The impact of price increases on water station performance and inclusiveness in Ghana

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The impact of price increases on water station performance and inclusiveness in Ghana

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Water utilities face the difficult challenge of balancing affordable water service provision and covering the costs of operation and maintenance (O&M) and sustainability reserves through water sales revenue - approximately 70% of all utilities globally do not fully cover costs with revenue. In April 2016, Safe Water Network (SWN) increased prices at 29 of its 35 Safe Water Stations in Ghana to adjust for increasing variable costs and high inflation. SWN analysed sales and consumer data before and after the price increase to understand the impact on financial viability and inclusiveness. Our analyses show a 12% reduction in consumer purchases overall in the 15 months following the increase, driven largely by decreased participation of low socio-economic status (SES) groups. However, evidence suggests that average monthly sales volumes are recovering to pre-price increase levels.

Background

Water utilities face the difficult challenge of balancing affordable water service provision while covering the costs of operation and maintenance (O&M) and sustainability reserves through water sales revenue. According to the World Bank, approximately 70% of the world's water utilities do not fully cover costs with revenue; in low-income countries, 97% of utilities set tariffs too low to cover even basic O&M, resulting in heavy reliance on subsidies (2005).

Safe Water Network (SWN) in Ghana provides affordable, safe water through small water enterprises (SWEs). These SWEs, or Stations, abstract, purify, and sell water at affordable prices that accommodate populations at the bottom of the pyramid. The Station selects the appropriate water treatment technology based on the ground- or surface-water resource potential in the area. Stations that source from groundwater with adequate quality treat water through Limited Mechanization Systems (chlorination and mechanized boreholes) and, in the case of surface freshwater with low turbidity levels, Modular Slow Sand Filtration. In a few instances where water has more quality challenges than the other two technologies can accommodate, the SWE apply Multi-Staged Filtration with Ultraviolet Radiation. All Stations use chlorination at the end of the treatment processes for residual protection. In each community, SWN staff train and supervise local operators and vendors to manage the Stations operations and water sales.

To maintain Station financial performance in response to changes in the local operating environment, SWN Ghana raised water prices by 33-50% in April 2016, based on Station technology type (Table 1) —a driver of variation in O&M expenses—after engaging with communities, district assemblies, and the water boards. The new prices also considered the availability of currency denominations and affordability targets[1] for those earning approximately USD 1.90 per day, the target demographic (World Bank 2015). Prices were not increased in six of the 35 Stations due to various factors (market conditions, weak performance, etc.). Both Station groups (those with and without a price increase) comprised a similar mix of water treatment technology, age, geography, and price-point distribution.

Table 1. Stations analysed by technology type

		Price per 20L (in pesewas)		
Technology	**# Stations (# with price increase)**	**OLD**	**NEW**	**% Price Increase**
Limited Mechanization System	26 (23)	6.7	10	33
Modular Slow Sand Filtration	5 (3)	10	15	50
Multi-Staged Filtration with Ultra Violet	4 (3)	15	20	33
TOTAL	35 (29)	33% Average Price Increase		

At the previous price point, Station financial viability was highly susceptible to increases in electricity costs (which saw a 23.2% average annual increase from 2010 to 2015) and high inflation rates (which experienced a 16% average annual increase from 2010 to 2015) (Energy Commission of Ghana 2015; World Bank 2017). However, SWN recognized that a price increase to counteract higher O&M costs could potentially reduce consumption and impact Station financial performance. The impact of the price increase was analysed so that its effects on financial sustainability and consumer inclusiveness could be understood.

Methodology

Two analyses inform the findings in this report:

Operational data analysis

SWN used monthly operational data from each of the 35 Stations in Ghana that have been in operation for more than one year, grouped into different cohorts (Stations with or without a price increase; Station age; new price point; and location). The data was further categorized by the sales level of different water services, including total Station sales, onsite sales[3], Household Connection (HHC) sales[4], and bulk delivery sales[5]. Cohort trends were compared by assessing sales volume, revenue, and gross margins between January 2015 and June 2017 (15 months before and after the price increase). This report includes significant findings with programmatic implications.

Consumer survey analysis

SWN collected water purchase data from 332 households in eight representative communities (of the 29 that experienced a price increase). Data was collected over 41 days—11 days before the price increase and 30 days after.[6] Households were stratified into socio-economic statuses (SES)[7] to evaluate purchase behaviour.

