

This technical brief provides an overview of pre-paid communal water dispensers. Although 'pre-paid' is the industry term for this type of water dispenser, they can be configured so that users receive free allowances for water. They are also commonly referred to as 'Water ATMs', due to their similarity in appearance and operation to a regular cash-dispensing ATM.

This document discusses what pre-paid water dispensers are, their expected advantages and disadvantages in different uses, some of the issues which must be considered if a programme is to implement them, and features to consider when selecting which technology to use. It is particularly focused on the usefulness of pre-paid water dispensers to humanitarian teams.

Summary

- Pre-paid communal water dispenser interventions can contribute to:
 1. Financial sustainability of water supply provision
 2. Equity in access to water by all
- Applications in humanitarian settings includes:
 1. In protracted crisis, for example in camp settings, transitioning to long-term operation, in which water is eventually paid for by users. Dispensers could allow for improved financial transparency.
 2. Where pre-paid dispensers are already installed as part of normal operation of the system. In this case during a short-term acute crisis, free allocations of water can be given to users for a limited time.
 3. In contexts with water rationing, dispensers could potentially be used to equitably ration the available water.
- Implementation steps should be followed, particularly for long-term applications, which include assessing where pre-conditions are met for pre-paid dispenser interventions.
- Choosing which dispenser to use in a program should be based on a thorough assessment of technology providers, based on a range of factors presented here.



Figure 1: Lorentz SmartTAP system in Zimbabwe (left) and Susteq dispenser in Uganda (right) (Oxfam)

PRE-PAID COMMUNAL WATER DISPENSERS

Pre-paid communal water dispensers are water points where users collect water in exchange for credits. Credits are either pre-paid by users or allocated for free by a service provider, such as by a government, NGO, or company. Typically, each user or family has an individual account that holds their credits. Users can pay to add credits, either remotely through mobile money payments or by paying in cash to a designated agent who is authorized to credit the user's account. Management of account balances is done through these transactions, which often uses physical tokens, such as through radio frequency identification (RFID), to transmit data between the individual and the one providing credits. Separately, data on both financial transactions and performance of the water dispensing unit may be transmitted remotely to an online platform which tracks all transactions from a network of water dispensers.

Pre-paid communal water dispensers are primarily used to meet one or both of the following key objectives:

1. To sustainably finance water supply operations, allowing for tariffs to be transparently collected from users while decreasing fraud in tariff collections.
2. To contribute to equity in access to water, controlling volumes accessed by users and providing basic allocations to those who need it.

Pre-paid water dispensers are not a silver bullet solution to all aspects of service provision. They are dependent upon having a successful system of management of water supply services and require a well-functioning upstream water supply and distribution system. Where Oxfam is involved in implementing them, they should be part of a wider programme of water management support.

