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Mobile Phone Prepayment for Household Water Connections in Ghana

Paper for the WASH systems symposium

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Safe Water Network Ghana, with funding from the World Bank's Consultative Group to Assist the Poor, implemented a prepaid metering programme for household connections in selected communities to improve water stations' financial viability and consumer satisfaction. Consumers prepay for water with mobile money – an electronic wallet service on mobile phones. Once credit is exhausted, a built-in automated valve shuts water flow until the consumer makes the next purchase. After about five months, preliminary results indicate that prepaid meters improve water stations' financial viability. Although household connection sales volumes decreased by 25% from prepaid meters, revenue increased by 18% and arrears decreased by 46% because of the meters' improved revenue collection mechanism. As a result, stations' gross margins improved from -8% to +30%. After an initial learning period, customers and station operators both preferred prepaid meters to the post-paid meters. Consumers reported feeling more control and ownership over their water consumption. Operators reported saving up to 7 hours per week on payment collection. Though mobile money penetration is high (72%), using mobile money for water bill payments is not top of mind and would require additional awareness campaigns to achieve increased uptake.

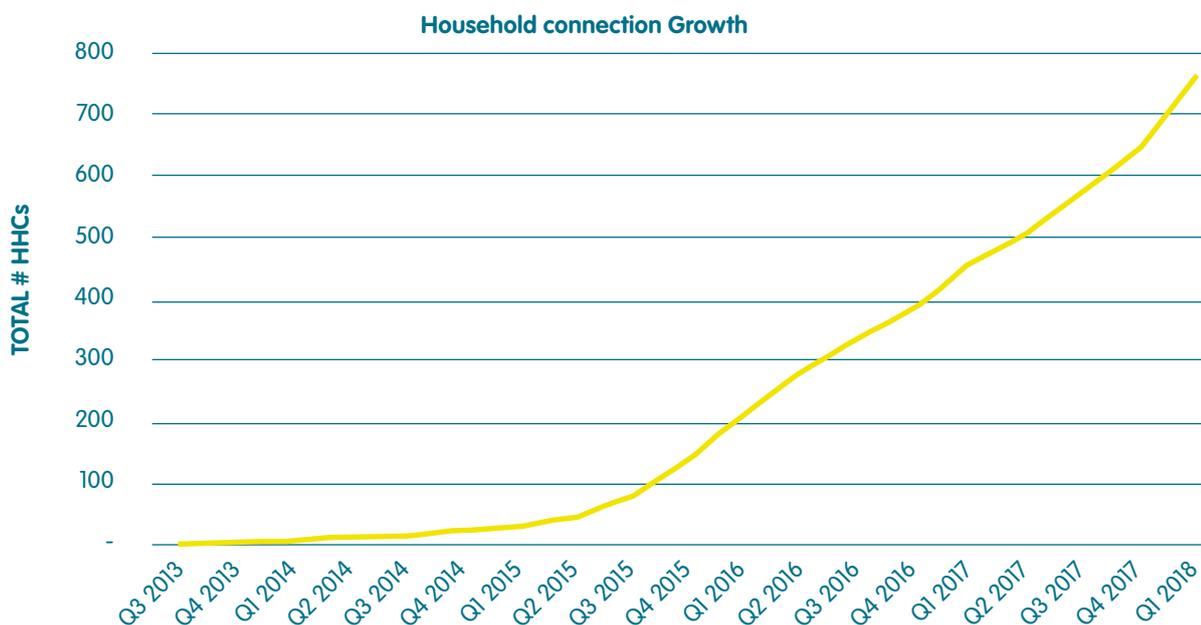
Context

Safe Water Network Ghana's H2OME! Stations are small water enterprises that sell high-quality water at affordable rates. Water access is provided through public standpipes and household connections (HHCs) that pipe treated water from the H2OME! Station directly to the consumer's premises for on-demand access.