Limitations

Limitations include compounding factors and externalities that could not be entirely controlled, such as:

- Seasonality and rainfall patterns that may have affected consumer purchase behaviour;
- HHC revenue collection arrears;
- Sales trends due to the effect of launching new Stations nearby; and,
- Station downtime from pump- or electricity-related issues that may have affected sales after the price increase (especially in September 2016 and June 2017).

Results and findings

Sales volumes nearly recovered to pre-price increase volumes after 15 months

Operational analysis

SWN's analysis suggests that the price increase negatively affected sales volumes temporarily at Stations with a price increase, compared to those without a price increase. After an initial decline, however, Station sales volume recovery was on track to match pre-price increase volumes 10-15 months after the price increase (January to June 2017), though more data is required for conclusive evidence of recovery.

Overall, average monthly sales volumes decreased by 12% in the 15 months after the price increase—from 349,000 litres per month per Station (LMPS) to 306,000 LMPS. By contrast, average monthly sales volumes at the six Stations without a price increase only decreased by 1% (from 309,000 LMPS to 306,000 LMPS) for the same period[8] (See Figure 1).

Figure 1. Average Monthly Volumes per Station (L)

Source: Safe Water Network (SWN)

However, January to June 2017 show a marked improvement in sales volumes (see Figure 2). The average monthly sales volumes for the first six months of 2017 were only 4-5% below volumes for the same period before the price increase. The monthly volume comparison between January and June 2017, compared to the same time period before the price increase, further improves to breakeven with pre-price increase volumes—if one excludes the data set for periods that experienced non-price-increase-related issues, such as unseasonably heavy rainfall (which is attributable for low volumes in June 2017[9]) and downtime from technical issues.

Although these trends are promising, month-over-month volume growth remains volatile and highly susceptible to external factors. Further data collection and observation is therefore necessary to confirm recovery from the price increase.

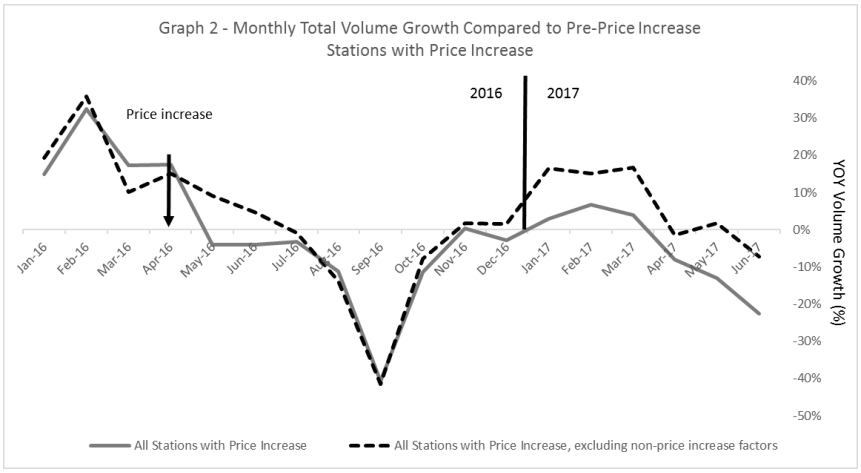

Figure 2. Monthly Total YOY Volume Growth,

Source: Safe Water Network (SWN)

Consumer survey analysis

SWN's consumer research corroborates the result of a 12% decrease in volumes for stations with a price increase over a 15-month period. The research suggests that consumers purchased on average 15.6% less water 30 days after the price increase (an average of 53 litres per day of water pre-price increase and 45 litres per day post-price increase).

Low Socio-Economic Status (SES) cohorts were the most impacted by price increase for onsite sales

On average, SWN's consumer study found that low-SES households were most affected by the price increase. Low-SES households decreased their water purchase by 26% for onsite sales, while purchases by high-SES households increased 26%. Of low-SES households surveyed, 57% reported decreased use or dropped out, compared to 19% in high-SES households (see Table 2).

