



IMPACT REPORT SEPTEMBER 2017

CityTaps - SEEN
Prepayment CTSuite
Pilot Project
in Niamey, Niger



CITYTAPS



TABLE OF CONTENTS

3	Foreword	23	Subscriber Satisfaction
4	Introduction	26	Direct Donations
5	The Problem CityTaps Solves	27	Commercial Impact
8	The CityTaps Water Access Solution	28	For Utilities
9	For Households	29	For Mobile Networks Operators
10	For Water Utilities	30	Key Challenges and Learnings
11	Impact Framework	31	Next Steps
12	Methodology	32	Special Thanks
15	Demographics - Lives We Impact	33	Awards and Partnerships
19	Social Impact	34	Get Involved with CityTaps
20	Finances and Budgeting	35	Bibliography
21	Time		
22	Health and Well-Being		



FOREWORD

In a few short months, CityTaps has shown that its vision leads to a verifiable social impact. Running water in every urban home is a better solution than other improved alternatives like public water access points or delivery services.

I am a feminist and a humanist, and I started CityTaps in 2015 to ensure that, in my lifetime, no woman or girl will have to choose between getting water for her family and working, playing, or attending school. Moreover, I believe that it is each person's birthright to access clean and affordable water conveniently. Unfortunately, even in 2017, there are nearly a billion urban people who cannot just turn a tap to access water.

In urban areas, technological solutions are well-known and well-tested. Missing is the financial sustainability for both the water utilities and their subscribers. I believe that we have begun to solve this problem, with an exponential impact potential to follow.

I hope that you find this first impact report interesting, and that it will inspire you to join us in whatever capacity to help us realize CityTaps' vision: running water in every urban home.

Grégoire Landel
CEO and Founder of CityTaps



INTRODUCTION

CityTaps is a French startup whose vision is to bring running water to every urban home in the developing world. Established in 2015, CityTaps aims to improve the health, dignity and livelihood of the urban poor in developing countries by creating access to running water at home.

To overcome payment barriers facing low-income water subscribers, CityTaps has pioneered a smart water meter that lets subscribers Pay As You Go for water services. Using CityTaps' technology, subscribers pay for water and connection fees via any mobile phone, and make flexible micropayments. This seamless payment system results in superior customer service, and increases trust between utilities and subscribers. Utilities also benefit from reduced billing costs, the elimination of bad debt, and increased cash flow predictability. With these simple micropayments, CityTaps improves the investment return of urban networks, significantly reduces customer care costs, and curtails human interference with our upfront collection processes.

CityTaps deployed 20 CTMeters in Niamey, Niger in October 2016 in partnership with Niger's national water utility: SEEN (a Veolia subsidiary).

This document gives an overview of both the social and commercial impact we measured over the course of a six-month pilot of our technology and service. This project is ongoing and serves 20 plots, providing water at home to 261 individuals.



THE PROBLEM CITYTAPS SOLVES

Today **830 million urban people lack on-premises water services** (WHO, 2017). Utility-piped water at home is the best source of water and thousands of water operators need solutions to help them reach urban dwellers (UNICEF, 2017).

Partnering with water utilities, CityTaps aims to solve two major problems:

1. **The inability of water utility companies to extend their services and still break even**, particularly to the very poor, due to lack of reliable revenue; and
2. **The difficulty for the urban poor to access clean, utility-piped water at home**, pay for water services, and remain connected over time.

Labor-intensive and costly metering, billing, collections, and delinquency processes make utilities reluctant to invest to serve low-income subscribers: revenues are uncertain and costs are high. Water usage data is incomplete, and utilities cannot optimize operations and **reduce Non-Revenue Water** (NRW).^{*} As a result, water utilities cannot finance network extensions to meet their main social objective: to provide service to everyone, particularly to poorer areas.

^{*} loosely defined as potable water that does not generate a revenue, either because of leakage or commercial losses (illegal connections, poor meter readings, etc.)



The Triple Tax on Poverty

The urban poor rely on second-class solutions (e.g. standpipes, boreholes, water delivery services) that often provide water of inferior quality, and are often unreliable and expensive. Without on-premises water, the urban poor face a triple tax on poverty: on their **finances, time, and health**. Water purchased from vendors can cost 15x the regulated rate of piped water, while collecting water from boreholes and standpipes is labor and time intensive. Women and children bear the burden of procuring water from these alternative sources, instead of going to school or work, and face the possibility of assault while fetching water (United Nations, 2015). Access to on-plot drinking water supplies improves health outcomes (Overboa et al, 2016).

Those with connections face difficulties with postpaid systems. Variable incomes among the urban poor mean that unpredictable and complicated post-paid bills, and time-consuming payment processes lead to high delinquency and disconnection rates.



1 billion

The estimated number of urban dwellers in developing countries without access to running water at home

Substitutes such as **public water points, delivery services and chlorine pills**, can be up to

15 times
more expensive
than utility-piped water,
and are often of **low quality and unreliable** *

Women and girls are
most affected, spending

over 200
million hours
fetching water annually **

443
million school days
are lost each year due to
water-related illnesses ***

To date, there
has been no
effective solution
to provide **safe,
convenient,
reliable and
affordable water
access** to
low-income
homes.

*World Bank, 2016 & CT Survey Data
UNICEF, 2016 *UNDP, 2006





THE CITYTAPS WATER ACCESS SOLUTION

CityTaps has developed CTSuite, a solution that **bridges the gap between water utilities and the urban poor**: a Pay As You Go (PAYG) prepayment service that includes the world's only smart and prepaid water meter (CTMeter), and its companion management system (CTCloud).

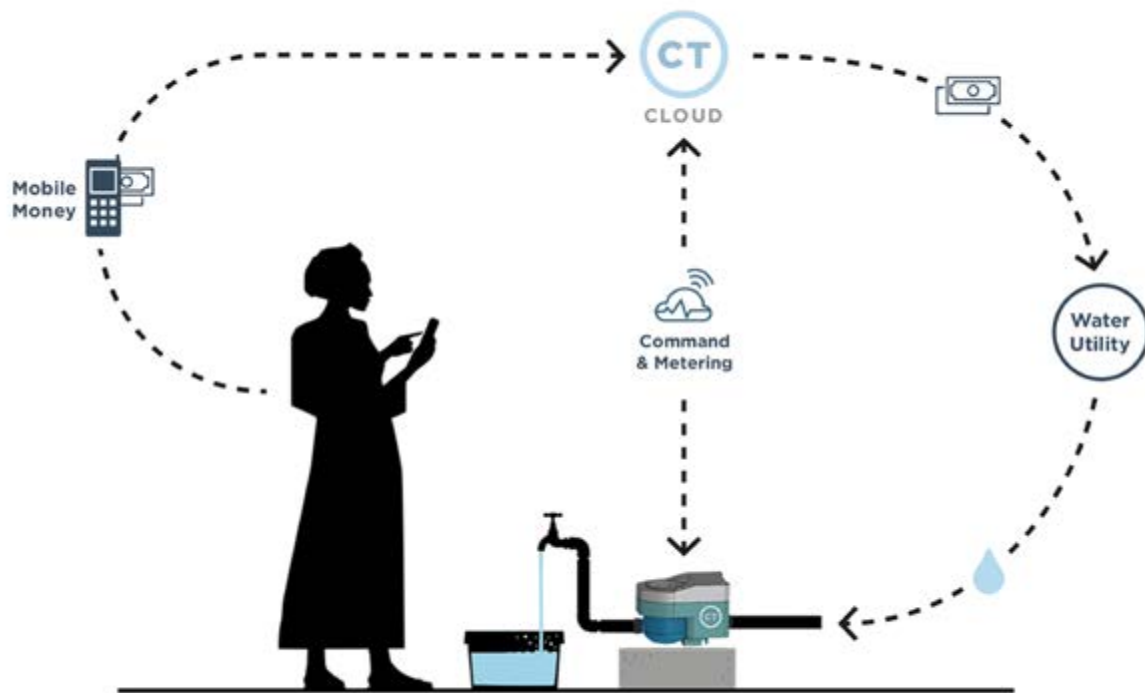
We alone offer our solution as a service instead of a product, lowering upfront capital expenditure costs for utilities. Our system helps utilities become financially independent and able to invest in infrastructure for at-home water service to even the poorest urban residents.

