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Netherlands Enterprise Agency

Payment modalities for low-income households

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Background, objective and approach

RVO (the Netherlands Enterprise Agency), through the Fund for Sustainable Water (FDW), supports the establishment of Public-Private Partnership (PPP) projects in amongst others water supply projects. In these projects, different (combinations of) payment modalities have been set up, and often specifically geared towards users in the low-income segments. This study aims to generate insights into the payment modalities across these projects, in terms of: 1) the type of costs to which users contribute, 2) the modalities through which payments are made, and their effectiveness, 3) accompanying social, technical and financial measures, and 4) the relation between these modalities and external contextual factors.

In order to meet the objective of this research, a methodological approach has been followed which consists of: 1) case studies of payment modalities in 10 selected FDW projects, and 2) a synthesis, leading to a typology of the modalities and a cross-case assessment of relevance, effectiveness, efficiency and sustainability of these modalities.

In doing so, the study uses a conceptual framework, which differentiates between the types of costs to which payments are made: 1) capital costs of new water supply systems, 2) costs of connecting to an existing system (connection fees), and 3) operation, maintenance and replacement costs, through user charges. It defines a payment modality as "the way in which users pay for these costs", which can be described by the following elements: whether a payment is one-off or in instalments; the timing and frequency of payment; whether payment is done via intermediaries; whether payment is volumetric or based on a flat rate; and the means of transaction. The combinations of these elements have implications in terms of: 1) the costs of collecting payments vs the revenue it generates, 2) affordability and alignment with cash flow of users and 3) synergies and trade-offs between payment for capital costs and user charges. The payment modalities are supported by a wider set of social and technical systems. These in turn take place in the wider regulatory framework.

Findings on the type of costs to which users contribute

There was one case (in Ethiopia) in which users paid a cost-reflective amount of the capital costs: of water filters. It is indeed a common practice that for individual supplies (such as water filters) a cost-reflective amount needs to be paid, particularly where market-based approaches are followed.

Wherever water was supplied through a household connection to a piped supply, users pay a connection fee, which reflects the costs of the material of the stretch between the homestead and the distribution network, the labour to install that and sometimes administrative costs. Where people access a networked supply through kiosks, standpipes or other communal water access points they don't contribute to capital costs. This finding also aligns with international practices, in which the capital costs of collective water supplies are largely or fully funded publicly, apart from the costs of the actual connection.

In all cases, users had to pay a user charge towards the costs of operation and maintenance – though the study did not assess the extent to which these user charges are truly cost reflective. Moreover, in those cases where the water is provided through intermediaries, users also pay the costs of having such an intermediary.

Findings on payment modalities

The payment of the full capital costs of water filters can only be done through a full upfront payment. Users could take a micro-credit for that and in that way pay it off in instalments. As this was just one case, and as the project is still ongoing, no tentative conclusions can be drawn on these modalities.

The upfront payment of a full connection fee is often a barrier to low-income households. Several utilities involved in the projects reviewed here introduced the modality whereby the fee is paid through monthly instalments. In that way, users can already have access to the service – and generate revenue for the service provider. Another alternative found is the social connection fee, whereby the fee is not cost-reflective but subsidized. Among the cases reviewed, the subsidies are paid for by a donor-funded project, and not through a cross-subsidy by higher income users. This indicates a limited institutionalization of social connection fees.

The study found a number of combinations in the payment modalities for the user charges. The main insights emerging from these are:

- Pre-paid modalities are preferred by service providers, as they result in almost zero commercial losses, and can reduce the transaction costs of billing and collection. They do require higher upfront investments. The advantage to low-income users is their potential to eliminate the roll of intermediaries and corresponding surcharges. But the cases show that they may also result in reduced water consumption.
- High-frequency post-payment systems have shown to be working effectively, with high uptake by low-income users. These come at higher transaction costs or require integration with wider mobile payment systems
- Intermediaries are often necessary to serve low-income house holds, mostly in the form of people to provide water through kiosks and public standposts, but also social enterprises that operate distribution networks between the utility and households. Provision via intermediaries comes at an additional cost, which is charged on to the users. Moreover, there are risks of abuse of their position, and surcharges beyond justifiable additional costs.
- The cases show different steps in moving from payment in cash, to hybrid systems and fully mobile money-based payment modalities. The switch to mobile payments in itself is also enabling more payment modalities and the possibility to take out the intermediary.

Findings on the enabling technical, social and institutional systems

The payment modalities are conditioned by a number of supporting systems:

- The type of access point. At household connections, user charges are usually through (high- frequency) post-payment systems. At public access points, pre-paid or pay-as-you-fetch modalities are found, often via intermediaries.
- ICT. Pre-paid water meters, dispensers and charging devices enable the pre-paid modalities, whereas electronic ledgers facilitate high-frequency post-payment modalities. As important as the ICT themselves, is the process of piloting, testing and selecting them, thereby considering factors of: costs, compatibility and interoperability with other software that the service provider uses, the maintenance of the ICT devices themselves, their offline performance, ease of use, data access rights.
- Institutional arrangements. Formalized agreements between the service providers and intermediaries, regulated rates for intermediaries and transparency around those were found to be important to mitigate against the risk of intermediaries abusing their position.
- Social-economic and market studies. These provide insight into affordability and user preferences as the basis for establishing payment modalities. The subsequent monitoring of water use and payment rates allows assessing effects of (changes in) payment modalities and making further adjustments.
- Pro-poor policies. Several of the cases showed the importance of defining payment modalities as part of a broader pro-poor policy.
- Regulation. The study found that regulation usually only defines the structure or level of the user charges, but not the modality for payment.

Overall conclusions and recommendations

This study confirms the high relevance of payment modalities that reduce the barrier of the upfront payment to get access to a water supply service. This is in the interest of both low-income households and service providers who can increase their revenue base more rapidly. The modality whereby users pay the connection fee over time through instalments is an effective one, and one that can be implemented relatively easily and at low cost to the service provider.

The payment of user charges is a standard practice in most settings and for most types of water supply – with the possible exception for handpumps. The study concludes that there is a wide range of modalities through which such user charges can be paid. The service providers in this study have developed these on the basis of considerations of: 1) alignment with the cashflow pattern of low-income users, next to overall affordability of the user charge; 2) the need to reduce the transaction costs associated with billing and collection, 3) the wish to reduce dependency on intermediaries, and the costs and risks that these are associated with. The diversity of payment modalities has furthermore been enabled by developments in ICT, particularly around pre-paid options, and high-frequency post-payment systems. However, some of the modalities also bring about risks of reduced water consumption or not accessing improved supplies at all.

The study did not find one single best (or worst) payment modality. The cases show the importance of process measures, including: doing social-economic and market studies upfront, adjusting payment modalities based on insights from monitoring data, piloting ICT options, and embedding in pro-poor policies. Through such process measures payment modalities can be defined and adjusted, so as to align with the realities of low-income households as well as with the interests of the service providers.

Based on the above, the study recommends:

For projects that seek to improve sustainable access to water supply for low-income households:

- In case of expansion of services by an existing provider, the project preparation team should undertake an assessment of existing payment modalities – both for contribution to capital costs (including connection fees) and user charges.
- In case of developing new supplies and establishing new service providers, the project preparation team should undertake social-economic studies and market assessments.
- In developing payment modalities, project teams should give particular priority to ones that allow reducing the barriers associated with the upfront payment of a connection fee.
- In designing new payment modalities, or changing existing ones, consideration needs to be given to: 1) alignment with cashflow of users, 2) transaction costs of billing and collection, 3) dependency on intermediaries and the associated risks, and 4) the requirements of the payment modalities in terms of supporting ICT and institutional arrangements.
- Take a piloting approach to new or changing payment modalities.
- Apply pro-poor policies and strategies as key instruments in which to embed the payment modalities.
- In designing new, or changing existing, payment modalities, seek the dialogue with the regulators so as to understand the regulatory requirements and space.

For RVO:

- When appraising and monitoring projects that seek to introduce new, or change existing payment modalities, check that these include accompanying process measures.
- When appraising and monitoring projects that do not include a component of introducing or changing payment modalities, discuss with the project team whether the existing payment modalities are the appropriate ones, or would merit further change and adjustment.

The study also considers that there is need and scope for further research on this topic. Most of such research would be highly contextual, and focus on assessing how different payment modalities function in other contexts, and how these could be strengthened. In addition, more research would be needed to address knowledge gaps around the following areas:

- The demand and supply factors that contribute to accelerating on-premise water supplies and their interaction with service provider sustainability.
- Exclusion and inequity around pre-paid, pay-as-you-fetch and post-payment modalities.
- The governance of intermediaries.

Acronyms and abbreviations

E&V	Eau et Vie
FDW	Fund for Sustainable Water
ICT	Information and Communication Technology
MCWD	Metro Cebu Water District
NGO	Non-Governmental Organisation
NWSC	National Water and Sewerage Corporation
PES	Payment for Environmental Services
PEWAK	Performance Enhancement of Water utilities in Kenya through benchmarking, collective learning and innovative financing
PPP	Public-Private Partnership
RVO	Netherlands Enterprise Agency
SDG	Sustainable Development Goal
WAP	Water Access Point
WASH	Water, Sanitation and Hygiene
WEP	Water Entrepreneurs Project

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1 Introduction

1.1 Background

RVO (the Netherlands Enterprise Agency), through the Fund for Sustainable Water (FDW), supports the establishment of Public-Private Partnership (PPP) projects in various water sub-sectors (water supply, sanitation, water resources management and water for agriculture). Within the scope of this fund, PPPs are defined as "a partnership between government and business, often with the involvement of NGOs, trade unions and/or research institutions within which risks, responsibilities, resources and skills are shared to achieve a common goal or to perform a specific task" (RVO, 2022). Such a PPP approach is believed to contribute, amongst others, to improved financial, economic, and social sustainability of investments in water, as it combines elements of public service delivery to all and sound business practices, whereby the service providers break even and can recover parts of the investment.

As part of PPP projects, users are in general expected to pay for services, mostly through a regular water charge to cover operation and maintenance costs, but sometimes also through a contribution to the capital costs, specifically the costs of connections. RVO has observed that in different PPPs different (combinations of) payment modalities have been set up, and often specifically geared towards users in the low-income segments, as they may face barriers in doing such payments. In addition, it has noted that PPPs apply a number of social, technical and financial management measures to ensure that such payments actually happen.

It is against this background that RVO seeks to get a better insight into the various payment modalities employed across FDW projects, and the lessons learnt around these.

1.2 Objective and scope

The objective of the study is to provide an objective assessment of payment modalities that were applied in selected FDW projects and generate insights based on the results of their application. Specifically, insights are sought on the following:

1. the type of costs to which users are expected to contribute,
2. the specific modalities through which users make those payments,
3. the accompanying social, technical and financial measures,
4. the effectiveness of these modalities in achieving certain results, and
5. the relation between these modalities and external contextual factors, as well as (inter)national best practices.

These insights should generate recommendations on how future PPPs can employ payment modalities that contribute to financially viable operation and maintenance and expansion of water infrastructure. That means that the scope of this study is above all one of learning for other, future, PPPs in the water sector, rather than an evaluation on whether the PPPs reviewed as part of this study have followed the 'right' approaches towards payment modalities.

Given the focus on learning and insight, this study also included a component of engagement with RVO staff, staff of the projects concerned, and a wider network of external parties working on payment modalities in PPP projects.

1.3 Structure of the report

After this initial chapter, chapter 2 presents the approach to the study, including the conceptual framework, approach and methodology. Chapter 3 presents the results obtained. In chapter 4 the conclusions and recommendations are presented.

In total 10 projects were reviewed as part of this study. The review of those has been written up in the form of short case studies. These can be found in Annex 1.

2 Study approach

This chapter presents the approach to the study. It starts by providing the conceptual framework for the study, on the basis of a review of the literature on the topic. This is followed by the description of the research approach, providing the overall steps taken, including the methodologies for data collection, processing and analysis as well as for stakeholder engagement.

2.1 Conceptual framework

2.1.1 Payment for water services

The conceptual thinking on payment for water services is broadly informed by two areas of practice, with corresponding bodies of literature:

1. **The demand-response approach towards rural water supply**. This approach sought to provide a response to the limited sustainability of water infrastructure developed under supply-driven approaches, which were common up till the end of the 1980s (and are still present to a lesser extent). In response, in the 1990s the demand-responsive approach gained traction among practitioners, policy makers and academics, and was articulated and promoted by the World Bank (e.g. Sara and Katz, 1997). One of the elements of the demand-responsive approach was that users would have a much stronger interest in sustainability of services, if they had a real demand for water services. That demand was to be expressed by (prospective) users in two ways:
   - By contributing to the costs of capital investments in developing the infrastructure. Users could make such a payment in the form of cash, in-kind (e.g. materials or labour).
   - By a user charge – often referred to as tariff – towards the operation and maintenance cost, and that would be cost-reflective, i.e. be (approximately) equivalent of the costs of operation, maintenance and possibly the eventual replacement of the infrastructure assets. Cost-reflective user charges would mean that service providers could be financially self-sustaining and not require additional (public) finance to run the water supplies. Moreover, user charges would also create mechanisms for accountability between users and the service provider. Users pay the provider for a service they get, and in that way, users would also be able to hold the provider to account for performance.
2. The efforts of **utility performance improvement in urban areas**. These efforts stem from the recognition that (public) utilities struggle to provide safe services, or to extend services particularly to low-income areas. In order to overcome that, utilities need to raise sufficient revenue that allows them to carry out the operation and maintenance works that are needed to provide adequate services. As the utility's performance improves, it can start generating a positive cashflow which can be used to finance small capital projects or to service loans (Soppe et al., 2018). But in order to get there, utilities need to improve their performance in multiple dimensions (technical, commercial, financial, organisational and environmental). This means that utilities should not only ensure that there is a user charge that covers the costs, but also that the commercial, technical, financial and organisational systems are in place through which payments are done and managed.

There has been ample research and debate on the premises behind the need of these payments:

User contributions to capital costs have been widely applied to communal (piped) supplies. These are types of systems to which users can make relatively easy in-kind contributions, for example by providing local materials and labour in digging trenches and laying pipes. It is less common for projects with point sources such as handpumps, as those lend themselves less for providing an in-kind contribution. The relation of upfront contribution with sustainability of communal supplies has been controversial (Whittington et al., 2009). Many users may have a demand for services but are simply not in a financial position to pay an (upfront) contribution and may remain excluded from water supply. Moreover, an upfront payment is only one out of many factors that affect the sustainability of services. Large studies to assess the demand-responsive approach (e.g. Whittington et al., 2009; Andrés et al., 2017) found that even where users have paid an upfront contribution, this was not a guarantee for sustainability; other factors were found to be more important for sustainability of communal services.

What is more common and accepted is the contribution to capital costs of individual or household supplies. Sutton and Butterworth (2021) describe how large numbers of households invest themselves in, for example, rainwater harvesting facilities or private wells, under what is labelled a self-supply approach. In addition, household water treatment products are often provided through market-based mechanisms, whereby the household pays the market price of such products. The market for such household water treatment products differs often a lot from one country to another (PATH, 2010). Conclusions from willingness-to-pay studies in low-income settings in other countries (e.g. Berry et al., 2020 for a study in Ghana; Burt et al., 2017 for a study in Tanzania) indicate that willingness to pay for different types of household water treatment is far below retail prices, indicating that significant scale-up may need significant subsidies (Burt et al., 2017). But there are also successful cases of scaling up.