In May 2017, Safe Water Network partnered with the Consultative Group to Assist the Poor (CGAP) to pilot new water meters for household connections in an effort to reduce arrears from under-collection and improve the payment experience for both consumers and station operators. Approximately 100 households from two communities in our Ghana portfolio were converted from post-paid to prepaid meters (to reduce under-collection) with the option to pay via mobile money (to allow users to buy water credit without operator assistance). We analyzed the effect on station financials, consumers, and operators during a five-month pilot.

Compared with water collection at the station, HHCs significantly increase convenience to the consumer, resulting in both social and financial benefits. Greater ease of access means that consumers can use clean water for more purposes (drinking, cooking, bathing, etc.), likely further reducing incidence of waterborne illnesses and the associated healthcare costs and lost school or work days. HHC customers consume approximately four times

FIGURE 1. SAFE WATER NETWORK GHANA HOUSEHOLD CONNECTION GROWTH



Source: Safe Water Network Management Information System

more water on a per capita basis than those without HHCs (60 LPCD vs. 15 LPCD). The higher water volumes (and consequently higher revenue) strengthen the long-term viability of the water enterprise.

As of the end of 2017, there were about 650 HHCs, representing 20% of total volume sold across our Ghana portfolio. Based on the historical growth trends (Figure 1) and field assessments of consumer demand, there is considerable potential to expand our HHC program.

However, two barriers would need to be addressed before pursuing further roll-out of HHCs:

- **Post-paid HHC bill collection process was time and resource intensive.** Station operators spent up to 25% of their time traveling to households for billing and payment collection and reported that revenue collection was successful only 50% to 70% of the time. Repeat operator visits were frequently required because consumers were either unavailable to receive the bill or did not have sufficient cash in-hand.
- **HHC program suffered from low collection realization rate.** Consumers, unaccustomed to tracking consumption during the month, were frequently surprised by the timing or amount of their bills. As a result, many HHC accounts were in arrears, and the collection realization rate (the percentage of billed fees actually collected) was below 50%.

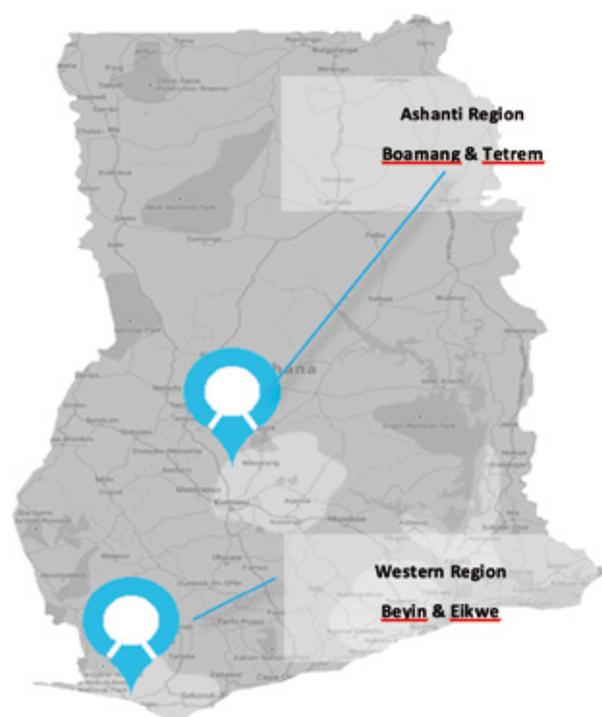
To address these issues, Safe Water Network Ghana partnered with CGAP to pilot new meters that (a) would reduce arrears and increase collection realization rate by requiring prepayment for water (the new meters allow consumption only when the HHC account has a balance); and (b) would reduce operating costs and improve user satisfaction by allowing HHC customers to independently top-up their account balances via mobile money, instead of relying on the operator to complete cash transactions. The prepaid meters were procured from Laison Technology Company Limited, a China-based technology company that specializes in prepayment solutions for water and energy. With an average landed and installation cost of ~\$120 per unit, these meters operate using a 20-digit token generated upon purchase by the customer. These codes activate the meters and allow water to flow to the consumer. Once credit is exhausted, a built-in automated valve shuts water flow until the consumer makes the next purchase. The meters operate on LoRa® communication systems with no need for active internet connectivity, no operating cost and minimal maintenance requirements (mainly battery replacement). The system makes it appropriate for deployment in rural Ghana, where mobile connectivity is a usually a challenge.

