consumable products (chlorine products).

Product development of HWTS devices

Products need to match local conditions and needs. For participants who do not treat their water consistently, a product that could be easily integrated with existing water storage containers during disease outbreaks and/or the rainy season could have a health impact. To address the potential contamination of drinking water during dispensing, developing a tap that could be used with the ceramic pots would be a potential next step. The researchers observed some ceramic pots that were modified by a local non-profit organization to include a tap. While the concept is valid, the technical engineering of this configuration is yet to be perfected.



Modified ceramic pot Credit: PATH/Siri Wood.

Products need to be accessible. Improving product choice is only the first step; for these products to have a health impact, potential users need to have access to markets and resources—including financing options—to buy products, get replacement filters, and also access to repair and maintenance services if

needed. Given the low buying power of consumers in Mali, price and affordability of HWTS products are key considerations.

Products need to be tested by actual users. While participants expressed interest in the products featured on the concept cards, these products need to be tested in the field—to evaluate the *user experience* (from initial set-up and daily use to cleaning and maintenance), overall *acceptability* (including flow rates, storage capacity, taste of treated water and temperature of stored water), and *durability*. In addition to extended product use, attention also needs to be paid to supply chains and consumer financing to ensure *access*. All these factors informed product design and market development as part of the Safe Water Project in Asia.

Products are only part of the solution. In addition to water quality, *access* to sufficient water is also important. Participants in Mali reported concerns with the availability of water, including long wait times and limited hours. *Awareness* is another part of the solution. Activities that increase awareness of water quality, advise where and when to treat drinking water, and correct misperceptions such as the belief that clear water is clean water are also necessary. Complementary activities to improve sanitation and hygiene are also required to maximize the health benefits of HWTS.

Product development of sanitation technologies

This initial needs assessment provided valuable information on how product development could help improve sanitation facilities and move participants and their communities up the functional sanitation ladder.

Product development—beyond latrines. Building a better latrine is only one step along the ladder to improve sanitation facilities as well as household and community health. In areas where latrines are more permanent and constructed of durable materials, such as the study sites, a focus on latrine emptying and waste management technologies is important to support both healthy households as well as communities.

Products to support behavior change. Increasing awareness and promoting behavior change, for example, around open defecation needs to be accompanied by the development of appropriate, acceptable, and affordable sanitation products. When sanitation facilities are well-designed, they are more likely to be used correctly and consistently. The development of an affordable improved pit latrine design, based on the functional sanitation ladder that provides a positive user experience, would support an increased demand for sanitation facilities through community-led total sanitation or other activities. This is particularly important given the percent of the population that is still using “unimproved” latrines.

Products that support upgrading existing facilities. In areas, such as the study sites, where latrine use is prevalent, the next phase of product development could focus on user needs surrounding the improvement of existing sanitation facilities, in particular, looking towards the first two rungs of the sanitation ladder.

Next steps

The PATH Water, Sanitation, and Hygiene (WASH) team is actively looking for partners to pursue follow-up activities for the Africa User Research, not just in the three countries where the research was conducted, but also in Africa more generally.

Current activities—existing and proposed—that build on and incorporate the learning from the Africa User Research include the following:

- Pilot product and user experience testing by partners in Africa, for example, in Uganda and Rwanda.
- Extended user testing of one or more of the three gravity-fed water filtration devices or the redesigned ceramic water pot. This would include in-home product placement with months of actual use as well as monitoring and evaluation of the impact and use of the devices.
- Sanitation activities in Africa, including a project focused on developing a latrine superstructure in Kenya, and a targeted WASH evaluation and intervention in coffee-growing communities in Tanzania.

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