Water dispensing system for public water points

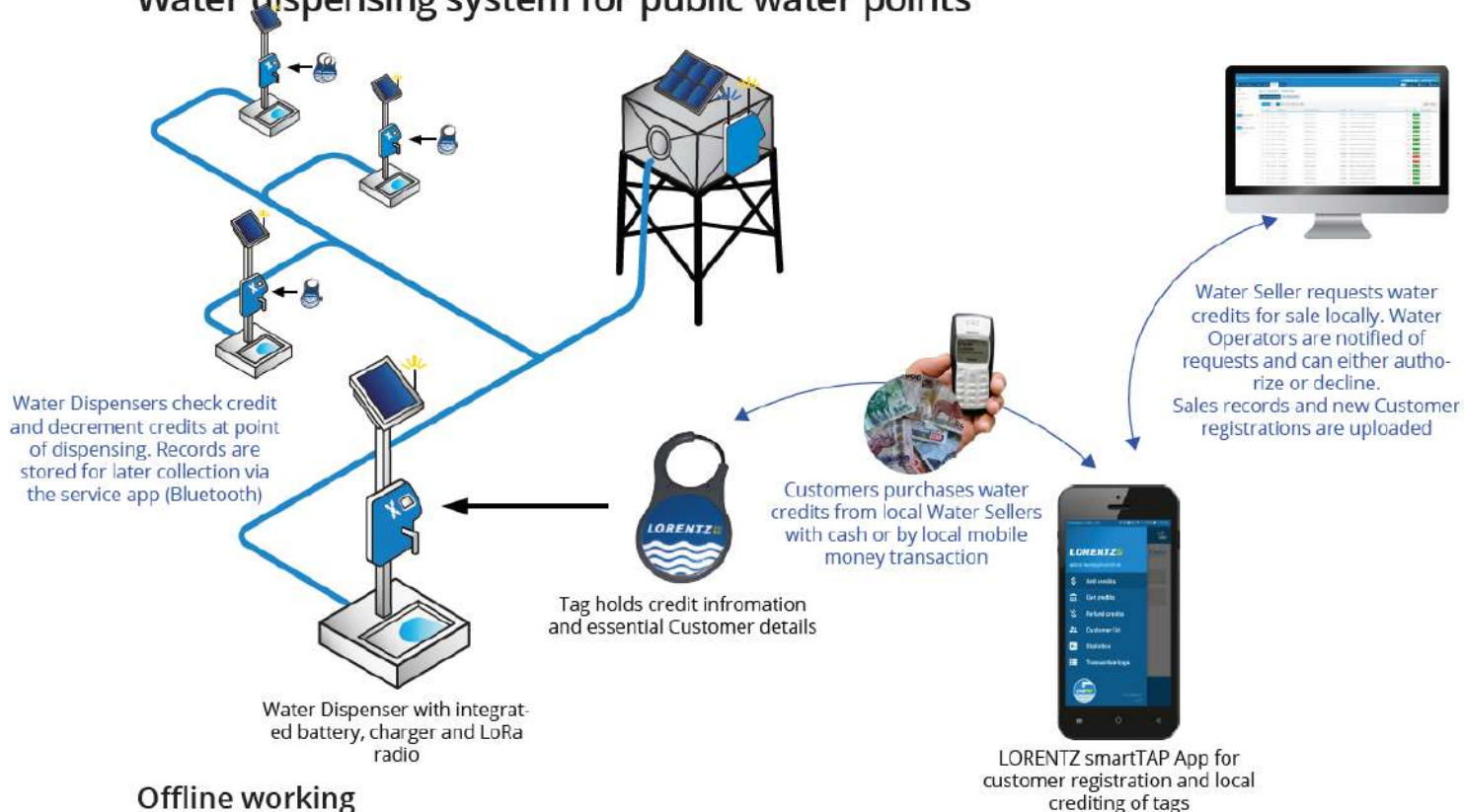


Figure 1: Pre-paid communal water dispenser components (Lorentz)

The core components of the water dispenser consist of an electromechanic “solenoid” valve/switch, water meter, and tap which dispense water in the correct volumes paid for by the user. A user interface may provide information to the user on their account balance and allows them to select how much water to dispense, transmitting data between the unit and the user’s token. Typically, the unit will be powered by a solar panel, which will charge an internal battery.

Many prepaid water dispensers contain telecommunications equipment to transmit data between the unit and the managing entity, either directly through GSM modems or LPWAN (Low Powered Wide Area Network) transmitters, or by transmitting data to a local operator who then uploads the data through a mobile phone. Data on financial transactions, water dispensed, and other performance data on the water system is held on a server, and typically available to the water service provider through an online dashboard.

WHY USE PRE-PAID WATER DISPENSERS?

Pre-paid dispensers are a tool for achieving two key goals in water supply management: financial sustainability and equity. By introducing an automated system where water is paid and accounted for, pre-paid dispensers can be used to finance long-term operations. By controlling allocations to users, dispensers can be used to make sure all people have enough water to basic needs. Prepaid dispensers can contribute to these overarching goals of improved sustainability and equity in several ways:

	Reason	Explanation
Sustainability	Formalizing water tariffs	Pre-paid dispensers create the expectation that water is a paid service. This removes the burden on community volunteers and water user committees to enforce payment, a difficult task that often fails.
	Enabling financing transparency.	With a clear record of all payments received for water credits, there is improved transparency on funds received, which can also be made available to users. There are decreased opportunities in fraud and over-charging, which may occur in cash collection from users by an operator.
	Phasing in the introduction of water user tariffs.	Pre-paid dispensers provide a tool to gradually introduce users fees, which may be subsidized by providing free allocations or introductory rates then gradually instituting tariffs.
Equity	Meeting basic needs.	Dispensers can be used for setting controls to make sure that all users access water to meet their basic daily needs.
	Targeting subsidies.	Pre-paid dispensers produce data which may be used to provide targeted subsidies to poor or vulnerable water users.
	Monitoring water use.	Dispensers include a system of measuring water use to see whether all people are accessing sufficient water. Monitoring can be done in real time and changes may be made quickly to ensure needs are being met.
All Uses	Monitoring performance in real time.	Many pre-paid water dispenser providers offer online dashboards where it is possible to monitor the technical and financial performance of individual units, making it easier for implementers to address problems, including providing remote support after receiving alerts.
	Reducing wastage and non-revenue water.	Record keeping reduces the amount of water that is not accounted for, such as through unbilled consumption, unauthorized consumption, and metering inaccuracies, thus improving the efficiency of the system.