Similar considerations are made about **connection fees** in utility-served areas. In such areas it is common practice to charge a connection fee to cover the costs that the utility incurs of providing

a connection to the water supply system, including the costs of: 1) the materials for the connection, like a pipe and a water meter, 2) labour to install the connection and 3) the administrative costs associated with a connection. Charging these costs to users is often justified based on arguments that utilities incur legitimate costs in making a connection and should be recovered users (ADB, 2008). Moreover, this is to avoid that users make connections themselves which are not complying with the required quality standards and then may not get registered in the cadastre of the utility.

However, these upfront investment costs pose a real barrier for users, and many may therefore continue using other (non-safe) sources of water. Moreover, for as long as people cannot pay the upfront connection fee, utilities also miss out on revenue from their user charges. Finally, it may lead to situations whereby users, or even criminal gangs, install unauthorised connections. Therefore, Franceys and Gerlach (2006) and ADB (2008) already indicate that alternatives are sought, whereby these fees are lowered (i.e. not be fully cost-reflective), or partly paid in instalments.

The payment of **user charges for costs of operation and maintenance** has become widely accepted, both in urban and rural areas. It is widely recognised that for sustainable services, the provider – whether a utility, a private operator or community-based organisation – needs to have sufficient revenue to cover its operation and maintenance costs. Rather the debate focuses on the relative size of the user charge, and the measures to be taken to balance between affordability to users and the financial sustainability of the service provider:

- A first element to that is whether the user charge is expected to cover only operation and maintenance costs, or also part of the eventual replacement (depreciation) of infrastructure. Whittington et al. (2009) found that in rural areas, the latter is rarely part of the tariff structure. Also, many utilities barely cover the operation and maintenance costs.
- A second element is how the costs of operation and maintenance are divided among the users. A range of tariff structures has evolved, that seek to reduce the costs for some users, whereas other pay relatively more. That may be based on considerations such as the wealth group to which a user belongs, its consumption level, but also on mechanisms for subsidies between urban and rural areas, or between service areas of different providers. In spite of the efforts to make services more affordable to poorer users, in practice many subsidies remain regressive (i.e. they benefit the relatively better-off rather than the poorest). The World Bank estimates that some 60% of water service subsidies are insufficiently targeted (Andrés et al., 2019). As Andrés et al. (2019) note: "subsidies tend to be pervasive, expensive, poorly targeted, non-transparent, and distortionary". Reasons are manifold and include political considerations in setting tariffs, characteristics of networked services which make setting cost-reflective pricing difficult, but also the fact that subsidies are targeted at those who have access to a (networked) service in the first place, but not those who don't have any access at all, who tend to be the poorest in a society.
- A third element is how the eventual tariff affects the behaviour of users. If the tariff is not affordable, even after applying subsidies, users may revert to non-safe water sources. Or, if the tariff is volumetric based, it may lead to situations whereby users restrain the amounts consumed. Users become prudent when water use is seen directly in relation to the costs. Prudency in water use is good when it helps to reduce waste of water; but the whole purpose of access to water, particularly through household connections, is to increase the volumes of water that people use, and the range of health and livelihood benefits that it brings.

The principle of payment of part of the capital investment costs, connection fees and user charges are accepted to varying degrees, with a broader consensus on the latter two, and a lower on the first one. The empirical evidence points out that this principle is mainly justified from the point of view of the service provider being able to recover its costs (operation and maintenance; or the costs associated with making connections), rather than from the point of view of the need to express demand.

2.1.2 Payment modalities

Accepting the principle of payment for these costs, a body of practice has evolved around the modalities through which these payments are made. This study defines the payment modality as: "the way in which users pay for the capital costs, connection fees and user charges to the service providers". The need to look into these modalities is driven by three considerations:

- Utilities need to consider the balance between the costs of charging to users, and the revenue it generates. Collecting payments (whether user charges or connection fees) comes at a cost, as these payments require social, technical and financial systems, such as having billing software, staff who collect user charges or water meters. If subsidies are provided, service providers may also need to have data about people's wealth status. Particularly among low-income communities, who typically consume very little water, there is a probability that the costs of billing and collecting the user charge may be higher than the revenue it would generate, depending on the approaches and technologies used for billing and collection. Likewise, it will cost service providers a lot to follow up on households that are in arrears with their payment. It is in the interest of the utility to have payment modalities whereby the transaction costs of collecting the payments are as low as possible.
- For users, particularly low-income users, the modality of payment needs to align with their cashflow situation, next to being overall affordable. Low-income users in urban areas for example may get their income from day labour. They may prefer modalities whereby they pay small amounts in a higher frequency, rather than larger amounts on a lower frequency. In farming communities, the cashflow may be highly seasonal, with a lot of income after selling a harvest, and less income the rest of the year.
- Utilities need to consider the synergies and trade-offs between contribution to capital costs (including connection fees) and user charges. Modalities whereby an upfront contribution is made may limit people to connect, and hence limit subsequent revenue from user charges. At the same time, any foregone revenue from not charging a connection fee means that the utility has less money available for investment or operational costs. Utilities therefore seek modalities whereby the upfront payment is reduced or paid in instalments.

In response to these considerations, a range of payment modalities have been developed, to address one or more of these considerations. Some have been developed to reduce the transaction costs to the utility whereas others have as objective to align better with the cashflow situation of users.

A payment modality can be described by a number of elements:

- **One-off or in instalments**. This refers to whether the total contribution to capital costs of connection fees is paid in one go or can be paid off in instalments. In some cases, also the regular contribution to operation and maintenance costs is paid in instalments. Finally, in some cases, people take a micro-credit to cover upfront costs, but then pay off the credit in instalments.
- **The timing of payment**. This refers to the moment at which a user pays, which can be: pre-paid (pay before you consume), pay-as-you-fetch, or post-payment (first consume and then pay).
- **The frequency with which payment happens**. For ongoing operation and maintenance this can be monthly, weekly or even higher frequency, but also seasonal, or as and when consumption takes place.
- **Presence of intermediaries**. Payment is not always happening between the users and the service provider. In some cases, there may be an intermediary, for example a kiosk owner.
- **Volumetric vs flat rate payment**. Volumetric payment refers to modalities whereby the payment is related to the volume of water used. A flat rate payment refers to situations whereby users pay an amount that does not depend on the volume of water used.
- **Means of transaction**. Sometimes payment is in-kind, particularly when it is the payment of the contribution to upfront capital costs. But for ongoing operation and maintenance, mostly payment is in-cash. Over the last years, also mobile payments have become more commonplace.

These elements can be combined with the purpose of payment (i.e. for capital costs of operation and maintenance costs) and leads to the typology of payment modalities, as shown in Table 1:

Table 1: Typology of payment modalities

Type of costs		Payment modalities
Contribution to capital costs	For new systems or facilities	• Upfront labour/ in-kind payment • Upfront cash payment, through instalments, or through micro-credit
	Connecting to existing systems	• Upfront cash payment, through instalments or through micro-credit
Contribution to recurrent costs		Through combination of the following variables: • Frequency • Timing • Direct payment or via intermediary • Volumetric or flat rate • In-cash or mobile money

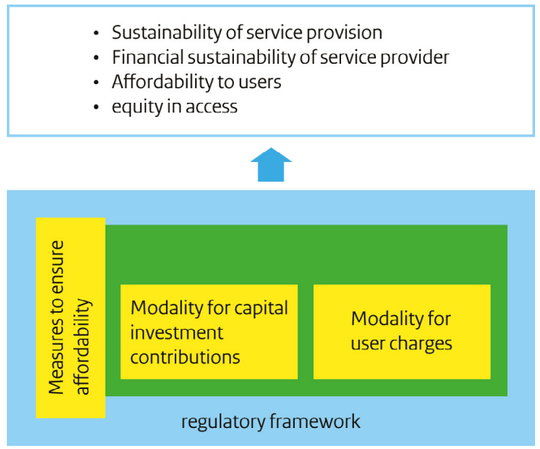
2.1.3 Economic regulation

In view of the need to balance affordability and financial sustainability of service providers, many countries have progressed in economic regulation, whereby a dedicated entity - an independent regulator, a Ministry charged with regulatory function or local authorities – carries out a number of regulatory functions. ESAWAS (2022) in its overview of progress in regulation across African countries, indicates that 71% of the countries in Africa have developed tariff regulations, i.e. on tariff rates, structures and adjustments, and 61% of the countries on the continent have developed pro-poor regulations. The overview does not indicate whether these regulations also extend to the modalities through which payment can take place.

2.1.4 Conceptual framework for the study

These considerations can be brought together in a conceptual framework which is used for this study, as presented in Figure 1.

Figure 1: Conceptual framework



It starts by understanding what the potential objectives of payment, and the payment modality are: sustainability of service provision and/or of the service providers, but also affordability to users and equity in access; and in some cases even controlling the amounts of water used. Furthermore, it shows the need to differentiate between two types of payment modalities:

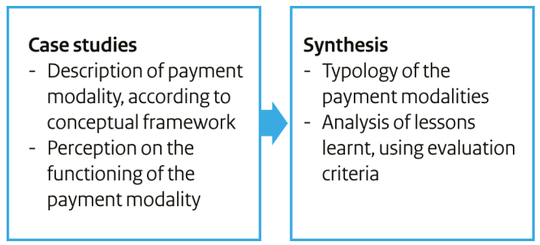
- those for contributions to capital investments, including connection costs, and
- those for user charges. These payment modalities may be complemented by measures to ensure affordability of the payment to users. The payment modalities are supported by a wider set of social and technical systems which may have been put in place for the functioning of the payment modalities. These in turn take place in the wider regulatory framework, which defines the details of the payment modalities, affordability measures and supporting systems to be put in place.

2.2 Methodology

In order to meet the objective of this research, a methodological approach has been followed which consists of two main parts:

- a research of case studies of payment modalities in selected FDW projects, and
- a synthesis. In both steps, two types of assessment or analyses are made, leading to a total of four research steps:

Figure 2: Research methodology



Descriptive assessment of the payment modality applied in each of the FDW projects. This is done according to the components of the conceptual framework presented in the previous section.

Perceptions on the functioning of the payment modality. In order to assess how the payment modality functions, and its strengths and weaknesses, the perceptions of different types of stakeholders are assessed, specifically: the service provider, users, local authorities and relevant third parties, such as an intermediate between the service provider and users.

Synthesising the descriptive findings. In the third step, the descriptions from across the case study reviews are brought together in a typology of the payment modalities, as well as for the surrounding social, technical and financial systems, and regulatory context.

Analysis of lessons learnt of the payment modalities. This is done by assessing the implementation of the modality against a number of criteria. Though this is not a formal evaluation, the study employs some of OECD's criteria for evaluating development interventions:

- Relevance: this criterion focuses on the extent to which the payment modality addresses a specific payment problem and whether it was a relevant solution to that.
- Coherence: this covers the extent to which the payment modality is in compliance with the regulatory framework, as well as aligned with pre-existing practices for payment, and with the pre-existing social, technical and financial systems.
- Effectiveness: this covers the extent to which the payment modality meets the expected objectives around, for example, sustainability, affordability and equity.
- Efficiency: this criterion is assessed by the extent to which the benefits of introducing or refining a payment modality weigh up to the costs.
- Sustainability: this looks into the extent to which the payment modalities are fully institutionalised within the social, technical and financial systems of the service provider and the regulatory framework.

2.2.1 Data sources

In order to do the analysis described above, the main source of data are the case studies. Initially, a total of nine cases was suggested for the review. After an initial screening of project documents and interviews with project managers, a number of changes were made to the cases to be reviewed, leading to a total of 10 projects (see Table 2 below)

Compared to the original list, the following changes were made:

- The case from Rwanda is only partially included. The case includes a description of the payment modality that is being piloted and its intent. As the pilot with the modality was still about to start at the moment of the research, its cannot be assessed yet.
- As the case from Rwanda would only be partial, it was agreed that another case would be added. Based on prior knowledge of both the RVO and the consultants teams, the case from Ghana has been included.
- It was realised that the case of the water filters in Ethiopia is very different from the others, making it difficult to include it in the synthesis. Nevertheless it was decided to still include it to also explore the breadth of types of payment modalities.

For each of the cases, the following data sources were used:

- Compilation and review of project documents. Most of the information for the case studies derives from project documents, including project plans, progress reports and evaluations. In addition, for some cases, specific studies and reports were done on parts of the payment modalities. These are listed in the reference sections of each case[2].
- Key informant interviews. These were held with the project leads, as well as with other relevant stakeholders for each case, including utility and NGO staff, government representatives and independent experts.

2.2.2 Approach to stakeholder engagement

Given the emphasis on learning, stakeholders, including RVO, were engaged in the reflection during the research. This included:

- Inception meeting with the RVO team. During this meeting the approach and methodology were discussed and agreed upon.
- Interviews with the project leads as well as with other stakeholders involved in each case.
- Validation workshop: this focused on validation of the results but also served to disseminate the findings more widely.

Table 2: Overview of the projects, their location and partners, included in the study

Country	Project name[1] and code	Lead partner	Service delivery model
Benin	Water Entrepreneurs Project (FW14BJ18)	Eijkelkamp Foundation	Private operator in rural areas
Ethiopia	Source to tap and back (FDW12ET06)	VEI	Urban utility
Ethiopia	Safe Drinking Water for Ethiopia (FDW16050ET)	Resilience BV	Water filters
Ghana	Public-Private Partnership for Water in Ghana (GWW1507)	Safe Water Network	Private operator in small towns and rural areas
Kenya	Performance enhancement of water utilities in Kenya through benchmarking, collective learning and innovative financing (PEWAK) (FDW14KE13)	VEI	Urban utility
Mali	Sustainable O&M model for manual pumps in Mali; the UDUMA concept (FDW16003ML)	Vergnet-Hydro	Private operator in small towns and rural areas
Mozambique	Sustainable Water Services Beira (FDW14MZ02)	VEI	Urban utility
The Philippines	Sustainable and Resilient Pro-poor Water Supply Project in Cebu (FDW14PH03)	VEI	Urban utility
Rwanda	Scaling universal access to safe and climate resilient water services in Rwanda (FDW17181RW)	VEI	Urban utility
Uganda	Alternative Approaches and Tools for Improved Water Supply and Sanitation for Towns in Northern Uganda (ATWATSAN) (FDW14UG43)	National Water and Sewerage Corporation Uganda	Utility in urban and rural areas

1 For the remainder of this document we use the name of the country when referring to a specific project. For Ethiopia, we add the shorthand name of the project in parenthesis to differentiate between the two.

2 Several of these are internal project reports which are not available online. They can be made available upon request.

3 Results

3.1 Service delivery context surrounding the payment modalities

Before going into the payment modalities, it is important to describe the context and service delivery in which these payment modalities took place. As can be seen in Table 2 in chapter 2, three types of contexts can be distinguished across the case studies.