Methodology

Community selection

Two communities (Beyin and Eikwe) from the Western Region and two (Boamang and Tetrem) from the Ashanti Region were selected based on their geographic proximity, community socioeconomic characteristics, and number of HHCs. One community in each region was converted to prepaid meters; the other continued on conventional post-paid meters. In total, approximately 100 HHCs were converted to prepaid meters and approximately 50 HHCs served as the control group with post-paid meters.

FIGURE 2. MAP OF GHANA SHOWING PILOT COMMUNITIES



Source: Safe Water Network

1. Baseline survey

A baseline survey was conducted at all four communities to understand community perception of the prepaid meter payment process and mobile money:

- 50% felt prepaid meters and mobile money would improve their water payment process, primarily because of an expectation of improved convenience.
- 72% had mobile money accounts (52% had both mobile money and bank accounts).

2. Quantitative analysis

We tested our hypothesis that new meters would improve stations' financial performance by comparing water volumes, revenues, and arrears for the households in the

pilot communities during May–September 2017 with those during May–September 2016. To avoid confounding factors that could have affected year-on-year trends (e.g., rainfall), we conducted a parallel analysis for the control communities. We also analyzed consumer uptake of the mobile money payment option for water bill payments to assess the potential to integrate mobile money into our operations.

3. Qualitative analysis

Three visits were conducted throughout the course of the pilot to perform a qualitative assessment of consumer and operator satisfaction as a result of the new meters.

Results and findings

1. Volume

Water volume consumed by households with HHCs using the new meters decreased by 52% during the five-month analysis period compared with the same timeframe in 2016. However, control households reduced consumption volumes by 25%, suggesting that factors unrelated to the meters (such as rainfall and local competition) may have contributed to overall volume loss. We concluded that about 27% of the total 52% reduction experienced was likely due to the new meters.

A deeper dive into HHC purchasing patterns confirmed that households with the new prepaid meters were more likely to reduce consumption: 54% of pilot HHCs reduced consumption versus only 31% of the control HHCs (see Table 1). Interestingly, the percentage of HHCs with no activity during the pilot period ('dropouts') was identical for both cohorts, indicating that the new meters did not have a significant effect on dropouts. Instead, it seems that dropouts were driven by arrears, as those households that dropped out had the highest average arrears.

Some pilot HHC customers surveyed during our field visits indicated that they reduced consumption because of confusion about the new payment process. However, many responded that the decrease was due to better understanding of their own water consumption and an effort to reduce waste.

2. Revenue

Prior to the pilot, the collections realized were GH 0.06–0.07 per 20L on average versus a target due of GH 0.10 per 20L – that is, a 60% to 70% collection realization rate. Collection rate refers to actual revenue generated from water supplied to household (expected revenue) as a percentage. Collection realization rate at the pilot HHCs increased to 160% (GH 0.16 per 20L) because the prepaid meters automatically deduct credit from the HHC balance upon consumption, rendering it impossible to underpay for water consumed. Revenue collection exceeded even the full amount targeted because consumers were making extra payments to reduce their arrears. By contrast, although the collection realization rate at control households improved slightly, it remained at approximately 70% (Table 2). As a result, revenue collected for the pilot HHCs increased by 18% compared with the previous year, despite the 52% drop in volume.

Improvement in revenue collection rate is critical to a station's financial sustainability. The average station incurs GH ~0.071 per 20L in operating expenses. Prior to the pilot, revenue collected per 20L for HHCs was not enough to cover the operating costs specific to HHCs, yielding a gross margin of –8% for HHC sales. During the pilot, the new prepaid meters improved the gross margin to 56% (or around 30%, when discounting for arrears repayment).