For each connection, CityTaps' smart water meters monitor payments and water usage and immediately detect leaks, theft, and vandalism. CityTaps' smart water meters remotely disconnect after water credits expire, and reactivate once the subscriber makes another mobile micropayment.

To the low-income subscriber, who already pays in advance for inferior water sources, prepaid meters offer access to running water at home, with increased accuracy, transparency, and control over spending. For the utility, prepaid meters ensure revenue flow, enabling and incentivizing them to expand into poor areas. For the over 174 million active mobile money users, mobile payments can reduce transaction costs, improve convenience, and bolster efficiency (GSMA, 2017).

With urban populations expanding rapidly worldwide, cities must adopt sustainable infrastructures to meet growing demands.

Our innovative solution has the **potential to dramatically and quantifiably improve the lives and well-being of a billion people** who do not have access to water in the home. It is our goal to work together with utilities to make access to running water in every urban home a reality.



FOR HOUSEHOLDS

Pay As You Go (PAYG) water service allows households to better plan for and schedule their utility-piped water payments at their convenience. They can pay **any amount, at any time, with any phone** (no smartphones required). Our data shows that households reliably access higher quality water, and respondents reported savings in time and money, along with improved overall household budgeting.

We directly link household mobile phones to the utility's systems and mobile money. Subscribers use mobile money to add credits to their "water balance," which automatically enables water access through the CTMeter. **Those who previously did not have access to piped water at home can now be connected to the utility's network and pay low, regulated tariffs.** PAYG technology allows all households to better plan for and schedule their water payments and to avoid unexpectedly large post-payment monthly bills that result in non-payment, debt, and ultimately disconnection. Our data shows that families access higher quality water more reliably and can better manage their time and other monthly expenses.

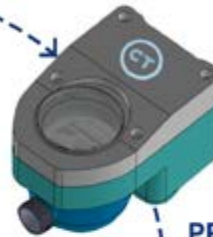


MOBILE PAYMENTS

Households load water credits using mobile money, with any phone, at any time.



CTSuite a customer management service



PREPAID CONNECTED WATER METER

Payment data are sent to the CTMeter, our smart prepaid water meter system that measures and sends water usage data in near real-time.

CLOUD SOFTWARE

Data is received on our CTCloud software, which the utility can view live and use to manage its customers.



FOR WATER UTILITIES

CTMeters generate payment and hydraulic data for **operational and commercial optimization** - all visible to the utility through the CTCloud. The CTMeters use LoRaWAN technology (bi-directional low power radio) to connect to the Internet of Things (IoT) and transfer data in near real-time. CTSuite allows the utility to interact with its subscribers through SMS notification and USSD-based mobile payments, and to optimize operations using data generated by the system.

Mobile money prepayments are convenient: they eliminate the working capital needs inherent in post-payment systems, along with the expenses and delays of manual water meter reading, billing, and collection. This gives **water utilities the financial agility to maintain and expand networks to underserved areas.**



IMPACT FRAMEWORK

CityTaps uses an impact model to **assess our social and commercial impact** and to refine both our technological and administrative processes in order to do **more of what works**. Evaluating results is useful to make adjustments in ongoing projects, to scale up for upcoming phases, and to plan future projects. CityTaps has taken a participatory approach to ensure the best possible result throughout the evaluation process, so that all stakeholders benefit from the results of our research.

CityTaps' approach to impact assessment relies on planning, monitoring, and evaluating, based on a theory of change model called program logic. CityTaps' Impact Framework groups information and action types to track how we can **create the most positive change**.

For simplicity the model is explained in a linear process. However, in practice, this framework relies on feedback at all stages and is ever-adapting, requiring flexibility and responsiveness. This is accounted for in the framework diagram and in project execution.

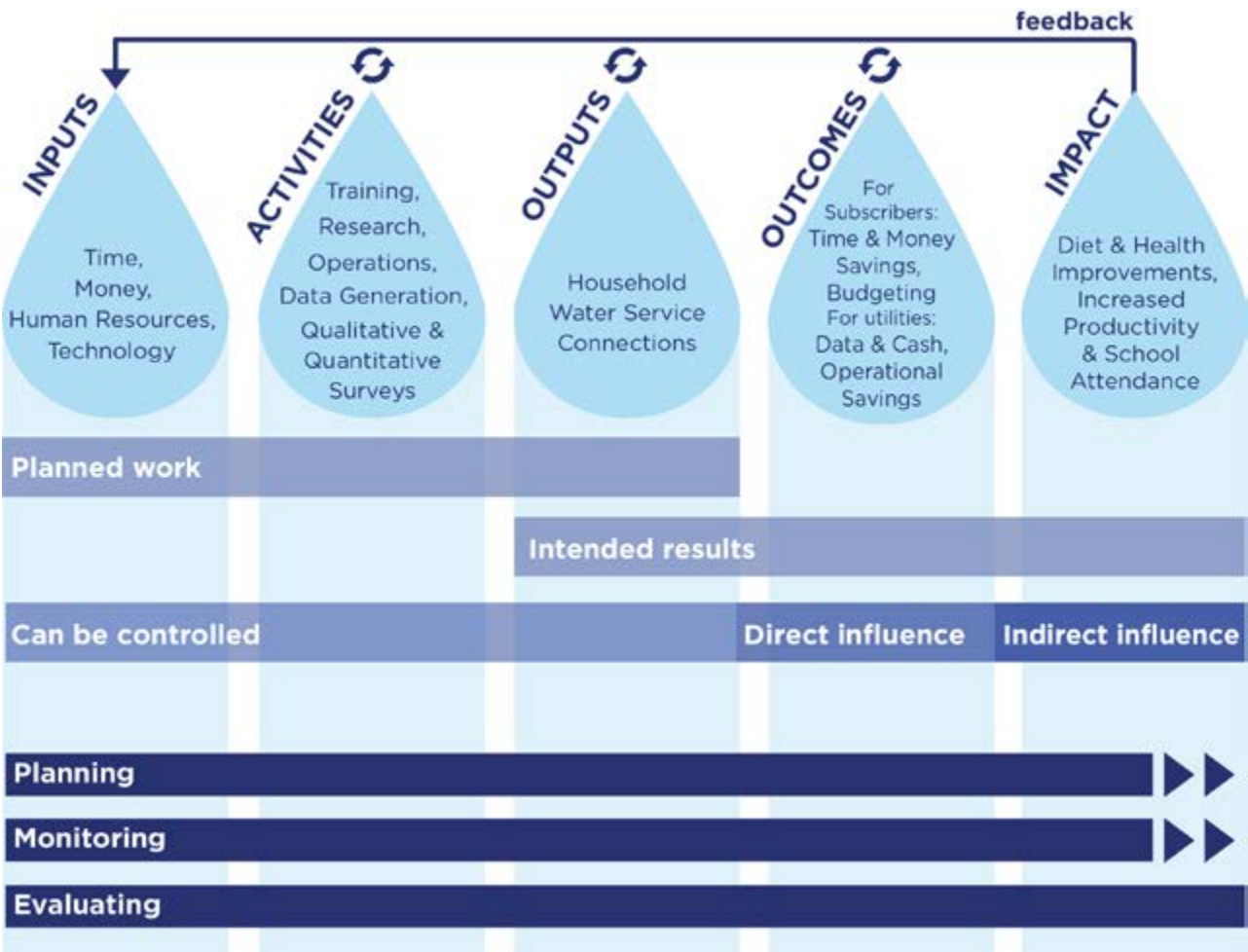
INPUTS - What we put into the project, i.e.: human resources (personnel), finances, time, and technological development