1. **Expanding utility service provision to low-income areas**. In five of the projects (Ethiopia (Source to tap and back), Kenya, Mozambique, the Philippines, Rwanda and Uganda), there was an established utility which sought to expand and improve its network so as to provide services to low-income areas. A sixth project, in Uganda, also falls in this category, but with the difference that there project included the development of new piped supplies in rural areas, which would subsequently be managed by the urban utility. As these are cases of existing water supply systems (with the exception of Uganda), there was no contribution to capital costs; however, several of these require contribution to connection fees, as well as modalities for payment of user charges. Moreover, these utilities had already pre-established practices and experience around payment and payment modalities. There were differences in terms of the level of service provided. In the cases in Mozambique and the Philippines household connections are the norm, whereas in the other cases, also kiosk, public standposts and yard taps are found. The case of Ethiopia (Source to tap and back) had one additional modality as well, whereby part of the project was about in-labour contribution by low-income households to catchment protection works in the upper catchment.
2. **Newly established water supply systems with private providers**. In three projects (Benin, Ghana and Mali) through the PPP project new water supply systems were constructed, all of which were subsequently to be operated and maintained by private service providers. These projects had in common that they all took place in rural and small-town settlements. Moreover, they mainly provide water through communal tap stands or dispenser, though in Ghana in the course of the project also household connections were provided. Finally, the private operators in Ghana and Mali had prior experience in being a private operator – and hence with issues around payment (modalities), whereas in Benin that still had to be established.
3. **Household water filters**. This was the project in Ethiopia, through which a private company seeks to sell household water filters, and whereby buyers have the possibility to also access micro-credit for that.

3.2 Characterisation of the payment modalities

The payment modalities found across the cases are linked to a large extent to the service delivery context and summarised in Table 3

As can be seen, various combinations of elements of the payment modality were found across the cases. These are not only related to the context of service delivery, but also to the type of access point. Zooming in on the elements of the payment modalities, as defined in chapter 2.1, we can further characterise those as follows:

3.2.1 Upfront contribution to capital costs

The only case in which users were required to make an upfront contribution to capital costs is the case of the water filters in Ethiopia. Users pay the full costs of such water filters upfront. They can, if wanted, get access to micro-credit, which is then used to pay the costs of the filter upfront. The loan can be paid back in instalments.

The study also looked into the modality of payment of contribution to catchment protection in the other Ethiopian project (Source to tap and back). Communities located in the upper reaches of the Awash River Basin are expected to contribute their labour to undertake catchment protection activities, which would reduce sedimentation in one of the reservoirs that serves Addis Ababa's water supply and eventually benefit the utility and its users. Upon closer analysis, it appears that these activities take place on own land of the community members and include for example terracing. So the labour they provide serves them directly – in terms of better in-field soil and water management -, next to that it serves the utility. It is thus not a modality whereby users of water and sanitation services pay for access to, or use of services. It is one of encouragement of upstream communities to spend time and effort on improved soil and water management, facilitated also by the project. In a subsequent project, the utility even pays the upstream communities to also undertake such catchment protection works on communal land, and thus falls under the definition of a payment-for-environmental-services (PES) mechanism. Such a PES is also found in the project in the Philippines. That is a mechanism that falls outside the scope of this study, as it is not about how users pay for a service; but how service providers pay o users for environmental services.

Table 3: Payment modalities found accros the case studies

Context	Project	Payment modalities
Utility service provision	Ethiopia (Source to tap and back)	In-labour payment of catchment protection activities. Payment of user charges via intermediaries at public standposts. Payment of metered users charges at yard taps.
	Kenya	Different modalities according to type of access point: • Kiosks run by intermediary with pay-as-you-fetch and pre-pay • Yard taps run by intermediary with post-pay, pre-paid water meters of inclusion of payment in rentall bill • Fees for household connections through payment in instalments • Subsidized (social) connection fee
	Mozambique	• Subsidized (social) connection fee • High-frequency post-payment of user charges
	The Philippines	• Payment of connection fee in instalments • High frequency post-payment of user charges via a social enterprise and NGO as intermediary
	Rwanda	Pre-paid user charges
	Uganda	Different modalities according to type of access point: • Public standpipes and kiosks with pay-as-you-fetch • Household connections, with subsidized connection fee, and payment in instalments
Newly established water systems with private operator	Benin	Pre-paid user charges, including possibility of seasonal subscription
	Ghana	Different modalities according to type of access point: • User charges at public standpost with pay-as-you-fetch, and pre-paid (in-cash and mobile money) • User charges at household connections with post-payment and pre-paid (in-cash and mobile money) • Connection fee payment in instalments
	Mali	Different modalities according to type of access point: • Handpumps with volumetric pay-as-you-fetch, or pre-paid flat rate • Public standposts: volumetric pay-as-you-fetch (in-cash and mobile money)
Water filters	Ethiopia (safe drinking water)	Upfront payment for household water filters, with and without micro-finance

3.2.2 Connection fees

Connection fees were only charged in those cases where users access the system via a household connection. Where users access yard taps or kiosks, no connection fees are charged.

The following payment modalities were found:

- **As an upfront payment of a cost-reflective fee** (i.e. covering the costs of material of the connection, labour and administrative costs). This is for many utilities the standard practice they apply to all customers.
- **Social connection fee**, an upfront payment of a fee that is not cost-reflective. Though this is not a type of modality that was promoted or set-up as part of the projects, these modalities already existed in the utilities in Kenya and Mozambique. Users pay an amount to the utility that is well below the actual cost of the connection.
- **Paying the connection fee through interest-free instalments**. In Ghana, Kenya, and the Philippines this modality was applied specifically as part of the project.

3.2.3 User charges

The study found the following with respect to elements of the payment modalities across the cases:

Frequency and timing. The cases included a number of possible combinations of frequency and timing, including:

- **Pre-paid volumetric payment**. Under this modality, users have a payment device (a tag or card), which they can charge whenever they want. Upon obtaining water, the charge – usually volumetric - is deducted from the tag or card. Once the charge has been used up, the users need to charge it again, so the frequency of payment depends on the amounts that users are willing to charge to the payment device each time. The pre-payment modality is used mostly at public standposts or dispensers (including at kiosk and yard taps) – including in Kenya, Rwanda, Uganda, Benin, Mali and Ghana, but also at household connections in Ghana.
- **Pre-payment of a fixed amount**. Both in Benin and Mali, the service providers offer a seasonal subscription. The users pre-pay a fixed amount that would be equivalent to several months or an entire season of obtaining water and can then fetch water when they need it. In Mali this method is employed at handpumps only.
- **Pay-as-you-fetch**. Under this modality, the users pay a vendor at the moment of fetching water, and is employed only at public standposts and dispensers, including at kiosks and yard taps. The payment can be in-cash, but also through mobile money. The vendor can be an employee of the service provider (as in Ghana), or an intermediary who has an agreement with the utility, as for example in Ethiopia (Source to tap and back), Kenya and Uganda

- **High frequency post-payment**. Under this modality, the users pay the amount they have actually consumed after the fact and do so by paying small amounts at a high frequency. So for example, every day they pay a small part of the bill of the previous month. This modality deviates from the standard practice of having to pay the bill on a monthly basis, and thereby align with the cashflow of low-income users. Over time it is the intent to transition to monthly payments. This modality has been employed in Mozambique and the Philippines.

Intermediaries. The following types of payment via intermediaries were found:
- **An NGO and social enterprise**. In the Philippines, the utility provides water in bulk to a social enterprise which was established by an NGO. The social enterprise pays the normal user charge to the utility, and in turn ensures distribution of water to the households and collects the user charges from households. As described above, in the case of the Philippines this follows a high-frequency post-payment modality. In doing so, the social enterprise also collects a surcharge to cover its own costs. In parallel the NGO undertakes ongoing demand creation and awareness raising.
- **Kiosks or public standpost operators** (sometimes referred to as vendors). These are private persons, often selected by the community who operate a kiosk or public standpost. They buy water in bulk from the utility, and sell it on to users, who get water from dispensers at the kiosk. This reselling happens with a surcharge which then serves as remuneration for the operator of the kiosk or public standpost. This model of kiosk operators is found amongst others among the utilities in Ethiopia (Source to tap and back), Kenya and Uganda, but also at the private operators in Benin, Ghana and Mali.
- **Landlords**. This is a type of intermediary particularly found in Kenya. They are the owners of compounds which are housing numbers of households, sometimes up to 20 or 30 households. They have one or more taps on the compound. These taps count as normal domestic connections, and the landlords pay the utility for the amount consumed. The households who live in the compound pay the landlord for their consumption, sometimes through meters, or sometimes by having a fixed amount included in their rental bill. That makes the landlords de facto an intermediary between the utility and user groups.

Volumetric or flat rate payment. In most of the cases, user charge is based on the volumes of water that are used. This is found across the different types of access points (household connections, kiosks, communal dispensers, and yard taps), which are all equipped with meters, or where people pay per the number of containers they fill. The only exceptions are the handpumps in Mali. It was found that when people have to pay per container of water filled up at the pump, they reduce their consumption, presumably obtaining water from alternative sources. That also affected the revenue of the private operator. It was therefore decided to ask a flat rate payment, meaning that once the amount was paid, people could fill as many containers as they want.

In-cash or mobile payment. The following was found:
- **In-cash payment** is mostly found in combination with pay-as-you-fetch, whereby people pay the water consumption in cash at the moment of fetching (e.g. at water kiosks in Kenya, public standposts in Ethiopia, Ghana, Mali and Benin). Also, where people have a seasonal subscription like in Benin and Mali, in-cash payment is found.
- **A hybrid system** is found both for the post-payment systems (as in the Philippines and Mozambique) and some of the pre-paid systems. For the post-payment systems, people have an electronic ledger, or account, that they pay into, as a kind of a running account. The payment itself into the ledger is in-cash but can also be through mobile money. The same goes for some of the pre-paid payments. For example, in Ghana people have a card which they can charge with credit for operating the pre-paid meters. But when charging the card they can either use cash or mobile money.
- **Fully mobile-based systems** exist whereby one pays into one's account or card with mobile money, and that is then used to obtain water. Ghana is the country that has advanced the most in this.

3.3 Assessment of the payment modalities and their supporting systems

Having described the various payment modalities found across the cases, this section provides their assessment. It does so by reviewing for each of the three types of costs, whether the modalities found in the study were relevant in addressing the problems associated with it, the effectiveness and efficiency of the measures, and their sustainability. The findings are put into the broader perspective of the international literature on the topic.

3.3.1 Upfront contribution to capital costs

In none of the cases, users were required to pay a cost-reflective contribution to capital costs of new communal supplies. As indicated in the literature review, the payment of upfront contribution to capital costs of new communal supplies is controversial, as there is little evidence that such payment is a defining factor contributing to sustainability of services. It is therefore not surprising that such a practice was not found among the cases here, and that capital costs of new systems are funded publicly.

The only exception are the water filters in Ethiopia, for which users have to pay an amount that reflects the variable costs of the fixed investment costs in establishing the production factory. The reason for that is that such filters are sold by private suppliers, who need to recover their costs. That is a very different model of water supply as compared to public (networked) supplies. Moreover, water filters are seldom a stand-alone service delivery model, but rather complementing piped supplies or handpumps.

Whereas the payment of full costs is relevant and necessary for suppliers, for the Ethiopian case, it is still too early to assess whether the payment of the full costs is effective. Currently, sales of water filters are far below expectations, but that is also reportedly due to other reasons than the costs. One way of overcoming the high upfront costs has been through micro-finance, whereby users pay off in small amounts. In the Ethiopian case, the use of micro-credit for water filters to date has been low, probably also due to the very high interest rates (23%).

3.3.2 Connection fees

As noted, already in the early 2000s, there were strong critiques on the requirement that users pay an upfront connection fee (Franceys and Gerlach, 2006; ADB, 2008), as this is a barrier for households to get connected. The relevance of addressing that barrier has since then only become higher for two reasons:
- The SDG target of safely managed services implies by definition that water should be available on the premises of the household.
- There is a growing demand from users for having access to water at the homestead. The case from Ghana reviewed for this study attests to the rapid shift from public standposts to household connections.

Reducing the barrier posed by the upfront connection fee is therefore highly relevant.

The modality of paying the connection fee in instalments was found to be effective and efficient, as evidenced by the findings from Ghana and the Philippines. A large number of users made use of this modality, leading to a rapid increase in the number of household connections (a 114% increase in the uptake of this modality in the Philippines). And it comes at a very low cost to the service provider. Arguably the only cost is the lost interest due to the payment in interest-free instalments. But that is offset by the fact that the utility gets the revenue much earlier as the household does not have to wait to be connected until it has saved up sufficient funds to pay for the connection fee. This modality is also in line with what has been recommended by for example the ADB (2008).

This modality is also favourable from the point of view of sustainability. It can be implemented relatively easily by the utility, as it doesn't pose additional information requirements and hence no need for ICT. This is illustrated by the case from the Philippines. The utility decided to open up this modality not only to low-income users, but also to any households that want to be newly connected. In that way, the utility does not have to have an administration of which households are low-income ones.

The other modality – social connection fees – was already a practice among the utilities in Kenya and Mozambique, but not developed through one of the reviewed projects. As such, we don't have the data to assess its effectiveness and efficiency. Interviewees indicated that this modality may make the connection more affordable but doesn't take away the problem that it is still a relatively large one-off amount. This in turn indicates that the main barrier is not necessarily one of affordability of the connection fee, but rather one of alignment with cashflow of households. The social connection fee can be seen as more equitable, as it is paid for through cross-subsidies via the tariffs of existing users. However, that in turn poses more information requirements on the utility, in the sense that it would need to have information on whether households are low-income ones, and hence be eligible for the social connection fee.

3.3.3 User charges

Given that we found a number of combinations of modalities in terms of frequency and timing, the presence of an intermediary, volumetric versus flat rate charges, and whether payments were in-cash or via mobile money, this section reviews each of the elements.

Frequency and timing. The relevance of having different frequency and timing in payment modality can be assessed from both the users' and service providers' perspective:
- For users it is important to have the option to pay their user charges with a frequency that: 1) aligns with their cash-flow situation, and 2) avoids risk of bulky payments, for which they have not set aside sufficient money.
- For service providers, it is of importance to offer these options, so as to: 1) minimize the levels of arrears, and 2) where possible, reduce the transaction costs of billing and collecting the user charges.

The fact that this is relevant is witnessed by the sheer fact that across the cases different practiced frequencies and timings of payment emerged; or that service providers shifted or expanded the frequencies and timings with which payments could be done:
- In low-income urban areas of Mozambique and the Philippines users who earn daily wages, prefer to use part of their daily wage to pay off their water bills on a high frequency basis, rather than having to pay the entire bill in one go. That gave rise to the modality of high frequency post-payments, though with the intent to gradually transition to weekly or eventually normal monthly payments. Data from Mozambique shows that this modality is highly popular, even though not all low-income users make use of that option.
- In rural areas of Benin and Mali, people's income is more seasonal, having more cash at hand after selling their harvests. That led to the development of having a seasonal subscription, or pre-paying their water bill a few months in advance.

- In Ghana, initially a post-payment mechanism existed for household connections. But this led to high transaction costs of reading water meters, billing and collection. Moreover, arrear levels were high, as not all users could pay the bill in one go. That led to a switch to a pre-payment modality, supported by pre-paid water meters.