Table 1. HHC change in volume activity

Category	Pilot HHCs (76 total)		Control HHCs (39 total)	
	% of Total HH	Avg Arrears @ Start (GH)	% of Total HH	Avg Arrears @ Start (GH)
Increased	13%	113	33%	112
Maintained	1%	63	5%	45
Reduced	54%	111	31%	104
No activity	31%	151	31%	210
Tot. avg. arrears	100%	121	100%	136

Table 2. Average revenue per HHC

	May–Sept 2016 (GH)	May–Sept 2017 (GH)	%Δ
Pilot HHCs (76 total)			
Revenue per HHC	104	123	+18%
Revenue per 20L	0.07	0.16	+128%
Control HHCs (39 total)			
Revenue per HHC	109	99	-9%
Revenue per 20L	0.06	0.07	+17%

3. Arrears

Table 3. Average arrears per HHC

	Pilot start (GH)	Pilot end (GH)	%Δ
Pilot HHCs (76 total)	123	67	-46%
Control HHCs (39 total)	136	225	+65%

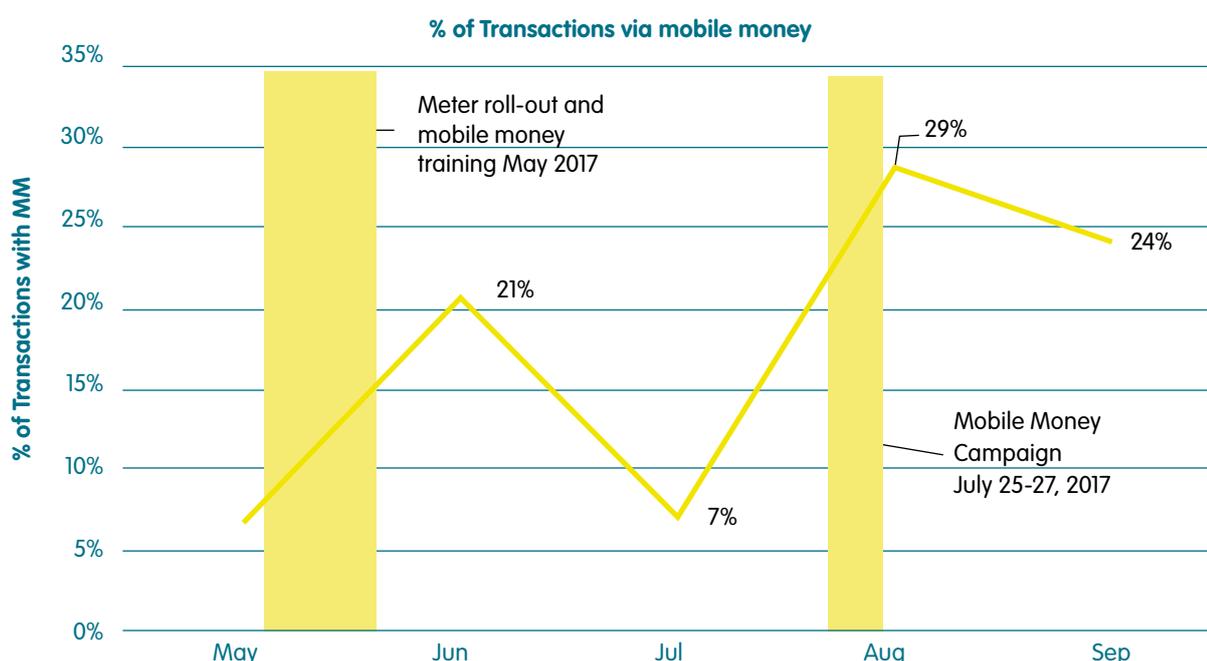
The prepaid meters were calibrated to apply 50% of payments towards reducing arrears. This policy significantly improved consumer awareness of their arrears, and some households paid off their arrears entirely before converting to the new meters. Arrears of the pilot HHCs decreased by 46% (Table 3), and half of the pilot HHCs eliminated their arrears entirely by the end of the pilot. Meanwhile, arrears for control HHCs increased by 65% during the same period.