ACTIVITIES - What we do as part of a project, i.e.: subscriber mobile money training, quantitative and qualitative surveys, CTSuite operations, and data collection through CTSuite

OUTPUTS - The first level of results associated with a project, i.e.: the number of household water connections installed using CTSuite.

OUTCOME - The second level of results associated with the project and linked to project goals, i.e.: for subscribers: savings in money and time, improved household budgeting, number of mobile money top-ups per subscriber; and for water utilities: positive cash flow and operational savings.

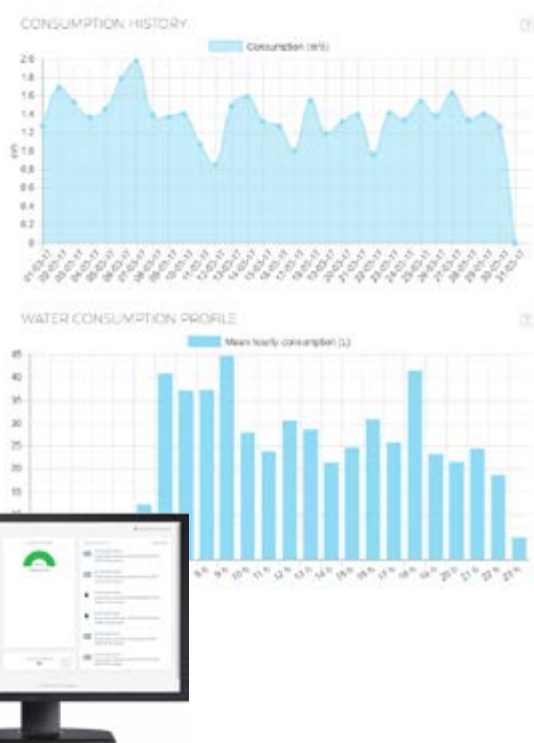
IMPACT - The third level of project results - the measured long-term outcomes of our work, i.e.: improvements to diets or health outcomes (e.g.: reduction in diarrhea in children), increased school attendance by children (particularly girls), and more productive work hours per household (particularly for women).



METHODOLOGY

Qualitative and Quantitative Surveys and Interviews

For this six-month reporting period (October 1, 2016 to April 30, 2017), CityTaps collected data through qualitative surveys - baseline, midline and endline - conducted on the ground by CityTaps staff in Niamey, Niger at three levels: by plot (20), household (48) and individual (261). We also administered shorter topic-specific surveys throughout the pilot. We conducted in-depth interviews with several subscribers for feedback as well as with water utility staff to better understand their procedures and internal processes.



CTCloud Data

Data obtained for our commercial key performance indicators comes from CTCloud, our proprietary software used to manage our solution. These data are accessible through a web dashboard, and include water consumption patterns, mobile transaction data, credit top-ups, and debit amounts for water consumption. The dashboard also provides can meter-related data (i.e. temperature inside the meter).

Analytics based on data collected on our servers allow us to generate quantitative reports related to service use, such as the volume of water transiting through the CTMeters, prepayment operations, and the use of the mobile money prepayment system using Orange Money. Throughout our analysis, we have measured any difference between those who have been newly connected and those who have switched to prepayment from traditional post-payment services. We have disaggregated the respondents by gender where relevant to see our impact on women and girls.

Limitations of the Methodology

Methodological limitations were related to sampling and non-sampling errors, partly due to the different sizes of our respondent groups. For example, we surveyed 20 head of plot respondents in the baseline, and 18 in the endline.

The response rate varied between individual, household, and plot surveys as total sample sizes varied between baseline and endline surveys. This is due to the fact that 2 plots, comprising 10 households, were surveyed for the baseline, but not for subsequent surveys (one plot opted out and one head of a plot was a SEEN employee and was not surveyed).



PHASE 1 PROJECT - NIAMEY - NIGER

In October 2016, CityTaps began our Phase 1 pilot project (still ongoing) in Niamey, Niger with 20 CTMeters installed on 20 plots in the Yantala Haut district and a LoRa antenna situated at the SEEN water utility headquarters.

LIVES WE IMPACT

Demographics



INDIVIDUALS BENEFITING FROM PRE-PAID RUNNING WATER AT HOME IN CITYTAPS' PHASE 1 PILOT



The CityTaps pilot impacted the lives of **261 individuals** residing on three different kinds of plots:

- 1. newly connected** plots who previously relied on alternate sources of water (167 individuals impacted),
- 2. reconnected** plots that were cut-off from water service and in arrears (37 individuals impacted)
- 3. previously connected** plots who opted to replace their post-paid meters with the prepaid service (57 individuals impacted).

TOP TWO PRIMARY SOURCES OF WATER FOR BASELINE HOUSEHOLDS WITHOUT RUNNING WATER AT HOME



In Niger, **41.8% of the population does not have access to running water** (Burgess et al, 2016). Of our sample, individuals without water access in the home would most often have to buy water from their neighbors (8% of 39 households during the baseline), or from a water delivery service (92% of 39 households during the baseline).

However, 77% of the households (30 of 39) not previously connected reported during the baseline survey that they used more than one source of water including collecting water from the nearest public water standpipe. This source of water has not been accounted for in the graph figure as it was never listed as the primary water source.