As the modalities were deployed in different contexts, this study cannot assess whether one modality is more or less effective than another. Rather, we provide the extent to which the modalities were able to meet the (implicit) objectives of both users and service providers in each case.

The pre-paid volumetric payment modalities have the advantage that the user is in charge of the frequency of payment, according to cashflow. They can either charge the payment devices with larger or smaller amounts, at moments of convenience. And they cannot build up bills that are then too big to pay. The drawback is that when they have need to collect water and have no credit on the device and no cash to recharge it, they cannot obtain water. This may lead to further inequality among users (as observed by Amankwaa et al. 2022 in Ghana). Moreover, it may result in reduced water use levels. For example, when in the Ghanaian case, the switch was made from post-payment to pre-payment, the water use went down significantly, as users were restraining their own consumption. In Benin and Mali, consumption from the pre-paid systems reduced a lot in the rainy season, when alternative – but unsafe – sources are available. It cannot be assessed though whether users would have used the safe water supply under a post-payment system.

Where service providers have the choice, they prefer such pre-paid modalities, as appeared in some of the interviews (e.g. Mali and Ghana). By definition, arrears in pre-paid systems are close to zero. Moreover, particularly in combination with mobile payments, the transaction costs to the service provider, are very low. Even though pre-paid meters require a higher upfront investment (they are more expensive than analogue meters), these are seen as cost-effective investments, as they reduce transaction costs and increase revenue.

Similar advantages to users were found among the **pay-as-you-fetch modalities** as under the pre-paid system. However, when users temporarily don't have cash, and need the water, they cannot access that. From the point of view of service providers, the main drawback of pay-as-you-fetch is that it requires a vendor or intermediary to be present at the water point, who collects the fee upon fetching, thereby increasing transaction costs. Moreover, as will be explained in the next section, it opens up for undue overcharging by intermediaries.

The high frequency post-payment systems were found to be popular among users in Mozambique and the Philippines, showing that these align with their cashflow situation. No insight was obtained whether this resulted in lower arrear levels. However, these modalities come with additional transaction costs and requirements. In the Philippines, the collection of these high-frequency payments is very labour intensive, and the social enterprise who acts as intermediary therefore levies a higher tariff level than the utility. However, this is off-set by two factors: 1) the utility charges a minimum amount (equivalent to a consumption of 10 m3/month) whereas the intermediary charges on the basis of actual consumption without considering the minimum; as low-income families typically consume far less than that volume their total bill is more or less similar to what they would have to pay the utility; and 2) included in the higher tariff level are additional services provided by the social enterprise such as solid waste management. In Mozambique, the high-frequency payment system relies on a broader payment system for utility services, so the additional transaction costs are manageable.

I**ntermediaries**. The relevance of having of an intermediary between the user and utilities is controversial at best.

In part, intermediaries find their origin in constraints that utilities are facing in providing access to low-income users. In the case in the Philippines, the utility is not able to provide household connections, if the household cannot meet certain technical and legal requirements. And many households in low-income areas cannot meet those, e.g. where there is no clarity on land- and housing tenure. To overcome that, the utility is developing a Memorandum of Agreement with the social enterprise and NGO to act as intermediary. The main reason for an intermediary is in this case not driven by the payment modality, but by other reasons. Moreover, in the Philippines the provision via an intermediary is intended to be a temporary arrangement, whereby after 10 years the network and customers would be transferred to the utility, once users have been able to consistently show that they are able to afford regular water bills.

But in other cases (e.g. Kenya), intermediaries such as kiosk operators, find their origin in informal cartels, who use a monopolised position to extract financial gain from users, as elaborated in Boakye-Ansah et al. (2019a). The same is said about landlords, who use their position, to include a high surcharge to the water costs in rental bills.

Whatever the origins or reasons for having an intermediary, in the case studies we identified the following relations between payment modalities and having an intermediary.

- The costs of provision via an intermediary are charged to the user. In the Philippines, the social enterprise has real and significant transaction costs, as it does the collection of the high-frequency post-payment fees, and it also provides other services, such as waste collection. It is therefore charging a higher tariff level, as is also defined in its agreement with the utility. Also in Uganda and Ethiopia (Source to tap and back), operators of public standposts and kiosks cover a surcharge. In Kenya, the tariff that kiosk owners are allowed to surcharge is regulated.
- Particularly, under pay-as-you-fetch systems, intermediaries can abuse their position and charge much more beyond the justifiable additional costs, as elaborated in Ansah-Boakye et al. (2019a). If one pays at the moment of collecting, the control over whether the right tariff is charged is often effectively not there, giving rise to opportunities for abuse. Likewise, where landlords levy a post-payment to their tenants, they can charge much more than the regulated prices.
- Pre-paid modalities can reduce such a risk. In this case, the users buy from an official sales point, or use mobile money, and can then operate the pre-paid dispenser without interference of the intermediary at the dispenser. Amankwaa et al. (2022) describe a similar mechanism in Ghana whereby pre-paid dispensers reduced the relative inequality between consumers and former water intermediaries. In Rwanda, it is the intent that the pre-paid meters would address the same problem.
- Payment modalities also affect the position of vendors, i.e. staff of service providers. Just like the intermediaries, they at times also abuse their position by extracting bribes and overcharging. Moreover, users depend on the vendor to be there under pay-as-you-fetch modalities. By shifting to pre-paid modalities, their role becomes largely redundant, and users can access water without a vendor needing to be present. This may result in vendors resisting the introduction of pre-paid modalities.

Volumetric and flat rate. The relevance of volumetric-based payments finds its roots in the argument that the cost of providing a water service is proportional to the volumes consumed, and that it is therefore equitable that those who use more water thus contribute more to the operation and maintenance costs. Also the argument is often made that without volumetric payment, more water would be wasted by users. However, a volumetric-based payment system comes at a higher cost as well: meters need to be installed, and these need to be read and maintained, and linked to a volumetric-based billing system. Moreover, meters need to be of high-quality and tamper-proof, thereby again increasing the costs. So, a volumetric-based payment is relevant if: 1) the costs of providing the service to a large extent depend on the volumes used, 2) there are likely big differences in water use between users, 3) there are high risks of spillage and waste of water, and 4) the costs of the volumetric-based payment system itself are much lower than its benefits.

This is the situation in many urban utilities. They typically serve large numbers of customers, with very different usage patterns. Moreover, volumetric payment is mostly the normal business practice. So, it is not surprising that in all the cases of urban utility provision, volumetric payment was applied. In these cases, it is thus a relevant modality.

The three cases of private providers in rural areas (Benin, Ghana and Mali) also were found to apply volumetric charges from the onset. This is in part induced by the fact that they opted for a pre-paid modality, which almost by default implies a volumetric payment. One could argue that in these cases the conditions are only partially met. For example, in the types of systems in Benin and Mali, one would not expect large differences in consumption patterns between users. Moreover, some of these water points are solar-powered implying a less than linear relation between the volumes used and operational costs. The fact that a volumetric payment is charged may also explain a seasonal effect observed in these cases, whereby the water use from the installed systems goes down during the rainy season, when people have access to alternative (unsafe) sources. This begs the question whether in these contexts a pre-paid flat rate charge – based on an average consumption pattern - would have avoided such resorting to alternative sources. This question cannot be answered as the providers in these cases have not tried out that alternative.

The only case where the provider went back and forth between volumetric and flat-rate payment is in the case of handpumps in Mali. Initially, users had to pay volumetrically (per recipient filled). But that led to low levels of usage, as people resorted to alternative (unsafe) sources. The service provider then provided the option that people paid an upfront flat rate fee. They can now use the hand-pumps for an unlimited amount. This is not a big risk to the provider, as the operational costs are not-linearly related to usage. Moreover, there is a low risk that some people will use a lot, as usage is constrained by what they can physically pump up. A final advantage is that it doesn't require a vendor to be present at the handpump.

In-cash, hybrid and mobile money. The cases found that whether payments could be made in-cash, via mobile money or through a hybrid system depended on the following factors:

- **Overall presence and reliability of mobile money payment systems**. This was higher in urban settings, such as in the case of Mozambique or the Philippines, than in rural areas in Benin and Mali. In the latter two cases, it is not that mobile payment is not there, but its reliability is too weak.
- **Alignment with other existing payment systems**. In Mozambique the high-frequency post-payment system was made possible by aligning with a broader payment system for other utility services.
- **Time**. In Ghana, the use of mobile money was already common when the project started, but not yet for paying for water services. It took time to undertake social awareness raising campaigns to make that more common.

The effectiveness of the shift from in-cash to hybrid and mobile money was observed by the following:

- The hybrid or mobile money-based payment systems avoid the risk of being overcharged by intermediaries, as explained in the sections above about intermediaries.

- Under fully mobile money-based systems, users can get water at any moment, as they don't rely on the vendor to be present at the tap-stand.
- It eliminates the need to have cash, with all the security risks that entails for both consumers and vendors.
- Consumers can track their credit and plan ahead for their expenditure.

Mobile money allows the service providers to make smaller increments to the prices then when cash is used, particularly in the absence of very small denomination coins, as observed in the case of Ghana (Ampadu-Boakye et al., 2021).

3.4 The technical, social and institutional supporting systems

As can already be seen, the payment modalities don't stand on their own. They are closely linked to the type of technology used to access the water and supported by Information and Communication Technology (ICT) systems, and institutional and social arrangements, and – to some extent – by regulatory measures. This section provides a description of these systems and the extent to which they enable payment modalities.

3.4.1 Type of water access point

A key factor influencing the payment modality is the type of technology through which a user accesses the water, the main ones being:

- Household connection. This is a tap that is available on the premises or within the homestead that uses the water. In all the cases, household connections are equipped with a water meter. Two types of payment modalities are found around such connections: 1) a post-payment system, whereby the operator (or in the case of the Philippines by the intermediary NGO) does the meter reading as the basis for billing; or 2) fully electronic pre-paid water meters, whereby the volume used is accounted for electronically. When the account is empty, the meter stops letting through water, until it is recharged again.
- Public standposts, dispensers and kiosks. These are posts, with one or more taps, which are open to the public, and usually located on public land (along the road or pavement). The tap stands are either operated manually, or through electronic dispensers, linked to a water meter. There may be a person there (either a vendor or kiosk owner/operator) to operate the taps and receive payments. In fully automated ones, there is not necessarily a vendor present. This is the type of water access point at which the greatest variety of payment mechanisms takes place: from pre-paid, fully mobile-based payments, without involvement of an intermediary nor vendor, to cash-based pay-as-you-fetch to an intermediary.
- Yard tap. These are taps located within a compound with several households and is mainly found in Kenya.
- Communal handpump. These are manually operated pumps, mainly in rural areas. This type of access point was only found in the project in Mali. Prior to the project, users paid only when a breakdown occurred and a repair needed to be done, a common practice around many handpumps. Through the project, first a volumetric payment was introduced (payment by recipient) and then a flat rate amount. In Benin, the project itself didn't include handpumps, but there were handpumps present in the areas of intervention. In those cases, people didn't pay at all, or only as and when a repair was needed.

These different types of access point thus enable different types of payment modalities.

3.4.2 Information and communication technology

The payment modalities are also closely linked to different types of information and communication technology (ICT). The following types of ICT were found across the cases:

- All the pre-paid modalities require **electronic water meters**, either at households or at water dispensers. There are several types of such water meters available from suppliers.
- Closely related to those are the **devices to which to charge money** to activate pre-paid water dispensers. Different types of tags and cards were reported.
- **Electronic ledgers**. For the post-payment system in Mozambique and the Philippines, electronic ledgers were set up. These are essentially current accounts that a user has with the utility, and in which the user can deposit money, and from which then the water bills are subtracted.

As important as the ICT, is the process of piloting, testing and selecting pre-paid water meters, charging devices and electronic ledgers. In, amongst others Benin, Ghana, Kenya and Rwanda such processes were undertaken. This has allowed the service providers to compare different water meters against criteria of: costs, compatibility and interoperability with other software that the service provider uses, the maintenance of the ICT devices themselves, their offline performance, ease of use, data access rights, amongst others. For example, in the Ghana case, different types of pre-paid water meters were reviewed on the basis of which the service provider can also access the water consumption data and integrate those with other monitoring data. In Rwanda, a key issue was that data had to be stored in-country, thereby limiting cloud-based software.

Also electronic payment systems are important enablers of different payment modalities. Moving away from the standards of post-payment of monthly bills (at household connections) or pay-as-you-fetch (at public standposts) has been enabled by the various electronic payment systems like the electronic ledgers, and the chargeable tokens. These have allowed for a wider diversity of payment modalities. And with the further growth in mobile payment, this is expected to rise. The study also found a risk that it creates dependency, particularly if those electronic systems fail. For example, if households cannot charge their tokens (e.g. because the mobile payment system is down), they cannot access water via in-cash payment, if operators or vendors are not around.

3.4.3 Institutional arrangements

The institutional arrangements for payment modalities are closely related to whether there is an intermediary or not, and can be characterised as follows:

- Payment is directly from the user to the service provider. The payment is done into the accounts of the utility, e.g. via mobile-money pre-paid water meters.
- Payment is from the user to the service provider, but with payment possibilities located with third parties. This is the case in the post-payment system in Mozambique. People can pay their bills in small instalments at corner/convenient shops where devices are present to pay the water bill (as well as the bills of other utilities). This means that the utility needs to have institutional arrangements in place with a third-party financial services company.
- Payment is from the user to an intermediary, who in turn pays the service provider. Under this modality, the intermediary also charges costs to the user to cover its own expenses. The relation between the intermediary and the service provider may be more or less formalized. In Kenya, there is often no formal agreement between utilities and landlords and kiosk operators; whereas that is the case in Ethiopia (Source to tap and back). Also, in the case of the Philippines, there is an agreement in place between the utility and the NGO, also because the NGO undertakes some of the infrastructural development works to ensure that households get connected between the stub-out (i.e. the place where a bulk meter is placed) and the homesteads.

3.4.4 Understanding user preferences

This refers to measures taken to understand and monitor user preferences around payment as well as to increase demand among the community about the need to pay for water, and the ways to do so. The following was found:

- Studies into affordability and preferences for payment modalities. This was reported upon in, amongst others, the cases from Mali and Mozambique. There the projects looked into current payment practices of low-income households (whether they paid, how much, with what frequency), and linked those to considerations of affordability and alignment with cashflow. These studies provided the service providers with detailed insight into the possible affordability of water services, but also into preferences for payment modalities. It also is clear that these preferences may change over time, as users first get access and then want to increase their service levels, as found in Ghana. Also, in the case of the water filters in Ethiopia, a market study was undertaken to get insight into what people might be willing to pay for such filters. Given the importance of these studies, it is noteworthy that not in all cases, such studies were done.
- Marketing and awareness raising about the need to pay and payment modalities. In the cases of utility service provision, there was mostly a strong awareness among the communities that they need to pay for water prior to the projects. In such contexts, payment has been a long-standing practice. This was much lower among the private providers in rural areas, like Benin and Mali, as prior to the projects people either used open water sources (which are for free) or handpumps, where they only pay when a repair needs to be done. Therefore these projects had to put specific emphasis on efforts to market the provision of an improved water supply and make users aware that they need to pay for the service.
- Monitoring payment practices. Several of the projects have undertaken dedicated studies to monitor how people pay for water and how it affects water usage and revenue. This in turn proved to be relevant to inform changes and adjustments to payment modalities. For example in Mali, a shift was made from volumetric to flat rate payment at handpumps on the basis of monitoring data on water consumption from handpumps. Also, based on the monitoring data the project identified that the use of water from handpumps was below what people had expressed to be willing to pay for. Therefore the project introduced solar-powered pumps, thereby increasing the service level (users no longer needed to pump), for which people were willing to pay. In Ghana, the monitoring of payment data supported the transition towards household connections. And in Mozambique, the introduction of the electronic ledger was accompanied by a dedicated study into its uptake.