4. Mobile money use

Mobile money – an electronic wallet service that allows users to store, send, and receive money using their mobile phones – accounted for 14% of the total transactions and 10% of the total revenue received during the pilot period. Although mobile money penetration was high at the start of the pilot (72% per the baseline survey), willingness to use it for water bill payment had to be increased and sustained.

HHC customers were given the option to pay their bills via mobile money or via cash to the operator. Although many households use mobile money for remittances, using it for bill payment was not top of mind. We conducted mobile money awareness and promotion programs during our first and second field visits and found communities were highly receptive. Mobile money use spiked in the month immediately following exposure to awareness programs but tapered off as time passed (see Figure 2).

FIGURE 2. CONSUMER RESPONSE TO MOBILE MONEY AWARENESS TRAININGS



Source: Safe Water Network (pilot data)

Consumers interviewed during field surveys and trainings expressed interest in mobile money and a willingness to learn. Future roll-out of mobile money processes must be paired with robust consumer training and engagement programs to facilitate adoption.

5. Consumer and operator satisfaction

After an initial adjustment period, pilot HHC customers reported increased satisfaction with the payment process. Users were initially very enthusiastic (they were impressed by the meters' appearance) but provided mixed feedback during the second visit, with some customers complaining that it was difficult to anticipate when the meters would cut off water supply. Additionally, they indicated that the delay between making the payment and receiving the top-up credit on their meter—the top-up code had to be generated manually by the Safe Water Network Ghana head office—was inconvenient. During the final visit, however, the majority of the customers interviewed reported that they preferred the new meters. They were relieved that they were no longer surprised by their water bills and felt the new meters gave them more control over household consumption.

Station operators also preferred the new meters. They estimated that the new meters had reduced their time spent managing HHC payments from 12 hours to 5 hours per week (a 58% time savings). The nature of their customer interactions also changed: whereas previously they were chasing HHC customers to resolve billing issues, now they were directly approached by customers to collect payments and assist with account top-up.

Next Steps

The pilot demonstrated that tangible financial, operational, and consumer benefits to incorporating prepaid, mobile money-enabled meters for HHCs. Safe Water Network Ghana is committed to transitioning all HHCs (existing and new) to the new meters. The lessons learned through the pilot will inform our next steps as we pursue broad roll-out:

- **Design targeted consumer training and promotion programs.** As user satisfaction and uptake increase with better understanding of the prepaid system, consumers will be given comprehensive training on the basics of using the meters and mobile money (with picture guides). The program will include repeat trainings for a period of time to ensure retention. Training will be paired with promotions and incentives to encourage adoption.
- **Design 'training of trainers' program for operators.** Station operators reported significant time spent helping households with account top-ups (a process

that should be autonomous). Going forward, operators will be trained and equipped with materials to train HHC customers to top-up their prepaid accounts independently.

- **Fully digitize meter top-up process.** To streamline and remove friction from the transaction process, we plan to fully digitize the mobile money payment process. The prepaid meter software platform will be integrated with the mobile network operator's platform so that mobile money payments will be automatically recognized by the prepaid meter.

About Safe Water Network

Safe Water Network is advancing the potential for small water enterprises to ensure that millions in need gain access to the most essential of needs: safe water. Working in hundreds of communities in Ghana and India, we are demonstrating the affordability, effectiveness, and sustainability of the enterprise approach. Working with government, development agencies, and other implementers, we are expanding this approach to improve the health and livelihoods of millions of people in need of safe water.

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Notes

- i LPCD = Liters per Capita per Day
- ii Some HHCs were excluded from analysis due to insufficient historical data, as a result the analysis in this report represents data from 76 pilot HHCS and 39 control HHCs
- iii Three visits conducted: (1) Pilot start Apr/May 2017, (2) Mid-Pilot July 2017, (3) Post-Pilot
- iv Both pilot communities experienced greater reductions in volume than their corresponding control communities.

Keywords

Prepaid, arrears, mobile money, activations

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