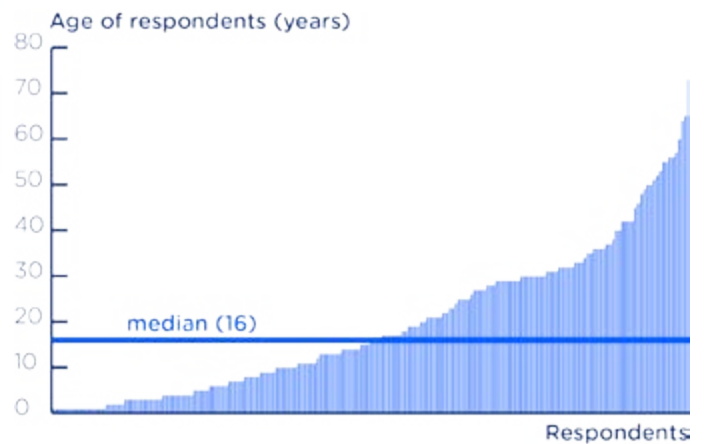
Water delivery service workers



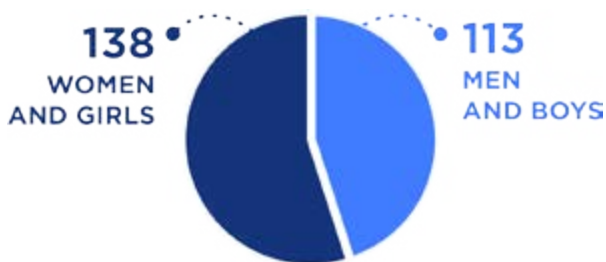
AGE



According to the CIA World Factbook (2017), 70% of the population of Niger is **below the age of 25**. In the baseline individual survey, we were able to gather data on the ages of 204 out of 261 respondents, 65% of whom were below the age of 25.



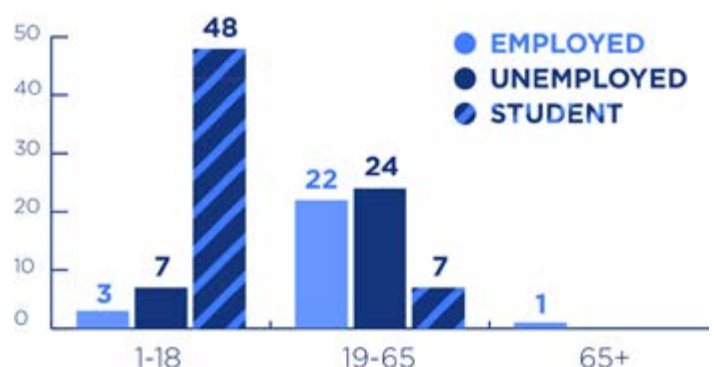
GENDER



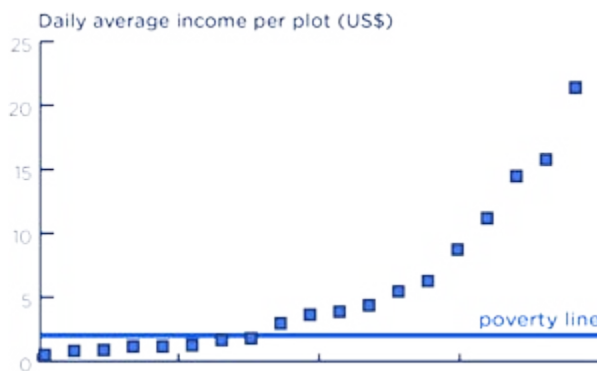
According to the UN Department of Economic and Social Affairs (2017), the current population in Niger stands at 51% male and 49% female. Our survey respondents comprised of 138 women and girls (55%), and 113 men and boys (45%).

OCCUPATION

Overall, 48 of our 112 individual respondents between the ages of 1 and 18 are students. Occupational statistics reveal that 22 out of 112 individuals above 18 years old in the endline survey are employed and 24 out of 112 are unemployed.



INCOME



According to World Bank data, **44% of Niger's population lives below the global poverty line** set at \$1.90 US a day (World Bank, 2015). The median daily average income per household of our subscribers is \$3.32 US, based on data from 19 of 20 plots surveyed. Overall, **41% of all households in our survey earn below the global poverty line** further highlighting the need for a solution that decreases the percentage of income allocated to water spending.

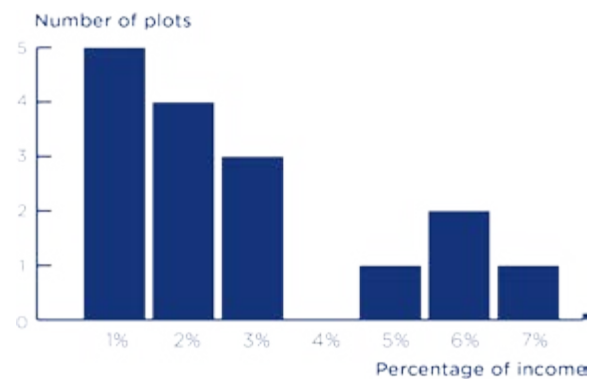
SAVINGS



70% of households reported that they did not have a bank account. Among those who reported having a bank account, 90% of respondents answered that they also save money in cash and/or with a community savings group, or “tontine,” which is common in Niger.

For the urban poor, **mobile money is a welcome solution** to easily transfer money and pay for utilities, as it is safer and more reliable than storing cash, and more convenient than walking with cash to the payment center.

PERCENTAGE OF INCOME SPENT ON WATER BEFORE CTSUITE



The above consumption data was obtained from the CTCloud and is on a plot basis. Compared with our analysis of income in the baseline study, our subscribers spent between 1-7% of their total monthly income on water before using CTSuite. However, if potable water exceeds 5% of a household's total expenditures, it is no longer considered “affordable” (Foster, 2008). The share of income spent on water in developed countries, such as the UK, stands only at 0.1% (Burgess et al, 2016). **In other words, relative to their incomes, our subscribers were paying up to 70 times more money on water as people living in developed countries!**

MOBILE PHONE OWNERSHIP RATE

Of 236 individual respondents in the endline survey, we found that 139 phones were owned in total. Phones were divided among 106 individuals (slightly higher than 1 per mobile phone owner), with an **overall ownership rate of 45%.**



45%

NUMBER OF HOUSEHOLDS WITH ACCESS TO ELECTRICITY



Currently, only **14.4% of the population in Niger has access to electricity** (World Bank, 2015). Within our surveyed population of 48 households, 94% have access to electricity. This figure is not surprising given the disparity in access to electricity between urban and rural populations. In Niger, our research revealed that tenant households often “rented bulbs,” meaning they would pay an agreed amount to the head of plot for the use of a light bulb to light their home. Further, of 20 plots, only 2 had a computer.