Lower rainfall likely resulted in 26% increase in high-SES households' volumes; after the price increase, average daily rainfall decreased by 34% (compared to what) at the communities surveyed for the consumer analysis. Low rainfall typically drives consumers to increase volume purchased from the Stations. Socioeconomics may have influenced responses to the price increase, as the low-SES households may have been unable to increase purchases with the new price.

Table 2. Household SES Status and Purchases Pre & Post Price Increase, based on Consumer Surveys

	# of HH, High SES	# of HH, Low SES
Household behaviour user changes		
Total HH Surveyed (#)	90	65
HH % Increased Use	50%	8%
HH % Decreased Use	19%	57%
HH % No-Change in Use	20%	20%
HH % Drop Out	1%	3%
HH % New User	11%	15%
Average household volume changes		
Average Volume (L) per HH Before Price Increase	49.1	47.5
Average Volume (L) per HH After Price Increase	61.7	35.0
After Volume Change	26%	-26%

In Ghana, consumers use SWN water primarily for non-drinking purposes; since water is used primarily for non-essential activities, reduction is use after the price increase is unsurprising, particularly for low-SES consumers. That said, it is concerning to see the high decrease in low-SES use, both because low-SES households are SWN's target market, and also because there are likely to be health impacts associated with switching from a safe source to an alternative source even for non-essential activities.

Following the price increase in 2016, SWN is devising pricing strategies that will balance financial performance while maintaining affordability to low-SES households. One activity under evaluation is allowing for lower-tiered pricing options, with below-market inflation rates, that offer safe and affordable water access to the target low-SES households at Station standpipes, while offering higher prices at HHCs. Additionally, SWN is considering customer loyalty programs such as offering 20L free after buying five 20L purchases over time. A loyalty program requires more consumer data available to analyse; it will also take time to determine what the program would look like and work.

Convenience of household connections contributes to pricing resilience

Operational analysis

HHC sales volumes increased despite the price increase, suggesting that the convenience afforded by HHCs may strengthen pricing resilience. Average monthly sales volumes for HHCs were 3% higher during the 15-month period after the increase than the same period prior to the increase[10], while onsite sales volumes decreased by 27% (see Figure 3). Prior to the price increase, HHC sales volumes contributed to 6% of total volumes of the 26 stations with HHCs; after the price increase, HHC sales volumes contributed 22%. These findings indicate that HHCs have played a key role in the recovery of volumes to date.

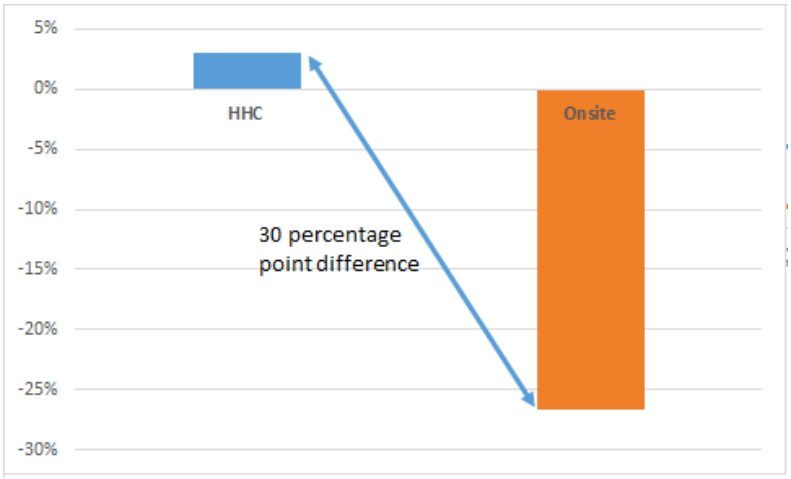

Figure 3. Change in Average Monthly Volume, Pre and Post Price Increase (%)

Source: Safe Water Network (SWN)

External factors that could be contributing to HHC sales volume trends include:

- Higher proportion of high-SES households among those with HHCs.
- New HHCs added after the price increase, which may have boosted averages (as these households may have been unaware of previous lower price points).

Consumer survey analysis

Results align with previous research on convenience as a key driver of consumer water purchases, where penetration decreased from 85% within 100m to 10% outside 200m. (Ampadu-Boakye et al 2013).