APPLICATIONS IN HUMANITARIAN SETTINGS

Transitioning to payment for water in protracted crises

In protracted crises, it can be difficult to finance the long-term costs of providing water. Pre-paid dispensers are an option for transitioning into a system of payment by users. Introductory low tariff rates, sometimes combined with a minimum volume of free allocations, can be set. Tariffs can then be adjusted over time, as the practice of payment becomes established. One application for this approach is where refugee and displaced populations are integrated with host communities, especially where host communities have been paying for water. Numerous considerations have to be made during the ‘phasing in’ period, especially where there may be neighbouring communities not covered by the pre-paid dispenser intervention. This transitional approach is being implemented by Oxfam in Uganda in communities with host populations and refugees from DRC.

Free allocations of water during short-term crises

In cases where pre-paid dispensers are already installed as part of normal water supply operations, they can be used to provide water for free during times of crisis. Dispensers enable the service provider to make changes to the price of water and the amount given to users, and these settings can be used to provide people with a free minimum standard of water during emergencies. This has been done by Oxfam in Kenya during the COVID-19 crisis to ensure users had sufficient access to water for basic needs, including for increased handwashing.

In contexts with water rationing

In certain contexts, such as in places with water scarcity or where the supply has not kept up with demand, water rationing is unavoidable. Emergency water supply by water trucking is a common humanitarian intervention, but water trucking is expensive and can only be used to supply a limited quantity of water. Another example of where water supply is limited occurs in supply from desalination plants, where costs are high. In such situations, dispensers could provide a method to ration and equitably distribute the available water. No user payment would be involved, with a minimum volume of water provided without charging users. This can allow for an equitable distribution of the available water. It may also reduce the cost of these interventions by minimising water wastage. Finally, dispensers can allow for improved monitoring of operations, to account for all the water supplied.

However, there are no documented examples of dispensers being used for water rationing and it is an unproven approach. In emergency contexts where water is supplied through trucking, it would be difficult to effectively manage credits for a rapidly changing population – ensuring nobody is left out while attempting to limit the water withdrawals from others.

CONSIDERATIONS FOR HUMANITARIAN PROGRAMS

It is important to consider the potential advantages together with the disadvantages or risks when operating pre-paid communal water dispensers in humanitarian settings:

Advantages	Disadvantages
<ul style="list-style-type: none"> For long-term programs, dispensers offer benefits to service providers: potentially greater revenue collection, reduction in non- 	<ul style="list-style-type: none"> Dispensers are not silver bullet solution, and by introducing more technology, dispensers depend even more to having a strong

<p>revenue water, and the use of monitoring data to improve overall performance.</p> <ul style="list-style-type: none"> • Within a large distribution network, dispensers can provide a simple way to ensure that all have equitable quantities of water. Some dispenser brands can allow for daily limits to be set for users, preventing over-consumption from a small number of individuals at the expense of others. • Dispensers provide a convenient and transparent method for transferring monthly allowances to people for water. • Pre-paid dispensers allow for 24-hour service, which can reduce queueing. • Installation of water dispensers can result in a reduction in wastage of water. 	<p>management model in place with a service provider that is accountable to end users.</p> <ul style="list-style-type: none"> • Pre-paid dispensers are most successful in contexts where there are no alternative water sources. Users may opt to get water for free at alternative water sources. • Reliability of the supply of water is required which exceeds the amount to meet basic needs. If supply is not reliable, users will lose trust in the system and resort to other, potentially unsafe sources of water. • The capital costs of pre-paid dispensers are significantly higher than simple taps.
<ul style="list-style-type: none"> • Pre-paid dispensers are adaptable for emergencies as they occur. Existing subscribers can be given allocations for free water. • Pre-paid dispensers also allow for adaptable allocations to be made: for example, allocation of free credits for newly arrived displaced people. However, not all brands of dispensers have this capability. 	<ul style="list-style-type: none"> • It can be difficult to manage allocation of token and water allowances. Assigning allocations that vary with household size involves complexity using household data. If the implementing team does not have capacity to conduct this data analysis and manage changes to individual allocations, it could have an adverse effect – not allocating enough water for larger families to meet their basic needs. • In refugee settings that are volatile and with fluctuating populations, and where security and access concerns exist, it can be difficult to manage tokens for users to ensure all can continuously access water.
<ul style="list-style-type: none"> • Pre-paid dispensers do not rely on a small number of individuals to control water points, who may otherwise restrict others' access to water. 	<ul style="list-style-type: none"> • Water dispenser interventions may face opposition from entrenched interests that control access to water.