TYPE OF HOUSES & HOME OWNERSHIP BY PLOT

Roof tiles and cement/brick/wood

11

Roof tiles and clay walls

6

Straw roof and cement/brick/wood

1

Straw house

2

50% 50%
OWNERS TENANTS

Survey results show that 55% of respondents live in houses made of a mixture of cement/brick/wood walls with roof tiles (11 out of 20 plots), while 15% of respondents (3 out of 20 plots) live in houses made entirely of straw or a mixture of cement/brick/wood walls with a straw roof. Half of the plots in our pilot are owned by respondents, while the other half are occupied by tenants.

SANITATION FACILITIES BY HOUSEHOLD

39 Latrines with sandplat platform

5 Turkish toilet

2 British toilet

1 Hole in the ground

1 Sanitary tube

In Niger, 89% of the population does not have access to improved sanitation facilities (World Bank, 2015). 4% of our surveyed population (48 households) use sanitary tubes and holes in the ground. These are not considered “improved sanitation facilities” as they lack an evacuation system, an unsanitary solution that can lead to the spread of disease.



straw house



toilets



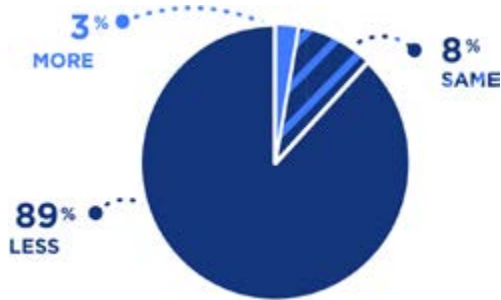
clay house



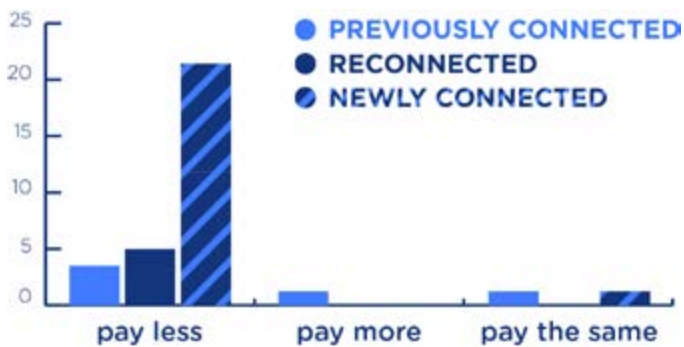
SOCIAL IMPACT

Finances - Time - Health

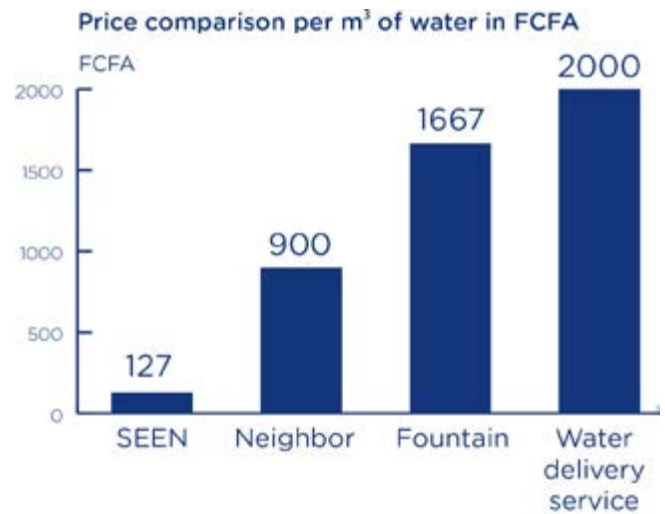
FINANCES AND BUDGETING



Perceived change in household spending in water



The majority of households surveyed (89%, or 34 out of 38) feel water spending has decreased since taking part in the CTSuite pilot. 8% of households feel their water spending has not changed, and 3% feel it has increased. This 3% is attributable to the head of a plot that was previously connected and who found it difficult to collect pre-payments from his tenant households. He therefore ended up having to pay all water expenses for the plot on his own.

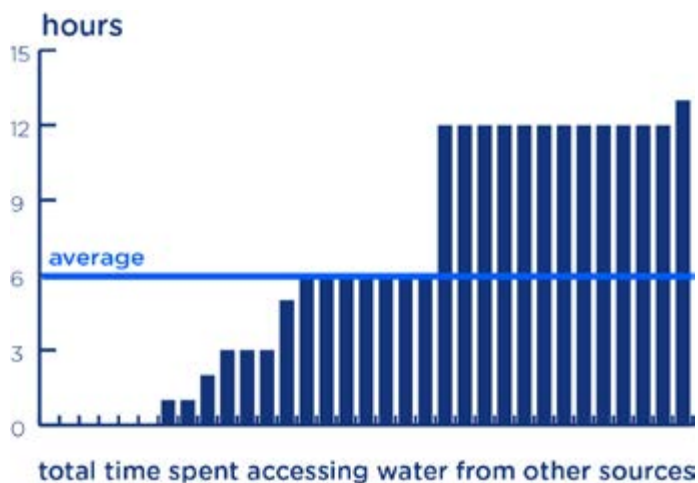


At 127 FCFA (\$0.23 US) per/m³ of water piped to homes by SEEN is up to **15 times cheaper** than purchasing from a delivery service, the primary source of water for 92% of our households who were not previously connected. Based on a median consumption of 25 cubic meters of water per month per plot, respondents obtained savings of 94% with piped water compared to using a water delivery service.

Incremental payments allow those households who switched from post-payment to avoid large end-of-month bills.



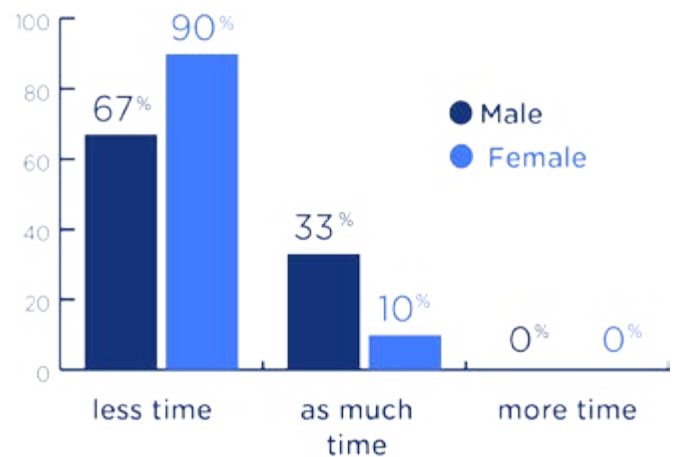
BEFORE CTSUITE



Time spent obtaining water includes waiting for the water delivery service at home with no guarantee of delivery, walking to neighbors' houses, or walking to the standpipe to collect water. Household baseline surveys revealed that **on average, each household spent 6 hours a day to access water for their households before CTSuite**. In the worst cases, 13 of 37 households reported waiting up to a full day for water delivery. Those who previously had piped water connections reported spending up to a full afternoon (5 hours) traveling to the water utility office and waiting in long lines to pay their bills. When asked in the endline to describe the experience of topping up their water credits using Orange Money, respondents explained that they spent between **20 and 30 minutes in total** to buy Orange Money from the kiosk and conduct the quick transaction.