3.4.5 Alignment with regulation

The interviews revealed that in most cases there are no regulatory requirements with respect to the payment modality. Where there is a regulator (e.g. in Kenya, Mozambique and the Philippines), the regulator only sets the regulation for the tariff structure and the height of the tariff, but not for the modality through which the the payment happens. However, these regulations indirectly affect the payment modality, as follows:

- Regulations imply that tariffs are preferably based on volumes consumed, and thereby lead to volumetric payment modalities. For example, in Mali, the Ministry responsible for water strongly favours volumetric tariffs – though it makes exceptions for handpumps. This means a strong support for the pre-paid water dispensers.
- Connection fees. In amongst others the Philippines the regulator defines that connection fees need to be charged to users. This means that the utilities somehow need to charge this, without it becoming a barrier to access.
- Embedding in a pro-poor or low-income strategy. In Kenya, regulations require that utilities undertake special efforts to ensure affordability for low-income users, and that utilities develop dedicated policies and strategies for that. The project in Kenya supported utilities in developing a dedicated pro-poor strategy, which has amongst others resulted in the diversity of payment modalities, and linkages with different types of access points. Also in Uganda, the project supported the development of pro-poor strategies in a similar way.

4 Conclusions and recommendations

The objective of this study was to provide an assessment of payment modalities that were applied in selected FDW projects and to generate insights on the basis of the results of their application. Based on the review, the study concludes the following:

On the type of costs to which users are expected to contribute

Users were found to bear only a small proportion of the capital costs, specifically:

- To the direct costs of having a household connection as part of a networked service, via a connection fee. In cases where water is provided through a piped network (either by an urban utility or a private operator), users with a household connection pay a connection fee. This fee reflects the costs of the material (pipes, valves, water meter) of the stretch between the homestead and the distribution network, the labour to install that and sometimes administrative costs. Where people access a networked supply through kiosks, standpipes or other communal water access points they don't contribute to capital costs.
- To the costs of water filters in the one project where such filters were promoted.

In all the cases, the users were found to have to contribute to the costs of operation and maintenance through user charges. This is in line with common practice. The study did not assess the extent to which these user charges are truly cost reflective, i.e. whether the tariff reflects the operation, maintenance and replacement costs.

Moreover, in those cases where the water is provided through intermediaries, users also pay the costs of having such an intermediary.

On the modalities for payment

The upfront payment of the full connection fee was found to represent a barrier to low-income households. Therefore, several service providers – all urban utilities - that were reviewed in this study provide an alternative whereby the connection fee is paid through monthly instalments, usually over a period of a year. In that way, users can already have access to the service – and generate revenue for the service provider. It reduces the problem of what Franceys and Gerlach (2006) already called 'charging to enter the water shop'.

In some cases (e.g. Kenya), the connection fee is subsidized, i.e. the fee is not reflective of the costs of making the connection. However, such social connection fees were found to be employed only where a donor-funded project is present. The institutionalization of social connection fees, whereby the fees for low-income households are subsidized by higher income ones, was not found to be present. connection fees, whereby the fees for low-income households are subsidized by higher income ones, was not found to be present. The study found a number of combinations in the payment modalities for the user charges, in terms of: frequency and timing, via intermediaries or not, and in cash or via mobile money. Moreover, in several of the projects, the payment modalities were found to change over time. The main conclusions emerging from these modalities are:

- Pre-paid modalities are preferred by service providers, as they – by definition – result in almost zero commercial losses. And when they are done through mobile payments (e.g. with chargeable tokens) they also reduce the transactions costs of billing and collection. But they do require higher upfront investments, as pre-paid meters and the enabling software are more expensive. The advantage to low-income users is that they have the potential to eliminate the roll of intermediaries and hence the corresponding surcharges. But the cases also show that they may also result in reduced water consumption levels.
- Where post-payment systems are applied, the modality of high-frequency payment (through electronic ledgers) has shown to be working effectively, with high uptake by low-income users. However, it comes at higher transaction costs, or requires integration with wider mobile payment systems. Though the intent is too eventually phase out the high frequency over time, it is too early to assess whether that is happening.
- Intermediaries are often necessary for serving low-income households, mostly through kiosks and public standposts with a person present to dispense the water; but also social enterprises that operate distribution networks between a macro-meter and households. Provision via intermediaries implies additional costs, which is charged on to the users. Moreover, there are risks whereby the intermediaries abuse their position, and surcharge beyond the justifiable additional costs.
- The cases show different steps in moving from payment in cash, to hybrid systems and fully mobile money-based payment modalities. The latter is more common in urban settings, where mobile payment is the norm. The former is more common in rural areas, where access to internet and mobile systems are less developed. The switch to mobile payments in itself is also enabling more payment modalities and the possibility to take out the intermediary.

On the enabling technical, social and institutional systems

The payment of the full capital costs of water filters can only be done through a full upfront payment. Users could take a micro-credit for that and in that way pay it off in instalments. As this was just one case, and as the project is still ongoing, no tentative conclusions can be drawn on these modalities. The study found that the payment modalities for user charges are to a large extent linked to the type of access point. At household connections, user charges are usually through (high- frequency) post-payment systems (though some examples of pre-payment were found). At public access points, like kiosks, public standposts and yard taps, pre-paid or pay-as-you-fetch modalities are found, often via intermediaries.

The different modalities are enabled by a number of supporting systems:

- ICT. Pre-paid water meters, dispensers and charging devices enable the pre-paid modalities, whereas the electronic ledgers facilitate the high-frequency post-payment modalities. As important as the ICT themselves, is the process of piloting, testing and selecting them, thereby considering issues of costs, compatibility and interoperability with other software that the service provider uses, the maintenance of the ICT devices themselves, their offline performance, ease of use, data access rights.
- Institutional arrangements. Formalized agreements between the service providers and intermediaries, regulated rates for intermediaries and transparency around those were found to be important to mitigate the risk of intermediaries abusing their position.
- Social-economic and market studies, and the monitoring of water use and payment rates. Social-economic and market studies give service providers insight into affordability and user preferences, as the basis for establishing or adjusting payment modalities. The subsequent monitoring of water use and payment rates give service providers insight into the effects of (changes in) payment modalities and making further changes to them.
- Pro-poor policies. Several of the cases showed the importance of defining payment modalities as part of a broader pro-poor policy. Such policies articulate the mix of types of access points that will be provided in the entire service area of the provider, but specifically in low-income areas, and what affordability measures will be taken.
- Regulation. The study found that regulation usually only defines the structure or level of the user charges, but not the modality for payment. That is considered appropriate as in that way, service providers can experiment with different modalities.

Overall conclusions

This study confirms the high relevance of payment modalities that reduce the barrier of the upfront payment to get access to a water supply service. Reducing this barrier is not only in the interest of low-income households, but also of the service provider, as the service provider can increase its revenue base more rapidly. The modality whereby users pay the connection fee over time through instalments is an effective one, and one that can be implemented relatively easily and at low cost to the service provider.

The payment of user charges is now a standard practice in most settings and for most types of water supply – with the possible exception of handpumps. The study concludes that there is a wide range of modalities through which such user charges can be paid. The service providers in this study have developed these on the basis of considerations of: 1) alignment with the cashflow pattern of low-income users, next to overall affordability of the user charge; 2) the need to reduce the transaction costs associated with billing and collection, 3) the wish to reduce dependency on intermediaries, and the costs and risks that these are associated with. The diversity of payment modalities has furthermore been enabled by developments in ICT, particularly around pre-paid options, and high-frequency post-payment systems. However, some of the modalities also bring about risks of reduced water consumption or not accessing improved supplies at all.

The study did not find one single best (or worst) payment modality. The cases show the importance of process measures, including: doing social-economic and market studies upfront, adjusting payment modalities based on insights from monitoring data, piloting ICT options, and embedding the modalities in broader pro-poor policies. It is through such process measures that payment modalities can be defined and adjusted that align with the realities of low-income households as well as with the interests of the service providers.

Recommendations

Based on the above, we identify the following recommendations:

To projects that seek to improve sustainable access to water supply for low-income households:

- In case of expansion of services by an existing provider, the project preparation team should undertake an assessment of existing payment modalities – both for contribution to capital costs (including connection fees) and user charges. Such an assessment should provide insights into current alignment with some of the good practices described above, as well as into problems, barriers and risks these pose. If not available, the project preparation team should also consider undertaking additional social-economic studies.
- In case of developing new supplies and establishing new service providers, the project preparation team should undertake social-economic studies and market assessments, thereby getting insight into current levels of access and payment practices.
- In developing payment modalities, project teams should give particular priority to ones that allow reducing the barriers associated with the upfront payment of a connection fee.
- In designing new payment modalities, or changing existing ones, consideration needs to be given to the following factors: 1) alignment with cashflow of users, 2) the transaction costs of billing and collection, 3) possibility of dependency on intermediaries and the associated risks, and 4) the requirements of the payment modalities in terms of supporting ICT and institutional arrangements
- Take a piloting approach to new or changing payment modalities. In that, make use of monitoring data on water use, payment

rates, number of users, amongst others. Those will give insight into the uptake of measures, but also possible undesirable side effects such as lower consumption levels.
- Apply pro-poor policies and strategies as key instruments in which to embed the payment modalities. Payment modalities are but one element of providing services to low-income users, and as such need to be part of a broader policy or strategy.
- In designing new, or changing existing, payment modalities seek the dialogue both with the regulators, so as to understand the regulatory requirements and space.

To RVO:
- When appraising and monitoring projects that seek to introduce new, or change existing payment modalities, RVO should check that these include accompanying process measures (such as social and marketing studies, piloting of options and monitoring). In their absence, discuss with the project team that such process steps should be included.
- When appraising and monitoring projects that do not include a component of introducing or changing payment modalities, RVO should discuss with the project team whether the existing payment modalities are the appropriate ones or would merit further change and adjustment.

Next to these targeted programmatic recommendations, the study also considers that there is need and scope for further research on this topic. Most of such research would be highly contextual, and focus on assessing how different payment modalities function in other contexts, and how these could be strengthened. But the study also identifies a number of broader knowledge gaps, and therefore recommends further research into the following areas:

- The demand and supply factors that contribute to accelerating on-premise water supplies and their interaction with service provider sustainability. Several cases in this study have shown a big latent demand for household connections, and by removing supply barriers, the demand can quickly be met, which in turn contributes to stronger financial sustainability of service providers. But it requires well-performing service providers to be able to offer supply options to users, and to create demand. The complex interaction between demand of users for water on premise, supply options and service provider financial sustainability merits more research, as that could contribute to providing safely managed services.
- Exclusion and inequity around pre-paid, pay-as-you-fetch and post-payment modalities. The study has indicated that several payment modalities may lead to reduced water consumption, particularly if other alternative sources are available. At the same time, some of these modalities provide an improvement compared to ones that were used before. More detailed studies on patterns of exclusion and inequity would need to complement this study, to get more fine-grained insight.
- The governance of intermediaries. The study has indicated the risks associated with intermediaries, but also some of the institutional and regulatory measures to reduce those risks. There is a growing body of literature on this topic, as also referred to in this study. However, accepting that in many situations intermediaries will remain necessary at least for the time-being, there is a need for research into appropriate governance arrangements for such intermediaries.

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Annex 1: List of interviewees

Name	Function and organisation
Alinta Geling	Uduma Mali
Antonio Madeira	WSUP Mozambique
Asaph Kabaasha	Manager SCALE project, VEI
Carmen Sing Sing	WSUP Mozambique
Daniel Truneh	Regional advisor, VEI
Djoouro Bocoum	Ministère des Mines, de l'Energie et de l'Eau, Mali
Emma Lesterhuis	Pro-poor coordinator, VEI
Jan van Saane	Project advisor, RVO
Jan Spit	Project manager WaterWorX Kenya, VEI
Joseph Ampadu-Boakye	Head, Partnerships & Business Development, Safe Water Network
Manuel Tayara	Project Officer, VEI
Mikael Dupuis	Deputy Director, Uduma
Patrick Egan	Project manager the Philippines, VEI
Sidy S. Coulibaly	Mayor of Koumatou District, Mali
Thierry Barbotte	Managing Director, Vergnet Hydro
Toni Flores	Partnerships and communications manager, Eau et Vie
Troy de Guzman	Principal engineer, corporate planning department MCWD
Zaituni Rehema	Pro-poor expert, PEWAK project

Annex 2: Case studies

Benin: pre-paid water supply in the Water Entrepreneurs Project

Context

The Water Entrepreneurs Project (WEP) (project code FW14BJ18) is a project carried out with the aim of providing secure and sustainable drinking water in Alibori province of Benin. The project approach consisted of the following:

- Water is supplied through WAPs (Water Access Points). These are stand-alone posts, consisting of a drilled well equipped with a solar-powered pump, and a pre-paid water dispenser. See figure 1 below.
- Training university graduates to become Water Entrepreneurs (WEs). These WEs operate and maintain the WAPs (each WE operating some 4 WAPs). They are remunerated on the basis of the revenue generated from water sales at the WAPs. In order to do so, the WEs get a franchise contract from the municipality. The latter are the owners of the WAPs infrastructure.
- These WEs also formed an association (ABEEA), which has the responsibility to jointly undertake community mobilization works.

Objective and set-up of the payment modality

The payment modality employed is a pre-paid modality, using a tag-based pre-paid dispenser, called TagMeter. Users charge their tag with a certain amount of money. The tag is then used to activate the dispenser, and based on the volume of water collected, a corresponding amount is subtracted from the charge on the tag.

The tags can be recharged on a needs basis. Users can do so by buying a recharge from the WEs. The model also offers a subscription system, whereby users can charge their tags with a larger amount of money, equivalent to several months of water.

Users make use of this type of subscription when they have larger amounts of cash available, for example after the harvesting of their crops.

The objective of the payment system is to create a constant cashflow for the WEs, so as to create the revenue needed for operation and maintenance, whilst at the same time providing convenience to users.