IMPLEMENTATION FOR LONG-TERM PROGRAMMES

Pre-conditions

A number of conditions should be in place before pre-paid dispensers should be considered:

Long term commitment. Pre-paid dispensers cannot be installed as a one-off activity that will quickly address water supply sustainability. In programs working on sustainability, there must be a long-term commitment by the WASH program to improve the overall management of water service delivery. The service provider should be prepared, organizationally, financially, and technically to provide services for the a long-term. Where organizations are working in support of an existing water management authority, they should also be committed to providing long-term technical support. Such programs should have at least one full time program staff member leading the organization's work on pre-paid dispensers and one person dedicated to monitoring and analysis of data.

Availability of technology and service providers. There must be an availability of both spare components and expertise readily available within the country to provide service support.

Potential for scale. Pre-paid dispensers are more likely to be part of an effective intervention when working at scale. Having an adequate number of dispensers can be necessary to generate enough revenue to pay for water supply operations and to receive high quality technical support.

Present or future ability to pay for water. Pre-paid dispensers are appropriate when there is an ability of users to pay for water. If there is no prospect of users paying for water, pre-paid dispensers will not be a useful tool for financial sustainability.

Reliable supply of water. There must be a continuous, reliable supply of purified water to meet the basic needs of water users and ensure no downtimes in service.

Implementation steps

Once the conditions are in place, a series of steps may be followed to begin an intervention:

1. **Assessment of the currently management model and service delivery model for water supply.** The objective of this assessment will be to determine the key barriers to sustainability, to see if the advantages offered by pre-paid dispensers will contribute to addressing these barriers, or if other interventions are required.
2. **Demand side assessment.** End users will need to be engaged. This assessment will include developing an understanding of their challenges in accessing water supply, especially towards how payment of water is handled and how finances are managed. Additionally, the assessment may measure willingness and ability to pay for water, although such data is not always reliable. An overall assessment of the potential for user fees should be made, which can be improved with time.
3. **Supply side assessment.** Assessment will be required both of existing service providers and market actors involved in management and O&M of water supply systems and in potential technology and service providers for pre-paid dispensers. Analysis of existing providers can help to identify conflicts. While pre-paid dispensers can have a positive impact by decreasing the potential for fraud, risks should be analysed including whether current providers' interests are threatened and who may try to undermine the intervention.
4. **Financial analysis.** Where financial sustainability is planned, a basic spreadsheet model will need to be developed to evaluate the potential tariff revenue versus the cost of providing services. The cost of services will include the costs of operating dispensers along with those of providing water supply, including capital maintenance. The potential price must also be compared with the price of water from other sources, such as vendors, to determine whether dispensers may be viable. Margins of the actors involved will be identified, including the overall water service provider and those responsible for selling credits. Some technology providers offer paid subscription services for real-time remote monitoring, and a plan for the long-term payment for these services may be made.
5. **M&E Framework.** Developing a monitoring plan as part of an intervention will help assess the performance to determine if pre-paid dispensers are contributing to sustainability and equity objectives. Monitoring is especially important in identifying negative impacts. It is necessary to track how poor and vulnerable people are accessing water, and whether they are being priced out of access to basic services. Measuring user satisfaction is especially important when introducing a pay for service approach.
6. **Planning the number and locations of dispenser.** In addition to following guidance on community engagement in siting of water points, it is necessary to do technical planning. Technical specifications, such as the number of taps per dispenser, and guidelines on maximum number of users should be considered. Planning multiple dispensers within a reasonable distance of users allows for a back-up in case of any downtime for an individual unit. Some suppliers use 'tapping time', or the actual time water is dispensed to guide the number of units to install. This is an important metric for avoiding excessive queues and wait times at taps. However, some humanitarian standards on the maximum number of users per tap were not formulated considering pre-paid water dispensers and