AFTER CTSUITE



90% of women and girls felt that they spent less time obtaining water after the installation of the CTMeter according to data obtained from 43 households. With the piped water connection and CityTaps prepayment service, water is “on-demand” and immediately available. Time saved frees individuals from water chores, especially women and girls who most often bear this burden. Results from our baseline survey show that 74% of the time women were in charge of water collection.

RECONNECTION TIME REDUCTION

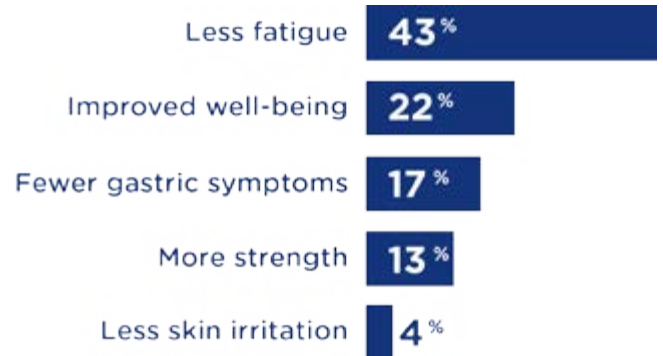
Survey respondents who had previously been disconnected reported that they never received any warning that their water was going to be cut off. Further, they all stated that their outstanding bills were very high (often comprising several months of arrears), and that they faced difficulty to gather the money to clear their debt. While disconnected, residents would have to pay more for water from the water delivery service or ask neighbors for assistance. Once a payment was made at SEEN headquarters, it could take **between two to four days** to have water flowing again on their property.

CityTaps' sends low credit warnings in advance and the CTMeter closes the valve, cutting the flow of water, as soon as credit reaches a zero balance. It **opens once the subscriber adds credit**. Subscribers are **never in arrears, avoid queuing** at utility offices to pay their balance, and **save on high water delivery costs** while waiting for reconnection.

PERCEIVED CHANGE IN HEALTH



Respondents were asked in the household endline survey whether they felt their health or that of their family has changed (worsened, stayed the same, or improved) as a result of the CityTaps solution. They were then asked an open-ended question to expand upon the way(s) in which their health and that of their family has changed, if at all. **61% of our respondents report a perceived improvement in their own health and/or the health of their families** in our survey of 38 households.



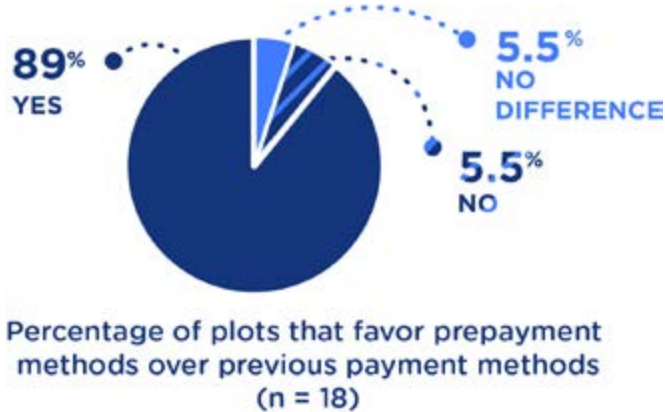
Piped water at home eliminates carrying heavy containers from other sources and is cleaner and less contaminated than dirty jerrycan delivery services (Overboa et al, 2016). With piped water on-premises, households most often cited having **less fatigue and an overall improvement in their well-being knowing they have clean water for their families.**



98% WOULD RECOMMEND CITYTAPS

98% of households surveyed reported they would recommend the CityTaps service to their neighbors. The positive perceived savings in time, impact on health, and financial savings are among the most frequently cited reasons in response to open-ended questions regarding satisfaction with the service. These data are a testament to the positive impact the CityTaps solution has on multiple aspects of our subscribers' lives.

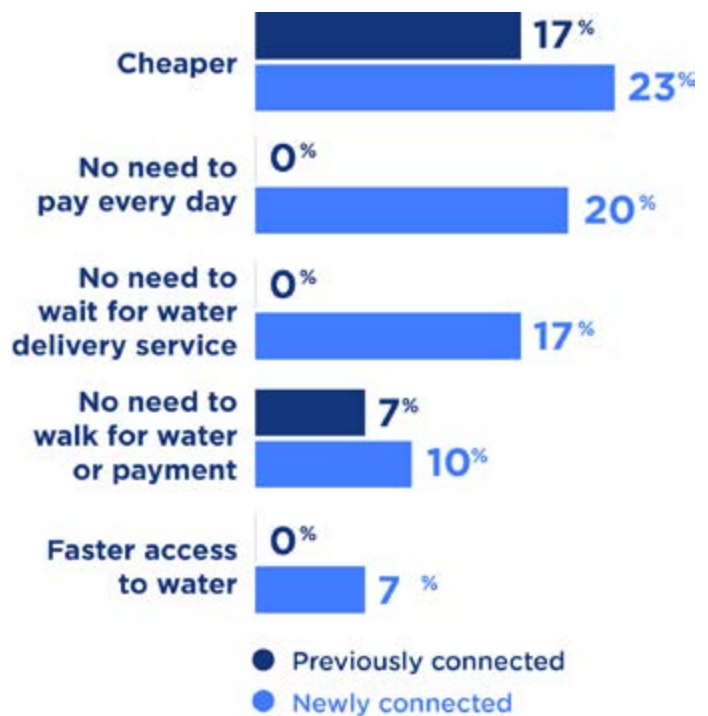
64% of our survey respondents' neighbors stated that they had heard of the CityTaps service. Further, 72% of those neighbors said they would be interested in the service for their own plots. The remaining 28% stated that they could not answer the question alone, as they were not the decision maker for the plot. Many asked for information about the service. **Those that expressed interest in the service said they thought the CTSuite would make it easier, cheaper, and simpler to manage their water consumption.**



We asked respondents if they preferred using the CityTaps mobile prepayment method or previous methods of payment (e.g. going to SEEN offices if they already had piped water, or paying a water delivery service or neighbor). The responses were overwhelmingly (89%) in favor of the CityTaps prepayment option. Stating that their dissatisfaction was not related to the CityTaps service, the 5.5% (i.e. 2 plots) that preferred the previous methods stated they had issues collecting money from tenant households within their plot.

We also asked households specific questions regarding their level of satisfaction about paying for water service with Orange Money and whether their opinion of Orange Niger had changed after using Orange Money to pay for water. Household respondents reported **100% satisfaction** (on a 5 point scale), expressed increased trust with Orange Money, and reported no problems with the service.

ADVANTAGES OF CTSUITE



The most frequently cited reasons for preferring the CityTaps service are listed above, disaggregated by those who were newly connected and those who previously used post-payment. Both groups cite **cheaper water as their main reason** for preferring prepayment.