Perspectives on the functioning of the payment modality

Both the final report (Eijkelkamp, 2022) and evaluation report (Poel, 2022) reflect on the payment modality. The main points related to the payment modality from both reports include:

- The practice of regular and recurrent payment (irrespective of whether it is pre-paid) for services is relatively new in the context of the project. Most users get water from boreholes with handpumps, where only a payment is done when there is a breakdown and a repair is needed. It has taken time for users to switch to such regular payment.
- Even though the WAPs provide a higher level of service, the costs of water supply through WAPs are much higher from a hand-pump. In combination with the previous point, it does mean that not all envisaged users are using the system all the time. This is caused by the fact that usage of the system is much lower in the rainy season (when alternative water sources are available) than in the dry season.
- There is no data on the profile of the users, and non-users, of the WAPs. So, it is not known to what extent the poorest households are making use of the WAPs or not.
- The pre-paid system on the basis of tags was considered convenient for users, as it doesn't require a vendor to be present all the time at the dispenser.
- It has been important to experiment with different pre-paid dispenser technologies. The project sought to be able to monitor water usage and revenue data from the water meters, so as to integrate it with the projects broader monitoring system. A first provider required a percentage of the revenue from water sales, which was not acceptable. Also a second system was tried before settling for the TagMeter system employed currently.
- The maintenance of the pre-paid system itself needs to be factored in. These systems cannot be maintained locally by the WEs, so it is important to have a representation of the supplier, with spare parts and repair capacity, at a reasonable distance
- Whereas a subscription model may fit better with the cashflow of users, it has meant that the WEs had to provide water at a lower unit price, further reducing the revenue that could be generated.

Ethiopia: Payment for household water filters in the Safe Drinking Water for Ethiopia project

Context

The project "Safe Drinking Water for Ethiopia" (FDW16050ET) is to ensure 250,000 people (50,000 households) in rural areas of Amhara region have access to safe drinking water at the point of use, through household water filters. The project was implemented by a consortium of Resilience BV (consortium lead), Shayashone, Nazava[4], IDE and Amhara regional Bureau of Health, and implemented in Amhara region.

In order to achieve those objectives, the project has four core work packages:

- Increasing knowledge and awareness on water borne diseases and household water treatment and storage solutions through training of health extension workers and women development armies to reach 400,000 people (mainly women).
- Ensuring supply and distribution of household water filters and safe storage.
- Improving access to microfinance for loans, and
- establishing local manufacturing and assembling of filter housing and candles.

Objectives and set-up of the payment modality

Under this project, households are expected to pay the full capital costs of the water filter. The water filter in this project is the Nazava water filter that costs 25 Euros/piece and can filter about 7,000 litres of water. The only spare part that needs to be changed after 7000 litres is the candle, which costs about 10 Euros . Considering an average household size of five, and the current per capita per day standard for rural water supply which is 25 litres, a household need to change the filter's candle every two months. This would cost 5 Euros per month per household, which is expensive according to Ethiopia's current context. Of course, the cost could be reduced if a household prefers to filter water which it uses for drinking and cooking.

The payment modality is thus one of an upfront payment, or buying, of the filter. The payment takes place in cash and is paid directly to the distributor. The payment of the replacement parts is also an upfront payment. The payment is in cash to the spare parts supplier.

Anticipating that households may not be able to afford the full costs at once, the project has reached out to different micro-finance institutions including Harbu, Vision fund, and Amhara Credit and Savings Micro-finance institutions and Abay Bank. In addition to micro-finance institutions, other local savings and credit organisations were approached including RuSaCCos (Rural Savings and Credit Cooperatives). These cooperatives provide loans only to their members in all target or member woredas of the cooperative. Cooperatives provide loans to households with an interest rate ranging from 11-16%. Clients receive loans through group collaterals, with 3-7 group members; they are members of the communities, usually neighbourhoods. It is through such micro-finance arrangements that households are then expected to be able to afford the upfront costs and pay it off via the loan.

Perspectives on the functioning of the payment modality

To date the project has sold 8,697 Nazava filters, out of which 59% were for urban users. This number of sales is only about 17% of the project target sales. At the same time, the project's mid-term review indicated that users' interest to buy the water filter increased from 19% at baseline to 53% (Nazava, 2021). However, only few respondents are willing to pay more than about 17 Euros, which is less than the actual price of the water filter.

It cannot be concluded that the below-expectation sales are related to the costs or the payment modality only. There have been issues with the container mould and difficulties in acquiring a business license for the company, which have negatively affected the sale of filters since May 2020.

At the same time, the sales figures and willingness to pay suggest that the upfront payment of the full price of the filter is a barrier for part of the population. Although the micro-finance facilities have lowered the upfront costs, the actual use of such facilities has been very limited. Out of the sales only 42 were through loans from micro-finance institutions (Harbu), but at an annual interest rate of 24%. All recipients of the loans returned the loan they had received with the interest rate after a year. Micro-finance at these interest rates has till date thus been a payment modality that provides only a very partial solution.

The mid-term review (Nazava, 2021) therefore recommends to particularly focus on availability and affordability of the water filters by ensuring local production and thus lower the cost of the product.

These early data reflect the broader situation with respect to household water treatment and safe storage (HWTS) technologies in the country (MWA, 2015). The government has defined a target that 35% of households should apply HWTS (through different methods, including filters, chemicals and boiling), by 2020, compared to the baseline of 10% in 2015. So there is some demand for HWTS, as well as a government target. Different types of household water filters

are available in Ethiopia, with prices ranging from 10-100 Euros (MWA, 2015), which means the Nazava water filter has a reasonable price compared to other filters. But there is still room to lower the costs.

4 Joint venture between Resilience and Shayashone.

Ethiopia: Payment modalities in the Source to Tap and Back project

Context

The main concept behind the Source to Tap and Back (S2TAB) project (project code 12ET06) was that improved water resources management in the Upper Awash River Basin would provide conditions for improved water service delivery, both in Addis Ababa and the town of Adama. Moreover, improvements in water supply and sanitation in these towns would then lead to improved water resources further downstream.

In order to achieve these objectives, the project worked on a range of activities and outputs around both improved water resources management and water supply, including: setting up an intraregional stakeholder dialogue group, various baseline assessments, a framework for water resource protection and erosion control, improved sanitation, industrial pollution control, water safety plans, reduction in non-revenue water (in the Addis Ababa Water and Sewerage Authority - AAWSA), expansion of water supply in Adama town, development of alternative water sources and related infrastructure and establishment of a training centre.

Among all these activities two focused specifically on pro-poor interventions:

- Reduction of sedimentation in the catchment where one of the dams for Addis Ababa water supply is located, and improved sanitation for people in the buffer zone around the reservoirs of Addis Ababa.
- Water Safety plans introduced and emergency programme for improved water supply in Adama town implemented.

Objective and set-up of the payment modalities

In these two pro-poor interventions, the following payment modalities were employed:

In-kind labour contribution by upstream communities for catchment protection.

To reduce sedimentation of the Dire reservoir for Addis Ababa's water supply, communities living around the reservoir have the social duty to perform activities for AAWSA particularly by undertaking works in the catchment. The project was able to mobilize communities to undertake such protection works, including terracing on their own farmland only. No one was expected to contribute labour on someone else's land. The labour contribution was to be provided for free by the communities. In return, the project provided these communities with the following:

- Access to inputs for alternative sources of income for livelihoods and other incentives (apiculture, fruit tree seedling distribution, experience sharing visit to other areas).
- Construction of engineering structures such as check dams and gully protection.
- Sanitation infrastructure. The project has constructed 25 institutional sanitation facilities (schools, health care facilities and marketplaces).
- Improved water supply infrastructure, including 10 public water points and water storage tankers, in the upper catchment communities.

This modality can thus be classified as an in-kind payment to upfront capital investment costs to other water supply systems. Communities contribute labour for catchment protection works which benefit the Addis Ababa water supply. In return, the capital investment costs for both public water points and institutional sanitation facilities in their communities are fully covered by the project. This approach has also smoothened the relationship between Addis Ababa water supply authorities and the project area communities which had been challenging due to the perception that the communities were excluded from the development of the services.

Though the future management, operation and maintenance of the 10 public water points is the responsibilities of the communities, currently they are managed by the contractor contracted by AAWSA. In addition, communities are using water from the public water points without payment until the defect liability period of the construction is over.

Payment of user charges in Adama town

As part of improving water supply services in Adama town, the project constructed two boreholes that were connected to the mainline of the water supply, thereby creating the capacity to serve some 25,000 people in a low-income area, including internally displaced people. The specific payment modalities differ per type of access point:

- **Public water points**. These public water points were mainly for internally displaced people. The capital costs of these points (including pipeline extension, trench excavation, cost of pipes, cost of water meter, plumbing) are fully covered by the project. Following completion, the management of the water points follows a delegated management model. The town water utility has an agreement with caretakers who manage the water points. The caretaker buys water from the utility in bulk (and based on meter reading) at a set rate and resells to users via pay-as-you-fetch systems at a higher rate. The difference between what a caretaker charges a user, and what the user pays to the utility is the remuneration of the caretaker. It is thus a pay-as-you-fetch volumetric payment via an intermediary.
- **Yard connections**. These were for existing communities that were identified as low-income areas and were also fully subsidized by the project. Clients who have yard connections are paying their bill based on actual meter reading.

Perspectives on the functioning of the payment modality

In-kind contribution to catchment protection

The farmers benefit directly from the works they undertake on their own land. Though the free labour contribution on own land to protect soil erosion was assumed to benefit the communities, certain community members (elders, disabled people and chronically sick) could not contribute labour. In addition, there could be communal land/public land where mobilizing such free labour is challenging. Hence, cash compensation for labour contribution for catchment protection looks more feasible. A follow-on project is using a paid labour contribution for catchment protection in similar areas; in this case community members do the catchment protection irrespective of the land ownership (whether the land belongs to them or not).

User charges at public water points

These public water points were implemented as emergency response to serve displaced people who were desperate to cover expenses by themselves at that time. Hence the project constructed all the water supply facilities, facilitated the nomination of caretakers, and linked them with the Adama water utility. Since then, the public water points have been managed by caretakers who have contracts with the utility and get a remuneration out of the difference between the bulk and sales price. The internally displaced people who are using the water points still have the perception that they can use the water for free which is challenging for the caretakers.

Payment of bills at water meters

Irrespective of the economic status of the yard connection owner, the bill needs to be paid based on the actual reading of the meter. The block water tariff (Adama water utility has an incremental tariff approach) is less for the first few volumes of water consumption as it is subsidized, which is to the advantage of the low-income households who consume less water.

Ghana: Payment modalities at Safe Water Stations

Context

The project "Public-Private Partnership for Water in Ghana" (Project code: GWW1507) aimed to demonstrate the viability of a market-based approach to community water supply at convincing scale. Two of the key elements of the approach are:

- Safe Water Stations (SWS). These are stations consisting of a well, equipped with an electric pump (either grid- or solar powered), a water treatment station, and dispensers. Initially, the dispensers were public tap stands (typically several stands within a community). But in the course of the project, also household connections were provided.
- Having a private operator for each station, under a BOT (Build, Operate, Transfer) contract with the district authority. The stations are built by Safe Water Network (SWN). For each station, a separate legal entity is established, having its own bank account. The legal entity contracts a team of staff to operate the station, typically consisting of an operator – responsible for the technical operation -, and a vendor – responsible for billing and collecting the usage fee from users. The vendor gets his or her remuneration in the form of a commission based on the revenue they generate. The operator gets a fixed salary. The legal entity in turn is supported by a Field Services Entity (FSE) that is part of SWN. An FSE consists of water system technicians and specialists in station operations. It trains local operators in skills such as monitoring system performance, cleaning filters, testing water quality and performing simple repairs. FSE technicians provide technical support over the phone and provide on-site support when a system breakdown occurs. Spare parts and consumables are stored in a central location to provide rapid distribution of chlorine, antiscalant, valves, pumps and other critical spare parts.

Objective and set-up of the payment modality

During the course of the project the payment modalities changed (Safe Water Network, 2019), and are differentiated according to the type of dispenser used:

- Connection fees for household connections. Initially users had to pay the actual costs of the household connection, typically covering the costs of the material and the labour needed to install the connection. Though on average these were 150 US$ per connection, there was big variance depending on the households' location in relation to the station. The connection fee needs to be paid upfront. In order to increase the number of connections, donor-funded programmes provided subsidies. As these costs were still very high, SWN reconsidered the station design, creating a loop-shaped network, so that most households would be more or less equidistant from the network. This allowed SWN to change from a fee based on actual costs to a fee that is the same for everyone in the community – and thus effectively one whereby those living closer to the network cross-subsidize the ones living a bit further away.
- User charges at household connections. Initially, the SWS only had tap stands, but from 2014 onwards more household connections were provided, as those provide a higher level of service, but also a higher potential for increase in sales (Hwang and Yeboah, 2018). Initially, these were equipped with analogue water meters, and a post-paid, cash only system. Later on, as part of a pilot, household connections were equipped with pre-paid meters and the option to pay using mobile money instead of cash. They come with a handheld device, a kind of remote control, which is used to recharge the credit and to activate the meter.
- Tap stands. Initially, at the tap stands, a pay-as-you-fetch mechanism applied. Users would pay the vendor-operator an amount depending on the number of containers filled. The exact price is determined by SWN and approved by the district assembly. Later on, the project experimented with several pre-paid water dispensers. These included the water "anytime machines" (ATMs), whereby users charge a token or card with money, which is used to activate the ATM, so that water can be obtained even if the vendor is not present. Later on, other pre-paid dispensers from other suppliers were tested.

Perspectives on the functioning of the payment modality

The experience of changing from a **connection fee** based on actual costs to a cross-subsidized one has been positive. It meant not only that everyone pays the same; also the costs have reduced overall from around 150 US$/connection to about 50 US$/connection. This is also possible due to the fact that these connections are promoted through campaigns, whereby users get a discount on the connection fee if they connect in a certain period. In that way, the service provider can connect a larger number in one go, and thereby reducing transaction costs. Moreover, as people see the advantages, more and more people want to have household connections.

The experiences with the payment of user charges at **household connections** have been evaluated by Hwang and Yeboah (2018). They found the post-payment bill collection process time- and resource-intensive. And as a result, it suffered from a low collection rate. That triggered the pilots with the pre-paid mobile-money enabled system. The shift to the pre-paid system meant a great reduction in arrears from households with household connections. But it also meant the volumes consumed decreased whilst revenue increased. This may be due to a consumer awareness of water expenditures in relation to consumption. It also meant a reduction in the time operators spent on managing household connection payments. And the incremental costs of the pre-paid meters were justified by the increase in revenue and reduction in staff time. Though the pre-paid meters were enabled with mobile money, initially only a small percentage of users made use of that option. However, after an awareness campaign that increased.

With respect to the experiences with **pre-paid dispensers** at public tap-stands, a differentiation needs to be made between those dispensers that are operated by the consumer (having his or her own card of chip charged with credit) and ones operated by the vendor (who has a chip and uses that to effectuate the tap stand, after receiving a pay-as-you-fetch payment). Initially, the latter was most common, also as mobile payment was relatively limited. But as the project progressed, a switch was made to consumer-operated dispensers, which were found to offer the following advantages:

- Consumers can get water at any moment when using an ATM, as they don't rely on the vendor to be present at the tap-stand.
- It is a cost-saving to service providers, and eventually to the users, as vendors don't have to be there, and their costs don't have to be covered.
- Consumers can track their credit and plan ahead for their expenditure.
- It also allows the vendors to make smaller increments to the prices (of 0.01 pesewas) whereas with coins the minimum increment is 0.05 pesewas. The 0.01 pesewas increment is closer to the inflation cost (Ampadu-Boakye et al., 2021).