may be too restrictive, as dispensers can supply water for more hours per day than typical taps. It is recommended to discuss these standards with relevant stakeholders (WASH Cluster, UNHCR, and others), in light of the increased capability of prepaid communal dispensers. Standards may need to be relaxed, otherwise dispensers are not likely to be used optimally and may not be a cost-effective intervention.

7. **Making allocations and placing limits for users.** To ensure equity in access to water, minimum allocations and maximum limits may be set for users. Especially where the overall supply of water is not enough to meet demand, it is necessary to ration water to users, so that certain users do not take excess water at the expense of others. Minimum allocations may be made either to all users, especially in crises, or may be made by targeting subsidies to the poorest and most vulnerable to meet their basic water needs.
8. **Proper Installation.** Installation and maintenance of dispensers should be done by trained technicians. Improper installation of pipework is the most common cause of problems with dispensers.

ASSESSING PRE-PAID DISPENSER OPTIONS

For programs trying to determine the most suitable dispenser product and technology provider, it is recommended to conduct a side-by-side comparison using key factors and this should be based on the latest context-specific information. As Oxfam programs build experience and evidence from pre-paid dispenser interventions, this will be a valuable source of information on the performance of systems. Thus far, Oxfam has implemented Lorentz and Susteq dispensers in different interventions in Kenya, Uganda, Zimbabwe, and South Sudan. A list of key considerations has been provided below for assessing technologies. A table can be prepared to compare two or more suppliers according to each of the factors discussed below.

Reliability: The reliability of the technology should be assessed, including by obtaining first-hand accounts from references. The hardware components should be considered to determine the number of moving parts or electrical components that are likely to require periodic replacement.

Durability. Pre-paid dispensers should be durable and able to withstand a degree of misuse and extreme weather conditions. Additionally, the presence of strainers in the design can be effective in preventing blockages and damage to the dispenser.

Length of Warranty. The length of warranty provided by a supplier may be an indicator of reliability and durability. The extent of coverage for repairs and replacements should also be reviewed along with the ability of the supplier to meet any replacement needs.

Use of Non-Proprietary Technologies. It is preferable not to get 'locked in' to one service provider's technology where possible. If using multiple proprietary platforms, it can be difficult to combine data from dispensers of different suppliers. Some governments are now requiring that prepaid water dispensers include universal parts, providing specifications on valves and flow sensors, that can be procured from multiple suppliers in-country.

Data Collection. Many but not all pre-paid dispensers come with some form of data collection. Collecting data on the volume of water dispensed to users, and comparing this versus revenue received and versus water supplied at the source is key for measuring effectiveness of the intervention. Beyond this, while it is possible to collect very large quantities of data, some data may not be regularly used for operating the system.

Means of Transmitting Data. Most units will function effectively offline. Some units can use GSM networks, while others can use Bluetooth to connect to phones, and from there to the internet. Consider the access to networks in the location where units will be installed. It is

important to consider the types of data transmitted when assessing technologies. LPWAN data transmission may be viable in dense settlements where enough dispenser units may justify the cost of LPWAN gateways for data transmission. LPWAN is only suitable for small volumes of data. Software updates involve larger data volumes and require transmission over GSM or in-person installation. In assessing the communications equipment within the water dispenser, it is important to consider whether these require monthly or yearly top-ups to SIM cards to keep them active. The feasibility of keeping these systems up to date across all water dispensers should be considered. The suitability of GSM equipment must be assessed to consider the possibility that the communications equipment in the dispenser (ie. modem) may require replacement within the lifetime of use of the dispenser. The feasibility of this and the cost of this replacement should be considered in the financial model.

Data Access. Most providers offer an interface for viewing data from the water dispenser network. In most cases this will suffice, but it may be linked to a larger information management system, with an API to programmatically retrieve data. For programs looking to analyse data from water dispensers from multiple suppliers in a single platform, it is best to negotiate access to data from suppliers outside of their dashboards before committing to using a particular dispenser.