With CTSuite, subscribers receive an SMS notification of a low credit balance. When credit reaches zero, CTSuite sends another SMS notification as the valve closes and water is cut off. Subscribers must then make a mobile money transaction for any amount, from any phone, and **reconnection occurs within 30 minutes** of the mobile money transaction.

*"This system is a thousand times better than the old one; I find it totally transparent. Overall, I think **this is really good.**"*

*"I can prepare dinner on time now because I no longer have to wait for the water delivery service. **We have water all the time.** We can do our bathing and our clothes washing at any time and we don't have to walk to fetch water when the water delivery doesn't come. **We are very happy with this service.**"*

*"**I no longer have a problem finding water** and I do not need to wait for the water delivery service. I pay much less for water."*

"I can do what I want with my money, because I don't need to wait until the end of the month to know how much I need to pay for water."

*"**I prefer prepaying for water** because there is no risk I will consume more than I can pay."*



*"I am **very satisfied**. I know that a bill at the end of the month would be much harder to pay because I need to wait one month and the amount is too high."*

*"We are **very happy** because now we do not need to rely on the bill, we get notifications, and paying takes as long as getting the Orange top-up card and sending the SMS."*

*"I get along better with my neighbors (that I share water with) because there are **no longer large water bills**. I do not lose so much time to pay the bill, and the water is immediately available when I pay the bill as opposed to at the SEEN office where I need to wait until the end of the day. **I do not have to pay the large bills** which could happen before, up to 25,000 FCFA (~45,35\$)."*

"I don't need to wait in line for hours to pay at the branch."





DIRECT DONATIONS

CityTaps' CTSuite technology means that **anyone can top up any account, with any phone, at any time.** This service is convenient for all income groups, but in particular benefits the urban poor who can make micro-payments at increments that match their irregular incomes. Moreover, this makes it easier for family members to pay on behalf of their families.

CityTaps is currently working to **allow direct donations to subscribers' CTMeters from abroad,** facilitating diaspora contributions to family members. This also opens new opportunities for **individualized subsidies from charity donations globally.** Development organizations and charities can simply top-up the water credits of selected beneficiaries and in doing so, provide water for weeks or months at a time for several households.

In Niamey, generous donors collected money that CTSuite allocated directly to subscribers' CTMeters at the end of the six-month trial period. The amount of credit gifted to subscribers **provides up to 6 months of water** for free to our pilot testers. Our subscribers have reported improved food consumption with the money saved with this gift.

COMMERCIAL IMPACT

Utilities - Mobile Money

Comment prépayer mon eau par téléphone ?

Pour pouvoir utiliser l'eau, il est nécessaire de prépayer son compte d'eau. Voici comment faire :

Vous pouvez prépayer votre compte d'eau par téléphone en utilisant le service 92 76 33 62.

- Appeler le 92 76 33 62
- Suivre les instructions à l'écran
- Insérer le numéro de votre carte d'identité
- Insérer le montant de votre paiement
- Insérer le code de paiement

Après avoir effectué ces étapes, vous recevrez un SMS confirmant votre paiement.

Il est important de bien noter le numéro de votre compte d'eau, car il sera nécessaire en cas d'urgence de payer votre facture.

Service Clientèle : 92 76 33 62



DAILY BALANCE FOR SEEN FROM ALL CTSUITE PLOTS



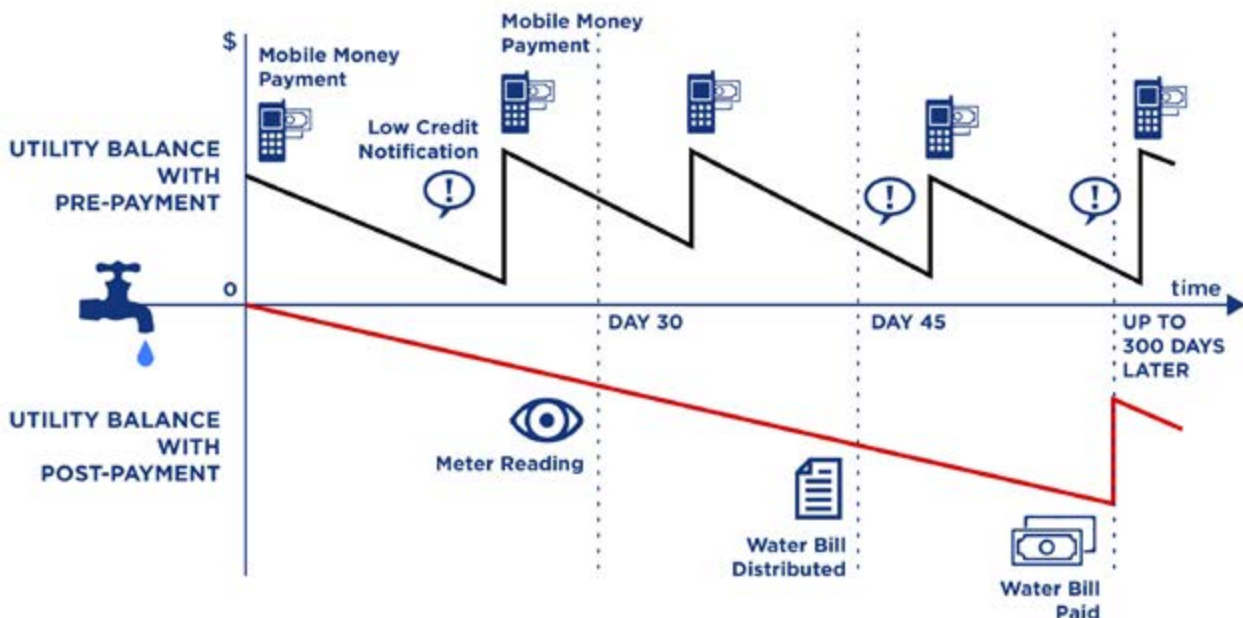
The median balance for 18 prepaying plots was 35,275 FCFA (~\$64 US). The increase shown in early January 2017 is due to the addition of a final CTMeter. The graph illustrates funds to SEEN's credit.