Three types of pre-paid dispenser technologies were tested and piloted and were generally well-received and accepted by users. But all had limitations in terms of extracting data and linking that to the customer management software; and data access and ownership (Safe Water Network, 2019). The latter is increasingly important as SWN is proceeding with integration of its data management tools. Interoperability between the pre-paid water meters and other data management tools is therefore crucial.

Kenya: Payment modalities as part of pro-poor strategies in the "Performance Enhancement of Water utilities in Kenya through benchmarking, collective learning and innovative financing (PEWAK)" project

Context

The aim of the project "Performance Enhancement of Water utilities in Kenya through benchmarking, collective learning and innovative financing (PEWAK)" project (project code: FDW14KE13) is to improve the performance of Water Service Providers (utilities) in Kenya. One of the three intervention areas of the project is developing strategies

for creating access to water services in low-income areas, and related pro-poor investment strategies.

Utilities in Kenya have a dual mandate of:
1. operating as commercially viable organisations, and
2. extending services to everyone, particularly the urban poor.

However, as Boakye-Ansah and Schwartz (2020) note, there are a number of tensions between the two mandates:
1. not all utilities can operate on a commercially viable basis immediately and hence are not in a position to make the investments in low-income areas;
2. the transaction costs of billing and collecting relatively small amounts of money from large numbers of users make it commercially less interesting to serve low-income areas,
3. many users struggle to pay the water tariffs, and
4. low-income users often do not have formal tenure for their dwellings, and that puts legal limitations on the utilities to extend networks into dwellings.

In order to deal with these tensions and meet their dual mandate, PEWAK (and subsequent projects, including WaterWorX) have supported over 18 utilities in Kenya in developing pro-poor strategies.

Such strategies elaborate how the utilities will provide services in low-income areas, and how they address some of the tensions highlighted above. In a review of those, Boakye-Ansah and Schwartz (2020) identify three key elements to such strategies:
- Service differentiation. This consists of distinguishing different water service options for different categories of (low-income) utility customers. These service options differ per type of technology employed, but also the corresponding payment modality.
- Using intermediaries, whereby the utility sells water in bulk to the intermediary, who then ensures further distribution to a group of users and ensures tariff collection from them.
- Establishing specialised Low-Income Area Units within the utility, which are specifically tasked to implement and oversee strategies to serve low-income areas.

Under this project there was thus not one single payment modality, but rather a number of modalities associated with different service options. The remainder of this case describes those and reflects on the advantages and disadvantages of each.

Objective and set-up of the payment modalities

The utilities that were supported through PEWAK provide the following service options, and corresponding payment modalities:
- Kiosks. Kiosks are operated by intermediaries, usually a private operator from within the community or by a landlord (Boakye-Ansah et al., 2019a). Users come to the kiosk to fetch water. At most kiosks, a pay-as-you-fetch modality applies. But increasingly, kiosks are equipped with pre-paid water meters, which operate with tokens. Users need to buy a token upfront, and then each token allows tapping a certain volume of water, for which then a certain amount is deducted of the charge on the token. Recharging the amount of money on the token can be done by paying it to the kiosk operator, or in some cases with mobile money. The kiosk itself is also equipped with a bulk meter, and the community group needs to pay the bulk amount consumed to the utility. Boakye-Ansah et al. (2019a) indicate that increasingly kiosks are equipped with pre-paid bulk meters, so as to ensure that the kiosk operators actually pay the utility.
- Yard taps. These are taps, with water meters, placed in the yard of a compound, which houses typically between 30-50 households. Three payment modalities are employed (Boakye-Ansah et al., 2019a): 1) in a post-payment modality, the households pay for the water they consumed (as metered) to the landlord, who then pays the water bill to the utility; 2) pre-paid water meters, whereby tenants pay directly to the utility via the token system as described above, and recharge their tokens via mobile money, 3) landlords add a flat rate water consumption charge to the rental bill, and then pay the utility. Not all tenants use a yard tap. Some have household connections, paying via the modality described below.
- Household connections. With this service level, households have a connection on their own premises. The household needs to pay a connection fee, so as to cover the costs of the material for the physical connection but also the technical assistance from the utility to the household. In low-income neighbourhoods, the utility applies a social connection fee. This entails lending the materials for the physical connections to the customer. After connection the customer pays for the borrowed materials on a monthly basis. The client receives the monthly water bill and the borrowed material payable for that month. Whenever the customer pays the monthly payment, the first deduction goes to the borrowed materials and the remaining to the water bill. Moreover, the social connection fee is about a third of the normal connection fee. The revenue from the connection fees goes into a ringfenced account of the utility which can be used for further expansion. The user charge is levied through a post-payment system, whereby the user pays the consumption of the previous month. In some of the utilities, a high-frequency post-payment system is experimented with, whereby users on a regular basis deposit money into an electronic ledger, rather than paying the full amount in one go.

Perspectives on the functioning of the payment modalities

On the basis of the interviews, the following reflections were obtained on the functioning of the payment modalities. These are complemented by the findings from Boakye-Ansah et al. (2019a) who undertook a detailed review of the advantages and disadvantages of the various payment modalities. These include:

Pro-poor policies or strategies

- More than a specific payment modality, it is important for utilities to have a policy or strategy for how it provides different service levels in low-income areas. Differentiated service levels are needed for a number of reasons. These include the type of housing and house ownership, whereby for example a yard tap applies more in compounds that are home to several households; and household connections are applied in cases where people own their house. Also, considerations of the financial capacity of the households play a role in this. On the other hand, Boakye-Ansah et al. (2019b) also reflect on the fact that some of these service levels actually limit the amounts of water that people use, so as to keep their financial arrears low.
- Next to being able to offer different service levels, the policies also often provide a perspective on the evolution of service levels. This refers to how users can go from having access through a kiosk towards a yard tap and eventually to a household connection, as well as the role of the utility in promoting and facilitating that. This evolution is important as the unit price of water at a household connection is much lower than at kiosks, but the upfront costs of a household connection are higher. And the business case for kiosks is weak, i.e. the time it takes to earn back the investment costs of installing a kiosk is around 7 years.

Intermediaries

- Post-payment or pay-as-you-use mechanisms make kiosk owners and landlords intermediaries between the utility and the users. Boakye-Ansah et al. (2019a) indicate that the main advantage of such intermediaries to the utility is that it allows for serving more households that were previously unserved, whilst having to interact only with a limited number of intermediaries. However, the disadvantage is that by being intermediaries, kiosk owners and landlords, are in a powerful position and can charge a tariff that is above what the utility charges them. Though formally this extra charge is regulated for kiosks, utilities cannot effectively monitor the surcharge. And as a result kiosk owners and landlords often use their position as intermediary to exploit users by charging excessive prices for poor services (Boakye-Ansah and Schwartz, 2020). Moreover, they increase the rent because of the availability of water.
- Pre-payment systems have the advantage that tokens, and their recharge, are purchased for a fixed and regulated price, from either the intermediaries or sometimes directly from the utility. This means that the intermediaries cannot overcharge. And when users buy the token or recharge from the utility, intermediaries are removed entirely from the water supply chain (Schwartz et al., 2019). Moreover, the pre-paid system also reduces the risk of non-payment to the utility. However, the pre-paid system is not fully institutionalised within the utility.
- For as long as intermediaries are there, however, it is important to have an agreement between the utility and kiosk operator. That needs to stipulate the responsibility of the operator, but also the charges that can be levied, and how that is to be done. That is not a guarantee against abuse by the intermediary, but at least provides clarity.

Dispensers

- Pre-payment systems imply that dispensers need to be in place. Schwartz et al. (2019) report that the pre-paid dispensers themselves experience frequent breakdowns. In the absence of a back-up supply, this means that users are then without access to water. This finds its root cause in the fact that the costs of maintenance of the dispensers themselves are relatively high, requiring additional staff and financial capacity. Moreover, the fact that these pre-paid dispensers effectively cut out the intermediaries means that these intermediaries sometimes vandalize the pre-paid dispensers. Also the selection of these pre-paid dispensers needs to be done carefully. Within PEWAK, experiments were done with different dispensers. Key considerations in that include the technical functioning of the dispensers but above all the software that comes with the dispensers, the costs of the licenses for those, and the eventual data use. Pre-paid water metering also comes at a cost, including the installation of the kiosk itself, the various water meters and the pipes. Calculations by VEI show that the business cases for the water meters themselves is very weak, it takes many years for the investments to pay off.

Household connections

- The post-payment system at household connections implies that households have to pay the bill in one go at the end of the month, which may be a large amount for low-income users. The high-frequency payment modality with the electronic ledger is a way of reducing that effect. This is reflected in very low non-payment rates of less than 6%.
- The social connection fee in effect means a subsidy from the utility to users. So far, the subsidy is mainly paid for by donor projects. It is not yet institutionalized by the utilities, in the sense that the utilities are not providing social connection fees in

neighbourhoods where there are no donor projects. At the same time, the data shows that there is a good business case, as the subsidy could earn itself back in less than a year. Therefore, the utilities are now starting the institutionalization by setting aside a seed fund for the social connection programme.
- In order to rapidly move towards household connections, it is important that the utility organises campaigns. These entail that households are made aware of the option to get a household connection and knows what this implies. Moreover, the campaigns can include a discount if they apply for one within a certain time period. In that way, the utility seeks to get as many people as possible connected, so they can install the physical connections in one go. That is more cost-effective than doing them one by one.

Mali: Pre-paid payment modalities in the project "Sustainable O&M model for manual pumps in Mali; the UDUMA concept"

Context

The aim of the project "Sustainable O&M model for manual pumps in Mali; the UDUMA concept" project (project code: FDW16003ML), from here on referred to as the UDUMA project, is to ensure that the rural population of three circles in the region of Sikasso has permanent access to and consumes safe and affordable drinking water, that is managed sustainability.

It is a public-private partnership between the Malian Government through the *Direction Nationale et Régionale de l'Hydraulique* (DNH & DRH) and a partnership composed of Vergnet-Hydro / Uduma Mali, SNV, Akvo and Aqua for All. The project seeks to rehabilitate 1400 handpumps already existing in these three circles. In addition, it will ensure their functioning, through a 15-year delegation contract between the municipal authorities and the private operator Uduma Mali. As part of the delegation contract, the private operator charges a water tariff to cover the operation and maintenance costs.

In the course of the project, the initial project target of 1400 handpumps has been adapted to better meet the population's expectations. Rather, the project will install and operate 75 solar-powered pumping systems, called Improved Village Hydraulic Systems (SHVA) in addition to the handpumps already installed.

Objective and set-up of the payment modalities

The project applies a number of payment modalities. These are all based on the principle of pre-payment but differ in terms of: 1) the type of tariff structure, and 2) the form through which payment happens.

The two types of tariff structure applied are:
- Flat rate tariff. A village pays a fixed monthly amount irrespective of the volume of water consumed.
- Volumetric tariff. A user pays per litre of water consumed.

The two types of payment forms are:
- Payment by cash.
- Payment through cashless cards or mobile phone.

These various modalities emerged as the project gained insight into which tariff structures and payment forms worked best for different types of technology and village conditions:
- At handpumps, the volumetric tariff was applied initially. But it was found that it meant that users consumed and paid much less water than expected, and hence the revenue was low. The project then tried flat rate tariffs. This led to more consumption, and also to more revenue.
- At solar-powered systems, only volumetric payment is possible.

The payment by cashless cards was tried but in many instances the form of payment by cash is preferred.

For cashless cards, payment devices are needed which require electricity, which is not always reliably available. In addition, digitisation rates are low, especially among the elderly women working as caretakers.

These payment modalities were introduced through a number of supporting measures. These include:
- A gender and pro-poor household survey study (UDUMA project, 2020). This gave insight into payment practices prior to the project, as well as willingness and ability to pay for improved services, for different groups of households.
- Ensuring regulatory support through the delegation contracts. The delegation contracts indicate that the private operator can charge tariffs, and even indicate the volumetric payment. Contracts had to be adjusted to reflect the shift to flat rate tariff structures.
- Experimenting with different payment modalities. As indicated above, the project started with the volumetric tariff structure and cashless payment modality. However, it started experimenting with flat rates, and also accommodated payment by cash, whilst the cashless modality was being tried out.

Perspectives on the functioning of the payment modality

The most recent progress report (Vergnet-Hydro/Uduma, 2022) provides insight into user preferences, indicating:

- On handpumps, a flat fee payment has been progressively introduced. This system led to an important increase of the consumption at manual pumps and a better recovery rate. At the time of writing that progress report, 197 out 248 handpumps have shifted to flat rates, indicating also the preference from users. Moreover, it reduces the overhead in the sense that there is no need to measure water consumption.
- On solar-powered pumping system, water is paid per volume in cash. The solar facilities are highly appreciated. In fact, Vergnet-Hydro / Uduma (2020) indicates that initially many villages rejected rehabilitation of handpumps, wishing to rather have higher levels of service, as can be provided through solar-powered systems. And indeed consumptions as well as payments are higher than on the manual pumps per volume.

The government's perspective on payment modalities is as follows:
- In general there is a preference for volumetric payment, as also defined in national regulations. However, it recognises that volumetric payment does not really work for handpumps. In such cases, a flat rate is acceptable.
- There is also a preference for pre-paid systems. But it recognises that such a system may result in under-use by the most vulnerable populations. In such cases, ideally cross-subsidy mechanisms should be employed.

- The government has observed that there is a shift towards mobile payment, away from payment by cash – particularly in (peri)-urban settings. The government is considering whether there is need for regulations on mobile payments.

Mozambique: partial payments in the Sustainable Water Services project in Beira

Context

The Sustainable Water Services project (contract number FDW14MOZ02) is focused on the reduction of commercial and physical losses in the central water supply of the city of Beira in Mozambique and the surrounding settlements. The project is implemented by the asset holder in Beira, FIPAG (Área Operacional da Beira) together with VEI and WSUP (Water and Sanitation for the Urban Poor).

In this area, most users have household connections, either in the form of yard taps or in-house plumbing. All these connections are metered. There are very few public standposts and this number is reducing. In order to get a household connection, users have to pay a connection fee. In the past, there have been subsidies from the World Bank, and from the government, for these connection fees. But otherwise, users have to pay the full amount, either one-off, or in instalments.

Next to commercial losses (water that is consumed but not invoiced, due to for example unauthorized connections or inaccurate meters or reading) there are concerns around collection efficiency, which refers to invoiced bills which are not paid, which lead to debt accumulation, which at some point may need to be written off as a loss.

One possible reason for problems with collection efficiency is that monthly bills are too high for low-income users. The cashflow situation of such low-income households is often such that they cannot make savings to pay the entire bill at once, and therefore end up not paying at all.

Objective and set-up of the payment modality

The objective of the payment modality is to facilitate water bill payment in a way that is more in line with the cashflow situation of low-income households, so that it will a) make it easier for households to do the payment, and b) result in less unpaid water bills.

The set-up of the modality is one whereby users pay the bill in a number of small instalments, rather than all at once. The payment modality is one of post-payment, so paying the bill after having consumed the water. The payment can be done at the nearest FIPAG office or in small shops that are equipped with portable payment devices.

The introduction of this payment modality takes place in a context where mobile payments had already been introduced. Devices that can receive payments for water (and other public services) are widely available in small neighbourhood shops. In order to facilitate the the partial payments, only an app had to be installed, in order to spread out the payment over a number of instalments.