Price increase improves station financial sustainability

Though the price increase initially resulted in a 12% decline in sales volume, it ultimately improved financial sustainability: Station revenues increased by 4%[11]. Similarly, gross margins increased by 14 percentage points (from 43% to 57%[12]). This upward trend continued beyond pre-price-increase levels.

Conclusion

As Ghana strives to achieve its SDG6-related missions, these results clearly illustrate that the convenience of piped water to households is critical to both improving accessibility and providing better services delivery whilst ensuring financial viability for SWEs. It seems likely that consumers with easy access to safe water services at home are more likely going to consume more clean water and more often. One question that remains unanswered by the study is whether the SES of those who purchase HHCs for themselves are mostly high-SES households. This could open up opportunities for different pricing structures that would be

able to subsidize the prices of water bought at Stations by low-SES households while also ensuring better financial health for the Station.

Pricing is key in to the understanding of sustainability of SWEs. It is clear that unilateral pricing increases of over 33% is not ideal and risks jeopardizing affordability to vulnerable low income households. A more nuanced pricing strategy is required to meet the financial bottom line while remaining inclusive to all people within a community. Strong financial performance of water utilities potentially supports scaling programs that can improve reach to new communities. Marked opportunity also exists for socioeconomic market segmentation, through consumer tracking and behaviour analysis, allowing for lower-tiered pricing options that offer safe and affordable water access to the target demographic of low-SES households through cross-subsidized pricing. As our programs begin the process of digitizing our operations, we create the opportunity to employ technology for tiered-pricing through smart water dispensing systems at Stations and in connected households. With adequate consumer-level data, we could offer direct support and subsidy to vulnerable groups to improve inclusiveness.

A significant issue raised through these findings is that there needs to be heightened awareness that SES is a serious factor when siting SWEs and projecting performance. There needs to be an understanding that stations in low-SES communities are vulnerable to inflation because the population would be unable to support the sales required to cover increased operating costs over time. As there was a large percentage of low-SES households that stopped consuming SWN water after the price increase, it gives SWEs in low-income areas little flexibility for price increases in the future without risking significant customer drop-outs and sustained reduced sales volumes. Implementers should be aware of this during planning and factor in ongoing financial support for inflation risks.

Finally, further analysis is needed to better understand price elasticity and demand through the impact of tiered pricing increases. The analysis only had a brief consumer analysis to reflect consumer behaviour and interactions with the Station after the price increase in April 2016; SWN needs to have more data points on consumers through detailed surveys. These analyses need to look at consumer preferences, purchase decisions, and water consumption levels need to occur – that way, water service strategies can better serve target demographics. SWN has taken these lessons and applied them to a consumer tracking study that captures these consumer insights; results will guide future outreach and marketing around price changes, and will continue to share findings with the sector.

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Notes

1 Guidance on affordability is that an individual should not spend more than 3% of income on 20 litres.

3 Sales of water picked up at Station access points, including the treatment Station, sub-Stations, remote kiosks, and local standpipes manned by vendors.

4 In some communities with Stations, households can have piped water directly onto their property.
5 Some Stations offer bulk delivery, where they deliver large amounts of water to a customer in tanks, when ordered. This is a very small amount of sales volume and was not as significant part of this study.
6 The initial goal of the consumer analysis was to understand the initial impact of the price increase on consumers; therefore, the period is different from that of the operational data analysis.
7 We define SES by household assets owned, housing characteristics, and sanitation practices. SES indicators were selected using the Demographic and Health Survey in Ghana.
8 This decrease was due to two Stations with raw water quality challenges and unreliable electricity.
9 June's decrease of 21% in YOY volume growth was due to high rainfall as compared to historical June data – almost 30% of YTD rain fell in June alone, and June 2017's rainfall was the highest absolute monthly amount since the price increase in April 2016 (National Oceanic & Atmospheric Administration 2017).
10 There was significant growth in new HHCs throughout Ghana during the period of analysis (a 105% increase, from 205 in April 2016 to 421 in July 2017). This was adjusted for in the analysis.
11 There was low HHC revenue collection (and high arrears) from the increased volumes during this period, hindering revenue growth. Without any arrears, this number would be 10%. Challenges with HHC arrears (due to post-paid meter supply) are being addressed through a prepaid meter pilot program.
12 Indicative gross margin after isolating for non-sales volume related factors (e.g. electricity rate hikes and arrears from HHCs).

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