CONSUMPTION

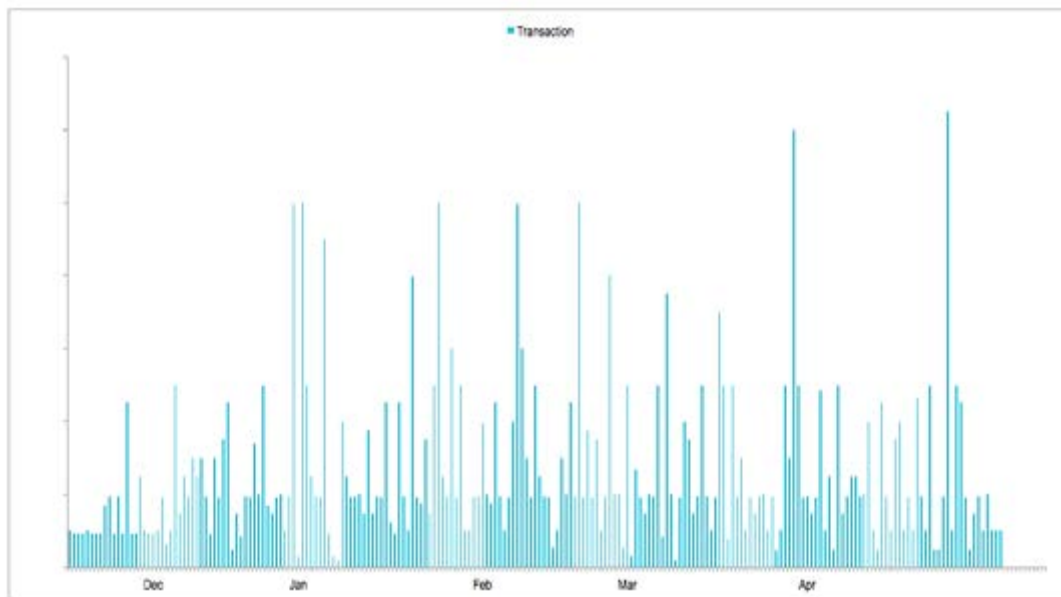


The CTSuite can accurately show consumption levels in near-real time and patterns of water use and expenditure. The figure above shows consumption for all subscribers over the course of our study. November shows low overall consumption as not all subscribers were connected. Further, a leak during the installation of one meter can be clearly seen in early December. We are continuing to monitor these data for patterns of use over time.

POSITIVE CASH BALANCES



Prepayment services allow utilities to enjoy positive cash balances. With traditional payment structures, water utilities are only paid for their services 30 to 180 days after they have sent meter readers, and produced and sent a bill. Account receivables can approach 300 days of sales. Prepayment offers SEEN a positive cash balance that can be used for investment and maintenance.



Value of all top-up transactions in FCFA over the course of the pilot

The total transaction volumes for 18 prepaid connections over 177 days (from 4 November 2016 to 30 April 2017) was **223 compared to a maximum 108 that would have been made through post payment**. The value of transactions ranged widely from 900 FCFA to 12,500 FCFA (\$1.63 US to \$22.64 US) with the highest value transaction made at the end of April.

The **increased frequency of top-ups** is a clear benefit to mobile money providers, but also shows that it is easier for the urban poor to budget for water utility payments several times a month, rather than face a larger end of month bill.

The **variance in top-up amounts** demonstrates that the households on each plot are able to manage their water payments at the amount and rate at which they feel comfortable. Further, we see that payments gradually increase and become more consistent over time, signaling trust in the system.

Further, the **consistency of transactions** shows an increased awareness among subscribers of the amount needed for each transaction. User feedback showed that the amount of credit needed was found to be predictable over the time-frame established in their plots (every week/two weeks/month). Others reported that this predictability has improved relationships by reducing tension with plot neighbors and tenants as they can now ask for smaller and more regular contributions to top-up water credits.

The majority of plots (72%) opened Orange Money accounts for the pilot.

We saw an increase in mobile money accounts over the course of our study period as 16 new accounts were opened in total.

22% of our individual respondents already had a mobile money account, but had not used it for any transaction before the pilot. In addition to bringing in new mobile money users, the CityTaps solution also benefits mobile operators by increasing usage among users with idle accounts.



KEY CHALLENGES AND LEARNINGS

We faced several challenges in deployment, but managed to run the pilot without any major incident. Our main challenge was limited buy-in from Orange Niger for a pilot of this scale. With their approval, we implemented a simplified payment system instead of fully integrating into their USSD mobile money menu. For the next phase of our deployment, Orange Niger has committed (through a signed MoU) to fully integrate payments within their mobile money menu, thus facilitating payments for SEEN subscribers.

Internet communications and mobile money SMS notifications were unreliable, which also caused issues. We developed strategies in our architecture (e.g. buffers, lost message detection) to compensate for these delays and connections lapses.

Finally, written communication with subscribers could also be a challenge as some do not speak French, but rather Djarma, and are sometimes illiterate. Translation and oral communication were required. Our local team helped CityTaps overcome this communication barrier.

Fortunately, our product and service design were reliable, and challenges rare. We have learned enough to significantly improve our product and service for the next phase of our deployment.





NEXT STEPS

PRODUCT DEVELOPMENT

Engineers at CityTaps have been designing and testing the **newest version of the CTMeter** and improving the LoRa network coverage. Rigorous tests have confirmed that the wireless connection between the CTMeter and the LoRa module is robust and the communication protocol is reliable, even with a slow or unreliable Internet connection.

The CTMeter seamlessly integrates a multi-jet water meter (R100), motor, battery, and custom electronics into a self-contained, weatherproof unit. We use an iterative design process and tools like 3D modeling, 3D printing, and laser sintering with a focus on improving the size and cost efficiency of the CTMeter. Environmental tests of this new design are ongoing.

We are continuously improving our sophisticated calibration and quality assurance procedures to support the large-scale production of the unit, and to address the maintenance needs identified in the pilot. These efforts will allow us to provide high-tech solutions that are durable enough to **withstand 10 years of outdoor use in various sub-Saharan climates.**

GROWING IN NIAMEY, NIGER

Our next project in Niamey will start in late 2017 in partnership with SEEN/Veolia and Orange Niger, with the support and financing from a GSMA Mobile4Development Grant.

SEEN and CityTaps will install up to **1325 meters**, benefiting **up to 3975 households** in the Yantala Haut and Yantala Bas districts of Niamey from two groups: 1) newly connected direct beneficiaries (up to 325 plots) and 2) re-connected direct beneficiaries who were in arrears/disconnected (up to 1000 plots). Based on pilot averages, 1,325 meters on 1,325 plots will impact up to **3,975 households and 19,875 individuals** (3 households with 5 individuals each per plot, on average), of which, up to 325 plots (975 households, 4,875 individuals) will gain **running water at home for the first time.**

SPECIAL THANKS

CityTaps would like to thank our partners at SEEN and Veolia for their support and interest in the CTSuite and this pilot.

We also thank CIPMEN, who provided a dedicated team on the ground that helped carry out surveys and provided customer service and quick responses to incidents.

CityTaps is proud to receive office space from STMicronics and continued funding for our Niamey project from the GSMA Foundation.

We are also grateful to the private donors who made direct contributions to our beneficiaries' water balances and investors.

Most importantly, CityTaps would like to thank our pilot testers for their honest feedback and enthusiasm for this project.



AWARDS AND PARTNERSHIPS



Grand Prix Winner
2016



{ POWERFUL ANSWERS }
AWARD

Internet of Things
(IoT) Category



Social Capital Markets
SOCAP15 Scholarship



Winner in the Social
Impact Category 2017



Scholarship for
Civic Innovation



2016 Cohort Finalist

AFD and Bpifrance



2017 Prize Winner



Fellowship 2017



Award Winner 2017



M4D Utility Grant
2015 and 2017



FOR MORE DETAILS AND INFORMATION ON HOW TO GET INVOLVED WITH CITYTAPS



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Running water in every urban home