In order to promote this payment modality, the introduction started with a household survey to get more insight into cashflow and payment preferences from households. This was followed by a campaign to mobilize people to pay using this modality. Moreover, once introduced the data on payment were monitored to follow on whether the payment modality was being followed.

A second modality was to be introduced as well, whereby the service provision would be delegated to a community-based organisation (CBO). Under that modality, the utility would sell water in bulk to the CBO, and the CBO would collect money from users. That payment modality would reduce the risk of non-payment to the utility, and moreover reduce the transaction costs of receiving many small payments. However, this modality was not piloted in the end.

Perspectives on the functioning of the payment modality

Two studies were undertaken to assess the functioning of the payment modality (WSUP, 2020; WSUP 2022). The main findings from the study were:

- A relatively small percentage of users made use of this modality. In the initial period only some 7% of the users made use of this modality – though those who did, did so regularly.
- Yet, overall, payment rates, and hence collection efficiency went up from 65% to an estimated 92% (Bouman, 2022; WSUP, 2020) in the first period (2019).
- The extent to which the payment modality was used was strongly correlated with the number of days the system of payment devices was working.

At the moment of evaluating the project overall, it was not yet clear whether FIPAG would continue this pilot.

The national independent regulator, AURA, has not been part of the pilot, nor have the results been actively shared with AURA.

The Philippines: payment modalities in the Sustainable and Resilient Pro-poor Water Supply project in Cebu

Context

The primary of the Sustainable and Resilient Pro-poor Water Supply Project in Cebu (project code FDW14PH03) is to improve sustainability of the Metro Cebu Water District (MCWD) utility, by adding to its infrastructure and increasing its customer base, with a particular focus on the extremely vulnerable, very poor families living in the Cebu slums.

Even though expanding the customer base is a key priority for MCWD, it faces both supply- and demand-side limitations in that (VEI, 2014). On the supply-side from the utilities' perspective, expanding into a low-income area presents a financial risk. Revenue from such areas is often low, not only because consumption is low, but also because tariff levels are insufficient to recover investment costs. Also users themselves face hurdles in connecting. Not only does a connection fee of 4950 PHP (~90 Euros) have to be paid; also households are responsible for providing the last stretch of pipe between the stub-outs (i.e. clusters of sturdy branches on the main pipes) and the homestead, which may cost another similar amount, making it very costly to users. Moreover, MCWD has a number of legal requirements, which many informal dwellers cannot provide. Finally, low-income users struggle to pay the monthly water bills in one go.

Two payment modalities have been introduced as part of a broader set of project activities to increase access to services among low-income users: 1) connection fee instalment scheme and 2) having an intermediary between the utility and users, with high frequency payment of water bills.

Objective and set-up of the payment modalities

Connection fee instalment scheme

Initially the project provided a subsidy to low-income households in order to overcome the hurdle of initial connection fees. When the money available for such a subsidy was depleted, a trial was started with 100 households, who could spread the payment of their connection fee over 12 monthly instalments.

The objective of this payment modality is to facilitate the payment of the connection fee in a way that is more in line with the cashflow of low-income users, so that eventually more households get connected.

The users don't pay the full connection fee upfront, but rather in instalments over 12 months. The instalments are free of interest or any other administrative penalty. These instalments are added to their regular water bills. In this way users can start using the service without having to wait until all instalments are paid.

Having an intermediary, with high-frequency payment of water tariffs

Having an intermediary between users and MCWD is broader than just a payment modality; it is a set-up that seeks to scale up access to services in - largely informal – low-income settlements. Within that, a modality of high-frequency payments for water tariffs is applied.

Under this set-up, MCWD provides bulk water to the boundary of the low-income area complete with a larger revenue water meter. From the bulk meter, two subsidiaries of the NGO Eau et Vie (E&V), called Water and Life (an NGO) and Tubig Pagasa (a social enterprise) are responsible for the further water distribution and other WASH activities. This consists of the following steps:

- Water and Life, carries out detailed studies and surveys to confirm the viability of the sites identified, ensuring that legal requirements are in place, and confirming the number of households that are willing to connect. Overall, this step seeks to confirm that the low-income area 1) continues to exist and is not subject to relocation in the short term; 2) has the minimum number of customers; 3) can continue to run the water service operations sustainably and 4) continues to receive a secure bulk water supply.
- Water and Life will design, procure and install the distribution network downstream of the bulk meter, consisting of inter-connection pipes and taps with individual household water meters in line with standards set by MCWD, as it is expected that MCWD will in the future take over the distribution network. This is grant funded by Eau et Vie
- Once constructed, Tubig Pagasa becomes responsible for the operation, maintenance and administration of the distribution of water between the bulk meter and the household meters. It is thus essentially then a service provider.
- Tubig Pagasa signs water connection contracts with the new customers, and customers start paying for the service.
- Tubig Pagasa takes responsibility for other community activities including emergency response planning (ERP), solid waste management and WASH interventions. These are all paid for from the water tariff.

There are two forms of payment under this set-up:

- High-frequency payment of water tariffs. Tubig Pagasa offers users the possibility to pay their water bills on a high-frequency basis: every couple of days, or even every day if they want. The bill collectors have mobile devices with an app which contains a ledger per customer. Customers can choose to pay the amount of the ledger that is due and that fits their cashflow. In that way, they don't have to pay a larger accumulated amount by the end of the month. In addition, the customer can overpay and hence be in credit. This encourages them to save for a time when they have
- less disposable income, or it allows the billing frequency to be reduced.
- Users pay for the tariffs for their household water consumption to Tubig Pagasa. Tubig Pagasa in turn pays MCWD for the bulk water consumption. So, also in terms of payment Tubig Pagasa is an intermediary between users and MCWD. Tubig Pagasa's water tariff is more than double that of MCWD, but for good reasons:
  - The billing and collection overheads are much higher as this can be up to five times per week compared to MCWD's monthly billing cycle
  - The additional ERP, solid waste management and WASH activities are funded from the water tariff
  - Customers are charged on their actual consumption, whilst MCWD charges customers a minimum 10m3/month. Families in the low-income communities use far less than 10m3/month and so on balance, a typical MCWD bill is of similar value to a Tubig Pagasa bill despite the large difference in tariff.

Perspectives on the functioning of the payment modality

The results from these two payment modalities are described in the regular monitoring reports of the projects, and were confirmed though interviews, and include:

The trial with the payment of the connection fee in instalments was such a success that this payment option is now available to all households – whether low-income or not - to be served by MCWD. To date, project wise, there are 3,202 subsidised connections and 2,223 payment by instalment connections. MCWD implemented campaigns promoting the subsidized connections but also referred potential customers to the 12-month instalment fee option. This led to a 114% increase in instalment scheme connections since March 2020. The main benefit is that users don't have to wait until they have saved up enough money to connect but can already connect and enjoy the services. That in turn also means that MCWD starts receiving revenue from water consumption. Moreover, this modality also improves the image of MCWD in being a pro-poor focused utility.

The number of areas and households served by Tubig Pagasa is higher than the revised project target. Even during the COVID pandemic, there was a high growth in the number of households that got connected under this modality. The main benefit of this modality is that it allows serving neighbourhoods that cannot be served readily and directly by MCWD, as the legal and technical requirements cannot be fulfilled. Moreover, MCWD sees this as a positive set-up, and is developing a Memorandum of Agreement between MCWD and E&V. The second mid-term evaluation of the project concludes that the E&V MCWD partnership has proven to be a very good example of a social enterprise-utility collaboration for the benefit of very poor families.

Within that, the modality of high-frequency payment of water bills is seen as positive, as it is more attuned to the reality of cashflow of low-income users. But the disadvantage is that the transaction costs are very high. It is very labour intensive to collect water tariffs on an almost daily basis. This is one of the reasons that contributes to the fact that water tariffs charged by Tubig Pagasa are higher than those of MCWD. However, this higher tariff also represents an additional service to the users. Moreover, this tariff also covers additional WASH-related services. And there is no minimum charge compared to MCWD.

Rwanda: pre-paid water meters in the SCALE project

Context

The project "Scaling universal access to safe and climate resilient water services in Rwanda, with a focus on small towns (SCALE)", (Project code: FDW 17181RW) aims to accelerate provision of water services to the residents of small towns in Rwanda, by implementing and demonstrating appropriate approaches to improve operational performance of WASAC (Water and Sanitation Corporation, the national public water utility) at two of its branches: Nyagatare and Rwamagana.

WASAC provides water to urban dwellers, usually through household connections. However, many low-income households cannot pay the connection fee, consisting of the cost of materials and an administrative fee. In such cases, people have to fetch water from a public standpipe or kiosk. These kiosks form a system of informal vending, whereby the kiosk owner buys water in bulk from WASAC and re-sells it to the end users. The price that kiosk owners charge is not effectively regulated and cannot be enforced. This results in low-income households often paying a much higher unit cost (VEI, nd.)

Objective and set-up of the payment modality

In view of the above, the SCALE project intends to install at least 200 public standposts but making these pre-paid dispensers. The objective of that is to cut down on the excessive prices that intermediaries, like kiosk owners, charge. As the project plan states: "*Prepaid water supply will be piloted as a means to eliminate the extra cost of water vending*". That would have the dual objective of: 1) users being able to access an affordable service, and 2) the utility increasing its revenue stream, as the unit cost to the user would be lower, they may consume more.

The project recognises that from experiences from other utilities transitioning to pre-paid dispensers to increase revenue collection while removing intermediaries, reveals that it is often difficult to achieve intended results. Reasons include: 1) technical limitations and problems with the meters; 2) costs and capacity of maintenance of the meters, 3) issues with obtaining credit to charge the token or tag necessary for the dispenser, and 4) resistance by the intermediaries.

In order to assess the specific opportunities and constraints in the context of Rwanda, a phased pilot approach is done. During that pilot, specific emphasis is given to:

- Adaptation of the pre-paid dispensers to the existing WASAC Customer Metering System (CMS).
- Ease to integrate WASAC tariff into the pre-paid metering system.
- Hardware adaptation to the operational conditions in the target branches.
- Requirements for operation and maintenance of hardware. Requirements for maintenance of software including updates and (or) upgrades.
- Ease with which customers buy and load tokens.
- The mobility of the unit.
- The cost for necessary hardware replacement of the pre-paid dispenser.

Perspectives on the functioning of the payment modality

At the moment of doing this research, only the technical evaluation of two types of pre-paid meters was made (Kabaasha and Niringiyimana, 2022). On the basis of that, a specific model has been selected. This will now go into a second round of piloting.

Uganda: alternative approaches and tools for improved water supply and sanitation

Context

The project "Alternative approaches and tools for improved water supply and sanitation (ATWATSAN)", (FDW project code FDW14UG43) aimed to test technologies and financial elements of the pro-poor strategy that had been developed for improving water services to poor households in small towns in Uganda. The project is implemented in six districts and three towns of Uganda from October 2018 till September 2022.

The rationale for the project finds its origins in the need to improve on the common approach to pro-poor water supply service delivery in Uganda. The standard approach consists of providing access through public standpipes, which are operated by a caretaker. Users don't contribute to the costs of installing public standpipes, but they do pay user charges for the consumption of water. Caretakers are remunerated for their services through the difference between the price for which they buy water from the utility and the price for which they can resell it to users. This approach has a number of limitations:

- Users can only access water when a caretaker is there. This means that they cannot get water outside the working hours of the caretaker, usually in the morning and early evening.
- Sometime caretakers abuse their position and sell at a higher price.
- Caretakers do not always pay in time to the utility resulting in service disconnection and disputes.
- Though caretakers are responsible to buy and replace gate valves, taps and pipes after the water meter when broken, this does not always happen.

In response to these limitations, the ATWATSAN project implemented alternative pro-poor approaches. Moreover, the aim was that a revised pro-poor strategy framework for WASH would eventually be rolled out in the entire country. The utility, National Water and Sewerage Corporation (NWSC) has been extending its services to provide water to small towns in addition to major towns in Uganda.

However, the pro-poor strategy had been applied only in Kampala city before the ATWATSAN pilot project. Hence, there was a need to scale the pro-poor strategy to other areas.

Objective and set-up of the payment modality

As part of the pro-poor strategy, different types of access points are provided, with different payment modalities:

- **Public standpipes**. These are usually installed based on either of two approaches: 1) as part a service agreement contract between NWSC and government demanding at least two public standpipes per community; or 2) a demand-driven approach whereby individuals apply to NWSC, who then will do the installation, after checking some required criteria such as distance from other public standpipes, but also an upfront payment. So, under the demand-driven approach a contribution to the installation costs is required. Public standpipes are managed by caretakers – usually females - who are usually selected by the community together with the utility. Two types of institutional arrangements for the caretaker, and his/her remuneration are in place. In systems managed by NWSC, the caretaker is an entrepreneur who gets a remuneration from the difference in price between buying the water from NWSC and selling it to users, through the pay-as-you-fetch system. But in rural areas, where water is provided by rural utilities – called Umbrella Authorities – caretakes receive a fixed amount of money per month. This mitigates against the risk of caretakers overcharging. The payment modality is thus one of pay-as-you-fetch. Regular and high-volume users like businesses can use water on credits and settle the credits weekly.
- **Water kiosks**. Water kiosks are similar to public standpipes, except that they have sheds or houses covering them, but do not have concrete slabs. The institutional arrangements and payment modalities are also similar to those at public standpipes.
- **Household connections**. Though the provision of household connections was part of the ATWATSAN project, it did not consider subsidies for such connections as part of a pro-poor strategy. The connection fee to be paid depends on the distance of a house to be connected and the main pipeline. There is a high degree of interest for house connections, but the connection fees form a barrier as they are unaffordable to users. A review by the ATWATSAN project indicated that lowering house connection fees would enable more households to get connected. The ATWATSAN project tried to achieve this by: 1) making changes to the engineering designs, 2) easing the need for collateral for household connections without upfront payment, 3) paying the connection fee in instalments over time, and 4) providing subsidies for household connections.

Perspectives on the functions of the payment modality

Public standpipes and kiosks

- The pay-as-you-fetch payment modality at public standpipes suffers from problems encountered under this system elsewhere, whereby caretakers abuse their position and overcharge the price for which they resell the water. And then the utility takes measures such as disconnecting the caretakers, users suffer the consequences. In response to that, there is the intent to use pre-paid water meters (Brouwer, 2021).
- Nevertheless, most of the public standpipes function well, with only few of them having issues such as leakages, low pressure, and intermittent supply due to power outages.
- The high density of public standpipes is advantageous to users, as it reduces walking distance, but is disadvantageous to caretakers as it means fewer customers per public standpost and hence less revenue.

Household connections

- As there are no subsidized household connections, the payment of the normal connection fee appears to be prohibitive for users.
- Moreover, people are afraid that the bill for user charges may be high. Brouwer (2021) mentions that people have challenges to understand VAT, know that the user charges consist of a fixed fee and a consumption-based tariff, and find it hard to estimate their monthly usage. However, if a household uses more than three jerrycans per day, it is cheaper to pay for the user charge via household connections than the subsidized water sold with profit by caretakers.
- Nevertheless there is 'competition' between household connections and public standpipes. In places with a high density of public standpipes, people stop using household connections and prefer to use the lower tariff at public standposts.

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