Responsible Data Handling. It will be necessary to determine that sensitive information, such as user information and financial data is secure and only handled by approved parties. It can be useful for program staff to work with IT teams to ensure compliance with organizational policies on responsible data handling.

Price. As with any procurement, price is important to consider. Prices vary considerably by supplier, location, and technical capabilities of the device, ranging from approximately 200 USD to 2000 USD or more per unit. In Uganda for example, the Lorentz SmartTAP system was priced at 1000 USD per dispenser, including photovoltaic module for power, silicone deliver hose, and photovoltaic module mounting bracket, while the Susteq system was priced at approximately 1450 USD (+VAT) for a 3 tap dispenser, including all accessories and solar power module but excluding installation costs. High unit prices may limit the possibility of large-scale implementation. Some devices have multiple taps, which can be useful in densely populated areas, and may factor into cost comparison. The whole life cycle cost and the price of tokens and support services should be considered. If users are required to replace lost tokens and they perceive the cost of doing this to be high, they may cease to use the system. The cost of data transfers should be determined, including the optional cost of setting up mobile payments. The cost of any taxes and insurance should also be considered.

Subscriptions for remote monitoring platforms. Suppliers may offer use of their online dashboards as an optional paid feature. Ensuring funds are consistently available for subscriptions can be difficult to manage, and it may be easier to agree a lump sum payment for 10 – 20 years of access to any web-based platform. Also consider how access and payment will be handled if the system is handed over in the future, such as to a utility or government.

Presence of supplier/service provider in country. In the event that components require replacement, or repairs are required that go beyond the capacity of the implementing agency, having a supplier in country to provide spares and to provide service if required is important. Some suppliers, especially those who also supply submersible pumps, have extensive distribution networks that can be utilized to provide parts and service. Distributors may require additional training on pre-paid dispensers. Additionally, check if the flow meter and valve used are available in generic versions, provided that they meet quality standards, which should also make them easier to replace in future. It is recommended to seek references and experience

with suppliers from others who are operating units in the country and to understand the familiarity of stakeholders with specific models and accompanying supply and services.

Service Contracts. Optional service contracts should be assessed where the supplier can provide standby service.

Quality of customer service. It is important to assess the quality of customer service of potential technology providers to ensure fast response times. It is important to clarify what support will be given remotely and what support may be deployed for on-site repairs and maintenance. For this it is recommended to get references from other users of the service within the country.

Means of payment/credit. Pre-paid dispensers may use tokens. The appropriateness of the payment option should be assessed for the context. Ideally the tokens should use standard, widespread, technologies such as NFC. The security of this system may become critical, especially in large scale interventions. In this case, careful study of the financial information security should be done, and it is recommended to collaborate with colleagues working on information and technology. The IT and program team may wish to consult technical specifications in recent large scale projects, such as those sponsored by the World Bank.

No water detection. If Pre-paid dispensers are not supplied with water they cannot dispense it. Units should have a sensor before the meter to detect the absence of water, and display an indication to the customer that water is unavailable.

Water dispensing responsiveness. Some units can immediately stop the flow of water when the user removes their token from the unit, with the user only charged for the volume of water dispensed. On the other hand, if the unit is less responsive, users may end up paying for more water than they intended to withdraw and become unsatisfied with the service.

Control over pricing and allocations. A good system will allow granular control over pricing, including flexibility to give free allowances to individual households. The system needs to allow a record of these transactions, even when they are free to users.

Maintenance Alerts. Some providers collect data on performance of system components and are able to send alerts to the water service provider of maintenance requirements, such as the need to replace the battery.

MORE INFORMATION

Drinkwell Systems water ATM: <http://drinkwellsystems.com/water-atms>

Grundfos AQtap: <https://www.grundfos.com/products/find-product/aqtap.html>

Lorentz smartTAP: <https://www.lorentz.de/products-and-technology/products/smarttap-water-dispensing>

Piramal Sarvajal water ATM: <https://www.sarvajal.com/water-atm.php>

Susteq prepaid water ATM: <http://www.susteq.nl/product-prepaid-water-atm/>

Sarkar, Anindita. The role of new 'smart technology' to provide water to the urban poor: a case study of water ATMs in Delhi, India. *Energ. Ecol. Environ.* (2019) 4(4):166–174.

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